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Physicochemical Evaluation of Fruits of Some Sudanese Date Cultivars

Khalifa T. Ali[1] and Osman A.Sidahmed[2]
Faculty of Agricultural Sciences,
University of Gezira, Wad Medani
Sudan

Abstract

Fruit samples of 12 date cultivars were collected at the beginning of the rutab and tamar stages for physicochemical analysis. Physical and chemical characters showed significant ($P < 0.05$) differences among cultivars. The data obtained from physical characters revealed a decrease in all parameters studied from rutab to tamar stage except dry weight which increased from rutab to tamar stage. Chemical analysis indicated small amounts of ether extract, crude fiber, crude protein, and ash, while sugars predominated. Total sugars as well as reducing sugars were higher in the tamar stage than at the beginning of rutab. Sucrose content was higher at the beginning of rutab stage than at tamar stage. In general the majority of date cultivars investigated were found to be of the soft date type characterized by the dominance of reducing sugars.
Key words: Date-palm: Fruit; quality.

تقييم فيزيوكيمائي لثمار بعض أصناف البلح السوداني

خليفة طه علي وعثمان علي سيد أحمد
كلية العلوم الزراعية ـ جامعة الجزيرة ـ مدني ـ السودان

الخلاصة :

عينات من ثمار ١٢ صنف من أصناف البلح تم جمعها في بداية طوري الرطب والتمر للتحليل الفيزوكيمائي . الصفات الفيزيائية (الطبيعية) والكيميائية أظهرت

[1]Present address: Department of Horticulture, P.O. Box 194, Kassala, Sudan.
[2]Corresponding Author.

فروقات معنوية (احتمال ٥٪) بين الاصناف. الاحصائية التي تم الحصول عليها من الخواص الطبيعية أظهرت انخفاضا في كل المعايير التي تمت دراستها من طور الرطب الى طور التمر فيما عدا الوزن الجاف الذي ازداد من طور الرطب لطور التمر. التحليل الكيمائي دل على كميات صغيرة من مستخلصات الايثير والياف الخام والبروتين الخام والرماد حينما سادت السكريات. السكريات الكلية والسكريات المختزلة كانت أعلى من مرحلة التمر عنها في بداية طور الرطب. محتوى السكروز كان أعلى في بداية طور الرطب عنه في طور التمر. من الناحية العامة كانت الغالبية من الاصناف التي تمت دراستها من النوع الناعم وتميزت بسيادة السكريات المختزلة.

Introduction

Dates are a staple food in many desert areas. Their high energy value and good storability make them an ideal crop in places where they can be grown (Rygg, 1977). In general, dates are considered to be a good source of sugars (Hans, 1935).

Sudan, like most other date-palm-growing countries has its own indigenous date cultivars. The long, hot, dry summers with low relative humidity make Northern Sudan an ideal location for date palm culture. Production of dates in the Sudan was estimated at 116 thousand metric tons (FAO, 1983).

The suitability of date cultivars from the consumer's point of view are usually evaluated according to time of ripening, yield, storage quality and consumer preference. However, physical and chemical characteristics of fruits form one of the most important criteria for the evaluation of cultivars. This study was carried out to obtain more information about the physical and chemical properties of 12 Sudanese date cultivars at two different stages of development. Such information will improve the existing meager literature and provide a basis for future research on postharvest, composition and/ or processing aspects of dats.

Materials and Methods

Date fruit samples were collected from the cultivars Barakawi, Gondeila, Bentamoda, Deglet Noor, Asada, M.W. Lagai, M.W. Khateib, Madina, Bureir, Zaglouli, Umhat, and Sultani at rutab (when fruits begin to soften at the tips) and tamar (when fruits are fully cured) stages in August and September 1984, respectively.

The palms were 15 years old and grown in the Nuri government orchard, lo-

cated in the Northern Region of the Sudan (Latitudes 20° N). The region is characterized by long, hot, and dry summers, with low relative humidity which make it an ideal location for date palm production.

The trees were spaced 8×8 meters and arranged in a randomized block design with three replications. Fruit samples, each weighing one kilogram were picked at random from different bunches on the tree and from strands licated on different parts on each bunch. The samples were placed in perforated plastic bags and taken to the laboratory at the Faculty of Agricultural Sciences, University of Gezira, Sudan, for physical and chemical analysis.

External characteristics of fruit including length, width, length/width ratio, weight, pulp weight, seed weight, pulp/seed ratio, pulp dry weight, and moisture content were determined. Fruit color at both stages of development was assessed and recorded visually. The samples were dried and ground into fine powder for chemical analysis using a food blender.

Ether extract (crude fat), crude fiber, and ash content were determined by the standard methods of AOAC (1970). Crude protein was determined according to Mitchell (1972). Reducing sugars were estimated by the cuprimetric method of Nelson (1944) as modified by Asatoor and King (1954). Total sugars were estimated by Nelson's modified procedure (1944). The difference between the amount of reducing sugars before and after hydrolysis was taken as the amount of non-reducing sugars.

Results and Discussion:
Physical Characteristics

The data presented in Table 1,2,3 and 4 showed significant differences between cultivars in fruit physical characteristics which included fruit size, weight, pulp weight, seed weight, pulp/seed ratio, pulp dry weight, and moisture content at both stages of development.

Fruit size, which was presented as fruit length, width, and fruit length/width ratio differed greatly among the cultivars. The cultivars Barakawi, Bentamoda, and Gondeila showed no significant differences in fruit length. However, they produced significantly ($P < 0.05$) longer fruits than the other cultivars. The cultivars M.W. Lagai and M.W. Khateib produced fruits significantly ($P < 0.05$) lower in length/width ratio as compared to other cultivars. Madina produced significantly ($P < 0.05$) heavier fruits followed by Bureir, and both were significantly heavier than the other cultivars; while Umhat produced significantly ($P < 0.05$) lightest fruits. Significant differences in pulp weight, seed weight, and pulp/seed ratio were observed among the various cultivar. Madina gave fruits with signifi-

cantly ($P < 0.05$) heavier pulp while Umhat produced fruits with lighter pulps. The cultivars Zaglouli produced fruits with significantly ($P < 0.05$) heavier seeds than the other cultivars. Minimum pulp/seed ratios were given by Zaglouli, M.W. Lagai and Asada.

Significant variations in dry weight and moisture content were observed among the various cultivars. Bentamoda significantly ($P < 0.05$) produced the highest dry weight and Umhat produced the lowest. The highest moisture content was produced by Asada and the lowest by Bentamoda (Table 2). During the tamar stage all the physical characters revealed a decrease in all parameters studied compared to the rutab stage except dry weight which increased during the tamar stage (Table 3, 4). Variation in fruit characteristics of the date cultivars studied were expected since most of them were chance seedlings and genetically heterozygous. Differences in date fruit characteristics were reported independently by Mohamed et al. (1983) and Sawaya et al. (1983).

Although the relative size of the fruit is a varietal characteristic, yet it may be influenced by pollen number, number of fruits per bunch or palm, and soil moisture content (Nixon, 1950). Inadequate irrigation was reported (Abu-Khalid et al. 1982) to reduce fruit size. Dowson and Aten (1962) reported differences in fruit size between varieties and within a given variety, and that the longer dimensions and the heavier weights were characteristics of fruits at Khalal (color break) stage and the opposite was true for dates at tamar stage. Rygg (1977) reported a decrease in moisture content as fruit ripened.

Chemical Characters.

Crude fat content (Table 5) was found to be significantly ($P < 0.05$) different among and within investigated cultivars at the two stage of development. Crude fat ranged from 0.14 to 0.60% at the beginning of rutab stage and from 0.11 to 0.41% at tamar stage. Asada produced significantly the highest and Gondeila the lowest amount of fats at rutab stage, while Deglet Noor gave the highest and Bentamoda the lowest fat content at tamar stage (Table 5). The fat contents reported in this investigation were comparable to those reported by Yousif et al (1982) and Sawaya et al. (1983).

Crude fiber contents (Table 5) of fruits from all cultivars were high at the beginning at rutab stage and decreased as fruits ripened. Crude fiber ranged from 1.76 to 8.00% at the beginning of rutab stage and from 1.30 to 4.08% at tamar stage. Significant differences ($P < 0.05$) between cultivars were observed at both rutab and tamar stages (Table 5). These results were similar to those reported by Yousif et al. (1982) and Sawaya et al. (1983).

Ash content of fruits (Table 5) showed significant differences between culti-

vars and ranged from 1.81 to 3.34% at the beginning of the rutab stage and from 1.37 to 2.81% at tamar stage. Haas (1935), Yousif et al. (1982), Sawaya et al. (1983), and Baangood and Ahmed (1984) reported similar findings.

Crude protein conttent (Table 5) ranged from 2.40 to 4.06% at the beginning of rutab stage and from 1.25 to 2.92% at tamar stage. These results were in agreement with Yousif et al. (1982), Sawaya et al. (1983) and Bangood and Ahmed (1984).

The significant differences observed in crude fat, crude fiber, ash content and crude protein among the investigated cultivars could be attributed to variations in cultivars, since they received similar cultural practices and were grown under the same climatic and environmental conditions.

Total sugars, reducing sugars and sucrose (Table 6) were calculated on dry weight basis. Total sugars varied from 56.72 to 91.87% at the rutab stage and from 69.79 to 94.79% at tamar stage. Reducing sugars ranged from 14.94 to 58.88% at rutab stage and from 36.67 to 83.75% at tamar stage Sucrose content varied from 21.82 to 68.05 at rutab stage and from 1.25 to 58 13% at Lamar stage. These results indicate that total sugars as well as reducing sugars were higher at tamar stage than at the beginning of rutab stage, while sucrose content was higher at the beginning of rutab stage than at tamar stage.

It has been reported by several investigators (Osman and Boulos, 1977; Rygg, 1977; Yousif et al., 1982; and Sawaya et al., 1983) that soft dates contain higher quantites of reducing sugars and lower quantities of sucrose than semi-dry and dry types. The sugar content of the investigated date cultivars revealed that the cultivars Asada, M.W. Lagai, M.W. Khateib, Madina, Bureir, Zeglouli, Umhat and Sultani had a high content of reducing sugars (62.92-83.75%) and a low content of sucrose (1.25-7.92%) at the tamar stage. Consequently, these cultivars could be classified as soft date types. However, Osman and Boulos (1977) reported that M.W. Lagai and M.W. Khateib had the advantage of being raisin-dried and treated as dry cultivars. At the tamar stage reducing sugar content of Barakwi, Gondeila, Bentamoda and Deglet Noor cultivars were relatively small (36.67-56.67%) while sucrose content was high (15.21-58.13%) (Table 6), and they were, therefore, classified as dry types. Deglet Noor was categorized as a semi-dry date type by Rygg (1977) and Osman and Boulos (1977).

LITERATURE CITED

1- Abou-Khalid, A., S. A. Chaudhry, and S. Abdel Salam. (1982): Preliminary results of a date palm irrigation experiment in central Iraq. Date Palm J. 1(2): 99-232.
2- AOAC. (1975): Official Methods of Analysis. Association of official Analytical Chemists, Washington, D.C. 2nd Ed.
3- Asatoor, A., and E.J. King. (1954): Simplified colorimetric blood sugar method. Biochem. J. 56 XIV:.
4- Ba-angood, S.A.,M. Ahmed, and M. Shamshad. (1984): Chemical composition of major date cultivars grown in the United Arab Emirates. Date palm J. 3(2): 381-394.
5- Chatfield, C. and G. Adam. (1940): Proximate composition of American food materials. Circ. No. 545. U.S.D.A., Washington, D.C.
6- Dowson, V.H.W. and A. Aten. (1962): Date handling, processing and pakking. FAO, AGric. Development. Paper 72, 392 pp. Rome.
7- Food and Agricultural Organization. 1983. Production year book. FAO, Rome.
8- Haas, A. R. C. (1935): Inorganic composition of date fruits. Date grower's Inst. Rept. 12:6-8.
9- Mitchell, H. L. (1972): Microdetermination of nitrogen in plant tissue. Journal of AOAC 55: 1-3.
10- Mohamed, S., H. R. Shabana and E. A. Mawlod. (1983): Evaluation and identification of Iraqi date cultivars: Fruit characteristics of fifty cultivars. Date palm J. 2(1): 27-55.
11- Nelson, N. (1944): A photometric adaptation of the Somogyi methods for the determination of glucose. J. Biol. Chem. 153-375.
12- Nixon, R. W. (1958): Imported varieties of dates in the United States. U.S-.D.A. Circ. No. 834. Washington, D.C. 144 pp.
13- Osman, A. M. A. and N. N. Boulos. (1977): Evaluation of some Sudanese date cultivars. Acta. Hort. 84:185-190.
14- Rygg, G. L. (1977): Date development, handling and packing in the United States. U.S.D.A. AGric. Handbook No. 482, Washington, D.C.
15- Sawaya, W. N., A. M. Mishi, J. K. Khalil, H. A. Khatachadourian and A. S. Mashadi. (1983): Physical and chemical characterization of the major date varieties grown is Saudi Arabia. I-Morphological measurements, proximate and mineral analyses. Date palm J. 2(1): 1-25.
16- Sawaya, W. N., W. M. Safi, L. T. Black, A. S. Mashadi and M. M. Al-Maham-

med. (1983): Physical and chemical characterization of the magor date varieties grown in Saudi Arabia. II-Sugars, Tannins, Vitamin A and B. Date Palm J. 2(2): 183-196.

17- Yousif, A. K., N. D. Benjamin, A. Dado, S. M. Aidin and S. M. Ali. (1982): Chemical composition of four Itagi date cultivars. Date palm J. 1(2): 285-294.

Table 5. **Ether extract (fats), Fibre, Ash and Protein content (dry weight basis) of twelve date cultivars grown in Nuri (Northern Region), Sudan.**

	Ether Extract %		Crude Fiber %		Ash %		Protein %	
Cultivar	R	T	R	T	R	T	R	T
Barakawi	0.48ab	0.030abcd	2.13h	1.63ef	2.91c	2.81a	2.92b	2.92a
Gondeila	0.14c	0.12e	4.59d	2.88c	2.58e	2.21de	3.44ab	2.92a
Deglet Noor	0.45ab	0.41a	5.55c	1.88e	1.91g	1.62h	2.10b	1.25b
Asada	0.60a	0.37ab	7.19b	3.29b	1.81h	1.68h	3.44ab	1.88ab
M.W. Lagai	0.59a	0.31abcd	9.23f	1.30g	2.71d	2.24cd	3.02ab	1.25b
M.W. Khateib	0.38b	0.16de	2.30gh	1.52fg	1.84gh	1.70h	2.40b	1.25b
Medina	0.44ab	0.24bcde	2.57g	1.50fg	3.28a	1.86g	3.44ab	1.88ab
Bureir	0.47ab	0.12e	1.76i	2.40d	2.77d	2.41b	4.06a	1.88ab
Zaglouli	0.17c	1.16de	8.08a	4.08a	3.14b	2.03f	2.92b	1.88ab
Umhat	0.20c	0.20cde	4.50d	2.97c	2.41f	2.12ef	2.92b	2.40a
Sultani	0.37b	0.32abc	3.33e	1.85e	3.34a	2.32bc	4.06a	1.25b
S.E. ±	0.0491	0.472	0.0866	0.0868	0.294	0.029	0.3167	0.3348

- R = Beginning of rutab stage.
- T = Tamar stage.
- Mean separation within columns is by Duncan's multiple test at 5% level.

Within a column means with the same letter in common do not differ significantly according to Duncan's multiple range test.

Table 6. Total sugars, reducing sugars and sucrose (dry weight basis) of twelve date cultivars grown in the Sudan.

	Total Sugars %		Reducing Sugars %		Sucrose %	
Cultivar	R	T	R	T	R	T
Barakawi	71,07d	71.88bc	48.69b	56.67d	22.37e	15.21c
Gondeila	91.87a	94.79a	31.82f	36.67f	60.05a	58.13a
Betamoda	75.23c	79.19b	35.97e	44.17e	39.26b	35.00b
Deglet Noor	56.72f	78.75b	14.94g	40.00ef	41.78b	38.75b
Asada	65.87e	69.79c	41.50d	62.92c	24.37de	6.88de
M.W. Lagai	67.95e	70.84c	45.83bc	69.58b	22.02e	1.25e
M.W. Khateib	71.07d	75.00bc	49.27cd	72.50b	21.82e	2.50de
Medina	67.95e	69.79c	44.27cd	66.67bc	23.68e	3.13de
Bureir	85.97b	88.54a	58.88a	86.67a	27.09cd	1.88e
Zaglouli	67.95e	72.92bc	45.93bc	66.67bc	22.02e	5.84de
Umhat	67.95e	72.92bc	45.93bc	67.92bc	22.02e	5.10de
Sultani	88.775b	91.67a	58.88a	83.75a	29.86c	7.92d
S.E. ±	0.9031	2.252	1.1874	1.78	0.8635	1.7728

- R = Beginning of rutab stage.
- T = Tamar stage.
- Mean separation within columns is by Duncan's multiple test at 5% level.

Within a column means with the same letter in common do not differ significantly according to Duncan's multiple range test.

Evaluation of some exotic date-palm cultivars for bunch and fruit characteristics at "Khalal" stage grown under North Indian conditions

N.S. Nchra, K.S. Chauhon, N.R. Codara and R.K. Godara
Dept of Horticultnr Haryana Agriculture Uuin.

ABSTRACT

Six date-palm (Phoenix dactylifera L.) cultivars grown under North Indian conditions were evaluated for their bunch and physico-chemical fruit characters at "Khalal" stage. The minimum and maximum mean temperatures during harvesting period (August) were 22.8°C and 38.8°C, respectively. Shamran cultivar

N.S. Nehra, K.S. Chauhan, N.R. Godara and R.K. Godara.
Department of Horticulture.
Haryana Agricultural University.
Hisar- 125 004. India.

دراسة الصفات الكيموفيزياوية لثمار وعذوق بعض أصناف النخيل في مرحلة الخلال في شمال الهند

ن. س. نهرا، ك. س. جوهون، ن. د. كودرا، ر. ك. كودرا
قسم البستنة ـ جامعة هريانا الزراعية

الخلاصة

تم دراسة الصفات الكيموفيزياوية لثمار وعذوق ست اصناف من اشجار النخيل في مرحلة الخلال النامية في شمال الهند. حيث بلغ اعلىٰ معدل لعدد العذوق في النخلة الواحدة (١٣ر٧) في الصنف شمران في حين كان الصنف زهدي هو اقل (٧) عذقة اما الصنف زغلولي فقد سجل اعلىٰ معدل وزنه وهو (١٢) كغم. اما الصنف شمران فقد سجل (٤٢ر٤) كغم، كانت شمارغ الصنف حلاوي، خضراوي زهدي قصيرة بينما كانت طويلة في الاصناف زغلول، مجهول، شمران. اما من ناحية اللون فقد كانت جميع الاصناف صفراء اللون ماعدا الصنف زغلول فقد كانت ثماره حمراء. كما ان اعلى معدل وزنه للثمرة فقد كانت للصنف مجهول (٥٧ر١٩) غم يتبعه صنفي زغلول والحلاوي اما افضل نوعية فقد كانت في الصنف حلاوي.

recorded the highest average number of bunches per palm (13.7) whereas zaidi cultivar had the lowest number of bunches (7.0). The average bunch weight was the maximum in zagloul (12.27 Kg) and the minimum in Shamran (4.42 Kg). Three cultivars viz., Hillawi, Khadrawi and Zaidi were found to be short stranded whereas, Zagloul, Medjool and Shamran were long stranded. The number of strands per bunch and number of berries per strand were highest in zagloul and lowest in Hillawi. The fruits of all the cultivars were yellow in colour except that of zagloul which were red. The fruits of Hillawi were comparatively very sweet in taste and the rest were less sweet. The fruits of cultivars Medjool and Shamran were astringent at doka stage. The average weight of fruit was maximum in Medjool (19.57 g). followed by zagloul and Hillawi wherwas it was minimum in zaidi (6.47 Kg). The cultivar Hillawi produced the fruits of best quality with highest T.S.S (29.1%). maximum reducing sugars (76.13%) and lowest acidity (0.12%). The fruits of cultivars Hillawi and Khadrawi having negligible amount of sucrose were confirmed as soft type dates and the other four cultivars containing higher proportion of sucrose were categorised as semi-dry type dates.

INTRODUCTION

Date-palm (Pheonix dactylifera L.) is not yet cultivated commercially in any part of India. The wilm grooves of seedlings are, however, found growing in the coastal belt of Western India since long which indicated the possibility of successful date cultivation in some parts of the country. Hence during 1954-62 some good varieties from U. S. A., Iraq and other Middle-East countries were introduced in India for the first time to explore the possibility of their commercial cultivation in selected parts of Northern-Western India. The performance of these plantations have been satisfactory and now on the basis of various climatic parameters and availability of water resources, the potential date growing regions of India have been identified (Pareek, 11). At present there are 34 known cultivars of date-palm in India, of which 8 are available at Hisar (Haryana) in North India which is one of the selected centres for date-palm researeh. Unlike the Middle-East countries, the fruits do not attain full ripening at this centre and are generally harvested at Khalal stage to avoid spoilage due to ensuing rain and high humidity. In the present study, an attempt has been made to describe date cultivars available at the centre for bunch and fruit characters.

MATERIALS AND METHODS

Five representative palms of about 10-year age of each of the six cultivars grown at experimental orchard of the Institute were selected for recording ob-

servations on various bunch and fruit characters.

The data were recorded on number of bunches per plant, weight of bunch characters such as length of bunch, length of bunch stalk, number of strands per bunch, average length of strand and number of berries per strand.

For recording observations on various physical and chemical fruit characters, ten samples of 25 fruits each of all the six cultivars were taken at Khalal stage. The fruits were harvested in the month of August when the minimum and the maximum mean temperature weree 22.8°C and 38.8°C, respectively. The total soluble solids (T.S.S.) were determined with the help of hand refractometer. The fruit samples were analysed for moisture, sugar and acidity using A.O.A.C. (1) procedures. The astrengancy and sweetness were evaluated by organoleptic tests.

RESULTS AND DISCUSSION

Bunch Characteristics: The date on various bunch characters are given in Table 1. The number of bunches per palm varied from 7 to 14 with the maximum in Shamran and the minimum in zaidi, pareek and Muthana (10) have also reported the highest number of bunches per palm in Shamran. The average bunch weight was maximum in Zagloul, closely followed by Medjool and the minimum in Shamran. The cultivars Medjool. Zagloul and Shamran were categorised as long stranded with longer bunches and larger number of strandsper bunch, whereas the other three cultivars were found to be short stranded, carrying smaller bunches and lesser number of strands per bunch. The number of barries per strand were maximum in Zaglool and minimum in Hillawi. However, Chohan et al (2) recorded maximum number of fruits per strand in Hillawi and the minimum bunch number and number of strands per bunch in Medjool.

Physical fruit characteristics: The data in Table 2, show that fruits of all the cultivars were yellow in colour at Khalal stage, except that of Zagloul which were red. The fruit of Shamran had pinkish flush. Hussein et al (4) classified eighteen Saudi Arabian date cultivars on the basis of colour at Khalal stage and observed that the most reliable character in identification of date-palm is the colour of the berries.

The shape of the fruit is another important characteristic on the basis of which all the six cultivars could easily be differentiated. The fruits of Zagloul were oblong in shape whereas that of Khadrawi were oblong ovate. The berries of Medjool were oval and that of Zaidi were ovate. The other two cultivars i.e. Shamran and Hillawi were having oblong fruits but the fruits of Shamran were distinct by the presence of a curve in middle. one one side of the fruit. The shape of

the fruit apex was round in Hillawi and Khadrawi, where eas in others it was tapering. The base was slightly prominent in all the cultivars except Shamran where it was prominent.

In organoleptic rating indicated that fruits of Hillawi were very sweet in taste at Khalal stage, whereas that of Khadrawi, Zagloul and Zaidi were less sweet. The fruits of Medjool and Shamran were rated as astringent. The weight of the fruit ranged from 6.47 g in Zaidi to 19.57 g in Medjool. The highest length of the fruit (4.87 cm) was obtained in Zagloul, closely followed by Medjool (4.78 cm) and it was found to be lowest (3.26 cm) in Zaidi. The breadth of fruit was maximum (2.77 cm) in Medjool and minimum in Zaidi. The seed weight was almost equal in Medjool (1.25 g) and Zagloul (1.24 g) but it was lowest in Zaidi (0.5 g). The seed length was maximum (2.60 cm) in Medjool, followed by Hillawi (2.49 cm) and Zagloul (2.32 cm), whereas it was minimum in Zaidi (1.65 cm). The width of the seed was recorded maximum (0.99 cm) in Medjool and minimum (0.67 cm) in Shamran

Most of the characteristics of cultivar described in the present study are in confirmity with the earliest work done in India (2,5,6,10) and the studies performed in Iraq and in the United state of Ametica (8). The slight variations in the physical fruit characteristics of the date cultivars could be due to influence of various cultur al practices like polien source, thining of fruits etc. and environmental factors.

Chemical composition of fruits: The total soluble solids (T.S.S.) content in six cultivars varied from 19.7% in Medjool to 29.1% in Hillawi (Table 3). The TSS values were slightly less than those obtained by Kaira and Jawanda (5) in the same cultivars.

The T.S.S. values of Khadrawi and Zaidi reported by Mohemmed et al. (7) were more whereas in Hillawi T.S.S. values were less than reported in present study. The acidity was highest in Zagloul (0.18%) and lowest in Hillawi (0.12%). The date fruits have been reported to be slightly acidic (Rygg. 12) and high acidity is often correlated with poor quality. The moisture content of the cultivars varied from 66.60% in the Khadrawi to 77.70% in Medjool. The lower moisture content in Khadrawi is an indication towards the fact that it is least susceptible to damage by rain and high humidity as reported by Nixon (9). The total sugar content was recorded to be highest (79.00%) in Hillawi and Sharan but lowest (69.17%) in Zagloul. It is evident from the data that reducing sugars were the dominant from of sugar in all cultivars. Only two cultivars, Khadrawi and Hillawi were found to contain less amount of sucrose at Khalal stage and can be regarded as belonging to the group of soft cultivars. The other cultivars having higher proportions of sucrose can be categorised as semi dry dates. These results corroborates the findings of cook and furr (3).

LITERATURE CITED

1- A.O.A.C. (1975) Official methods of analysis. Assooiation of Official Analytical Chemists, Washington D.C., 12th Ed.

2- Chohan, G.S., J.S. Jawanda and J.C. Bakshi., (1972). Flowering and fruiting behaviour of promising date varieties at Abohar. Journal. of Res. P.A.U. 9(2): 256-260.

3- Cook, J.A. and J.R. Furr. (1953). Kinds and relative amounts of sugars and their relationship to texture in some American grown date varieties. Proc. Amer. Soc. Hort. Sci. 61: 286-92.

4- Hussain, F., S.Moustafa, F.EL. Saniria, and A, EL. Zaid (1976). Studies on physical and chemical characteristics of eithreen date cultivars grown in Saudi Arabia. Indian J. Hort. 33: 107-113.

5- Kalra, S.K. and J.S. Jawanda (1972). Fruit characters and quality assessment of some promising date cultivars at Abohar. Punjab Hort. J. 12(1): 39-43.

6- Kalra, S.K. and J.S. Jawanda, (1975). Identification and description of date cvs from Egypt. Punjab. Hort. J. 15 (1-2): 17-23.

7- Mohammed, S, H.R. Shabana and E.A. Mowlod, (1983). Evaluation and identification of Iraqi date cultivars: Fruit characteristics of fifty cultivars. Date. Palm. g2 (1): 27-55.

8- Nixon, R.W. (1950). Imported varieties of date in United States. U.S. Dept. Agr. Cir. 834. pp. 144.

9- Nixon, R.W. (1966). Growing dates in United States Agric. Information Bull. U.S. Deptt. Agric. 207. pp. 56.

10- Pareek, O.P. and K.D. Muthana, (1978). Growth and fruiting characteristics of some date cultivars in the Thar desert. Haryana. J. Hort. Sci. 7: 1-5.

11- Pareek. O.P. (1984). Date-palm growing potentials of Indian arid zone. Indian. Hort. 29(1): 2-5,8.

12- Rygg, G.L (1948). Acidity in relation to quality in the date fruit. Rept. 25th Date Growers, Instt pp 32-33.

Table 1. Bunch characters of six date-palm cultivars grown under North Indian conditions, (Hisar).

Sr. No.	Name of cultivar	No. of bunches (per plant)	Weight of bunch (Kg)	Length of bunch (cm)	No. of strands (per bunch)	Length of strand (cm)	No. of berries (per strand)
1.	Khadrawi	7.7	5.42	75.33	40.0	27.2	23.2
2.	Hillawi	11.3	4.64	68.67	38.7	26.3	22.0
3.	Medjool	9.0	11.13	130.07	46.3	35.6	31.7
4.	Zagloul	10.0	12.23	97.67	63.0	38.4	32.1
5.	Zaidi	7.0	8.55	76.67	55.7	26.5	26.4
6.	Shamran	13.7	4.42	106.10	49.7	40.3	27.3
C.D. at 5 per cent		2.7	1.33	9.12	3.6	2.9	3.6
C.D. at 1 per cent		3.8	1.86	12.78	5.1	4.1	5.1

Table 2. Physical characters of fruits of six date-palm cultivars grown under North Indian condition (Hisar).

Sr. No.	Name of cultivar	Colour of fruit	Shape of fruit	Shape of Apex	Base	Taste	Rag content
1.	Khadrawi	Yellow	Oblong-ovate	Round	Oblique slightly prominent	Sweet	Average
2.	Hillawi	Yellow	Ob-long	Round	Flat, lightly prominent	Very sweet	Little
3.	Medjool	Yellow	Oval	Tapering	Flat, slightly prominent	Astringent	little
4.	Zagloul	Red	Oblong-oblique	Tapering	Slightly prominent	Sweet	Much
5.	Zaidi	Yellow	Ovate	Tapering	Slightly prominent	Sweet	Little
6.	Shamran	Pinkish	Oblong yellow	Tapering	Prominent	Astringent	Average

Table 3. Chemical characters of fruits of six date-palm cultivars grown under North Indian condition (Hisar).

S. Name of	Physical characters								Chemical characters			
No. cultivar	Weight of fruit (g)	Length of fr. uit (cm)	Breadth of fruit (cm)	Weight of seed (g)	Length of seed (cm)	Breadth of seed (cm)	TSS (%)	Acidity (%)	Total sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)	Moisture (%)
1. Khadrawi	9.93	3.55	2.25	0.73	2.06	0.77	22.1	.153	77.67	74.00	3.67	66.60
2. Hillawi	14.27	4.47	2.38	0.96	2.49	0.79	29.1	.120	79.00	76.13	2.87	73.07
3. Medjool	19.57	4.78	2.77	1.25	2.60	0.99	19.7	.127	76.27	66.07	10.10	77.70
4. Zagloul	16.47	4.67	2.39	1.24	2.32	0.90	21.3	.187	69.17	62.00	7.17	79.59
5. Zaidi	6.47	3.26	2.04	0.59	1.65	0.78	22.7	.160	72.03	56.33	15.70	70.59
6. Shamran	10.00	4.05	2.11	0.63	2.18	0.67	25.0	.127	79.00	68.73	10.27	73.15
C.D. at 5%	2.38	0.51	0.09	0.21	0.28	0.07	3.0	0.035	4.35	4.30	3.94	5.85
C.D. at 1%	3.34	0.71	0.13	0.29	0.39	0.10	4.1	0.049	6.10	6.03	5.53	

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LEAF NUTRIENT LEVELS OF YOUNG DATE PALM TREES IN RELATION TO AGE

A.S. AL-GHAMDI AND G-HUSSAIN

Date Palm Research Center, King Faisal University, P. O. Box 380, Al-Hasa, Kingdom of Saudi Arabia.

ABSTRACT:

The objective of this study was to determine leaf age effect on leaf mineral composition of young date palm trees (phoenix dactylifera L.). The experiment was carried out in field on 17-different date cultivars grown on sandy soil with drip system of irrigation at Date Palm Research Center, King Faisal University, Al-Hasa in 1985-86. Leaf samples were collected from randomly selected trees at 3 months interval. It was found that Mn, Fe, N and Ca showed significant increase, while Zn, K, and Na decreased significantly with age. However, P and Mg did not show age effect on their concentration and were inconsistent. The different date cultivars showed significantly different response on the uptake of various plant nutrients from soil. A poor correlation existed between plant nutrients in soils and estimated in leaf at different ages. A definite relationship was found among different elements on their uptake with age and discussed for application of balanced plant nutrients.

المحتوى المعدني لاوراق اشجار النخيل الفتي وعلاقتها بالعمر

عبدالله صالح الغامدي، ج. حسين
مركز بحوث النخيل والتمور/ جامعة الملك فيصل

الخلاصة

تهدف هذه الدراسة الى تحديد تأثير عمر الورقة على تركيب العناصر الغذائية في اوراق اشجار النخيل الفتية. اجريت التجربة حقلياً على سبعة عشر صنفاً زراعياً مختلفاً ونامية في تربة رملية وخاضعة لنظام الري بالتنقيط في مركز بحوث النخيل التابع لجامعة الملك فيصل في الحسا لعامي ٨٥ ـ ١٩٨٦. جمعت عينات الاوراق

عشوائيا من النخيل المختارة وبفترة زمنية دورية قدرها ٣ أشهر. وجد بأن العناصر (المنغنيز والحديد والنيتروجين والكالسيوم) تزداد، بينما الزنك والبوتاسيوم والصوديوم تنخفض معنوياً تبعاً للعمر. وعلى كل حال، فان العمر لم يكن له تأثير على تراكيز الفسفور والمغنيسيوم ولكنها تعارضت فيما بينها. وظهرت هناك فروقات معنوية بين الاصناف الزراعية المختلفة من حيث استجابتها لكمية العناصر المختصة من التربة. ظهر وجود علاقة ضعيفة بين العناصر الغذائية في التربة وبين العناصر المقدرة في الورقة بالاعمار المختلفة. كما وجد بأن هنالك علاقة اكيدة بين العناصر المختلفة وامتصاصها مع العمر ونوقش استعمالها في مغذيات النبات المتوازنة.

INTRODUCTION:

Knowledge of plant nutrition is important to predict plant nutrient needs. Effects of soil pH (Sillanpaa, 1982), soil moisture (Hutchinson, 1970), soil texture (Lucas and Knezek 1972), and soil temperature (Rufty, et. al. 1979) are reported to have some bearing on plant nutrients availability in soil and cause different response of plants towards plant nutrition. Various plant species are described to influence the leaf mineral contents in date palm (Al-Whaibi and Al-Ackhal, 1984; Al-Whaibi, 1983; Nagai and Ishii, 1980; Haas, 1947; El-Shurafa and Nagai, 1979; and Reuther, 1948). Recently, Al-Whaibi, 1983 has explored some mineral aspects on two date palm cultivars. Seasonal changes in macro-elements in the foliage of date palm leaves are also stated (Minessy et. al. 1974, and Shawky and Mougheth, 1974).

Since date palm (phoenix dactylifera L.) is one of the major fruit crops in the Kingdom of Saudi Arabia and grown over 90% of the cultivated area (Nixon, 1954). It is, therefore, imperative to study the mineral nutrient status of this tree grown under arid climatic conditions. The experiment was initiated to find out the leaf mineral cont nts at different ages to develop a comprehensive fertilization program tor date palm. This paper summarizes information on the leaf mineral contents of seventeen date palm cultivars in relation to leaf age and describe the correlation between plant nutrients available in soil with those determined in date palm leaf.

MATERIALS AND METHODS

The present experiment was initiated in March, 1985 at the Date Palm Research Center, King Faisal University, Al-Hasa. The experiment was liad out by following complete randomized design with three replications. Three trees 4-5 years old were selected from each date palm cultivar (phoenix dactylifera L.). The date cultivars involved were Sukarat Yanba, Hilwa, Safawi, Rothana, Shalabi, Rabia, (Al-Madina Al-Munnawara) Shukul, Burnie, Qassab, Sifri (Bisha), and Shahal, Raziz, Mujnaz, Khalas, Shishi, Ghur, Hilali (Al-Hasa). All the trees received the same cultural and other management practices during investigation period.

Soil samples were taken from 0-30 cm depth under each tree about 30 cm away from the main trunk two times during the experiment (first with first leaf samples and the second with last leaf samples when the date leaf was considered as mature). The soil samples were air-dried, ground to pass through 2 mm sieve and important soil physico-chemical properties were determined (USDA Hand-Book No. 60, 1954). Available phosphorus was determined by extraction with sodium-bicarbonate (Olsen et. al. 1954), total nitrogen was determined by micro-kjeldahl and available potassium by ammonium acetate method (Chapman and Pratt, 1961).

For leaf analysis, a newly emerged leaf about one month old was selected and labelled from each palm tree and composited for three trees from each cultivar. The same leaf of the same palm tree was sampled for subsequent analysis to avoid any experimental error. Five leaf samples collected as leaflets were taken starting from March, 1985 through March, 1986 with a three months interval in between each sampling. Eac time, the leaf samples were collected leaving the upper 30 cm leaf portion. However, the final leaf samples were taken from the top because the leaf did not grow anymore and considered as leaf maturity age. Leaf samples were digested in a diacid mixture of nitric acid and per-chloric acid (3.3:1 v/v), and analyzed for Fe, Cu, Mn, Zn, Ca, Mg, K and Na using atomic absorption spectrophotometer (Walsh, 1971). Phosphorus (P) was determined by spectrophotometer and N by micro kjeldahl (Chapman and Pratt, 1961). The data were subjected to statistical analysis using different methods (Snedecor and Cochron, 1967).

RESULTS AND DISCUSSION

Soil Analysis

Soil samples collected from the experimental area were analyzed for the estimation of physico-chemical properties of soil as well as the initial and final soil fertility level. This was done to correlate the plant nutrients available in soil with those determined in the date palm leaf. The important physico-chemical properties ranged as soil pH (7.30-8.01), soil salinity (2.98-15.75 ds/m^{-1}), Sodium adsorption ratio (1.40-12.20), calcium carbonate (0.75-7.84%), Cation exchange capacity (2.45-4.20 me/100 gm soil) and soil texture (sandy). Soil fertility analysis gave different ranges for different plant nutrient availbility in soil like for nitrogen (0.003-0.0302%), phosphorus (2.4-18.1 ppm), potassium (135-380 ppm), Iron (4.0-6.4 ppm), copper (0.20-0.68 ppm), Zinc (0.74-4.78 ppm) and manganese (1.04-3.38 ppm).

Effect of Age

The nutrient levels in date palm leaf were significantly affected by leaf age (Table 1 & Figures 1-2). The average ranges for different microelements in palm leaf were 32.71-273.18 ppm (Fe), 2.24-4.86 ppm (Cu), 15.18-38.54 ppm (Mn) and 6.9-16.71 ppm (Zn). While the ranges for macro-elements were as follows. N (1.092-1.48%), P (0.163-0.555%), K (0.169-1.494%), Ca (0.358-1.261%), Mg (0.180-0.377%) and Na (0.018-0.0319%). It was found among the various micro-elements that Fe, Cu, and Mn concentration increased with leaf age where as Zn showed significant decrease. These significant increases or decreases might be due to leaf age, varying climatic conditions and due to change in seasons of growth. These results are comparable with the findings of El-Shurafa (1984) who also found similar trends for micro-elements in date palm leaf. The behavior of different macro-elements was also variable, for example N, Ca and Mg increased significantly with age while Na and K decreased significantly. This variation in leaf mineral content could be due to ion competition present in the plant growth media. However, the P contents of date palm leaf were inconsistent or leaf age had no effect on P uptake. It is possible that plant absorbed all

the P required for its development at early stage and later on the uptake was nominal. The results regarding macro-element agree with those of El-Shurafa and Nagai (1974), Minessy et. al. 1974, Reuther (1948), and Shawky and Mougheth (1974). They stated that N and K decreased with age while P decreased or did not respond to age. However, the N content of date leaf showed increase with age in this investigation. These variations can be attributed to varietal selectivity and/ or the plant growth conditions as stated by Haas, 1947 (Figures 1-2).

Effect of Cultivars

The various cultivars showed significantly different response on the uptake of plant nutrients from soil (Table 2). The average ranges for micro-elements and macro-elements obtained in the date palm leaf of various cultivars were as follows. Fe (150-193.4 ppm), Cu (2.62-5.38 ppm), Mn (17.2-47.4 ppm), Zn (7.34-14.42 ppm), N (1.160-1.538%), P (0.270-0.388%), K (0.608-0.812%), Ca (0.832-1.107%), Mg (0.280-0.410%), and Na (0.018-0.028%). This significant variation among the various ciltivars could well be attributed to varietal behaviour, plant age and agroclimatic conditions of the growing area. The results are comparable with those of Al-Whaibi (1983), Al-Whaibi and Al-Ackhal (1984), Nagai and Ishii (1980) and Minessy et. al. (1974), who expressed similar views regarding mineral uptake by different date palm cultivars.

Relationship between plant nutrient availability in soils and plants

The regression analysis was run to find out the relationship between plant nutrients available in soils and those determined in the plant leaf. The R^2 multiplied by 100 gives the percent variation in plant nutrients caused by their presence in soils. The coefficient of determination (R^2) values range from 0.01 to 0.16 which is a very poor relationship. This poor relationship could be due to poor initial soil availability for these plant nutrients (Table 3).

It is concluded from the experiment that there is a great differences in response to plant uptake for essential plant growth elements. This information is a valuable tool in determining the plant nutrient needs and also to help program a balanced fertilizer for young date palm orchard in the Kingdom.

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LITERATURE CITED

Al- Whaibi, M. H. (1983): Mineral Content of Date Palm Seedings. In Y. M. Makki ed. Proceeding of the First Symposium on the Date Palm in Saudi Arabia. Held at King Faisal University, Al-Hassa, Saudi Arabia, March 23-25, 1982. P, 190-195.

Al- Whaibi, M. H. and I. Al-Ackhal. (1984): Adsorption of Potassium, Sodium, Calcium and Phosphorus by two Date Cultivars and the Effect of Gibberellin Treatment. J. Plant Nutrition, 7(6), 991-1003.

Chapman, H. D. and P. P. Pratt (1961). Methods of Analysis for Soils, Plants and Water. Univ. Calif. Div. Agric. Sci. Berkly, CA, PP. 56-64.

Chapman, H. D. (1964): Suggested Foliar Sampling and Handling Techniques for Determining the Nutrient Status of Some Field, Horticultural and Plantation Crops. Indian J. Hort, 21: 87-119.

El- Shurafa, M. Y. and S. E. Abou Nagal (1979): Changes of Minerals in Fruits and Leaves of Date Palm During Fruit Development. Libyan J. Agric. 8: 107-113.

El- Shurafa, M. Y. (1984). Studies on the Amount of Minerals Annually Lost by Way of Fruit Harvesting and Leaf Prunings of Date Palm Tree. Date Palm J. 3(1): 277-290.

Haas, A. R. C. (1947): Varietal Differences in the Calcium, Magnesium, Potassium and Total Phosphorus Content in Pinnae of Date Palm. Amer. Soc. Hort. Sci. Proc. 50: 200-202.

Hutchinson, T. C. (1970): Lime Chlorosis as a Factor in Seedling Establishment on Calcareous Soil. New. Phytol. 69: 143-157.

Lindsay, W. L. and W. A. Norveil (1978): Development of a DTPA Soil Test for Zinc, Iron, Manganese and Copper. Soil Sci. Soc. Am. J. 42: 421-428.

Lucas, R. E., and B. D. Knezek. (1972): Climatic and Soil Conditions Promoting Micro-nutrient Deficiencies in Plants. In Micro-Nutrients in Agriculture. J. J. Mortvedt, P. M. Giordana, and W. L. Lindsay (eds.). Soil Sci. Soc. Am., Madison, Wis., pp. 265-288.

Minessy, F. A., M. A. A. Bacha and E. M. El-Azab (1974): Seasonal Changes in Some Macronutrient Elements in Foliage of Four Soft Date Palm Varieties Grown in Egypt. Alex. J. Agric. Res. 22: 293-299.

Nagai, K and G. Ishii (1980): Effect of Rootstock and Scion Cultivar on the Mineral Composition of Apple Leaves. Soil Fert., 43(2) 1627,p. 181.

Nixon, R. W. (1954): Date Culture in Saudi Arabia. Date Growers Inst. Rep. 31: 15-20.

Olsen, S. R., C. V. Cole, F. S. Watanabe, and L. A. Dean (1954): Estimation of Available Phosphorus in Soils by Extraction with Sodium Bicarbonate. U. S. Dept. Agr. Cir 939.

Reuther, W (1948): The Mineral Composition of Date Palm Foliage. Proc. Amer. Soc. Hort. Sci. 51: 137-144.

Richards, L. A. (1954): Diagnosis and Improvement of Saline-Alkali Soils. USDA Handbook 60, 160 p.

Rufty, T. W., G. S. Miner, and C. D. Raper, Jr. (1979): Temperature Effects on Growth and Manganese Tolerance in Tobacco. Agron. J. 71: 638-644.

Shawky, K. and M. G. Mougheth (1974): Mineral Content of Date Palm Leaves. Egypt J. Hort. 2: 215-226.

Sillanpaa, M. (1982): Micro-nutrients and the Nutrient Status of soils: A Global study. FAO Soils Bull. 48 Rome.

Snedecor, G. W. and W. G. Cochron (1967): Statistical Methods (Book). The Iowa State University Press Ames Iowa; U. S. A.

U. S. Salinity Laboratory Staff (1954): Diagnosis and Improvement of Saline and Alkali Soils. USDA Handbook No. 60. Washington, D. C.

Walsh, L. M. (1971): Instrumental Methods dor Analysis of Soils and plant Tissue. P. 29. Soil Sci. Soc. Amer. Inc. Madison, Wisc; USA.

Table 1. Mean Mineral Composition of Date Palm Leaf with Age.

Leaf Age (month)	Fe ppm	Cu ppm	Mn ppm	Zn ppm	N %	P %	K %	Ca %	Mg %	Na %
1	32.71	2.24	15.16	12.00	1.092	0.555	1.494	0.358	0.180	0.0319
4	201.94	3.85	29.00	16.71	1.326	0.163	1.101	0.687	0.374	0.0279
7	161.40	3.90	30.29	10.76	1.355	0.210	0.661	1.105	0.377	0.0240
10	215.41	3.50	35.47	8.82	1.460	0.318	0.210	1.206	0.359	0.0190
13	273.18	4.86	38.54	6.90	1.484	0.364	0.169	1.261	0.369	0.0180
Mean	176.93	3.67	29.70	11.04	1.343	0.322	0.727	0.923	0.332	0.024
LSD(0.05)	0.962	0.024	0.223	0.092	0.005	0.004	0.016	0.010	0.002	0.0001
C.V. %	0.280	0.376	0.054	0.476	0.182	0.621	1.109	0.583	0.369	0.411
St. Dev.	8.810	0.945	8.988	3.715	0.156	0.153	0.573	0.388	0.085	0.005

Table 2. Mean Mineral Composition of Date Palm Leaf in Different Cultivars

Variety	Fe	Cu	Mn	Zn	N	P	K	Ca	Mg	Na
	ppm	ppm	ppm	ppm	%	%	%	%	%	%
Sukarat Yanba	167.2	4.07	17.2	14.42	1.318	0.326	0.754	0.921	0.320	0.025
Rublaa	181.0	3.94	24.2	10.40	1.104	0.270	0.634	1.107	0.282	0.019
Hilwa	193.4	5.38	21.6	12.46	1.244	0.304	0.658	0.832	0.364	0.022
Safawi	175.4	3.53	19.6	11.82	1.236	0.326	0.608	0.928	0.330	0.022
Rothana	179.4	4.00	19.4	11.12	1.548	0.322	0.700	1.012	0.364	0.026
Shalabi	172.6	4.38	29.0	12.92	1.464	0.320	0.780	0.995	0.410	0.020
Shukul	165.2	3.10	34.4	7.34	1.318	0.300	0.634	1.021	0.374	0.026
Bumi	192.4	3.68	31.6	9.60	1.312	0.270	0.910	0.89,	0.358	0.024
Qassab	192.2	2.86	33.6	9.40	1.276	0.288	0.792	0.861	0.322	0.021
Sifri	191.4	2.62	26.8	9.68	1.160	0.278	0.652	0.884	0.338	0.018
Shahal	166.6	3.52	28.4	9.64	1.358	0.388	0.740	0.846	0.304	0.022
Raziz	177.8	2.92	30.2	11.30	1.444	0.380	0.720	1.011	0.366	0.025
Mujnaz	182.0	3.66	21.8	10.16	1.316	0.354	0.820	0.921	0.310	0.024
Khalas	187.2	3.56	47.4	11.36	1.524	0.364	0.814	1.014	0.374	0.022
Shishi	158.6	3.54	42.6	9.04	1.382	0.344	0.758	0.902	0.280	0.023
Ghur	150.0	3.78	34.2	11.02	1.326	0.338	0.716	1.044	0.280	0.028
Hilali	155.4	3.66	41.8	10.52	1.420	0.346	0.776	0.897	0.288	0.022
Mean	176.9	3.66	29.6	10.69	1.344	0.324	0.729	0.921	0.334	0.023
LSD (0.05)	20.75	0.58	5.63	2.06	0.051	0.044	0.101	0.048	0.012	0.003
C.V. %	17.11	23.0	27.75	28.08	5.57	20.01	20.31	7.60	5.19	20.13

Table 3. R^2 Values for Relationship of Plant Nutrients in Soils and Plants.

Nutrient	Co-efficient of Correlation (r)	Coefficient of Determination (R^2)
P	0.37	0.14
N	0.15	0.02
K	0.26	0.07
Ca	0.24	0.06
Mg	0.22	0.05
Na	0.10	0.01
Fe	0.39	0.16
Cu	0.34	0.12
Mn	-0.10	0.01
Zn	0.34	0.12

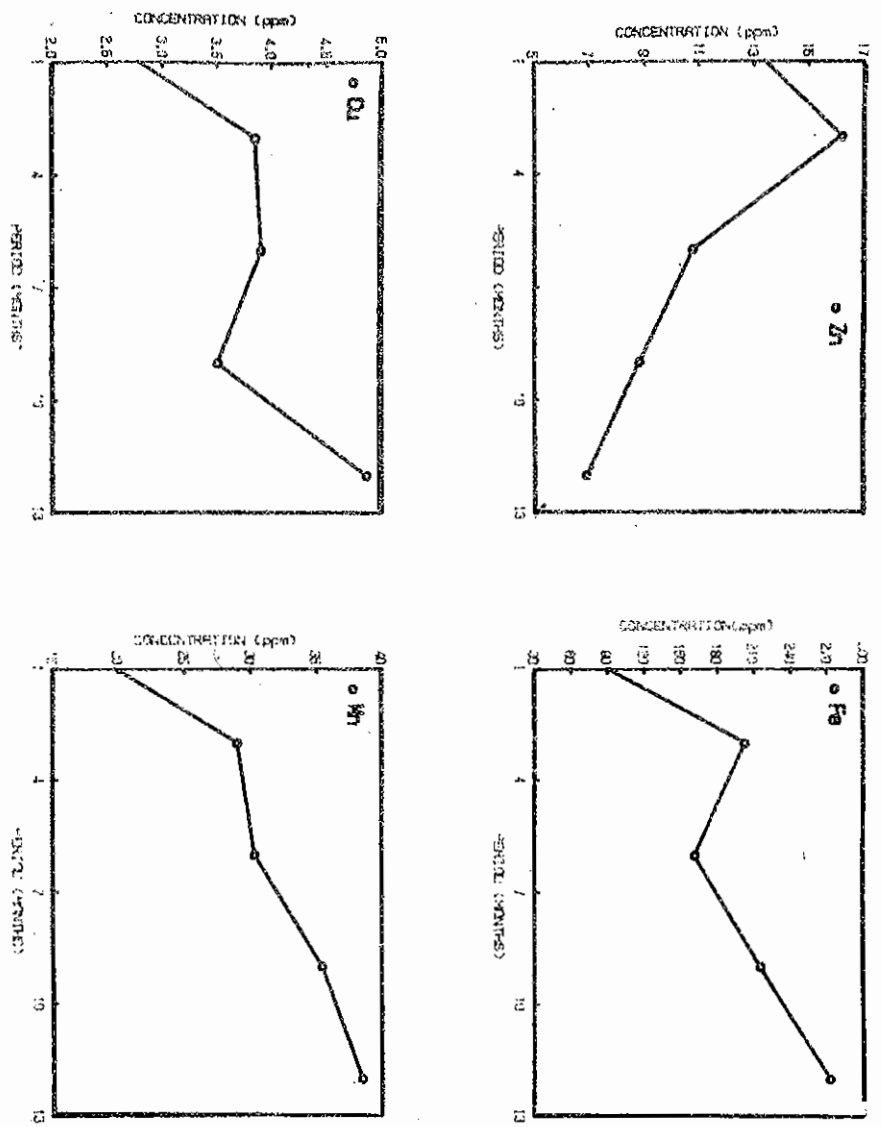

FIGURE 1: MEAN MINERAL COMPOSITION OF DATE PALM LEAF IN RELATION TO AGE

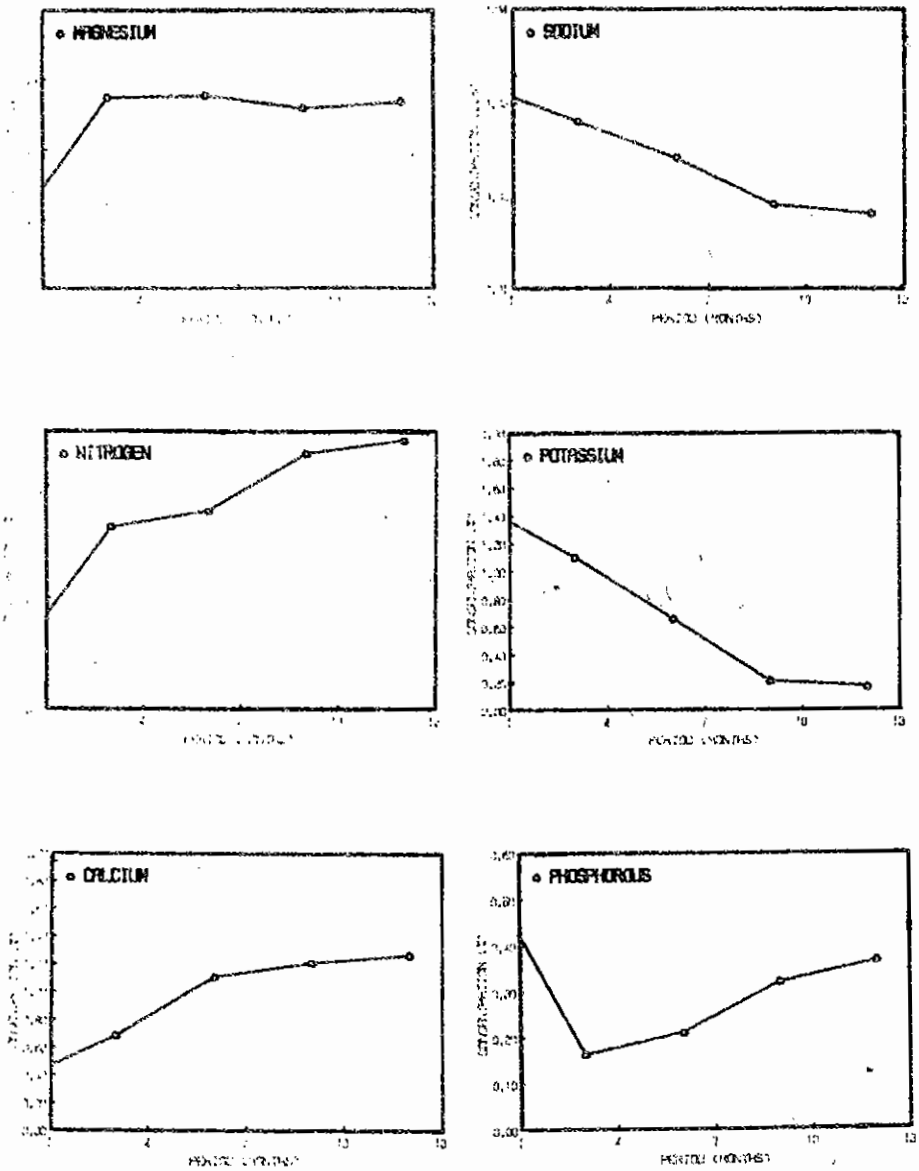

FIGURE 2: MEAN MINERAL COMPOSITION OF DATE PALM LEAF IN RELATION TO AGE

RESPONSE TO REVIEWERS COMMENTS

1- The initial age of leaf is quantified and taken as one month.
2- Soil analysis, as desired, is shifted to the Results and Discussion section.
3- The missing references are included.
4- The results regarding different cultivers were analyzed statistically and included in the test.
5- The introduction is revised and expanded to clarify the objectives.
6- The scientific name of Date Palm is endorsed.
7- This point is clarified in the Materials and Methods section, please. The leaflets were taken from each leaf leaving the upper 30 cm leaf portion.
8- Necessary changes are made as desired.
9- The title of a table is always given at the top to state the table contents. It is a common and standard practice being followed anywhere in research papers, so we do.
10- Title of figures are shifted to the bottom.
11- Figures are changed and redraw as pointed out for clarification.
12- Though it was one of the study objectives but it was found after analysis that it is not possible at this stage to provide a fertilizer programm based on the results of this single study and this could be misleading. Hence it was mentioned at the end of introduction section that this paper summerizes the results only for leaf mineral contents in relation to age and describe correlation between plant nutrients in soils with those determined in the Date Palm leaf. However, it is regrettedly mentioned that the fertilizer programming is still one of the main objectives of the Date Palm Research Center at King Faisal University, Al-Hasa, Saudi Arabia. This objective shall be accomplished when more data is available from the nutritional studies in progress at the Center on Date Palm.

RESPONSE TO REVIEWERS COMMENTS

1- The authors are fully aware that the results from any research study are always better if obtained over a period of more than a year. Since the main aim of this study was to follow the plant leaf growth and determine the corresponding changes in mineral contents of any till the leaf maturity age. Since the present study took more than a year period and covered all the reasons (i.e. Spring, Summer, Autumn, and winter). Hence the authors are of the opinion that in most of the nutritional studies, involving orchard trees such as Date Palm. The plant and soil samples are taken on a particular season most likely at fruit maturity stage. Because the plant needs are optimum at this stage and determines the mineral excess or deficiency in plants. Therefore it was thought that the amount of data so collected is enough to conclude the plant leaf mineral contents at different ages. Also with the increase in age of plant, its nutrient and other needs for optimum growth are likely to change.

2- As you might be aware that the required amount of fertilizer to any crop or Ipant is not applied as a single dose but always preferred in split applications depending upon Ipant growth stages. Hence it was considered important to determine leaf mineral contents at three months interval of age because the plant growth is significant in three months period of time. This is also quite clear from data in Table 1 which shown that leaf mineral contents vary with age.

3- One of the main objective of Date Palm Research Center is to develop a germ plasm for different Date Palm Varieties grown all over the Kingdom of Saudi Arabia. These varieties are grown here from different regions of Saudi Arabia for adaptation and growth performance under the climatic conditions of Eastern Province of Saudi Arabia. Hence these different varieties from different regions were included in the study to develop basic information regarding their nutritional behaviour. Furthermore we did not study and describe difference among varieties of different regions.

4- The leaf samples were taken as leaf lets and clarified in the Material and Methods part.

5- It is mentioned in the text that the leaf samples were taken from the same leaf of the same tree and replicated three times within each cultivar.

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Effects of Gamma Ray on Callus Cultures and Asexual Embryogenesis in phoenix dactylifera L.

M.S. OMAR
Faculty of Agriculture and Biology
Nuclear Research Center P.O. Box 765 Baghdad-IRAQ

ABSTRACT:

The effect of gamma irradiation on callus growth and asexual embryogenesis in the date palm was investigated. Callus fresh weight was increased with increased doses of gamma ray up to 10Gy, and declined afterward. A 2-fold increase in the number of asexual embryos was attained following irradiation with 10Gy. Cultures exposed to doses as high as 100 Gy lost 50% of their morphogenic capacity to differentiate into asexual embryos. Banding pattern of protein and esterase isozymes were different in calli that received different doses of radiation, suggesting a possible mutation induction. Work is in progress on the regenerated plants to verify the variations. The application of in vitro mutagenesis to plant breeding is also discussed.

تأثير اشعة كاما على زروعات الكالس والاجنة اللاجنسية لنخلة التمر

د. مبشر صالح عمر
هيئة الزراعة والبايولوجي - مركز البحوث النووية ص. ب ٧٦٥ بغداد - العراق

الخلاصة:

تم دراسة تأثير أشعة كاما على نمو أنسجة الكالس وتحوراالاجنة اللاجنسية لنخيل التمر. لوحظ زيادة الوزن الطري لانسجة الكالس بزيادة جرع اشعة كاما لحد 10) (Gy ثم أنخفض بعد ذلك. كما لوحظ زيادة عدد الاجنة اللاجنسية بمقدار مرتين في هذه الجرعة. اما الزروعات التي عرضت الى جرع تصل الى (100 Gy) فقد فقدت 50% من قابليتها التمايزية للتخصص الى اجنة لاجنسية. وقد لوحظ اختلافات في الانظمة البروتينية والانزيمية في الانسجة والاجنة المعرضة لجرع مختلفة من الاشعة، مما يفترض احتمالية استحداث الطفرات فيها ولايزال العمل مستمراً في النباتات الناتجة لتحديد هذه الاختلافات. هذا وقد تمت مناقشة امكانية استخدام التطفير خارج الجسم الحي لتربية النبات.

INTRODUCTION.

One of the major applications of plant cell, tissue and organ culture lies in the field of plant breeding. Several techniques have been developed and utilized for different purposes in plant improvement. Such techniques include cell suspension, callus, protoplast, embryo, ovule, ovulary, pollen and anther culture, as well as in vitro fertilization (15). Recent adances achieved in these techniques haVE BEEN RECENTLY REVIEWED (17). Mutagenesis in vitro offers great advantages to the geneticist and plant breeder, who can treat millions of isolated cells, callus tissue or somatic embryos as individual mutable units and select for a rare variant in few petri-dishes or test tubes. It is now possible to initiate callus cultures virtually from all plant species. It is necessary, therefor, to obtain more knowldge of the various parameters that must be considered when this technique is used. Such parameters include the type and amount of radiation, the environmental conditions before, during, or after irradiation (temperature, light, oxygen, etc.) and the ontogenetical stage of the irradiated cells including ploidy level and phase of cell cycle (8). Following irradiation, the development of a screening system that allows the identification of mutated cells, is of prime interest. All of these factors should be carefully considered when irradiation is to be used for mutagenesis in vitro. Few authors have reported on their attempts on application of cell and callus cultures in developing salt (11) drought (7) and pesticide (19) resistant plants. However, regarding the use of radiation in mutagenesis in vitro, the few data in the literature show that this area has not been explored greately. Variant plants were obtained following irradiation of phaseoulus vulgaris callus (4) Nicotiana tabacum anthers (5,16) and Anthirrinum majus cell suspension cultures (20). The objective of this investigation is to determine whether solid mutants can be achieved following gamma irradiation of callus cultures of the date palm.

Materials and Methods

Callus cultures were initiated from ovule segments excised from a 2 months-old-immature fruits of phoenix dectylifera L. "Zahdi" cultivar. Following surface sterilization, they were dipped in an antioxidant solution (100 mg/1 citric acid + 150 mg/1 ascorbic acid) and transferred to culture tubes containing callus initiation medium that has been previously revised for the date palm (18). This medium was supplemented with kinetin (2mg/1); 2,4-dichlorophenoxyacetic acid (2,4-D) (10mg/1) and NaH_2pO_4. H_2O(170 mg/1). Callus was initiated on such medium following 8 weeks of incubation at 27 ± 1°C in the dark. The callus

was subcultured, at 8 weeks intervals to increase its quantity.

Freshly subcultured callus was irradiated with 0,1,3,10,30 or 100 Gy from a Co-06 source at a rate of 13.2 Gy/min. The irradiated callus from each treatment was then divided into 0.5g pieces and cultured on hormone-free medium to stimulate the initiation of asexual embryos (20). Ten cultures were initiated for each dose and they were kept under 16 h daily exposur to 1000 Lux light and 27 ± 1°C. Callus fresh weight and number of asexual embryos were determined following 2 months of incubation. Callus fresh weight was determined by weighing each culture, while the number of embryos was ciunted following transfer of the content of each culture tube to a petridish containing distilled water. The embryos were teased apart and counted with the aid of a 10X magnification under the microscope. protein and isozyme analysis of callus cultures and asexual embryos were conducted by electrophoresis on a 12% polyacrylamide gel. Methods of extraction, gel preperation, electrophoresis conditions and staining procedures of the gels have been reported in details elswhere (6,20).

Results and Discussion

The first observed phenomenon on irradiated callus was the pigement development. Unirradiated callus had white creamy color. Development of brown color in the irradiated callus was observed with increased dose of irradiation. Cultures received 1,3 and 10Gy developed very light brown color in few cells. At 30Gy, 50% of the cultures showed the development of brown pigmentation, while at 100Gy, all cultures turned brown, with the exception of few cells that remained white in color.

Callus fresh weight was also affected by irradiation (Table 1). A very slight reduction was observed at the 1Gy level, but increased afterward untill 10 Gy, where the callus doubled its fresh weight following one month of incubation. Severe reduction in callus fresh weight was observed at 30 and 100 Gy. Similar pattern of callus fresh weight change has been reported for Citrus sinensis (22). phaseoulus vulgaris (4) and Nicotiana tabacum (16). This reduction in callus fresh weight may be caused by inhibition of RNA, DNA and protein synthesis (9) or through altering hormonal contents of the cells by irradiation (14).

The effect of gamma irradiation on embryo initiation and development is summarized in Table 1. The highest number of embryos and number of germinated embryos was obtained following irradiation with 10Gy and decreased thereafter. Similar observation has been reported in Citrus (22) where gamma irradiation caused marked stimulation of somatic embryogenesis; the maximum effect being observable at a 160 Gy dosage. The effect was doubled when the me-

dium was irradiated. Kochba and Spiegel-Roy (12) examined this phenomenon further, using habituated callus grown in a medium devoid of growth substances, and discovered that irradiation of both callus and medium did not further stimulate embryogenesis. Rao et al (20) subjected stem explants of Antirrhinum majus to gamma irradiation and observed active proliferation, leading to callus formation followed by high degree of embryogenesis. Increased organogenesis was also observed following gamma irradiation of Nicotiana tabacum callus (13). This stimulative effect of irradiation on embryogenesis in date palm callus cultures may result from inactivation of the endogenous auxin contents of the cells as a result of irradiation (22). Such inactivation of endigenous auxin, coupled with cell culture on auxin-free medium may have triggered the cells to shift from the proliferation to embryo for mation state. The slight reduction in embryo number observed at the 3Gy level probably caused by the insufficient inactivation of auxin necessary to induce embryogenesis.

Protein and esterase (EST) isozyme analysis of extract from calli irradiated with different doses showed a banding pattern different than that, of unirradiated callus. The zymograms of protein analysis in callus (Fig.1) and asexual embryos (Fig.2) shows that major changes in protein contents have been taken place. Similarly the EST II system showed clear differences both in callus (Fig.3) and asexual embryos (Fig.4) zymograms following gamma irradiation, and in EST 1 system, to a lesser extent. These changes could be genetical since enzymes are gene products (21). Thus it is quite possible that genetic modification has taken place in the irradiated cells, there-fore they are mutated. Protein and isozyme changes following irradiation has been documented (1,3,10). These changes could be due to increased enzyme and protein synthesis, translocation of enzyme, change in cell population and enzyme activity (1,2). Synthesis of new enzyme in the cell could also cause an increase in enzyme activity, especially since an increase in protein content was observed in this study. More work is in progress to isolate variant plants following transfer of such plants to the free living conditions of the greenhouse.

LITERATURE CITED

1- Alkman, A.A. & E.D. Wills (1974): Studies on lysosomes after irradiation. II. Lysosomal membrane permeability and acid phosphatase activity of lymphoid and other tissues after whole body irradiation. Rad. Res. 57: 416-30.

2- Altman, G., B. Gerber & S. Okada (1970): Radiation Biochemistry. Vol. II. Academic Press, New York, London.

3- Auda, H., A.M. Rashid; A.H. Khaleel & M.J. Nasser (1987): Radiation induced changes in liver and kidney alkaline phosphatase and esterase of mice. Rad. Res. III. (in press).

4- Bajaj, Y.P.S. (1977): Effect of gamma irradiation on growth, RNA, protein and nitrogen contents of bean callus cultures. Ann Bot. 34: 1089-96.

5- Chaleff, R.S. & M.F. Parsons (1978): Direct selechion in vitro for herbicide-resistant mutants of Nicotiana tabacum. Proc. Natl. Acad. Scl(UAS) 75: 5104-07.

6- Hameed, M.K. (1986): Biochemical distinction between Spirplasma citri infected and non-infected Cotrus. proc. 4th Sci. Cont. SRC. (Agric. res.) 1: 1389-01.

7- Handa, A. K.; R.A. Bressan, S. Handa & P.M. Hasegawa (1983): Clonal Variation for tolemce to polyethyleneglycol-induced water stress in cultured tomato cells. plant physiol. 6q: 514-21.

8- Handro, W. (1981): Mutagenesis and in vitro selection. In: plant Tissue Culture Methods and Applications in Agicultere (T.A. Thorpe, ed.) Academic Press, New York. p.p. 150-80.

9- Holsten, R.D.; M. Sugi & F.C. Steward (1965): Direct and indirect effects of radiation on plant cell, their relation to growth and growth induction. Nature 208: 850-56.

10- Howland, G.P. & R.W. Hart (1977): Radiation biology of cultured plant cells. In: Applied and Fundamental Aspects of plant Cell, Tissue and Organ Culture (J. Reinert & Y.P.S. Bajaj, eds). Springer Verlag, Berlin. pp. 731-55.

11- Janardhan, P.R. & K. Vaidyanath (1986): In vitro characterization of salt stress effects and the selestion of salt tolerant plants in rice (Oryza sativa L.). Theor. Appl. Genet. 71: 757-60.

12- Kochba, J. & P. Spiegel-Roy (1977): Embryogesis in gamma irradiated habituated ovular callus of the shamouti orange as affected by auxin and tissue age. Envir. Expt. Bot. 17: 151-59.

13- Kurt, G.H. (1983): Survival of Nicotiana tabacum L. Cv. Wisconsin-38 plants regenerted from gamma irrdiated tissue cultures. Expt. Bot. 23: 139-42.

14- Lipetz, J. & A.W. Gaston (1959): Indoleacetic acid oxidase and peroxidase

activites in normal and crowm gall tissue cultures of Parhenocura trieuspidata. Am. J. Bot. 46: 193-96.

15- Murashige, T. (1978): The impact of plant tissue culture on agriculture. In: Frontiers of plant Tissue Culture 1982 (T.A. Thorpe, ed.) University of Calgary Offset Printing Servivee, Calgary, Canada. pp 15-26.

16- Nitsch, J.P. (1969): Experimental androgenesis in Nicotiana. phytomorphol. 19: 389-04.

17- Omar, M.S. (1986): Tissue culture methods and application. proc. Symp. Importance of plant Tissue Cultre and Applications in plant production, Rabat, Morocco, Nov 10-12 (in press).

18- Omar, M.S. (1987): Callus initiation, asexual embryogenesis and plant regeneration on phoenix doctylifera L. Date palm G. 5 (1) (in press).

19- Oswald, T.H.; A.E. Smith & D.V. Phillips (1976): Herbicide tolerance developed in cell suspension cultures of perennial white clover. Can. J. Bot. 55: 1351-58.

20- Rao, P.S.; V.A. Bapat & H. Harada (1976): Gamma radiation and hormonal factors controlling morphogenesis in organ cultures of Antirrhinum majus L. CV. Red Majestic chief. Z. Pflanzwnphysiol 80: 144-52.

21- Scandalios, J.G. & J.C. Sorenson (1977): Isozymes in plant tissue culture in: Applied and Fundamental Aspects of plant Cell, Tissue and Organ Culture (J. Reinert & Y.P.S. Bajaj, eds.) Springer Vererlag, Berlin. pp. 719-730.

22- Spiegel-Roy, P. & J. Kochba (1973): Stimulation of differentiation in orange (Citrus sinensis) ovular callus in relation to irradiation of the media. Rad. Bot. 13: 97-03.

Table 1. Effect of gamma radiation on callus fresh weight and asexual embryogenesis in phoenix dactylifera L.

Irradiation Dose, Gy	Callus fresh weight, m g ± SE	No. "young" asexual embryos ± SE, a	No. germinated asexual embryos ± SE, b	Total No. asexual embryos ± SE
0	0.62±0.03	366.00±47.20	64.00±13.39	431.62±53.74
1	0.62±0.07	434.75±123.46	33.50±13.42	468.50±134.87
3	0.92±0.05	260.11±32.32	93.33±29.54	365.86±51.99
10	1.13±0.15	560.0±84.77	284.50±76.76	943.75±148.72
30	0.59±0.06	292.71±39.94	60.85±18.71	353.57±54.36
100	0.59±0.06	227.66±81.36	17.00±2.51	245.00±79.73

a: Represent all young embryos in their early stages.
b: Germination = emergence of root or leaf.

Callus initiation, asexual embryogenesis and plant regeneration in phoenix dactylifera L.

M.S. OMAR
Faculty of Agriculture And Biology
Nuclear Research Center. P. O. Box 765. Baghdad-IRAQ

ABSTRACT:

Ovule segments excised from immature fruits of eight phoenix dactylifera L. cultivars initiated callus when cultured on MS medium enriched with kinetin and 2,4-D. Transfer of such callus to hormonefree medium resulted in the initiation of numerous asexual embryos, which eventually developed into plants. Histological examination of the asexual embryos revealed a tissue organisation comparable to that of the zygotic embryos. protein and esterase isozymes analysis of the asexually-derived plants resembeled those of the mother plants, suggesting their somatic nature.

نشوء الكالس والاجنة اللاجنسية وأخلاف النبات في نخيل التمر

د. مبشر صالح عمر
هيئة الزراعة والبايولوجي ـ مركز البحوث النووية ص. ب ٧٦٥ بغداد ـ العراق

الخلاصة :

تم استحداث انسجة الكالس على قطع البويضات المستأصلة من الثمار غير الناضجة لثمانية اصناف من نخيل التمر وذلك لدى زراعتها على وسط غذائي مجهز بالكايتين والـ 2,4-D . وعند نقل أنسجة الكالس هذه الى وسط غذائي خالي من منظمات النمو شجع نشوء العديد من الاجنة اللاجنسية التي تطورت فيما بعد الى نباتات كاملة . وقد أظهرت الفحوصات النسيجية للاجنة اللاجنسية مطابقتها للاجنة الجنسية من حيث الترتيب النسيجي . كما بينت نتائج تحليل البروتينات والاشكال المتشابهة لانزيم الاستريز مطابقة النباتات الناتجة من الاجنة اللاجنسية لامهاتها ، مما يدلل على طبيعتها الجسمية .

INTRODUCTION.

One of the major problems that hampers date plam commercial expansion is the slow method of asexual propagation by offshoots. Seed propagation, on the other hand, is not popular since the genetic make up of the resultant plants is unknown, due to the heterozygosity usuallyencounteredin the date palm. Thus developing a protocol for rapid clonal propagation of the date palm is of prime interest.

Plant tissue culture techniques have been employed to clone a wide range of plants, including members of the palmae (the palm family) such as Cocos nucifera (4) and Elaeis guienesis Jacq (12). Serious attempts have been also conducted to propagate the date palm through initiation of somatic embryos (13,17) or adventitious bud formation on callus cultures (2). However, application of such techniques is still limited to few cultivars (21). A brief account on tissue culture propagation of the date palm has been reported earlier (9). The objective of this investigation is to manipulate the response of specific tissues in vitro, and elucidate the tissue culture technique as an alternative mean of propagation of the date plam. An other aim of the investigation is to determine whether the resultant plants are true to type and similar to their mother parent.

Materials and Methods

Unripen green fruits from "Zahdi" cultivar were collected 2 and 3 months after pollination. The fruits were rounded in shape and measured about 2.5-3 cm in diameter. They were washed with running tap water and household detergent, followed by 5 minutes sterilization in 95% ethanol. working within the confines of a Laminar-air-flow hood, the fruits were bisected and their ovules excised. The membraneous pellicle surrounding the ovules was removed to reveal the germpore. Sections, about 2 mm^3 from the endosperm tissue, presumably surrounding the tiny embryo, were excised, dipped in the sterilized antioxidant solution (150mg/1 citric acid + 100mg/1 ascorbic acid) and cultured on nutrient medium. Microscopical examination of the excised portion did not reveal the developing embryo, which was still in the very early stages of development, espeically in segments excised two months after pollination.

Nutrient medium employed in this investigation composed of Murashige and Skoog (8) inorganic salts, in addition to the following (in mg/1): NaH_2PO_4. H_2O, 170; thiamin. HCL, 0.4; i-inositol, 100; adenine sulphate. H_2O, 40; sucrose, 30,000; agar, 8,000; charcoal, 3,000 and N^6 -furfurylamino purine (kinetin), 2. The effects of the auxins 2,4-dichlorophenoxyacetic acid (2,4-D), indole-3-ace-

tic acid (IAA) and 1-naphthaleneacetic acid (NAA) on callus initiation was investigated at the 0,3,10,30 and 100mg/1 level. preparation of nutrient media, PH adjustment, media dispensing and sterilization was conducted as described in detail elsewhere (10). Twenty cultures were initiated for each treatment, and all cultures incubated in the dark at a constant temperature of 27°C. Based on results obtained from the "Zahdi" experiments, one medium was selected and used to initiate callus and asexual embryogenesis in the other seven cultivars, namely Ashrasi, Khadhrawi, Khastawi, Barban, Maktoom, Braim and Sa'ada.

Pieces of callus and the asexually-derived embryos were prepared for histological examination. They were fixed in FAA solution, dehydrated through tertiary butyl alcohol series as described by Sass (14) and embeded in paraplast. The samples were then mounted to a rotary microtome and sectioned 12μ thick. The sections were stained with: Iron hematoxylin (14) and mounted with canada balsam. The slides were examined under the microscope and photographed for documentation. For comparison, the zygotic embryo obtained from mature date palm seed was fixed, sectioned and stained as described above.

Protein and esterase isozyme analyses were also conducted in this investigation to determine whether the genotype has been preserved in the resultant somatic embryos and asexually-derived plants. proteins and isozymes were extracted from callus cultures, somatic embryos, asexual plants and their female parent according to Al-Jibouri et al (1). Polyacrylamide gel (12%) preparation, electrophoresis conditions and staining procedures were conducted as described in details by Hameed (6). Esterase isozymes were developed according to Torres and Tisserat (20).

Results

1. Callus Initiation, Asexual Embryogenesis and plant Regeneration: Development of ovule segments in vitro was relativly slow. No sign of development was observed on the 2 months excised ovules during the first 6 weeks of incubation on any type of media. Soon after, explants cultured on nutrient media enriched with 10 mg/1 2,4-D and 2mg/1 kinetin showed the development of white creemy callus from within the germ pores (Fig. 1A). This callus was initiated from the endosperm tissue surrounding the repressed undeveloped zygotic embryo. Such callus was then propagated by subculturing it, at 6 weeks intervals, on fresh medium of the same composition (10 mg/1 2,4-D + 2 mg/1 kinetin). Transfer of such callus to hormone-free medium resulted in the initiation of asexual embryos, which appeared as many small white, root-like growths emerging on the surface and from within the callus cultures (Fig. 1B). The somatic

embryos were characterized by a multitude of sizes and shapes, some of which can be seen in Figure 1C. Following another 6 weeks of incubation in hormone-free medium, well developed plants with good root and shoot systems were achieved (Fig.1D). This observation (calugenesis and subsequent asexual embryogenesis) was encountered basically in the medium enriched with 10 mg/1 2,4-D. However it was also observed at other concentrations of 2,4-D, but to a lesser extent. Inclusuion of 3 mg/1 2,4-D in the culture medium slightly reduced callus initiation and subsequent embryogenesis (Table 1) but concentrations higher than 10 mg/1 were toxic, and 30 mg/1 2,4-D was sufficient to repress calugenesis in 50% of the cultures (Table 1). In few cultures, two types of morphogenic responses were observed such as those observed at the 10 mg/1 level where the same cultures initiated callus, asexual embryos, and their zygotic embryo also germinated.

No response was obtained from inclusion of IAA in the culture media, while only 30% of the explants initiated callus in the presence of 30 mg/1 NAA. when this callus was removed to the normone-free medium, only 20% of the cultures initiated somatic embryos.

As for ovule segments excised 3 months after pollination, embryo germination was observed in few cultures, while the majority did not respond. However callus initiation and subsequent asexual embryogenesis was observed in only two treatments (i.e. O mg/1 2,4-D and 100 mg/1 NAA). In both cases, only 20% of the cultures initiated callus followed by asexual embryogenesis (see Table 1 for 2,4-D). Thus, the medium that contained 10 mg/1 2,4-D and 2 mg/1 kinetin was selected as the most suitable medium for ovular callus initiation, and hormone-free medium for triggering of somatic embryogenesis.

The efficiency of such medium to induce callus initiation in another seven date palm cultivars was tested. All tested cultivars responded to this medium and initiated callus. The percentages of cultures producing callus, and amount of callus produced in each culture varied among tested cultivars. These observations are recorded in Table II. On the other hand, the amount of callus initiated from each cultivar was variable (Table II). The Maktoom cultivar initiated exceptionally high amount of callus (910 mg per culture) followed by Saáda, which initiated about half that amount of callus. Khastawi initiated the least amount of callus among all tested cultivars. Transfer of such callus to hormone-free medium resulted in the initiation of asexual embryos which further germinated and developed into complete plants.

Transfer of the asexually-derived plants from the test tubes (hetrotrophic conditions) to the free living (autotrophic) conditions of the green house was successful. This process was conducted gradually by transferring the plants to

liquid media containing 0.01mg/1 BA (N^6-benzylamino purine) and 0.1mg/1 NAA to improve shoot and root development, respectively. The plants were then individually trasferred to 10-cm pots containing sterilized peatmoss: vermeculite mix (1:1 ratio) and covered with polyethylene bags for three weeks. They were watered as needed and administered 2-3 sprays with 1% penlate fungicide as needed. Figure 2 shows a well developed tissue culturederived date palm seedling grown under the green house conditions for 5 months.

II. Histological Examination

Numerous growth centers were observed along the margins and the centers of the callus peices. Such centers consisted of tiny small cells that are easily distinguishable from the larger, highly vaculated cells of the callus (Fig. 3A). The cells of the growth centers stained more intensely than the callus cells and contained distinctly prominent nuclei, suggesting their meristimatic nature. When these centers were transferred to the hormone free medium, they apparently developed into asexual embroys. Meristematic cells with shoot apex, cotyledonary sheath, as well as well recognizable vascular tissues composed the major structures of the asexual embryos (Fig. 3B). The median section of a mature zygotic embryo is shown in Figure 3C. The similarity in morphology of zygotic and asexually-attained embryo is evident.

III Biochemical Analysis

Protein banding pattern of different tissue extracts of date palm is shown in Figure 4. The plants derived from somatic embryos showed a banding pattern completely similar to their female parent, suggesting their somatic nature. Although more heavily stained proteins were observed in the somatic plants, they were located on the same position and had the same retention time as determined by the ultrascan densitometer thus represent the same proteins.

When the same extracts were analyzed for esterase isozymes, similar observations were obtained (Fig. 5). The esterase banding pattern in the somatic embryos and the plants derived from them was similar to that of their female parent, both in number of isozymes and their location. Scanning of the gels with ultrascan densitometer confirmed these similarities (Fig. 5).

Discussion and Conclusion

This investigation attempted to develop a reproduceable tissue culture

technique that can be used to propagate the date palm clonally. In spite of the considerable amount of literature available on the tissue culture of date palm, it seems that little informations can be used inasmuch as the reported results are contradicting (3). Currently, there are three major methods that are widely used for propagation of higher plants through tissue culture (7). One of these methods, i.e. asexual embryogenesis has been manifested in a variety of plants belonging to different genera and species (18). The suggestion of asexual embryogenesis in Elaeis guinensis, a member of the palmea, was made by Rabechault et al (12). Reynolds and Murashige (13) are credited with the first successful initiation of asexual embryos in date palm callus cultures. Their work was successfully followed by Tisserat (17). In this investigation ovular callus was initiated in eight date palm cultivars on a medium enriched with 10 mg/1 2,4-D and 2 mg/1 kinetin. Such callus initiated numerous asexual embryos following transfer to hormone-free medium, which further germinated in a manner similar to the zygotic embryo. These results are in close agreement with others (13,17), although lower 2,4-D concentration were used in this investigation. This variation seem to depend on the cultivar employed.

The response of tested cultivars to initiate callus on the selected medium can be grouped into 3 catagories. Khastawi, Maktoom and Saáda may represent the "high responsive cultivars" while Ashrasi as the "low responsive cultivar". The rest of the cultivars (Khadhrawi, Braim and Barban) can be considered as "intermediate responsive cultivars". However it is noteworthy to mention that the Ashrasi ovules were bigger in size than the other cultivars at the time of excision (2 months after pollination) and thus they should be excised earlier to ensure higher incidences of calugenesis. These results indicate that the ovale cells of the tested cultivars are totipotent and this totipotetiality is different from cultivar to another (i.e. khastawi is most totipotent cultivar and Ashrasi is the least). This totipotentiality was expressed in the form of callus initiation and their subsequent growth and development into asexual embryos. Further transfer of such embryos resulted in the development of normal looking plants that were established in the soil.

Histological examination of the callus cultures revealed the presence of meristematic centers which corresponds the meristemoids. Such meristemoids are considered as the forerunner of organized development (19). When the callus was transferred to hormone-free medium, these meristemoids developed into organized structures in the form of embryoids, capable of germination on appropreate medium.

Protein banding pattern has been used to classify plants and distinguish between different species and cultivars (5). Isozymes, on the other hand, have

been successfully used as genetic markers in date palm (20). In this investigation, it was possible to relate the somatic embryo, and their subsequent plants to their parents based on their protein and esterase isozyme banding pattern. Several workers have attempted to identify hybrid plants (16). somatic and zygotic embryos (5) as well as tissue culture derived plants (15) based on such informations. This is the first report on such attempt in the studied cultivars. It is, as well, the only available technique that can be used now for rapid, early and sensitive determination of the genotype of tissue culture derived plants. Other enzyme systems should be studied to allow wider application of this technique.

The process of callus initiation and subsequent asexual embryogenesis described in this article can be adapted for rapid clonal propagation of the date palm. In one attempt, the number of somatic embryos initiated in one transfer was counted in the "Zahdi" cultivar. It was found that one gram of callus produced more than 230 somatic embryos in about 8weeks. The "Zahdi" cultivar initiates about 450mg of callus every 8 weeks and it is intermediate in its calugenesis capacity (see Table II for comparison). Therefor, millions of embryos can be attained by this method each year. Such embryos can be germinated into complete plants with appropreate handling. Thus this method can be used to propagate the plam through tissue culture, since the nucellar origin of the resultant plants has been established in this investigation.

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Literature Cited

1- Al-Jibouri, A.A., K.M. Adham & K.N. Jassam (1986): Isozyme differences between date palm (phoenix dactylifera L.) cultivars. NRC 6410-p18-86 (internal Report).

2- Ammar, S. & A. Benbadis (1977): Multiplication vegetative du palmier-dattier (phoenix dactylifera L.) parla culture de jeunes plantes tissues desemis. C.R. Acad. Sci. paris 284: 1789-92.

3- Blake, J. (1983): Tissue culture propagation of coconut, date and oil palms. In: Tissue Culture of Trees (J.H. Dodds, ed.) AVI publishing company, INC. Westport, Connecticut pages 29-50.

4- Eeuwens, C.J. (1978): Effects of organic nutrients and hormones on growth and development of tissue explants from coconut (Cocos nucifera) and date (phoenix dactylifera L.) palms cultured in vitro. physiol. plant. 42: 173-78.

5- Gebra, H. H., Khan & E. foster (1986): Barley cultivar identification by polyacrylamide gel electrophoresis of Hordein protein: Catalog of cultivars. Crop Sci. 26: 454-60.

6- Hameed, M.K. (1986): Biochemical disrinction between spiroplasma citri infected and non-infected citrus. proc. 4th Sci. Conf. SRC (Baghdad) 1: 1389-01.

7- Murashige, T. (1974): Plant propagation through tissue culture. Ann. Rev. Plant physiol. 25: 135-66.

8- Murashige. T., & F. Skoog (1962): A revised medium for rapid growth and bioassays with tobacco tissue culture. physiol. plant. 15: 173-97.

9- Omar, M.S. (1986): Propagation of date palm through tissue culture. proc. VI Int'l Cong. plant Tissue & Cell Culture, Minnesota, USA p. 325 (abstract).

10- Omar, M.S. & M.B. Arif (1985): An investigation of the fate of phoenix dactylifera L. carpels cultured in vitro. Date palm J. 4: 15-24.

11- Rabechault, H. & J.P. Martin (1976): Multiplication vegetative du palmier a huile (Elaeis guineensis Jacq.) a laide de cultures de tissus foliares. Compte. Rehdu. Acad. Sci. Ser. III. 283: 1735-37.

12- Rabechault, H., J. Ah'ee & G. Gu'enin (1970): Colonies Cellulaire et formes embryoides obtenues in vitro a partir de cultures d'embryons de palmier a huile (Elaeis guinensis Jacq. var dura Becc.). Compte. Rendu. Acad. Sci. Ser. III. 270: 3067-70.

13- Reynolds, J.F. & T. Murashige (1979): Asexual embryogenesis in callus cultures of palms. In Vitro 15: 383-87.

14- Sass, J.E. (1968): Botanical Microtechnique. Iowa State University press, Ames, Iowa.

15- Scandalios, J.G. & J.C. Sorenson (1977): Isozymes in plant tissue culture. In: Reinert, J. and Y. P. S. Bajaj (eds). Applied and Fundamentel Aspects of plant Cell, Tissue and Organ Culture. Springer-verlag, Berlin, Heidelberg, New York.
16- Soost, R.K., T.E. Williams & A.M. Torres (1980): Identification of nucellar and zygotic seedlings of citrus with leaf isozymes. Hort. Sci. 15: 728-29.
17- Tisserat, B.H. (1979): Tissue culture of the date palm. J. Hered. 70: 221-22.
18- Tisserat, B., E. Esan & T. Murashige (1979): Somatic embryogenesis in Angiosperms. In: Janick. J. (ed.) Hort. Rev. 1: 1-78.
19- Torrey, J.C. (1966): The initiation of organized development in plants. Adv. Morphol. 5: 39-91.
20- Torres, A.M. & B. Tisserat (1980): Leaf isozymes as genetic markers in date palms. Amer. J. Bot. 67: 162-67.
21- Zaid, A. & B. Tisserat (1983): Morphogenetic responses obtained from a variety of somatic explants tissues of date palm. Bot. Mag. 96: 67-73.

Table I. Effect of 2,4-D on callus initiation and asexual embryogenesis in phoenix dactylifera L. ovule segments. Original media contained 2mg/1 kinetin.

2,4-D conc.	Type of Response, %							
	2 months				3 months			
mg/1	C*	E**	G***	NR****	C	E	G	NR
0	20	30	30	20	22.2	22.2	66.6	0
3	10	10	50	30	0	0	33.3	66.7
10	100	100	30	0	0	0	66.6	33.4
30	50	30	10	10	0	0	12.5	87.5
100	0	0	22.5	77.5	0	0	12.5	87.5

C = Callus initiation
E = Asexual embryogenesis
G = Zyotic embryo germination
NR = No Response

Table II. Calugenesis potential in seven phoenix dactylifera (L.) cultivars. Original media supplemented with 10 mg/1 2,4-D + 2mg/1 kinetin

cultivar	cultures producing callus, %	callus frech weight (mg) mean ± SE (per culture)
Khastawi	100	170 ± 40
Maktoom	94.11	910 ± 190
Saada	88.88	520 ± 120
Khadhrawi	64.70	310 ± 80
Braim	53.33	290 ± 30
Barban	50.00	470 ± 130
Ashrasi	30.76	430 ± 150
Zahdi (control)	100	440 ± 120

Legend to Figures

Figure 1: (A-D): Regeneration of plant from callus cultures of the date palm. A: initiation of callus, B. initiation of asexual embryos.

Figure 2: Tissue culture-derived date palm, well established in the soil (5 months old).

Figure 3: (A-C): Histological examination of callus (A), asexual (B) and Zygotic (C) embryos of the dat palm SA = shoot apex, VT = vascular tissue, MC = meristematic center and CS = cotyledonary sheath (A,C, × 250, B × 400).

Figure 4: Protein banding pattern of tissue culture derived plant 2(C), aseexual embryo (D), the female parent (source of the explant); B, and a male cultivar (A).

Figure 5: Esterase isozyme banding pattern and ultrascan densitometer picture of the date palm. (A through D same as in Fig 4).

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CYTOPLASMIC INCOMPATIBILITY FOR SUPPRESSION OF *Ephestia cautella* INFESTATION RATE IN SIMULATED DATE STORES

M.S. AHMED
Faculty of Agricultare & Biology,
Nuclear Research Center,
P.O. Box 765 Baghdad-Iraq.

ABSTRACT:

In a test population high degree of replacement of Baghdad (B) strain of Ephestia cautella (walker) was brought about by the imported American (A) strain of the same species when they were confined in equal numbers for 13 generations.

The suppression effect of (A) males on the percentages of date fruits infested with (B) strain in a simulated date store was evident, since it caused highly significant decrease in infestation rate almost throughout the entire period of storage.

The incompatible (A) males fully competed with (B) males on mating with (B) females, when reduction in egg hatch was taken into account.

Although the effect of container sizes on the reduction of egg hatch was statistically not significant, the competitiveness of (A) to (B) males at 1:1 ratios seemed to increase as the container size increased.

دور التنافر السايتوبلازمي في خفض الاصابة بدودة عثة التين في مخازن تمور تجريبية

محمد سعيد هاشم احمد
مركز البحوث النووية - هيئة الزراعة والبايولوجي
ص.ب. 765 بغداد. العراق

الخلاصة:

حلت سلالة (أ) الامريكية المستوردة من دودة عثة التين تتصف بالتنافر (عدم التوافق) السايتوبلازمي بأتجاه واحد، مكان السلالة العراقية (ب) (بغداد) في تجربة مختبرية بعد اطلاق اعداد متساوية من كل منهما في اقفاص تجريبية تحت ظروف تشابه تقريبا مخازن تمور مصغرة، اذ بلغ عدد افرادها اكثر من ستة اضعاف عدد افراد السلالة العراقية خلال عدة اجيال بعد ان كان مساوياً له.

اثبتت ذكور طراز (أ) من عثة التين مقدرتها على خفض اصابة التمر الزهدي بسلالة (ب) العراقية في مخزن تجريبي، وذلك بأطلاق ذكور (أ) عدة مرات في المخزن وبنسب معينة مقارنة بالمخزن الذي لم يتم فيه اطلاق مثل هذه الذكور.

كذلك سببت ذكور طراز (أ) انخفاضاً معنويا شديداً في نسبة تفقيس بيض سلالة (ب) في تجربة لمقارنة التنافس التزاوجي عند استخدام نسب بلغ اقصاها: ٨: ١: ١ (٤٠: ٥: ٥) من ذكور (أ): ذكور (ب): اناث (ب) على التوالي، جمعت في اواني ذات احجام مختلفة. وعلى ما يبدو، لم يكن لحجم الاناء أي تأثير معنوي في نسبة خفض تفقيس البيض في ظروف هذه التجربة.

INTRODUCTION

Since the appearance of the preliminary data concerning the unidirectional cytoplasmic incompatibility in Ephestia cautella (Walker) in American (A) and Baghdad (B) strains, its importance in the genetic control of this moth was instantly recognized (1-3,6). Consequently this phenomenon was studied intensively either to replace (B) strain by (A) strain (5), or to suppress it by the reproductively incompatible (A) males (7,8). The present paper describes the effectiveness of (A) strain in replacing test population of (B) strain; the suppression effect of incompatible (A) males on the percentages of date fruits infested with (B)

strain adults; and mating competitiveness of (A) males to (B) males caged with (B) females, at seven different ratios in containers of a similar size, and at four different rations, in containers of three different sizes.

MATERIALS AND METHODS

Replacing (B) strain by (A) strain: The effectiveness in replacing test population of (B) strain by (A) strain was measured by confining simultaneously 10 pairs (10 females × 10 males) of each strain in a single fiberglass cage (internal dimensions: 40×40×40cm) containing 2 kg laboratory rearing medium composed of 81% crushed wheat, 12% glycerin, 6% date syrup (dibis), and 1% dry yeast by weight. Both strains were reared and tested at about 25±1°C, 40-60% relative humidity and approximately 6 h light: 18 h dark cycles, with certain precautions against an egg-eater mite (10), Blattisocius tarsalis (Berlese) (Ascidae), as determined by the Commonwealth Institute of entomology, British Museum (Natural History).

The F_1 late pupae were removed from the fiberglass cage using a piece of a cottonwool as pupation sites, sexed and kept individually in vials for emergence. Twenty pairs of F_1 adults (20 females + 20 males) were randomly taken and put in a similar cage under the same previously stated conditions to initiate a new generation. This was repeated for 13 generations. In order to measure the changing percentages of the two crossing types, some females of nine generations were mated (single-pair mating) to males of (A) strain and their cytoplasmic type was determined accordingly (4). Also, males have been mated to females of (B) strain then fertility or percentage of egg hatch was counted for each mating. If the overall rate of egg hatch was less than 4%, the male was considered to be of (A) crossing type.

Suppression of the Iraqi (B) strain of E. cautella by repeated releases of cytoplasmically incompatible males in simulated date stores: Two small stores were constructed simulating somewhat old country or terminal date stores in Iraq except that of some controlled environmental conditions (approx. :23-28°C and 40-60% relative humidity). The dimensions of store No. 1 are: 2.38 m long, 1.3m wide, and 2.95m high; while store No. 2 has the same length and height but 0.98m wide.

Ten uncovered single walled commercial Standard Carton Boxes (SCB), approximate dimensions of each are: 48.5 × 31 × 19 cm, with 100kg of untreated date, Zahdi variety of 1985 harvest, i.e. 10kg in each SCB, were loosely piled in every store, as shown in Fig. 1, to allow enough space for released adult

moths to invade the dry dates.

The initial rate of infested dates was 3.79% with no live insects whatsoever when 1096 date fruits were taken at random and carefully examined.

Then 30 pairs (30 males + 30 females) of E. cautella (B) strain + 300 incompatible (A) males were released in store No. 2, followed by adding 300 (A) males when adults just started to emerge in the stores. Also, 300 more (A) males were added two times 1 and 2 months later, respectively, making the total added (A) males equal to 1200 males in addition to the 30 pairs of (B) strain initially released in this store. Whereas 30 (B) females and 30 (B) males only (that is 30 pairs) were released in store No. 1 to serve as a control. The main problem encountered is that (A) females should be strictly avoided, otherwise a replacement of (B) strain by (A) strain could occur as described earlier.

Releases were carried out on the same day as 10 SCBs with dry dates were placed in each store. The reduction in the percentages of infested date fruits is taken as a measure for suppression of the (B) strain infestation activity. The rate of infested dates with larvae, pupae-dead or alive-, or merely with insect fragments or frass, has been determined by examining 1.5 kg (Ca. 180-210 date fruits) from every SCB 37, 68, 90, 123, and 158d, respectively, after the first releases of adult moths were made. Thus, about 15 kg of date have been taken out of each store at a time and carefully examined.

Comparative mating competitiveness of (A) strain males with (B) strain males for (B) females of E. cautella: Pupae of each strain were collected, sexed, and placed individually (or sometimes every 2-3 pupae of the same sex) in small cotton-stoppered shell vials (25×75mm) and left for emergence. Adult moths used in these tests were less than 24 h old.

In the 1st experiment, after emergence males of both (A) and (B), and females of (B) strains were combined in the desired rations in lantern globes (800 cm^3 each) with mesh screens placed on appropriate crystallizing dishes. Eggs laid usually dropped through the screen into the dish and were collected after 72 h. Then every 50 eggs were placed on a wet black filter paper. Hatchability was counted 7 d after incubation in 25 ± 1°C and a relative humidity of 40-60%. Presence and number of spermatophpres were determined by dissecting females as a measure of mating frequency.

In this experiment (A) strain males were caged in the previously described lantern globes with (B) males puls (B) females at the following ratios:- 0:1:1, 1:1:1, 2:1:1, 4:1:1, 8:1:1, 15:1:1, and 25:1:1. Five to seven replicates (lantern globes) were made for each ration.

In the 2nd experiment, under the same condi in s mentioned earlier, (B) females of E. cautella have been caged with both (B) males and (A) males, in con-

tainers of 3 different sizes: 1.6-,3- and 5-litre beakers in 6-14 replicates. The following ratios of (A) males: (B) males: (B) females were used: 0:1:1, 1:1:1, 4:1:1, and 8:1:1. They were held in the beakers for 72 h also, then eggs were collected and percent hatch recorded.

Data analysis: The results were analyzed by analysis of variance (ANOVA) with significance of differences between means was determined by Duncan's multiple range tests ($P < 0.05$). Reduction in egg hatch was also determined as a function of increasing strain (A) males following exponential decay curve: $y = ab^x$, where y = mean egg hatch, and x = number of (A) males released (13). Furthermore, the competitiveness of (A) and (B) males was calculated for the different container sizes by the formula of Fried (9).

RESULTS AND DISCUSSION

Replacing (B) strain by (A) strain: The results depicted in Table 1 clearly show the replacement of (B) strain by (A) strain as approximately 90% of the total number of E. cautella adults of several cytoplasmically tested generations (4) were of (A) crossing type. This represents an increase in the latter strain of about 40% over the percentage of 50% (A) type of the initially caged parents (cf. 1st row of Table 1). In Iraq, such replacement might occur in some field or storage populations as well if importation of dry-food products infested with E. cautella having (A) crossing type is continued (4) to flow unrestricted.

Suppression of the Iraqi (B) strain of E. cautella by repeated releases of males with cytoplasmic incompatibility in simulated stores: The data, summarized in Table 2, show the suppression effect of repeated releases at certain intervals of 1200 (A) males of E. cautella (4) in simulated date store (store No. 2) containing 10 standard carton boxes of dates (Fig.1) infested with 30 pairs of males and females of E. cautella Baghdad (B) strain, in comparison with the control (store No. 1). In the former store, the percentages of infested dates were low in general thanks to the repeated releases of incompatible (A) males. In this respect, the difference between store No. 1 and store No. 2 was statistically highly significant ($p < 0.01$) particularly in the first 4 intervals of date examination, that is 37, 68, 90, and 123 d, respectively, after the beginning of the insect release. It is believed that continual releases of incompatible males through several generations migh bring about more considerable suppression of infestation. Thus the incompatible males could substitute the use of sterile insect technique which usually lowers the sexual competiriveness of treated insects

(7). Furthermore, it is assumed that any single date storage structure can be separately treated, with perhaps one or few release sites per store; provided that an appropriate E. cautella strain be obtained (12) to have a genetic "match" to natural populations (11).

Comparative mating competitiveness of (A) strain males with (B) strain males for (B) females of E. cautella: Data of the 1st experiment, illustrated in Table 3, show that at all ratios investigated (A) strain males fully competed, in mating, with (B) males, when reduction in egg hatch was taken into account, since the actual percentages of reduction were almost similar to theoretical calculations (14). Furthermore, the number of spermatophores produced (Cf. column No. 7 in Table 3) by males at all ratios ranged between 1.10-1.36 per dissected female, and showed no statistically significant differences in mating frequency indicating somewhat that there are apparently no intrinsic mating barriers between the two unidirectionally incompatible Ephestia cautella strains. In this respect it is worthwhile to mention that E. cautella adults do mate several times during their short lifespan (Table 4). However, it seems that more than 60% of them would mate only once irrespective of the other circumstances shown in Table 4.

Results of the second experiment show that strain (A) males appeared to have significant effect in bringing about a decrease in egg hatch (Table 5) of strain (B) adults caged in containers of three different sizes at the ratios mentioned in the Table. Generally, the mean egg hatchability followed an exponential decrease with increasing numbers of (A) males of the form $Y = ab^x$, where $y = 50.0956e^{-0.1598x}$ and r value is equal to 0.91, $y = 59.7173e^{-0.2408x}$ and r value is equal to 0.97, and $y = 59.7173e^{-0.1324x}$ and r value is equal to 0.84, for the different container sizes, respectively (Table 5). Although the effect of container sizes on the reduction of egg hatch was statistically not significant, the competitiveness of (A) to (B) males at 1:1 ratios, calculated by the formula of Fried (9), seemed to increase as the container size increased.

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LITERATURE CITED.

1- Ahmed, M.S.H., I.A. Alhassany, S.B. Lamooza & N.A. Ouda (1974): Crossing experiments with two Ephestia cautella strains (unpublished). Cited by Brower, J.H. in Potential for Genetic Control of stored-product Insect Population. proc. 1st. Intern. Working Conf. on stored-prod. Entomology. Savannah, Ga.: 167-180.

2- Ahmed, M.S.H., I.A. Alhassany, S.B. Lamooza, N.A. Ouda & A.A. Al-Taweel (1975a): Further hybridization experiments with different strains of Ephestia cautella (Walker). proc. 1st Sci. Conf, Iraq Atomic Emergy commission, Baghdad: 108-111.

3- Ahmed, M.S.H., S.B. Lamooza, N.A. Ouda & I.A. Alhassany (1975b): Preliminary report on mating studies of three varieties of Cadra (Ephestia) cautella (Walker). In proc. Symp. on Sterility principle for Insect Control, Innsbruck, 1974, IAEA, Vienna: 413-21.

4- Ahmed, M.S.H., A.A. Kadhum, A.A. Hameed, S.R. Ali & Z.S. Al-Hakkak (1984): CYtoplasmic analysis of Ephestia cautella adult females collected in different regions of Iraq. J. stored prod. Res. 20, 3: 151-152.

5- Ahmed, M.S.H., A.A. Hameed, A.A. Kadhum (1985): Replacement of Ephestia cautella laboratory population of Baghdad crossing type by an imported strain, Abstract, 8th Sci. Convention, Iraqi Biological Soc., Erbil: 75.

6- Brower, J.H. (1976): Cytoplasmic incomoatibility: occurrence in a stored-product pest Ephestia cautella. Ann. ent. Soc. Am. 69, 6: 1011-1015.

7- Brower, J.H. (1979): Suppression of laboratory populations of Ephestia cautella (Walker) (Lepidoptera: Pyralidae) by release of males with cytoplasmic incompatibility. J. stored prod. Res. 15: 1-4.

8- Brower, J.H. (1980): Reduction of almond moth populations in simulated storages by the release of genetically incompatible males. J. econ. Entomol. 73,3: 415-417.

9- Fried, M.J. (1971): Determination of sterile-insect competitiveness. J. econ. Entomol. 64, 4: 869-870.

10- Henneberry, T. J. & A.N. Kishaba (1966): Cabbage loopers. In Insect Colonization and Mass Production, Academic press, New York: 259-70.

11- Lachance, L.E., A.C. Bartlett, R.A. Bram, R.J. Cagne, O.H. Graham, D.O. Mcinnis, C.J. Whitten & J.A. Seawright (1982): Mating types in screwworm populations? Science, 218: 1142-1143.

12- Lamooza, S.B., M.S.H. Ahmed, S.K. Al-Maliky, A.A. Al-Taweel, I.A. Alhassany & Z.S. Al-Hakkak (1977): Three new strains of Ephestia cautella (Wal-

ker). Abstracts, 4th Sci. Convention, Iraqi Biological Soc., Baghdad: 134.
13- Little T.M. & F.J. Hills (1978): Agricultural experimentation, design and analysis. Wiley and Sons Inc., N.Y., U.S.A..
14- Ouye, M.T., H.M. Graham, R.S. Garcia & D.F. Martin (1965): Comparative mating competitiveness of metepa-sterilized and normal pink bollworm males in laboratory and field cages. J. econ. Entomol. 58, 5: 927-929.

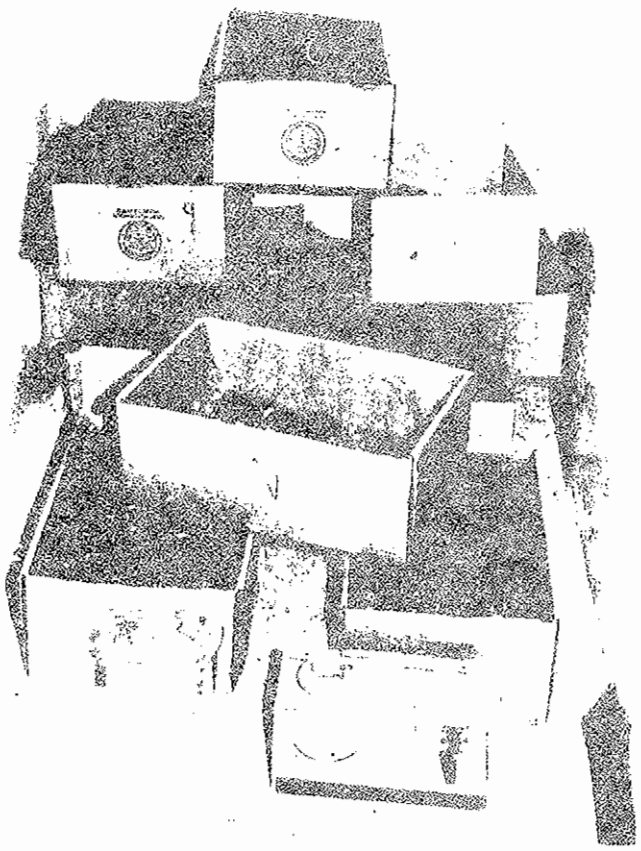

Fig.1. Simulated date store used in the present experiment showing the arrangement of standard carton boxes with dry dates, a 5-litre beaker served as a release site for E. cautella adults, and a thermohygrograph monitoring temperature and humidity.

Table 1. Number of males and females of two Ephestia cautella crossing types (A and B) through 13 generations when initially 10 pairs (parents) of each type were confined in a single cage, then 20 pairs of each subsequent generations taken at random were transferred to a new cage, while some adults from all generations (except F4, F6, F11, and F12) were individually subjected to cytoplasmic analysis (4).

Crosses (single-pair mating) Female × male	No. of cytoplasmically analyzed adults in 9 generations	(%) fertile adults (range) in 9 generations	Total No. of suggestive crossing type in 13 generations and their parents	
			A	B
Parents × parents	-	-	20 (50%)	20 (50%)
$F_1 - F_{13}$ × A (98499 eggs)	481 ♀	73.9-100"	419 (87.1%)	62 (12.9%)
B × F1 – F13 (45808 eggs examined)	298 ♂	20.0 –0.0	291 (94.3%)	17 (5.7%)

a 100% (A) females was achieved in F8 females, and around 84-94% in F9. F10, and F13. Could this discrepancy be attributed to sampling error and/or to slight fertility "feedback" (2,3)?

Table 2. Effect of repeated releases at certain intervals of incompatible males on the percentages of infested dates when commercial standard carton boxes of dry dates placed in two stores, where in store No. 1 30 pairs of E. cautella (B) strain adults were released, and 30 similar pairs plus 300 incompatible males (A strain) in store No. 2, followed by interrupted releases of 900 (A) males in the latter store when adults started to emerge in both stores.

Samples examined after: (day)	(%) infested dates in: Store No. 1 30 ♀ Bx30 ♂B strain	Store No. 2 30 ♀ Bx30 ♂Bx300 ♂A then + 900 ♂A strain	t value	Probability of error (P)
37	32.61 ± 12,73	10.75 ± 4.65	9.85	< 0.01
68	68.20 ± 7.33	12.08 ± 5.65	19.31	< 0.01
90	91.37 ± 3.62	37.73 ± 14.94	11.04	< 0.01
123	-	55.94 ± 14.78	7.36*	< 0:01
158	-	92.23 ± 2.48	0.23*	> 0.8

-- Discarded due to very high infestation rate.

* t value was obtained by the last percentage (91.37 ± 3. 62) of store No. 1 as a control.

Table 3. Mating competitiveness (% egg hatch) of an Iraqi strain (B) of E. cautella when cytoplasmically incompatible males from America (A) were added at the ratios indicated (actul numbers).

No. of each strain A♂:B♂:B♀	No.of replicates	No. eggs laid after 72h	Mean* hatch (%)	Reduction in egg hatch (%) (14) Actual	Theoretical	Mean No. of spermatophores/♀
0:5:5	5	1349	74.13a			1.27 ± 0.57
5:5:5	5	1657	36.55b	50.69	50.00	1.20 ± 0.37
10:5:5	6	2266	36.54b	50.71	66.67	1.26 ± 0.45
20:5:5	6	2565	5.42c	84.60	80.00	1.13 ± 0.35
40:5:5	5	1754	2.39d	96.77	88.89	1.16 ± 0.43
30:2:2	5	1226	0.82d	98.90	93.75	1.10 ± 0.56
50:2:2	7	1313	1.59d	97.84	96.77	1.36 ± 0.49

* Means following by the same letter are not significantly different at the 5% level by Duncan's multiple range test.

Table 4. Total number of spermatophores detected in Ephestia cautella females which were dissected after: single-pair mating (1 ♀ × 1 ♂) throughout their lifespan, mass rearing (multiple mating), or just after being captured in the field.

Type of mating	No. of females dissected	(%) females with the following No. of spermatophores:- 0	1	2	3	4	5	6	7
Single-pair	220	10.9	64.1	20.5	1.8	2.7			
In the field	220	16.8	68.2	14.1	0.9				
Multiple	410	15.1	63.2	13.9	2.7	3.2	1.0	0.5	0.5

Table 5. Percent hatch of eggs laid by E. cautella Baghdad strain (B) females mated with both (B) males and cytoplasmically incompatible American strain (A) males at the indicated ratios placed in beakers of 3 different sizes. Figures in parentheses are numbers of replicates).

No. of each strain A♂:B♂:B♀	Beaker size (litres) 1.6	3	5
0:5:5	72.26 a (10)	64.61 a (12)	64.70 a (14)
5:5:5	44.10 b (7)	33.18 b (9)	30.72 b (14)
20:5:5	17.38 c (7)	21.91 bc (13)	21.04 bc (13)
40:5:5	10.04 c (6)	15.82 c (14)	18.44 c (14)

Mean percents in a column followed by the same letter are not signifcantly different ($p > 0.05$; Duncan's multiple range test).
Mean within rows are not significantly different at the above- mentioned level of confidence and test.

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Post incidence in marketed date palm fruits in Dutse, Kano State, Nigeria

C.I. AISAGBONHI*
* Department of Zoology, University of Benin.

ABSTRACT.

Date palm fruit samples from five markets situated in Dutse Local Government are a ware mieroscopically examined every fortnight. Oryzaephilis mercator (Fauvel) (Coleoptera : Silvanidae), Coccotrypes dactyliperda (Fabricius) (Coleoptera : Scolytidae), Araecerud fasciculatus (Degeer) (Coleoptera : Anthribae) and Plodia interpunctella Hubner (Lepidoptera : Pyralidae) were recovered from infested fuuits Positive correlation was established between percentage number of fruits infested versus percentage number of fruits without Calyx ($r = 0.5074^{**}$); percentage number of fruits infested versus percentage number of fruits with cracks ($r = 0.4166^{*}$); percentage number of fruits infested with frass, yeast and fragments versus percentage number of fruits without Calyx ($r = 0.5788^{**}$); and percentage number of fruits infested with yeast, frass and fragments versus percentage number of fruits with cracks ($r = 0.5548^{**}$). These results show that carefully harvested and packed fruits with calyx ends still attached and without cracks have a lower percentage infestation than those with cracks and without calyx ends attached.

الحشرات الموجودة في ثمار النخيل في اسواق دتسي نجيريا.

سي . أ . اسجابوني

الخلاصة :

أخذت نماذج من خمسة اصناف تمور محلية في محافظة دايتس لغرض فحصها مجهريا كل اسبوعين . وقد تم معرفة وكشف الأفات التالية oiyzaephilis mercator, Coccotrypes dactyliperda, Araecerus fasciculatus, Plodia interpunctella . في ثمار هذه الاصناف . وقد أظهرت النتائج على وجود علاقة موجبة بين الثمار المصابة والخالية من القمع $r = 0.5074$ ، الثمار المشققة $r = 0.4166$ ، التخمر والشوائب $r = 0.5788$ أضافة الى ذلك فقد وجدت علاقة بين الاصابة بالخمائر والثمار المشققة $r = 0.5548$. ويمكن استنتاج على ان العناية بالجني وتعبئة الثمار ذات الاقماع وبدون اي خدوش تخفض نسبة الاصابة في الثمار مقارنة بالثمار المخدشة والتي بدون اقماع .

INTRODUCTION

Date palm fruits form an important component of the carbohydrate food of many people in the Northern parts of Nigeria.

Dry date fruits are commonly attacked by more than 12 insect species belonging to the Coleoptera and Lepidoptera (Hussain 1963, 1964). Lindgren and Vincent (1953) reported four species of nitidulid beetles (Carpophillus dimidiatus) (Fabricius) or the corn sap beetle, C. hemipterus (Linnaeus) also called fig beetle or two-spotted beetle; the pineapple beetle, Urophorus humeralis (Fabricius) and the yellow nitidulid, Haptoncus luteolus (Erichson).

Other insects reported by Elmer et al (1968) include the rusty grain beetle, Cryptolestes ferrugineus (Stephens), the saw toothed grain beetle Oryzaephilus surinamensis Linnaeus and the Merchant grain beetle, O. mercator Fauvel as feeding on dates in storage and causing fruit spoilage in much the same manner as the nitidulids.

The "date-stone beetle" Coccotrypes dactyliperda (Fabricius) has also been reported to occur in the United States and Mexico (Stickney, 1950), Algeria (Teisseire, 1961), the coastal areas of Libya (Martin, 1959), United Arab Republic (Buxton, 1920) and Israel (Kehat et al, 1966).

This investigation was carried out to determine the species of insects that are destructive to stored date palm fruits in Dutse locality.

MATERTIAL AND METHODS.

Five markets (Kachako, Shuwarin, Kiyawa, Laraba and Yadi) situated around NIFOR Dutse date palm substation were chosen. Two cellophane pakkaged- date fruits weighing 1 kilogramme each were randomly purchased from each of these markets every fortnight. These purchased packets were then conveyed to the laboratory, dissected and microscopically examined, for presence or absence of insect infestation. As far as possible all these market samples were examined within one week of the date of purchase.

Collections were made of insect specimens found within the date fruit mesocarp and the date seed. These insect specimens were preserved in 70 % alcohol solutions. The moth recovered was presrved dry and pinned up. They were prepared and parcelled to the Common Commonwealth Institute of Entomology, London for identification.

Statistical analysis: Simple regression analysis was carried out to find the

relationship between percentage number of fruits infested and percentage number of fruits without calyx; percentage number of fruits infested and percentage number of fruits with cracks percentage number of fruits without calyx; and also between percentage number of fruits infested with yeast, frass and fragments and percentage number of fruits with cracks.

RESULTS AND DISCUSSIONS

During periodic examination of randomly purchased date palm fruits from five markets in Datse local government area, the following insects were found feeding on the markedet fruits. They were identified by CIE London as follows:

Oryzaephilus mercator (Fauvel) (R. Madge and M. L. Cox determined) (Coleoptera : Silvanidae).

Coccotrypes dactyliperda (Fabricius) (M. L. Cox determined) (Coleoptera : Scolytidae). This was erroneously thought to be Poecilip sp as reported in NI FOR twentieth annual report 1983, and from earlier observations during this study.

Araecerus fasciclatus (Degeer) (M. L. Cox determined) (Coleoptera : Anthribidae).

Plodia interpunctella Hubner (J. D. Bradley determined) (Lepidoptera : Pyralidae).

Oryzaephilus mercator: Plodia interpunctella and Araecerus fasciculatus were found feeding on the date mesocarp while Coccotrypes dactyliperda was found puncturing and feeding on the date seeds.

The decreasing magnitude of relative occurrnce of these pests were O. mercator > C. dactyliperda > Plodia interpunctella > Araecerus fasciculatus.

Figures 1, 2 and 3 show the monthly titals of larvae, pupae and adults of O. mercator, the most abundant of these storage pests, during the period January 1984 to March 1986.

Figures 4,5, 6, and 7 show the positive linear regression graphs of percentage number of fruits infested versus percentage number of fruits without calyx; percentage number of fruits infested versus percentage number of fruits with cracks; percentage number of fruits infested with frass, yeast and fragments versus percentage number of fruits without calyx and percentage number of fruits infested with yeast, frass and fragments versus percentage number of fruits with cracks. Positive correlation ($r = 0.5074^{**}, 0.4166^{*}, 0.5788^{**}, 0.5548^{**}$) was established between each of these parameters.

Only three species of insects of the order Coleoptera and one Lepidopteran

were recorded as being destructive to marketed date palm fruits in this study. Hussain (1963, 1964) reported that dry date fruits are commonly attacked by more than 12 insect species belonging to the Coleoptera and Lepidoptera. Further investigation needs to be done to determine the range of pests of the date fruits in Nigeria.

Figures 1,2, and 3 reveal that the insects build up in population 2 to 4 months after the harvest (period of harvest, late February to late April). The peak period of insect infestation was June and July for all the larval, pupal and adult stages. A second peak occurred in October in the adult population, before obtaining zero infestation levels during the off season, just before the period of the next harvest. Freshy harvested fruits were not infested.

The implication of the positive correlation obtained between percentage insect infestation and number of fruits with calyx ends attached or without cracks indicates that fruits should be carefully picked from date palm bunches after harvesting so that the calyx ends could remain intact. Care should also be taken to avoid fruits getting cracked during drying, processing and packaging operations. Dowson (1982) similarly made these observations.

The implication of the time infestation consequently sets in one or two months after harvest and the monthly trend of insect infestation is that fruits need to be protected against insect infestation, for long term storage. Elmer and Carpenter (1968) gave the advantages of fumigation of newly picked dates. Insect infestation is thus arrested and reinfestation within the packinghouse is checked when dates are fumigated. Leesch et al (1982) indicated that Phospine was an effective fumigant for the disinfestation of date fruits.

Ahmed et al (1982) and Al-Hakkak et al (1984) in different experiments on disinfestation of commercially packed dates in standard cartons by ionising radiation, indicated this to be an efficient and safe method. WHO (1981) earlier gave an unconditional acceptance for date irradiation for the purpose of controlling infestation of stored product insects using an average dose of up to 100 Krad.

This study reveals that marketed date fruits are seriously attacked by storage pests and highlights the need to protect date palm fruits against insect infestat on for long term storage.

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ITERATURE CITED.

1- Ahmed, M. S. H., Hakkak, A. S., Ali, S. R., Kadhum, A. A., Hassan, I. A., Al-Maliky, S. K. and Hameed, A. A. (1982): Disinfestation of commercially packed dates, Zahdi variety, by ionizing radiation. Date palm J 1 (2): 249-273.

2- Al-Hakkak, Z. S., Ali, S. R., Ahmed, M. S. H. and Al-Maliky, S. K. (1984): Wholesomeness studies with a full diet of irradiated dates on the insect Ephestia cautella (Walker): 111 Effects of long term feeding. Date Palm J 3 (1): 337-347.

3- Buxton, P. A. (1920): Insect pests of dates and the date palm in Mesopotamia and elsewhere. Bull. entomol. Res. 11: 287-303.

4- Dowson, V. H. W. (1982): Date production and protection with special reference to North Africa and the Near East. F.A.O. Plant Production and Protection Paper 1982. P. 162.

5- Elmer, H. S. and Carpenter, J. B. (1968): Pests and Diseases of the date palm. Part 1. Mites, Insects and Nematodes. F.A.O. Plant Protection Bulletin. Vol. 16. No. 5. October 1968.

6- Hussain, A. A. (1963): Pests of Date Palms and Dates with methods of control in Iraq (Ay). Baghdad: Al-Edara Al-Mahila Press, 200 P.

7- Hussain, A. A. (1974): Date palms and Dates with their pests in Iraq. Iraq: Mosul University Press, 166 P.

8- Kehat, M., Stoller, S., Meisner, J. and Greenberg, S. (1966): Development of population and control of Carpophilus dimidiatus F., C. hemipterus L. and Coccotrypes dactyliperda F. in dates. Israel J. agr. Res. 16: 173-176.

9- Leesch, J. G , Redlinger, L. M., Gillenwater, H. B., Zehner, J.M. (1982): Fumigation of dates with phosphine. Journal of Economic Entomology (1982) 75 (4) 685-687.

10- Martin, H. (1959): Ravageurs et maladies du palmier dattier en Libye. 9 p. Paper presented at the FAO Int. Tech. Meeting Date Prod. and Processing 5-11 Dec. 1959, Tripoli, Libya. Rome, F.A.O.

11- Teisseire, M. (1961). Les ennemies du palmier-dattier et de la datte: mesures a prendre pour les Combattre. In Journees de la Datte, 3-4 Mai 1961, p. 47-58. Algerie, Direct Dep. Serv. agr. Aures.

12- WHO (1981): Wholesomeness of Irradiated Food; Technical Report series No. 659. World Health Organization, Geneva.

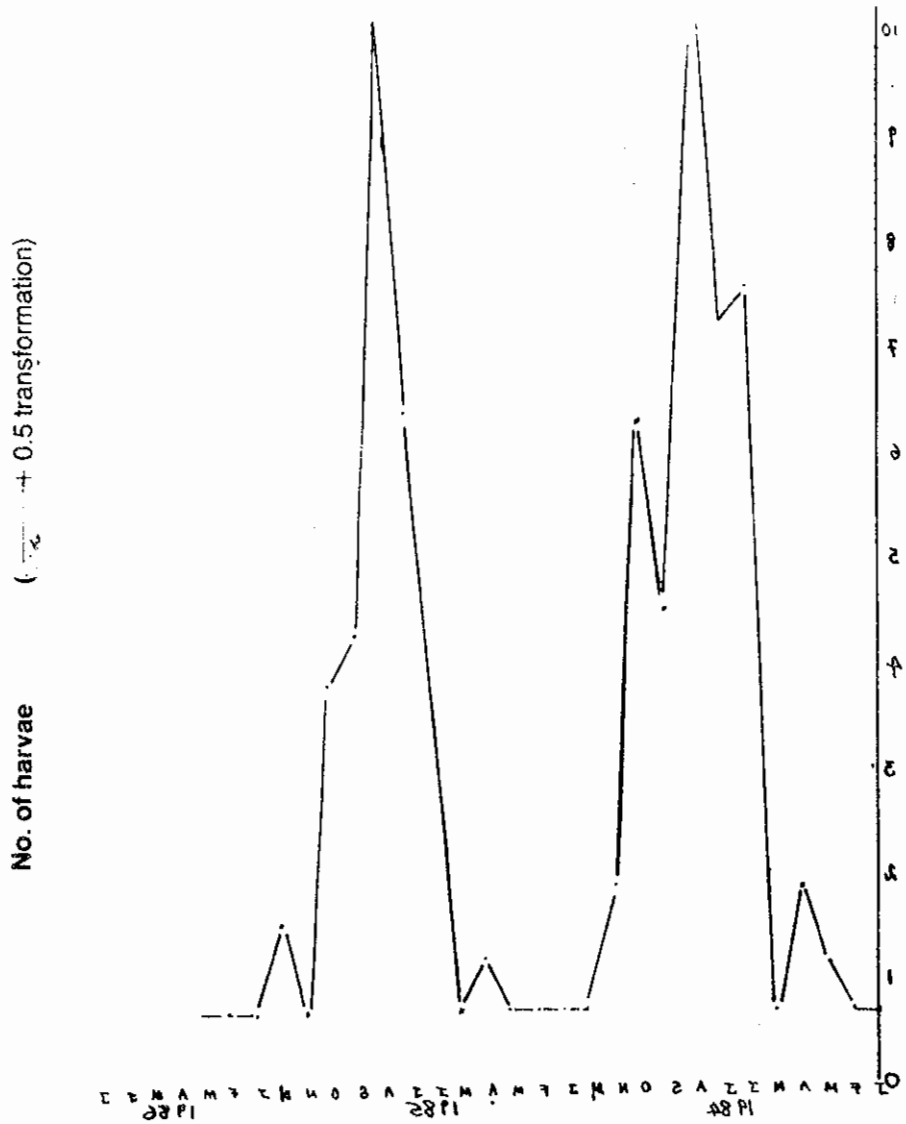

Fig 1. Monthly totals of harvae of Omercator reconded from Jon. 1984 to March 1986.

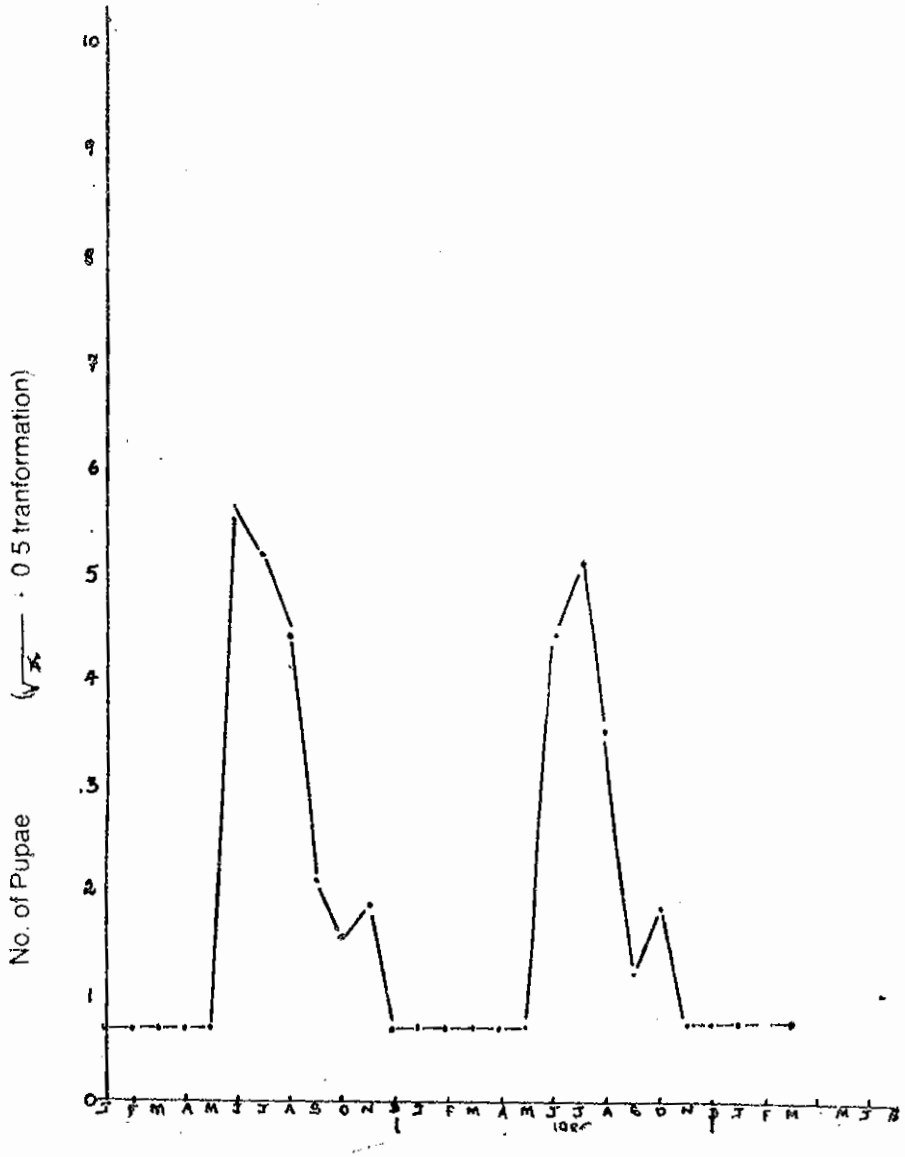

Fig 2. Monthly totals of Pupae of oryzaephilus nercator recorded from Jon 1981 to March 1986.

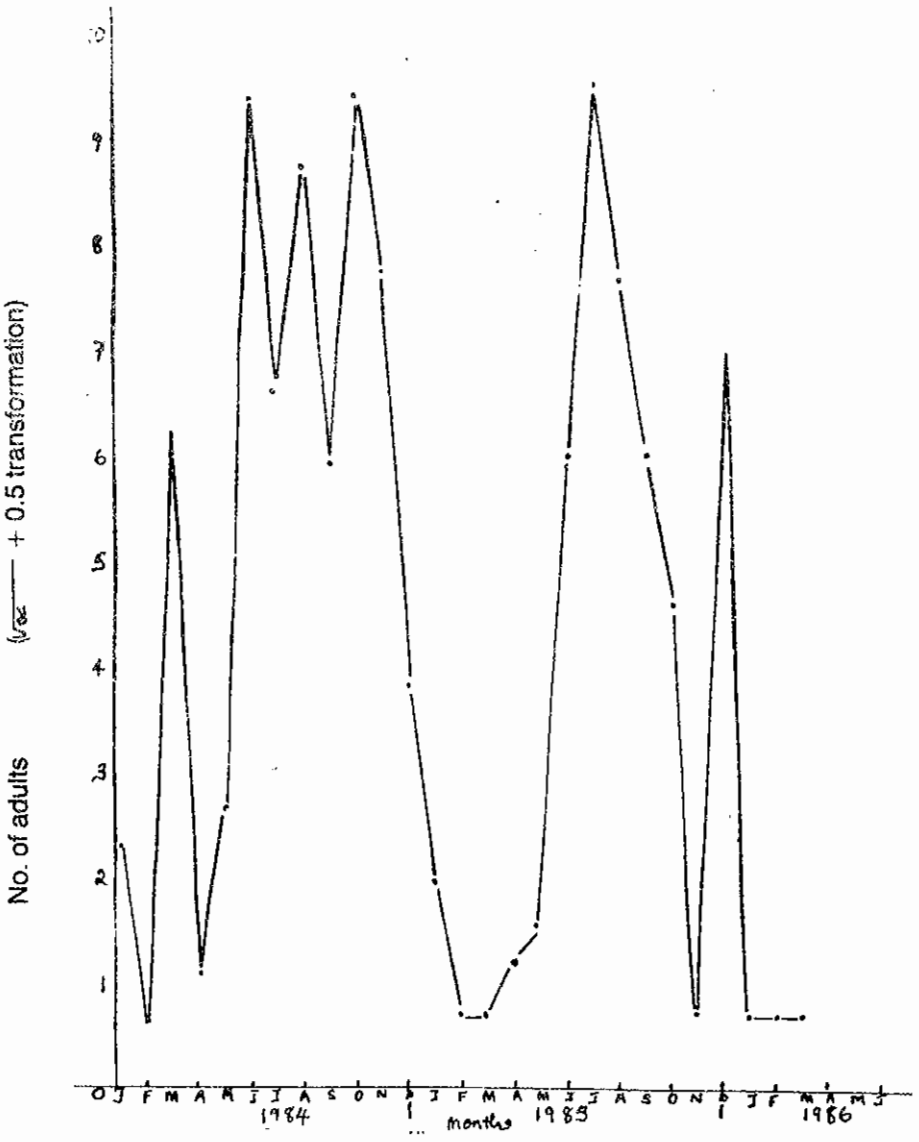

Fig 3. Monthly totals of adults of Oryzaephilus mercator secordad from Jon. 1984 to March 1986.

Pest incidence

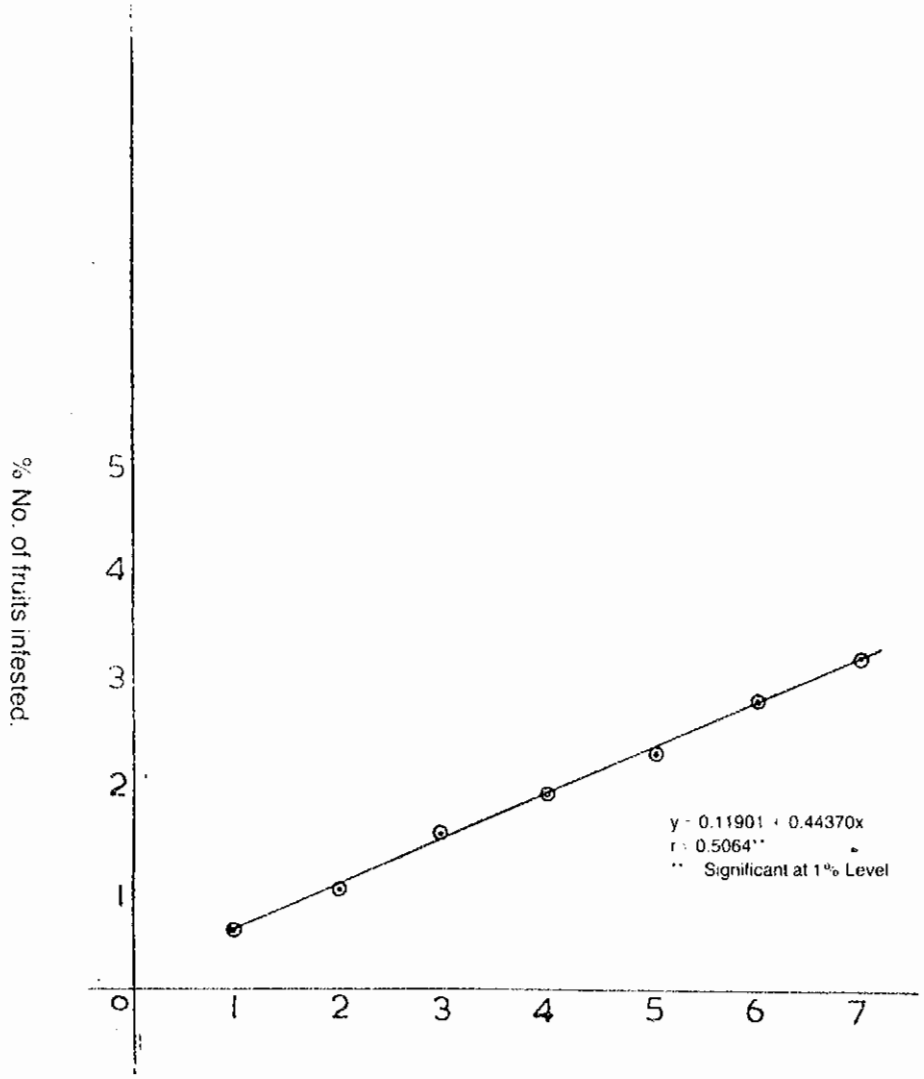

Fig 4. % No. of Fruits Without Calyx.

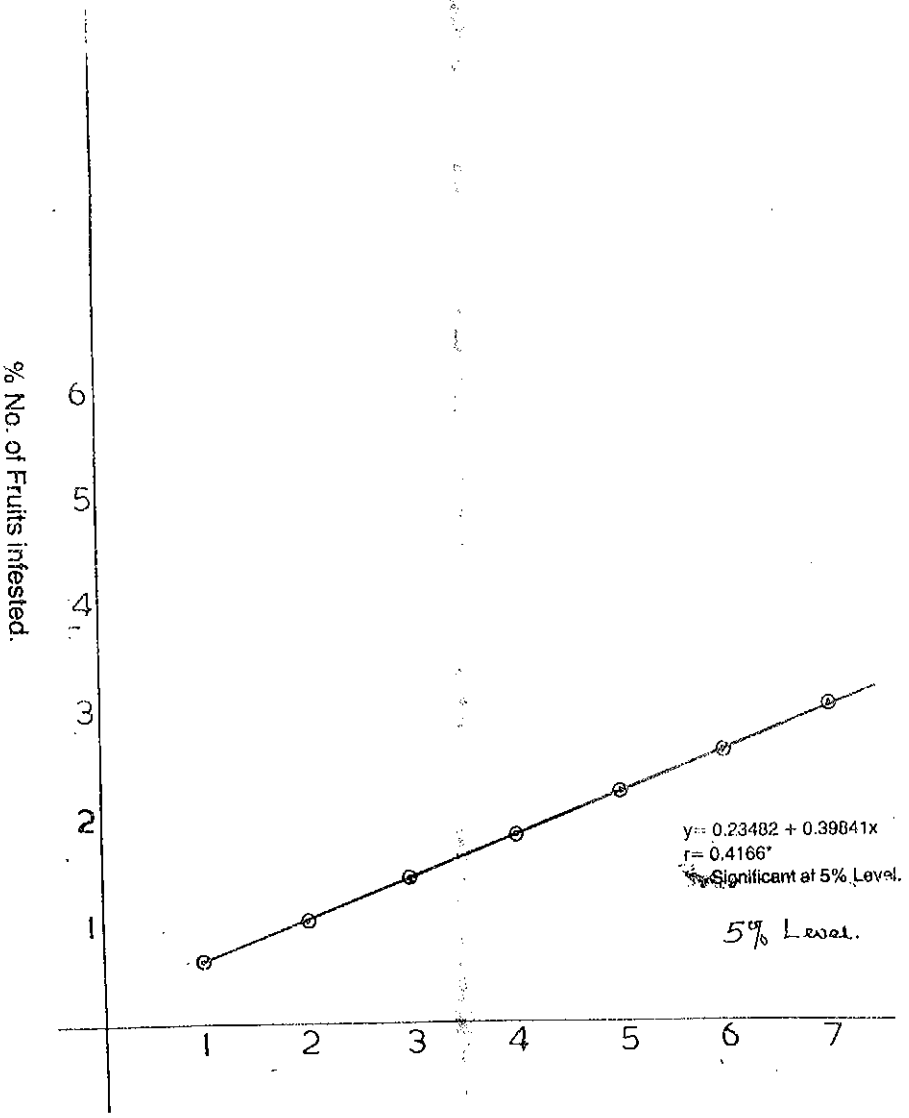

Fig 5. % No. of fruits with cracks.

Pest incidence

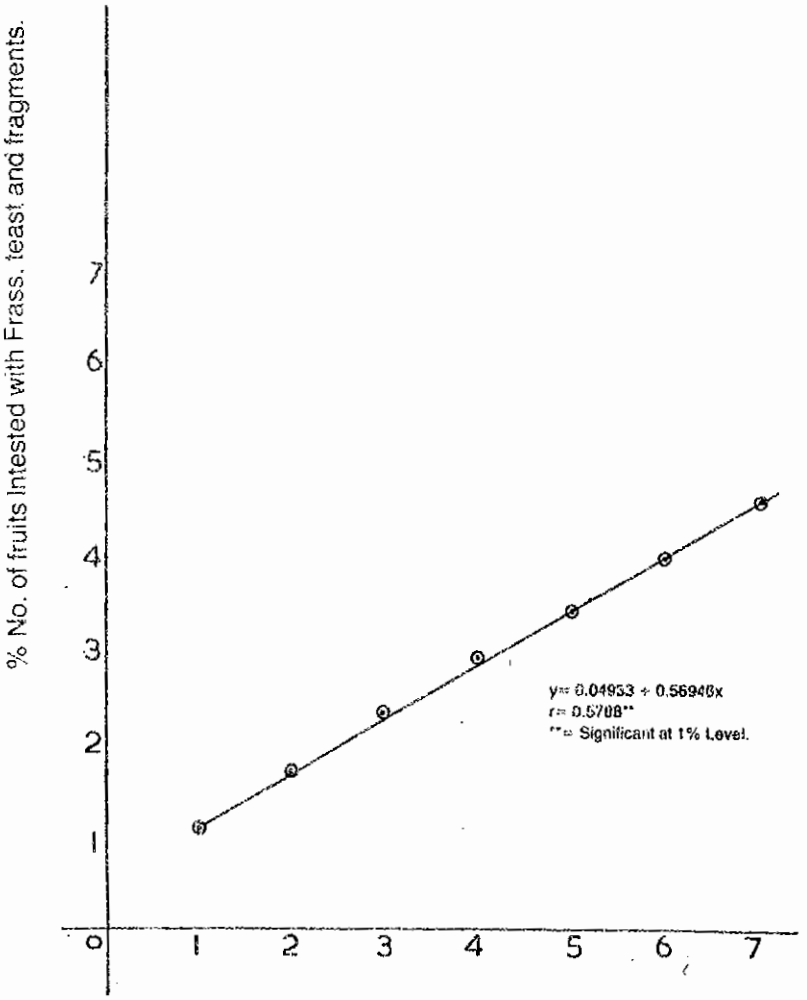

Fig 6. % No. of fruits Without calyx

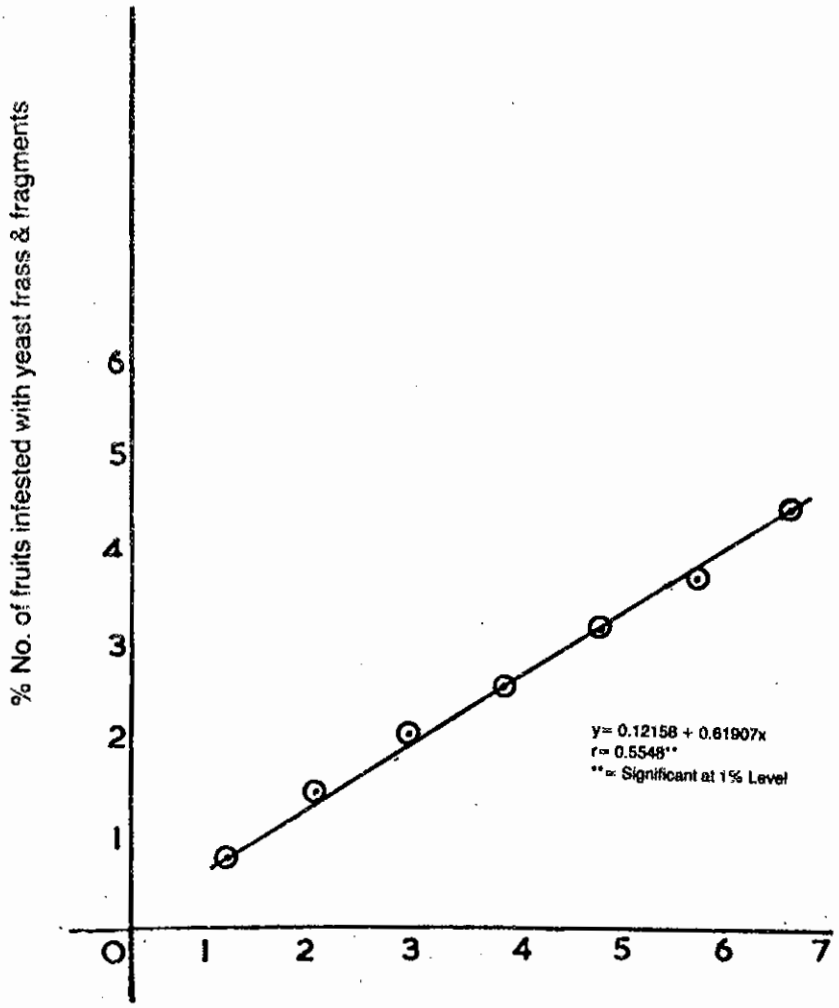

Fig 7. % No. of fruits with tracks

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BLACK ROT OF DATE FRUIT: a new post-harvest decay caused by Botryodiplodia theobromae

Ibiso B. Omamor
Plant Pathology Division
Nigerian Institute For Oil Palm Research (NIFOR)
P. M. B. 1030
Near Benin City
Nigeria

ABSTRACT:

A storage decay of date fruit is caused by Botryodiplodia theobromae pat. Within 2 days of inoculation, the fruit segments were covered by grey mycelium of the pathogen and sporulation occurred 3 days later. By the 8th day the fruit segments had turned black, thus rendering them undesirable. B. theobromae however, has no effect on seed viability and the radicle was not affected but can drastically reduce the amount of soluble sugars in the fruit.

التعفن الاسود لثمرة التمر

أبسو. ب. أومامور

الخلاصة

يسبب الفطر Botryodiplodia theobromae pat تفسخ ثمار النخيل المخزونة خلال يومين من التلقيح. غطيت قطع الثمرة بالغزل الفطري الرمادي للمسبب المرضي وحدث تكوين للسبورات بعد ثلاثة ايام. كما تحولت قطع الثمار الى اللون الاسود بعد مرور ثمانية ايام، وهذا يجعلها غير مرغوبة. على كل حال. فان الفطر لم يؤثر على حيوية البذور وكذلك لم يتأثر الجذير، ولكنه يخفض بشكل كبير من نسبة السكريات الذائبة في الثمار.

INTRODUCTION:

Date palm (phoenix dactylifera L.) fruits are considered as high energy foods due to their high sugar content and in addition, the provision of vitamins and other nutrients (10) make them an important factor in the diet of the people of the Middle East as well as Northern Nigeria where date is commonly grown and consumed on a large scale. The relatively high proportion of sugars in some date fruits, however, makes them particularly susceptible to infestation. Thus Thielaviopsis paradoxa (2) Aspergillus niger, species of Helminthosporium, Alternaria and Macosporium have been implicated as causing rot of date fruits. However, isolations from decaying date fruits yielded some pathogenic fungi, one of which was Botryodiplodia theobromae pat. This fungus has been reported to cause disease on numerous plants in the tropics (5). In addition to causing stem blight, it has been reported to produce fruit decay of many plants including banana (9) mango and cocao (3). Though B. theobromae has been reported as causing heart rot of date palm (7), this is the first report of it causing date fruit decay in storage.

MATERIALS AND METHODS

Source of the pathogen: The fungi were got from some decaying fruits obtained from the fruit store in Dutse and also from some markets in Kano State.

Isolation and identification of the fungi: Each fruit was surface sterilized in 0.35% calcium hypochlorite for 1mm and washed thoroughly in three changes of sterile distilled water. A portion of the epidermis was peeled back aseptically and a small piece of about 1mm^2 of the underlaying mesocarp was excised and placed on potato-dextrose agar (PDA) and incubated at room temperature (27-28°C) for 3 days. At the end of the incubation period, the different fungal colonies that grew out from the mesocarp were purified and maintained at room temperature. Samples of some fungi were sent to the Commonwealth Mycological Institute Kew for identification.

Source of fruit: Five month-old healthy, ripe and dey fruits were obtained from Dutse. Out of the different types, light brown and highly weinkled variety was used. In order to minimize variety response to the pathogen, all the fruits came from the same plant.

Pathogenicity Tests: Due to the high rate of contamination noticed during the preliminary investigations healthy date fruits were first washed thoroughly by using cotton wool soaked in sterile distilled water. These fruits were then surface sterilized with 0.1% mercuric chloride for 3 min and then rinsed thoroughly

in 3 changes of sterile distilled water. Each fruit was then aseptically destoned and sliced into 4-halves. These were again surface sterilized as previously stated but this time with calcium hypochlorite (0.35%). Six halves were placed in each of 15 sterile conical flasks and 1ml of the inoculum adjusted to 1×10^6 pycnidiospores per milliliter was introduced into each flask. The flasks were then shaken so as to distributed the inoculum evenly over the fruit segments. For the control: 15 flasks each containing 6 pieces of fruit segments were inoculated with 1 ml sterile distilled water and shaken thoroughly. The flasks were then incubated at room temperature for 20 days. At the end of the incubation period the pathogen was re-isolated and compared with the original organism. The experiment was repeated twice.

Effects of the pathogen on total soluble sugars of fruit. During the incubation period, 3 flasks of each treatment were harvested and the Anthrone method (4) was employed to determine the level of the total soluble sugar in the fruits at 0,4,8,12,16, and 20 days of inoculation. After drying the fruit segments to constant wt at 80°C, the fungal mycelium of the infected segments were brushed off before the sugar analysis was done. The experiment was repeated thrice. A graph of percentage amount of sugar consumed by the fungus against time in days after inoculation was plotted.

Effects of the pathogen on seed viability: One hundred and twenty date seeds were surface sterilized as stated previously and soaked in sterile distilled water for 24hrs. The water was then decanted and the seeds sterilized again. Twenty seeds were then placed in each of 3 conical flasks and inoculated with 1ml of the inoculum adjusted to 3×10^6 pycnidiospores per milliliter. Three flasks of the control, each containing 20 seeds were inoculated with 1ml sterile distilled water. The six flasks were incubated at room temperature for a period of 21 days. The flasks were kept moist and records of percentage infection and germination were kept. At the end of the incubation period, the opercular of the ungerminated seeds were removed and the embryo plated on PDA and incubated at room temperature for 5 days. The experiment was repeated twice.

RESULTS AND DISCUSSIONS

Four pathogens viz: Aspergillus niger, Botryodiplodia theobromae, pat. (Herb. IMI No. 283847, 283855) and species of Rhizopus and Penicillium were isolated from stored decaying date fruits. Out of these Asperqillus niger, Rhizopus and Penicillium spp have been reported before as date fruit rot organisms (1). About 50.04% of the infested samples analysed yielded A. niger existing alone or in combination with Penicillium sp. About 30.25% yielded Rhizopus sp

and about 19.71% yielded B. theobromae. The semi-dry, deep purple coloured fruits appeared resistant to A. niger as this organism was not isolated from infested fruits of this variety. Also during the preliminary investigations, the pathogenicity tests carried out showed that this fruit variety was indeed resistant to A. niger.

For this write up only B. theobromae was considered. Within 48hrs of inoculation, the fruit segments had about 10% infection cover. By the 4th day the whole external surface was covered by grey mycelia of the pathogen, but the ramifying mycelia had not gone deep into the internal tissue. On the 5th day, pynidia initials were evident on the external surface and the segments started turning black. On the 8th day there was clear decolouration of the internal tissue and by the 20th day both the external surface (plate 1) and internal tissue were black indicating total deterioration of the fruit segments. Re-isolations from the inoculated fruit segments yielded only B. theobromae. B. theobromae has also been reported to infest the oil palm (6) and the coconut palm (unpublished data) where it causes pannelling and gumosis of the coconut.

Infection of the seeds was very slow and even after 21 days of inoculation, only about 8.3% were infected. Infection was noticed particularly in grooves of the seeds where some bits of the mesocarp were left. It was observed that where there was an infection at all, the mycelia remained superficial. This was probably due to the hard nature of the endocarp which the pathogen was unable to penetrate. B. theobromae is thus not likely to be seed borne in date palm. Unlike in seeds of seeded banana where it grows deep into the seed coat and micropylar plug so as to be unaffected by surface sterilants (5).

Germination was observed in both the control and inoculated seeds at 13 days inoculation. By 21 days, germination in the control and inoculated seeds was 77% and 76.3% respectively. There is thus no significant ($P = 0.05$) difference between the two treatments. Also, there was no fungal growth grom the plated embryo of ungerminated seeds indicating that B. theobromae could not penetrate the operculum to infect the embryo. This confirms the views of many authors (5) that B. theobromae is a weak pathogen and only takes advantage of mechanical injury. Thus B. theobromae has no effect on seed viability. The radicle of the germinated seeds were also not infected.

The total soluble sugar available in the control fruit segments was found to be 72.50% and there was no significant ($P = 0.05\%$) deviation throughout the experiment. However, the total soluble sugar in the inoculated fruit segments decreased with time even though the external infection cover from the 4th day remained at 100%, (Table 1). This indicates that total colonization of the external fruit surface was faster than that of the internal tissue and that the utilization

of the sugars was dependent on the extent of the internal tissue colonization.

The first part of the graph (between days 0 and 8) Fig. 1 indicates a period of active utilization of the available sugars. This period corresponds to the period of active vegetative growth (days 0-4) and the production of pynidia (days 5-8). By the 8th day there was a reduction in sugars of about 74.72%.

B. theobromae is thus an aggressive rot causing organism which renders the date fruit totally undesirable barely 48hrs after it has gained entry into the fruit tissue. These fruits can thus not be marketed and this on a large scale can lead to a considerable loss of revenue. Considering the role of date fruits in jam and syrup industries (8), this disease may be of great economic importance.

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LITERATURE CITED

1- Abu-Zinada, A.H. and Ali, M.I. (1982): Fungi associated with Dates in Saudi arabia. J. Food Protection 45 (9) 842-884.

2- Al-Hassan K.; and G.Y. Abbas (1983): Biology of Thielaviopsis paradoxa and its role in date fruits rot. Date palm J. Vol. 2 (2), 37-54.

3- Charles, Vera K. (1906): Occurrence of Lasidiplodia on theobromae cocao and Mangifera indica J. Mycol. 12: 145-146.

4- Dreywood R. (1946): Qualitative test for carbohydrate material. Ind. Eng. Chem. Anal. Ed. 18, 499.

5- Goos R.D.; E.A. Cox and G. Stotzky (1961): Botryodiplodia theobromae and its association with Musa species. Mycologia Vol. 53 pp 262-277.

6- Johnston A. (1960): A supplement to a host list of plant diseases in Malaya Commonwealth Mycol. Inst. Mycol paper 77..

7- Narendra, D.V.; Nezzal, T. and J.C. Santiago (1979): Heart rot of date palm. FAO, plant protection Bulletin Vol. 27 p 132.

8- Sawaya W.N.; Khatchadorian, H.A.; Khahl, J.K. and Mashadi A.S. (1983): processing of three major Saudi Arabian date cultivars into jam. J. Food Science and Technology India 20 (4) 149-152.

9- Wardlaw C.W. (1931): Banana diseases. 1 observations on Botryodiplodia fruit rot of bananas. Trop. Agric. 8: 227-230.

10- Yousif, K.A.; N.D. Benjamin, Amina Kado, Shefa Mehi alddin and Saad M. Ali (1982): Chemical composition of four Iraqi date cultivars. Date palm. J. 1 (2) 285-294.

The Effects of B. theobromae on the total soluble sugars in dry, brown, highly weinkled stored date fruits

Time in days after inoculation	% Infection	% Total soluble sugars available in fruits	% Reduction in sugars
0	0	72.50	00.00
4	100	51.25	29.31
8	100	18.33	74.72
12	100	8.75	87.93
16	100	3.50	95.17
20	100	0.83	98.85

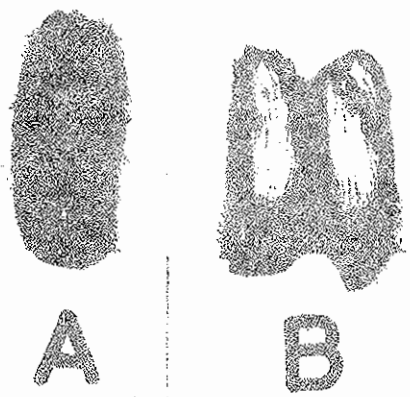
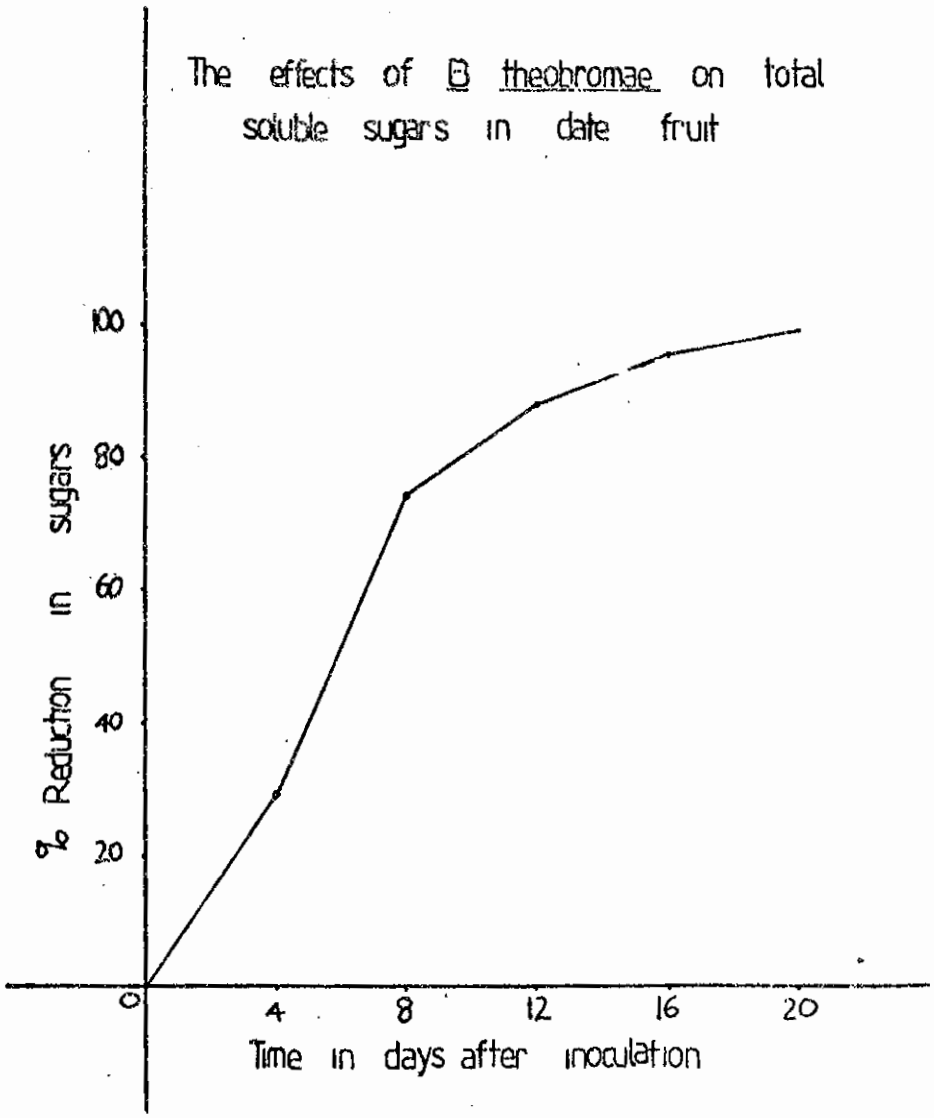


Plate 1: A. Date fruit segment infected by B. theobromae
B. Control

Fig 1


The effects of B theobromae on total soluble sugars in date fruit
% Reduction in sugars
100
80
60
40
20
0
4
8
12
16
20
Time in days after inoculation

Susceptibility of Ephestia calidella larvae to Bacillus thuringiensis local isolates

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J.F. Al-Maadhidi
Dept of Microbiolgy,
Faculty of Agriculture, and Biology,
O.O. BOX 765, Baghdad, IRAQ

ABSTRACT:

Five Bacillus thuringiensis isolates were bioassayed against larvae of Ephestia calidella. Larvae were highly susceptible to certain isolates in their diet if exposure began during the 1st instar; they were less susceptible if exposure began during the later instar. The effectivness of these isolates was even clear in preventing adult emergence from groups of neonate larvae fed on treated media.

قابلية اصابة يرقات Ephestia calidella بعزلات محلية من بكتريا Bacillus thuringiensis

جبار فرحان المعاضيدي
قسم المايكروبايولوجي ـ هيئة الزراعة والبايولوجي ـ ص. ب ٧٦٥ ـ بغداد ـ العراق

الخلاصة :

أجريتاختبارات احيائية لخمسة عزلات مختلفة من بكتريا Bacillus thuringiensis على يرقات حشرة Ephestia calidellà . كانت شدة اصابة اليرقات عالية لبعض من العزلات عند تعريضها وهي في الطور الاول ونوعا ما اقل شدة للاصابة عندما يكون التعريض في اطوار متأخرة . ان فعالية هذه العزلات كانت واضحة ايضا بمنعها خروج البالغات عند تعريض مجاميع من اليرقات الصغيرة لغذاء ملوث بها .

INTRODUCTION.

In the past two decades, among the entomogenous bacteria, Bacillus thuringiensis Berliner, which was isolated for the first time from its original host Anagasta Kuhniella in 1911 and 1915, has received much considerations from both insect pathologists and economic entomologists.

B. thuringiensis has a significant pathogenicity for a large number of insect species belonging to different order (1,2). Above all, B. thuringiensis is apparently harmless to humans, quite specific for insect pest, particularly those from Lepidoptera, and yet harmless to crops, animals, fishes, parasites and predators (3).

As a part of project intiated first time in Iraq, five bacterial isolates were purified from infected larvae of Ectomyelois ceratoniae and Ephestia calidella, and identified as B. thuringiensis.

The present study was conducted to measure the effectivness of these bacillus isolates in controling larvae of Ephestia calidella, a pest on dates in the field and wearhouse (4,5).

MATERIALS AND METHODS

Larvae (< 24 hr or 15 days old) of E. calidella were obtained from a laboratory culture of this insect grown on food mixture of 8% ground whole wheat, 12% dry yeast, 6% date syrup (Dibis) and 1% glycerol at 28 ± 1°C, 65 ± 5% humidity and 16-hr photoperiod.

Harvested cells of B. thuringiensis from slant culture were added to 100 ml aliquat of sterile nutrient broth in 250 ml Erlenmyer flasks. These flasks were incubated at 30°C for 24 hr and shaked at 150 rpm. The suspensions thus obtained were standarized by agar palte count method and serial dilutions were prepared. The marked differences in the initial sizes of inocula were relatively not wide; Such differeces are usually inherated during bacterial dilutions.

Bioassays of B. thuringiensis isolates were conducted by mixing 10 ml of each suspension with 100 g insect rearing medium. Larvae were distributed 1/vial (30 ml) and allowed to fed on ca. 2g treated and untreated (control) media. Mortalities were monitored at regular intervals following intiation of the experiments. When death occured in the controls, mortality rates in the treatments were corrected using Abbott's formula (6).

To examine the efficacy of bacterial isolates on larval population, groups of 1st instar larvae were placed into separate jars (1L. capacity) each contained ca. 250g medium. Three serial dilutions for each bacterial isolate were tested in ad-

dition to the control. These prepared jars were stored in the same controlled environment as the insect cultures. Adult that emerged were recorded daily until no further adults were observed

RESULTS AND DISCUSSION

The effectiveness of five B. thuringiensis isolates against 15 days old larvae of E. calidella in laboratory trials is summarized in Table 1. Larval mortalities were variable among isolates used as well as within the dilutions of each isolate. Isolates no. 1,2 and 4 gave the highest percentages of mortalitels of 100, 90 and 98, respectively at their initial size of inoculum. Moreover, their 10 folds dilution was even good in causing high rates of mortalities. Although, the inoculum size of isolates no.4 was the lowest in comparison with that of no. 1 and 2, its effectiveness was much better and there was an appearent gradual reduction in mortality correlated with the dilution. That means the vigor of microbial isolates or preparation to certain extent plays the major role in determining the efficacy and not only the inoculum size. However, the threshold to bring the highest mortality certainly will not be more than 2 folds of 0.33×10^8.

Differences in toxicity between subspecies of the same serotype and / or among different subspecies had been reported (7). Mostly, in all dilutions used, it was noticed that peak mortality occurred around 48-120 hr after larval introduction. In general, larval mortality was decreased as the bacterial dilution was increased, except with isolate no. 5 which showed unclear trend.

The efficacy of two different inoculum size of isolate no.2 (with high rate of spore viability) were tested on < 24hr old larvae (Table 2). The inoculum size of 1.7×10^8 cells/ml and its 10 folds dilution gave 100% mortality in comparison with 88% and 26% respectively of the other inoculum size of 0.25×10^8 cells/ml and its 10 folds dilution gave 100% mortality in comparison with 88% and 26% respectively of the other inoculum size of 0.25×10^8 cells/ml and its 10 folds dilution. Meanwhile, there is no significant differences between 100% and 88% mortalities obtained ($X^{2=3.649,\ df=1,\ p>0.05}$).

Apparently, the young larvae were more susceptible and succumbed to infection earlier than the mature larvae (Tables 1,2 and 3). Such differences in susceptibility, might be due to the individual differences in the physiological characters of the living organisms, being less in the younger instras than in the older ones (8).

Theresults of the effectivness of B. thuringiensis isolates on adult emergence after initial treatments of the media and introduction of 1st instar larvae are given in Table 3. In this respect, E. calidella larvae showed a high susceptibility to

'l bacterial isolates.

All 1st instar groups fed on treated media did not produced adults at the initial inoculum and its 10 folds dilution except with isolate no. 5. In comparison with results obtained (unpublised) for Ectomylois ceratoniae larvae larvae of E. calidella appeare to be more susceptible to any of the bacterial isolates tested. Differences in susceptiblity among pest population to B. thuringiensis infection could result from several factors. These factors are: natural immunity of the larvae, behavioral characteristics and feeding repellence (9), In addition to the population vigor (10). More knowledge about the mode of action of B thuringiensis on these species is needed before a preciese explination can be made. Results also indiacted that microbial propegation and spread through culture might be happened, especially if we compare the mortality percentage obtained from treatment with isolate no. 2 using individul larva/space unite or no. of larvae/space unit as in Tables 2 and 3. The usefullness of the present results are very obvious in the programme of controlling this pest. Using a whole treated grain, Nwanze et al. (12) found that B. thuringiensis Berliner could be applied to controle C. cautella and plodia interpunctella.

LITERATURE CITED

6- Burges, H.D. (1982): Control of insects by bacteria. Parasitology 84: 79-117.

4- Angus, I.A. (1986): The use of Bacillus thuringiensis as a microbial insecticide. World Rev. Pest. Cont. 7: 11-26.

5- Briggs, J.D. (1960): Pathogens for the control of pests, Biological and chemical control of plant and animal pests. Amer. Assoc. for the advance of Sci., Washington. 137-148.

2- Ahmad, T.R. (1985): Susceptiblity of different varieties of dates to carob moth, Ephestia calidella (Guenss) in middle of Iraq. J. Agric. Water Reso. Res. 4: 11-20.

7- Hussain, A.A. (1974): Date palms and dates with their pest in Iraq. 1st edition Univ. of Baghdad.

1- Abbott, W.S. (1925): A method of computing the effectiveness of an insecticide. J. Econ. Entomol. 18: 265-267.

3- Amonkar, S.V., Kulkarni, U. and Anand, A. (1985): Comparative toxicity of Bacillus thuringiensis subspecies to Spodoptera Litura (F.). Current Sci. 54: 475-478.

10- McGaughey, WM. H. (1978): Effects of larval age on the susceptiblity of almond moths and Indianmeal moth to Bacillus thuringuensis. J. Econ. Entomol. 71: 923-925.

- Mardan, A.H. and Harein, P.K. (1984): Susceptibility of malathion- resistant strain of Indianmeal moths (Lepidoptera: Pyralidae) to Bacillus thuringiensis Berliner. J. Econ. Entomol. 77: 1260-1263.

9- Kinsinger, R.A. and McGaughey, W.H. (1979): Susceptiblity of populations of Indianmeal moth and almond moth to Bacillus thuringiensis. J. Econ. Entomol. 72: 346-349.

1- Nwanze, K.F., Partide, G.j., and McGaughey, W.H. (1975): Susceptiblity of Cadra cautella and piodia interpunctella to Bacillus thuringiensis on wheat J. Econ. Entomol. 68: 751-752.

Table 1. Mortality of *E. calidella* larvae (15 days old) fed on media treated with different dilutions of *B. thuringiensis* isolates[a].

Dilutions	Percentage Larval Mortality				
Isolate No.	10^{0}	10^{-1}	10^{-2}	10^{-3}	10^{-4}
1 (0.74×10^{8})[b]	100	85	30	24	24
2 (1.2×10^{8})	90	80	20	16	9
3 (0.25×10^{8})	40	20	12	25	7
4 (0.33×10^{8})	98	90	51	14	14
5 (0.74×10^{8})	44	31	34	34	34

a- Three replicates were used for each inoculum, and 20 larvae were used/ replicate.
b- Initial size of inoculm (cell/ml).

Table 2. Mortality of *E. calidella* larvae (< 24 hr old) fed on media treated with different dilutions of *B. thuringiensis* isolates no.2.

Initial inoculum/ml / Dilution	Percentage Larval Mortality	
	0.25×10^{8}	1.7×10^{8}
	88	100
	(37)[a]	(28)
	26	100
10^{-1}	(27)	(28)
	18	11
10^{-2}	(27)	(28)
	15	7
10^{-3}	(37)	(28)
	15	4
10^{-4}	(37)	(28)

a- Number of observations.

Table 3. Average percent adult emergence of E. calidella from media treated with differen lutions of B. thuringiensis isolates.

Dilutions	Adult Emerged		
Isolate No.	10^{0}	10^{-1}	10^{-2}
1	0	0	1.80
(0.35×10^{8})[a]	(132)[b]	(99)	(111)
2	0	0	48.90
(0.14×10^{8})	(102)	(96)	(98)
3	0	0	17.00
(0.276×10^{8})	(87)	(98)	(94)
4	0	0	18.56
(0.232×10^{8})	(78)	(80)	(97)
5	0	9.38	63.27
(0.224×10^{8})	(104)	(81)	(96)

a- Initial size of inoculum (cell/ml).
b- Number of 1st instar larvae used in three replicates.

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Utilization of date stone in single cell Protein production

Hassan K. Al Ogadi; Saleh Khalifa; Hamood Hadi and Shafa Al-Nakash
Dept. of Palm and Dates, Agricultural and Water Resources Research Centre,
P.O. Box 2416, Fudaliyah, Baghdad

ABSTRACT:

A study was carried out on cultivation of C. utilis in date stone powder aqueous extract to determine the effect of the factors (sugar concentration, incubation temperature, PH value, inoculation, and nitrogen source) on biomass yield and protein content. The results revealed: (a) the suitable concentration of sugar to produce yeast protein was 3%. (b) optimum conditions of incubation temperature and PH value of C. utilis (S_1) & (S_2) were 30°C, 4.8 and 28°C, 5.0 respectively. (c) C. utilis (S_2) gave more amount of protein than C. utilis (S_1). (d) the inoculation of two stages (the first stage was done at the beginning time of fermentation and the second after 20 hrs) was better than inoculation of one stage. (e) ammonium sulfate was the best source of nitrogen.

استغلال نوى التمر في انتاج بروتين الخلية الواحدة

حسن خالد حسن العكيدي*، صالح خليفة، حمود هادي وشفاء النقاش
قسم النخيل والتمور، مركز البحوث الزراعية والموارد المائية، ص.ب ٢٤١٦ الفضيلية، بغداد

الخلاصة:

أجريت دراسة تنمية الخميرة Candida على المستخلص المائي لمسحوق نوى التمر لتقدير تركيز السكر ودرجة حرارة الحضن ودرجة PH للوسط الغذائي واللقاح ومصدر النتروجين على وزن الكتلة الحيوية ومحتواها من البروتين. واشارت النتائج الى أ) ملائمة تركيز السكر لانتاج الكتلة الحيوية والبروتين 3% ب) الظروف المثلى للحضن كانت للـ Candida utilis (S_1) و(S_2) هي 30 م، 4.8 و 28م، 5.0 على التعاقب جـ) السلالة Candida utilis (S_2) اعطت انتاجا من البروتين اكثر من (S_1) د) عملية التلقيح كانت بمرحلتين وان افضل مصدر نتروجين كان سلفات الامونيوم.

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* باحث علمي أقدم/ مركز البحوث الزراعية والموارد المائية

Introduction

The production of micro-bial protein from bacteria, yeast, fungi and algae using various carbohydrate and hydro-carbon media is a recent advancement in the field of food research (20).

The biomass of yeast was used as food in Germany during the first world war (5). A large number of raw materials such as spent sulfate liquor (7), molasses (27,6), hydrolysed cassava (15), wood sugar (21,4) whey (14,16), date juice (11,12) and peat (23) were used to produce yeast protein.

The suitable concentration of sugar to produce the yeast protein was 5% (20), 3% (7) and 2% (11). Nitrate (10), ammonium salts (30,22), urea and yeast extract (28) were used as nitrogen sources on the cultivation of C. utlils.

The growth conditions incubation temperature and PH value of medium that were set to produce protein varied according to the yeast used. The condition, PH 3.7, 30°C (9), PH 4.5, 32°C (6), PH 5-6, 30°C (25) were used on cultivation of C. utilis.

The biomass yield and protein content depend on the medium contents, growth conditions and the strain that was used (8). The variation of environemental factors caused changing in both quantity and quality of protein (2). Harvested biomass was 16.2 g /50g sugar (18), 10.6 g/liter (14), 10.0 g/ liter (23) and 7.45 g/ liter (11) when the yeast cultivated on date juice, whey, peat and prepared laboratory medium respectively.

In Iraq, dates by-products are in-expensive and rich in sugars (the carbon source) and other nutrients.

The objective of this work is to determine the effect of sugar concentration, incubation temperature, PH value, the inoculation and notrogen source on the biomass yield and protein content output of C. utilis cultivated on date stone powder aqueous extraxt.

Materials and methods

Organisms:

Two laboratory strains of candida, C. utilis (S_1) and (S_2) were used and maintained on potato dextrose agar slant and trons-fered monthly. Slants were incubated at 30°C for 48 hrs and then kept refrigrated (4°C).

Date stone powder:

Stones were obtained from Zahdi date, dried and crushed by milling machine (condux D 6450 Hanau 11/wolfgang) to powder form.

Date stone powder aqueous extract:

Distilled water (3 liters) was added to the one kilogram date stone powder in a glass jar. The mixture was heated in water bath (90°C) for one hour with continous agitation, cooled and filterated. The sugar content and the PH of the prepared liquor were adjusted to 5% and 4.5 respectively.

Inoculum:

C. utilis was cultivated on date syrup medium containing diluted solution of date syrup (1% sugar) and 2% yeast extract. The incubation was carried out on shaker incubator (30°C, 150 rpm) for 48 hrs. The inoculation ratio was 5% (25).

Cultivation medium:

Flasks of 500 cm^3 capacity, each contained 100 cm^3 of date stone powder aqueous extract, 0.2 g urea and 5 cm^3 inoculum. The cultivation was carried out in shaker incubator.

Biomass (dry cell weight):

A 50 cm^3 sample of culture broth was centrifuged for 10 min at 3000 rpm. The precipitated cells were washed with distilled water and recenterfuged. The washed cell, were placed in the oven at 105°C for 20 hrs (7).

Analytical methodes;
Protein:

Micro Kjeldhal Tecator system (1002 Distilling unit) was used to determine the protein of date stone powder and biomass.

Analysis of date stone powder:

Procedures used to detrmine moisture, fibre, ash, total lipids and total sugars were described in A.O.A.C. (1).

Analysis of biomass;
Reducing sugar:

Reducing sugar were determined by Miller methode (13). One cm^3 water

suspension containing 0.5 mg biomass was placed in a boiling water bath for 10 min. The sample was cooled and the absorbance measured at 550 nm. A glucose standard curve was prepared.

Total lipids:

The total lipids of one gram biomass were extracted by soxlet system (HT) with 50 cm^3 petroleum ether at 100°C for 2 hrs.

Nucleic acids:

Shenider method (26) was used to determine the nucleic acids.

Results and discussion

Date stone powder:

Date stone powder used in this work contained 5.69% total sugars, 7.82% total lipids, 5.35% protein, 64.8% fibre, 1.16% ash and 10.2% moisture (Table 1).

Sugar concentration:

The biomass yield and protein output of C. utilis (S_1) & (S_2) cultivated on date stone powder aqueous extract medium with different concentrations of sugar (1,2,3,4 and 5%) were presented in Figures (1) & (2).

Results Figurs (1) revealed that a high concentration of sugar gave higher yield of biomass than a lower concentration. The statistical analysis appeared that there were no significant differences between weight means of biomass output of C. utilis cultivated on media of 3,4 and 5% sugar.

Figure (2) showed that increasing sugar concentration up to 3% caused a decrease in protien yield. This meant that protien output of C. utilis decreased with increasing the sugar concentration. This result is in agreement with those mentioned by Vanuden (29) and Nowris and Toma (19) who observed negative correlation betwen growth rate and the protein content.

Incubation temperature;

Incubation temperature used for the cultivation of C. utilis was between 28-32°C according to previous worker's recommendations. The results of using in-

cubation temperature of 26,28,30 and 32°C (Figures 3 and 4) appeared that the incubation temperature had a significant influence on the biomass yield and protein.

The inoculation:

Previous results in this work showed that C. utilis (S_2) gave more amount of protein than C. utilis (S_1). As for that C. utilis (S_2) was selected to be used in study the effect of inoculation and nitrogen source on biomass yield and protein.

The inoculum was added to the cultivation medium as shown in (Table 2). The statistical analysis of the results Figure 7 revealed a significant differences between weight means of biomass and protein output of C. utilis (S_2) cultivated on media (A, B and C).

The cultivation on medium B gave more yield of biomass and protein than the media (A and C). Broth total soluble solid means (after separation of yeast cells) of the media A,B and C were 1.4, 0.5 and 1.6 respectively. This result meant the utilization of medium contents by yeast was more in medium B and led to higher production of biomass and protein.

The medium C gave a lower yield of biomass and protein when compared with medium A.

This result may be due to the following reasons.

a) The second stage of inoculation took place at the end of fermentation. b) the inoculum size that added to the medium C at beginning time of fermentation was less than that in medium A.

Cultivation of C. utilis (S_1) & (S_2) at 28°C gave a lower yield of biomass and protein when compared with 28, 30 and 32°C. The incubation at 32°C gave less yield of biomass and protein than 28 and 30°C. These results are in agreement with Evision (3) who stated that a decrease in the yield of the biomass and protein was due to the decrease in the activities of tricarboxylic acid enzymes.

Results Figures 3 and 4 revealed that suitable incubation temperature of C utilis (S_1) & (S_2) were 30 and 28°C respectively.

PH value of medium:

The biomass yield and protein output of C. utilis (S_1) & (S_2) cultivated on date stone powder aqueous extract medium with different PH (4.6, 4.8, 5.0, 5.2, 5.4, 5.6, 5.8 and 6.0) are shown in figures 5 and 6.

It was found that the PH had significant influence on biomass yield and prot-

ein content. The results revealed a negative correlation between values of PH up to 5.0 and both biomass yield and protein content.

The influence of PH depends on exchange of hydrogen ions of the cells for ions of some minerals that were found in the medium such as K' (24).

Suitable PH of C. utilis (S_1) & (S_2) to produce yeast protein were 4.8 and 5.0 respectively.

Nitrogen source:

The biomass yield and protein produced by C. utilis (S_2) cultivated on date stone powder aqueous extract medium with different sources of nitrogen are presented in Figure 8. It appeared that nitrogen source has a significant influence on yield of biomass and protein. The medium of ammonium sulfate. gave a higher amount of protein and the lower yield of biomass when compared with medium of urea. This result is in agreement with the Vanuden (29) who observed a negative correlation between biomass yield and protein output of C. utilis cultivated on medium of ammonium sulfate.

Chemical Composition:

10.87 g biomass was obtained when C. utillis (S_2) cultivated on a shaker incubator (28°C, 150 rpm) for 48 hrs. The results (Table 1) showed that biomass contained 42.2% protein, 21.7% sugar, 3.8% lipids and 5.78% nucleic acids.

It was observed that this biomass was a good source of nutrients (protein, sugar and lipids) and had a lower content of nucleic acids than 6.19 nucleic acids of biomass produced by Macris and Mokke (22).

LITERATURE CITED.

1- A.O.A.C. (1970). B: 122, 123, 128, 129, 532

2- Dezeew, J.R. (1968). Control of proteinccomposition in single cell protein. M.I.T. Press, Cambridge, Masschusetts, P: 181-83.

3- Evision, L.M: & Rose, A. (1965). II, J. gen-microbiology, 139, P: 55-70.

4- Fakubowska, F.; Makvayoki, F.; Niemyski, K. & Bedenoreck, Z. (1953). Production of fooder yeast in the pine wood hydrolyzate, Acta. Mikrob, 26 (213): 77-86.

5- Frazier, W.C. (1977). Food microbiology, McGraw-Hill Co., New York.

6- Giba, S. (1982). Production of SCP by C. utilis ommolass, Inter, sug. J., V. IXXXIV, 1002, P: 188.

7- Gold, D.; Mohagleyhl, A.; Coony, C.L. & Wang, B.L. (1981). SCP from spent sulfate liquor, J. Biotech. Bioengineering, V. XXIII, 9, P: 2105-117.

8- Han, T.W.; Dunlop, C.E. & Callihan, C.D. (1971). Olution control, SCP from cellulosic wastes, Fd. Sci. Tech., V. 25, 34, P: 130-33.

9- Heindode, P. & Mairell, I.F. (1973). Cultivation of microorganism for the production of biomass from solution of cane final molasses, Inter. Sug. J., V LXXXI, 867, P: 222.

10- Larue, T.A. & Spencer, J.P. (1968). The utilization of purine and pyrimidine by yeast, Cand. J. microb. 14, P: 79-86.

11- Loawford, G.R.; Kligerman, A. & Williams, T. (1979). Production of high quality edible protein from candida yeast, J. Biotech, Bioeng., V. XXI, P: 1163-172.

12- Macris, E.J. & Kokke, R. (1978). Continous fermentation, The effect of growth rate on biomass yield and chemical composition of P. moniliforme, J. Biotech. Bioengin., V. XXIV, 7, P: 1015-027.

13- Miller, G.E. (1959). Use of dinitro salecylic acid reagent for determination of reducing sugar, Anal. Chem., (1915) P: 426-28.

14- Mohmed, V.A. (1983). Using of whey to produce yeast protein, thesis submitted to College of Agric. Baghj. Univ., P: 18.

15- Museinge, H.M.; Anderson, J.G. & Holdom, R.S. (1980). Growth of C. utilis on enzymetically hydroly sed cassava, Biotech. Letters, 2,2, P: 45-50.

16- Naif, H.; Hazem, S.; Al-Robaii, R. & Al-Doori, M. (1985). Applications of non suplemented whey based medium in propagation of E. Coli. S. cerevis and C. utilis, The Eightin Scientific Conference of Iraqi Biological Society, Arbeel, Iraq.

17- Nowris, R.A.; Sachde, A.G. & Al-Kaisy, A.M. (Effect of different concentrations) of sugar, ethyl alcohol, tannic acid and sulfurdioxid on the production

of SCP, First Arab Conference of Date-Palm and Dates.
18- Nowris, R.A. (1976). Production of torula yeast from dates and date by- product, Thesis submitted to College of Agric., Bagh. Univ., P: 3.
19- Nowris. R.A. & Toma, S.J. (1977). Production of torula yeast from dates and date by-products, Iraqi J. Agric. Sci., V. XII, P: 26-44.
20- Nowris, R.A. (1981). Some study of production of high nutritive value protien from dates, First Arab Conference of Date Palm and Dates, Baghdad-Iraq.
21- Petrovic, S. (1971). Continious cultivation of yeast on wood hydrolyzate, Dkev. Vysk, 1, P: 36-47.
22- Prescott, S.C. & Dann, G.C. (1959). Industrial Microbiology, McGraw-Hill Co., Inc., New York.
23- Quierzy, P.; Therie, N. & Leduy, A. (1979). Production of C. utilis protein from peat extracts, J. Biotech. Bioengin., V. XXI, P: 1175-196.
24- Tothstein, A. & Enns, L.A. (1946). J. Cell. Comp. Physi. 28, P: 231-52.
25- Sandhu, D.K. (1982). SCP from treated cane begasse, Inter. Sug. J., V. LXXXIV, 998, P: 81.
26- Shenider, W.C. (1957). Determination of nucleic acid in tissue by pentose analysis, Methode in enzymology, V. III.
27- Snyder, H.T. (1970). "Advanced in food research" Microbial sources of protein, Academic Press, London.
28- Vananuva, P. & Kinsell, J.E. (1975). Production of yeast protein from crude Lactose by S. fragilis, J. Fd. Sci., 40, 336.
29- Vanuden, T.V. (1971). Kinetic and energetics of yeast growth, The yeast (V.2) Academic Press, New York.
30- White, J. (1954). Yeast Technology, Champan-Hall Co., London.

Table 1
Chemical Composition of date stone powder and Biomass

Substance	Moisture %	Biomass yield g /liter	Ash %	Protein %	Total Sugar %	Reducing Sugar %	Fiber %	Total Lipids %	Nucleic acids %
Date stone powder	10.2	-	1.16	5.35	5.67	-	64.8	7.[illegible]	-
Biomass	-	10.87	-	42.2	-	21.7	-	3.8	5.78

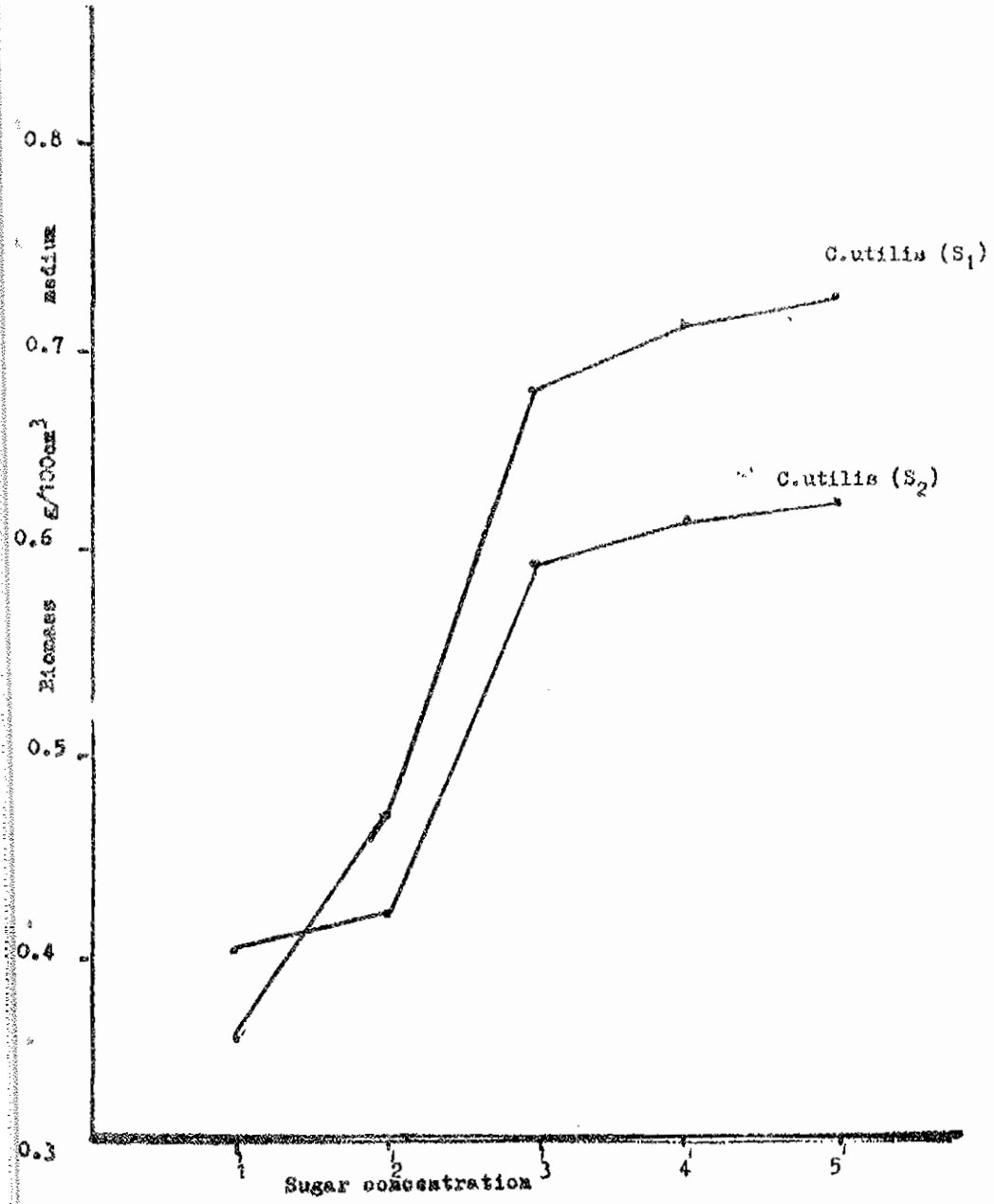
Table 2
The inoculation ratio

Media	zero hr.	20 hrs	40 hrs	Tss mean after separation of yeast cells
A	5 %	0	0	1.4
B	2.5%	2.5%	0	0.5
C	2.5%	0	2.5%	1.6

The tss of used aqueous extract was 3.4

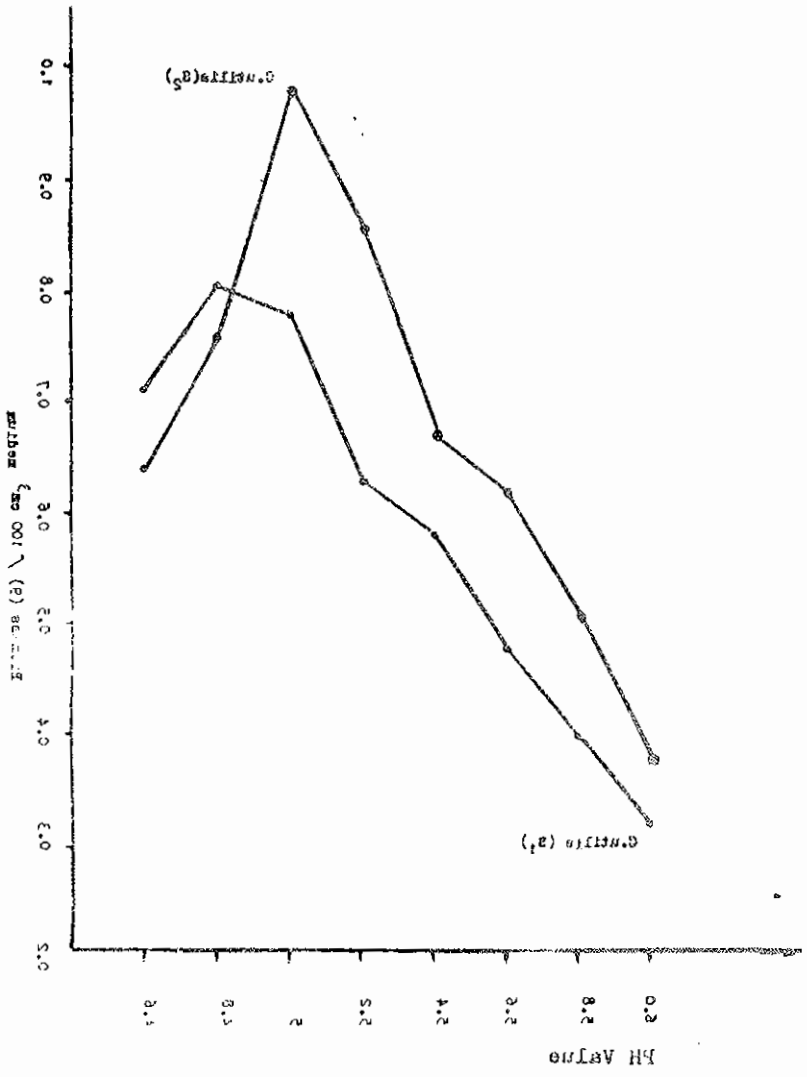
Figure 1.

The effect of sugar concentration on biomass yield of C. utilis cultivated on medium (date stone powder aqueous extracrt, 0.2g urea) (PH 4.5, 30°C, 150 rpm)



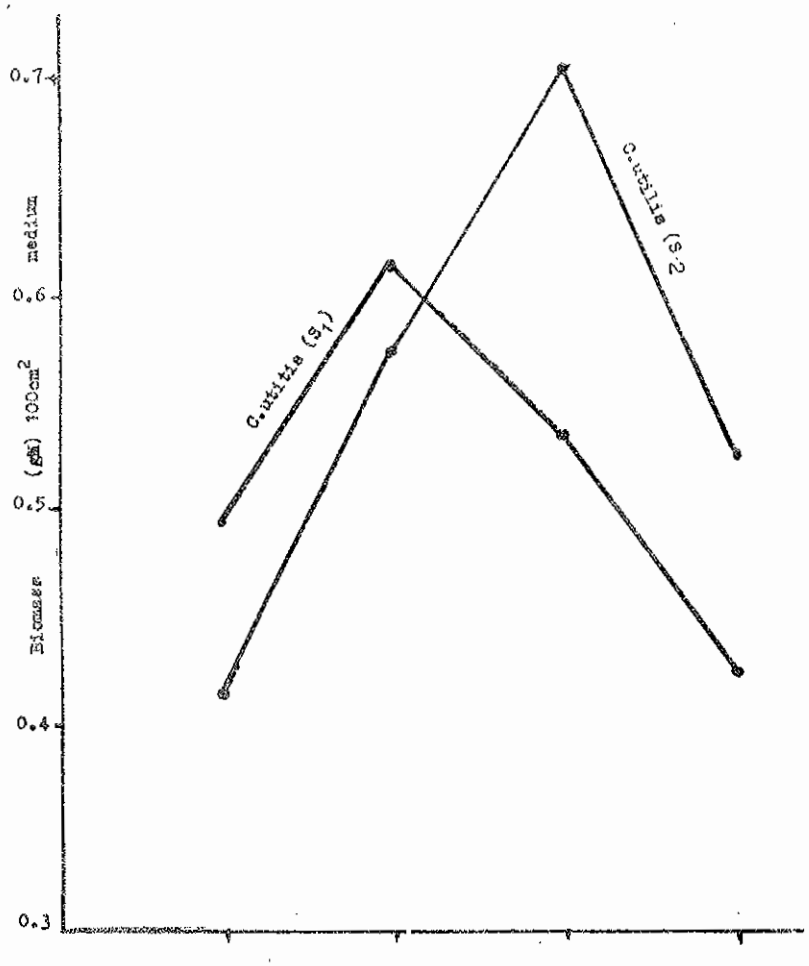
LSD (ofs1) = 0.045 LSD (ofs2) = 0.065

Figure 2
Protein content of C. utilis culsivated on medium (100 cm^3 date stone powder aqueous extract, 0,2g urea) (PH 4,5,30°C, 150 rpm)



LSD (ofs1) = 0.009 LSD (ofs2) = 0.012

Figure 3
Biomass out put of C. utilis (S1), (S2) cultivated on medium (100 cm^3 date stone powder aqueous extract- 3% sugar-, 0,2 g urea) (PH 4,5, 150 rpm)



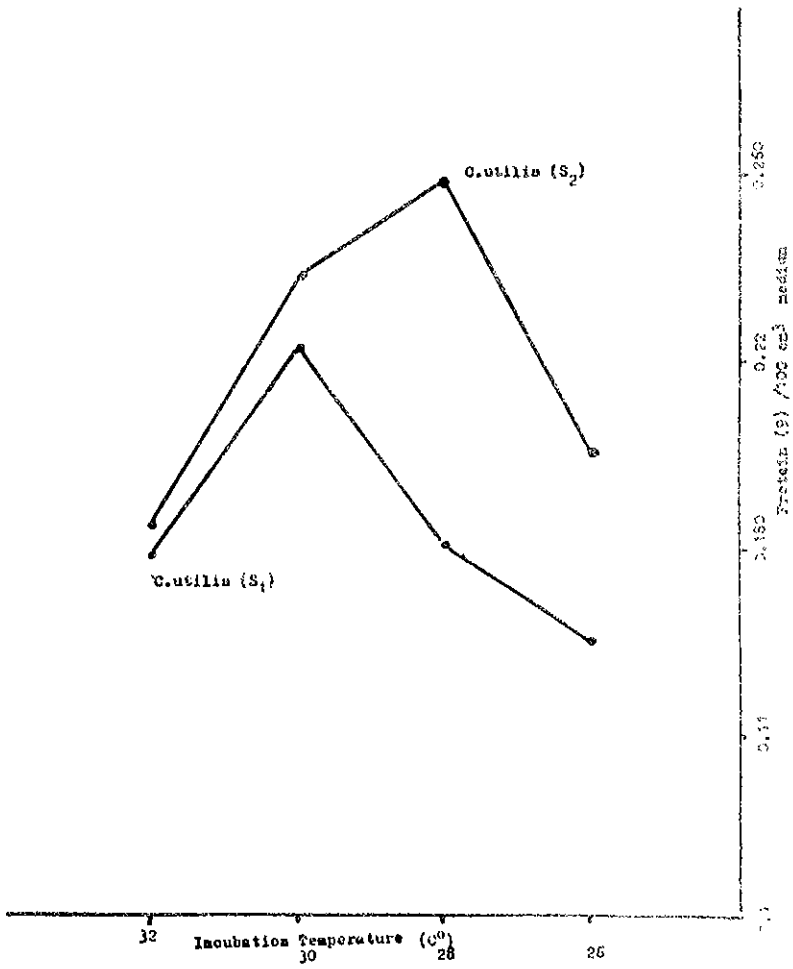
LSD (ofs1) = 0.049 LSD (ofs2) = 0.058

Figure 4

Protein content of C. utilis cultivated on medium (100 cm^3 dats stone powder aqueous extract- 3% sugar, 0,2g uree) (PH4,5, 150 rpm)

LSD (ofs1) 0.006 LSD (ofs2) · 0.016

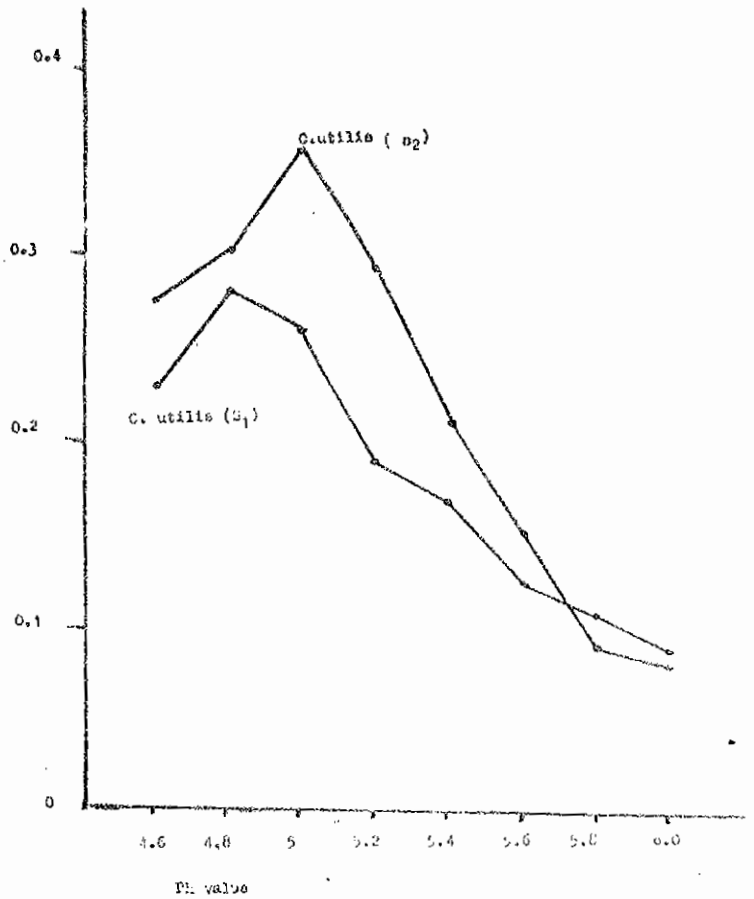
Figure 5
The effect of PH on biomossyicld of C. utilis cultivated on medium (100.0cm^3 date stonc povder aqueous eatract. (-3% sugor- 0.2 g urea C. utilis) (S_1) & (S_2) cicubated at 30, 28°C ruspectively)



LSD (ofs1) = 0.092 LSD (ofs2) = 0.043

Figure 6

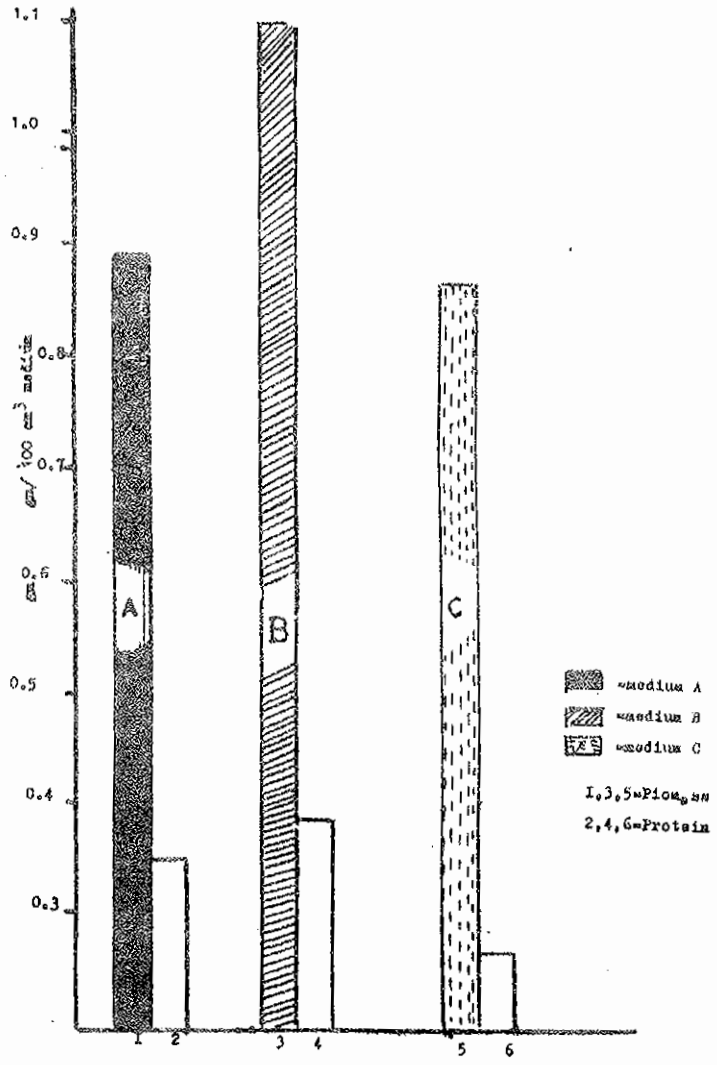
The Protein content of C. utilis cultivated on medium (100) cm^3 date stone powder aqueous extract- 3% sugar, 0,2g urea) (C. utilis "S_1" & "S_2" incubated at 30,28°C resbectively)



LSD (ofs1) = 0.016 LSD (ofs2) = 0.024

Figure 7

Biomass and Protein out put of C. utilis (S_2) cultivated on date stone powder aqueous extract- 3% sugar. (PH 5, 28°C, 150 rpm).



LSD (of Biomass) = 0.051 LSD (of prote) = 0.031

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CLARIFICATION OF DATE JUICE BY FOAMING TECHNIQUE

Jafar S. Al-Hakkak, Yousif Ali*, Suham H.F. Al-Madfai and Fadia Y. Batta
Petroleum Research Centre, Scientific Research Council, Jadiriya, P.O. Box 10039, Baghdad, Iraq.
*** Department of Chemistry, College of Agriculture, Abu-Ghraib, Baghdad, Iraq.**

ABSTRACT:

In this study we describe a new non-distructive and facile method for date-juice clarification, namely, foaming technique process. This was achieved by removing the heigh moleculer weight components of the date-juice, by selective adsorption of the molecules of these components with high surface activity, on the surface of rising gas bubbles through the date-juice. The remaining became clear pale yellow solution and had mostly the monosaccharides.

ترويق عصير التمر بتكوين الرغوة

جعفر صادق الحكاك ، يوسف علي ، سهام المدفعي

المستخلص:

تم في هذه الدراسة ادخال طريقة غير اتلافية (non-distructive) وسريعة لترويق عصير التمر تعتمد تكوين رغوة في العصير المراد ترويقه . يحصل الترويق وفق هذه الطريقة بازالة المكونات ذات الوزن الجزيئي العالي بامتزازها (adsorption) ، لكونها ذات فعالية سطحية عالية ، على الرغوة المتكونة بفعل تصعيد فقاعات غاز عبر عصير التمر .

ان العصير الناتج يكون صافياً (Clear) وذي لون اصفر فاتح ويتألف تركيبه الاساس من السكريات الاحادية .

INTRODUCTION

Date fruits is considered one of the important agricultural product of Iraq. It has been used industrialy for the production of vinegar, ethanol, protein yeast, Dibis* (1) and recently for the production of liquid sugar. The clarification of date-juice for the production of liquid sugar is considered one of the major problems in this industry. Two known processes are applied; one by the use of enzymes such as rapidase, celluclast and amylase (2), and the second is chemical processe, where lime is mainly used in a local liquid sugar plant (3).

In this investigation a physical non-distructive technique namely, foaming and bubble fractionation, is used. The primary objective of the clarification of date-juice is to remove most of the high molecular weight components, such as the pectic substances, waxes, gums, proteins and any other soluble polysaccharides.

* Dibis is a local name for a brown thick date syrup

Foam separation technique is based on the selective adsorption of surface active molecules at the surface of bubbles which rise through a column of liqud and produce a foam (4). It has been used in separation of polysaccharides mixtures (5), fractionation of the pectic substances of apple (6), and fractionation of synthetic polymers into narrow molecular weight cuts (7). And most recently for the fractionation of date juice (8).

MATERIAL AND METHODS

Materials

Samples of Zahdi date variety, 1985 crop, were obtained from the agriculture and water resources research center and stored at room temperature (25°) until further use.

Preparation of date juice

Date fruits were pitted and soaked in 3:1 (w/v), water: date ratio at (40°). It was then homogenized using a food processor, cooled and centrifuged at 6000 rpm for 30 min, at 5° (Bx°. 16.9).

Foaming

The foaming apparatus shown in Fig.1 was used with 3 different types of

Analyses

Turbidity

columns and solution pool (A,B and C). Different Nitrogen gas flow rate was required to achieve stable foam in each run.

Turbidity was determined using a (HACH 2100 A) turbidimeter (Table 1).

Colour

Optical densities were measured at a wave length 520 nm using a spectrophotometer model Unicam SP1800 (Table 2).

Total soluble solids

Degree Brix (Bx°) were measured at 20°, using a Carl Zeiss refractometer.

Sugars content

Sugars (glucose, frectose... etc.) were determined using a Pye Unicam HPLC system, fitted with Lichrosorb-NH column. Samples, 20 ul, of each fractions were eluted at 1 ml/min. The mobile phase was acetonitrile, water in a ratio of 75:25 (Table 3).

RESULT AND DISCUSSION

Clarification of date juice is basically a process used to remove most of the date juice components except for the sugars; either by separating or distroying them.

In this invistigation, three foam fractionation columns of different dimentions were used; because the dimention of the column is an important factor together with the concentration of the solution and flow ratio. In a resent study (6), pectic substances were foam fractionated using a similar apparatus as shown in Fig 1. It was shown that the flow rate was the main factor for the fractionation (6). However in the present work, a fix flow rate was used for all the runs, but changing other paramenters. Initially preliminary runs were carried out on solutions contaning equal weights of standard Dglucose and D-frectose of diffrernt concentrations; in all runs, no foam was produced. These observations suggested that separation of heigher molecular weight components (pectic substances,

waxes, proteins, etc.) of date juice could be possible if foaming technique was performed.

When foaming was applied on a date juice 23 Bx°, a complete carry over i.e., total foaming was observed in all three types of columns used. However, a 2.8 Bx° of date juice was only partially foamed in column A. It was therefore suggested that the concentration of the juice was important in order to have a stable foam which is necessary for the separation process.

Experiments were carried out on different date juice concentrations ranging from 4.6 Bx° to 23 Bx°, with columns of different sizes (Fig. 1) and the results of a selected runs are shown in Table 1, were a comparision is made between feed, collected foamate and residual solution in term of terbidity units. In all runs performed, the residual solution has much less turbidity than the feed solutions and the turbidity causing components were accumelated in the foamate; in most cases they were jellified.

Color measurments of the feed, foamate and the residual solution showed similar traneds table 2.

The results in tables 1, and 2 show that when using column A (2cm ID), a clear solution was produced from the 4.6 Bx° date juice with turbidity of 10 NTU and color of 0.125 nm. However, using a wider column B (2.8 cm I.D.), the residual solution had a higher turbidity value but lower in color. It was also noted that when using column C (4cm ID) a jell was formed on the sides of the column and in the receiver. This jellification was only observed in column C and when juice concentration was above 10.2 Bx°. A possible explanation given to this observation is that the ratio of the pectic substances to the accompanied monosuccharides is favorable for jellification.

It was concluded, from the results obtained from the different experiments, and taking into account the economical values of the process, that using date-juice of 10.2 Bx° with column B (2.8 ID) gave the best results.

The percentage of the foamate volume to feed solution was in the range of 14-25% and they had similar monosaccharides ratio (Table 3). This could be due to the carry over of the monosaccharides with the foamable materials.

In order to minimize the carry over of the monosaccharides, ethanol was added to the date juice and the mixture was then subjected for foaming. The foaming process was slower, in this case, than usual and the sugars content were lower in the foamate but higher in the residue, as shown in table3.

From Table 3 one can conclude that, when date juice (10.2 Bx°) was used, foaming did occur but with higher percentage of foaming volume (22 for foamate and 78 for residue having same ratio of sugars content). On the other hand, the ethanol containing date juice had a lower foamate volume (18 for foamate and

82 for residue) and the monosaccharides ratio was higher in the residue.

Following this non-distructive method will minimize the use of chemicals and omit the use of enzymes in the process of date-juice clarification. It also has main advantage that the materials separated in the foam could be subjected for further fractionation to obtain products of value in the food industries, such as pectic substances.

LITERATURE CITED.

1- Al-Madfai, S. and Abdul-Hussain, M.R., (1982). Foam Fractionation of commercial P.V.A. 16th Middle Atlantic Regional Meeting, Am. Chem. Soc., Delaware, USA.

2- Al-Madfai, S., Al-Hakkak, J.S., and Ali, Y., (1988). Patent 2018..

3- Al-Madfai, S., Al-Hakkak, J.S., Kasim, Sh.G., (1986).

4- Al-Sadi, J.KH. and Benjamin, N.D., (1982) Date Industilization in Iraq. First palm symposium. King Faisal University. Saudi Arabia..

5- Benjamin, N.D. and Abbas. M.F., (1985). Agriculture and water resources research 4, 155.

6- Brasch, D.J., Ngeh N.N.L., Robilliard. K.R., 1983, Carbohydrate research, 116, 1-19.

7- Complex-Hungrain Trading Company for foctory Equipment, 1976 Report on sugar Extraction from Date-Budapest.

8- Lemlich, R., Perry, R.H. and Chilton, C.H., (1973). (Eds)., Chemical Engineers Handbook, 5th end., McGraw-Hill-Kogakusha, Ltd., Tokyo, Section 17, pp. 29-34.

Table -1- Turbidity N.T.U.

Bx°.	Column	Feed	Sample Residue	Foamate
4.2	A	125	10	160
	B	125	23	370
6.5	B	137	82	310/F1* 290/F2
10.2	B	200	19	250/F1* 290/F2
	C	200	86	24**

* Foamate was collected in two fractions.
** Complete jellification of pectic substances.

Table -2- Colour (nm)

Bx°.	Column	Feed	Sample Residue	Foamate
4.2	A	0.5	0.125	0.31
	B	0.5	0.07	1.97
6.5	B	0.59	0.09	1.25/F1* 1.98/F2
10.2	B	1.09	0.25	1.19/F1* 0.3/F2
	C	1.09	0.39	0.94**

* Foamate was collected is two fractions.
** Complete jellification of pectic substances.

Table (3) HPLC analyses of sugars in date juice and fractions from column B.

Bx°	Sample	Sugars area		percentage
Date juice		Glucose	Fructose	of volume
10.2	feed	7.40	5.33	100
	foamate	7.25	5.30	22
	residue	7.58	5.35	78
10.2	feed	6.48	4.85	100
+ 10%	foamate	5.25	4.12	18
Ethanole				
	residue	8.52	7.09	82

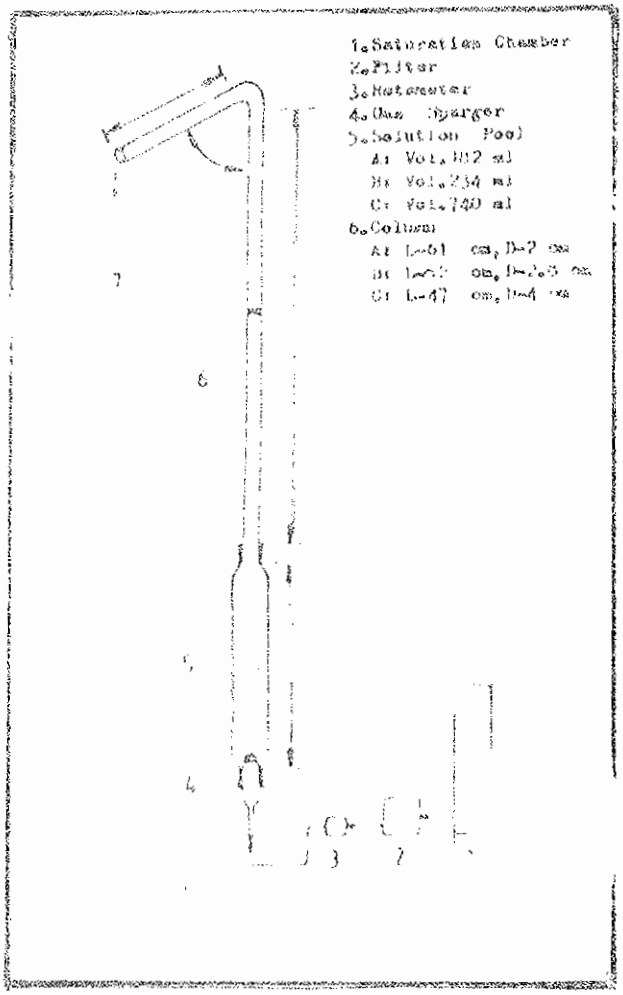
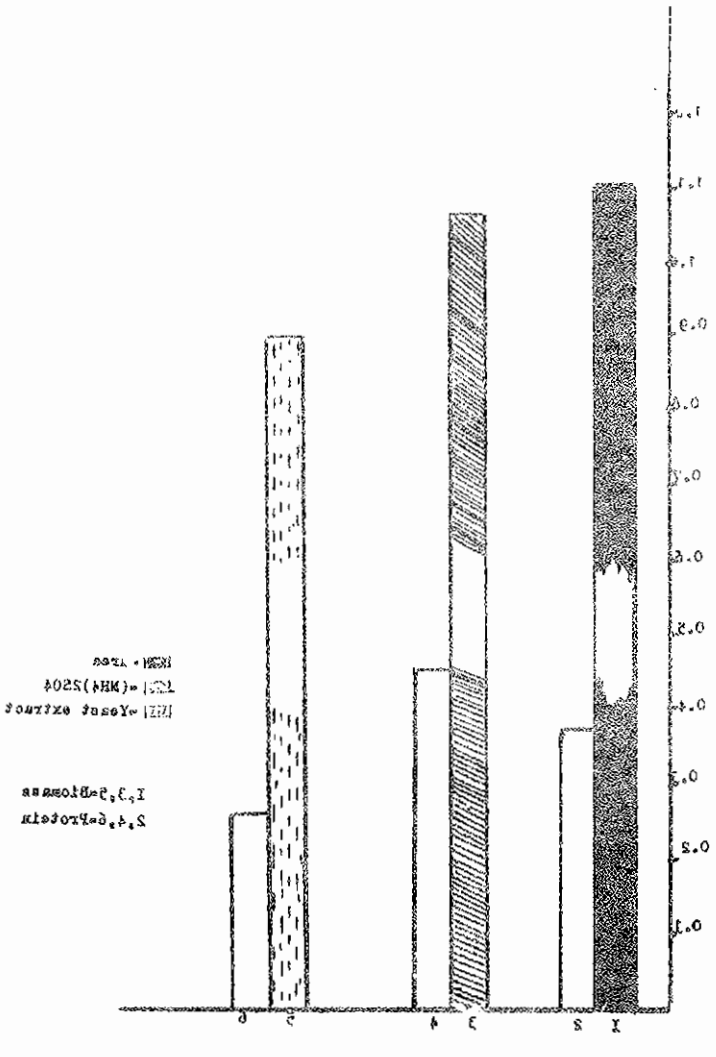


Fig. -1- Foaming Apparatus



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Title: The Efficiency of the Sind Date Marketing System

Rizvi Muneer Ali Shah and Dr John Davis*
The authors are, respectively, research student and Lecturer in Agricultural Economics, The Queen's University of Belfast, BT9 5PX

ABSTRACT:

The aim of this paper is to analyse and evaluate production and exchange efficiency in the Sind date marketing system.

At present there are certain difficulties in interpretation and measurement, but despite these, criteria of "workable" competition, provided a satisfactory theoretical and analytical framework. A fragmented production structure is identified and this is associated with inefficient use of resources. Considerable variation in production efficiency between districts is evident. Efficiency at wholesale level is related to firm size and business functions performed.

دراسة وتحليل وحساب الانتاج ومعامل التغير في نظام تسويق التمور في السند

رزاقي منير علي شاة . جون ديفز

الخلاصة :

تهدف هذه الدراسة الى تحليل وحساب الانتاج ومعامل التغير في نظام تسويق تمور السند . توجد في الوقت الحاضر بعض الصعوبات في التفسيرات والقياس . ولكن بالرغم من ذلك فأن معايير العمل والمنافسة تغطي قواعد نظرية وتحليلية مرضية . ثم تشخيص عملية الانتاج وهذه لها علاقة بالاستعمال غير الامثل للمواد وأن الاختلاف الملحوظ في معامل الانتاج بين المقاطعات يعتبر كدليل على ذلك وأن الكفاءة في مستوى التسويق يعود الى الحجم الرصين والاعمال المنجزة .

INTRODUCTION

This paper reports the results of the final part of a three part study on the structure, conduct and performance of the date market in Sind, pakistan. Results of the first two stages were reported in earlier papers by Rizvi and Davis (1985) and (1986).

The relative efficiency of production and exchange has considerable impact on the welfare of enterprises producing and marketing dates. Efficiency is also a matter of concern to the consuming public since it ultimately affects the prices paid by consumers. According to Kohls and Uhl (1980), marketing efficiency can be increased in two ways. Any marketing change that reduces the costs of performing the functions without altering the marketing utilities would clearly be an improvement in marketing efficiency. Alternatively, enhancing the utility output of marketing process without increasing marketing costs, would also increase efficiency. According to Gibbons (1970), production is deemed to be efficient when the required output is obtained with minimal resource input. In simple terms, the aim is to use and allocate resources efficiently in order to maximise the output-input ratio.

Production Level

In order to evaluate efficiency at the date orchard level in Sind, analytical coverage was extended to the two main date producing districts (viz Khairpur and Sukkur) in Sind. Together these cover 96.5 per cent of total date production in Sind. The period of analysis covered only one year, ie 1983-84. Clearly, this restricts the conclusions which can be drawn from the analysis.

Efficency at orchard level has been measured as a ratio of input to output:

$$\frac{\text{Total costs}}{\text{Total Revenue}} = \text{Average cost per rupee of output}$$

Thus, this measure reflects both the quantity of an orchard output and the average prices (date variety/form wise) received. Similarly, total costs (establishment, fixed, semi-fixed and variable costs) incurred in production and marketing were divided by the total quantity of output to get the unit costs (rupee per maund[1]) in each size group, by district.

1. "Per maund" has been used as "Unit" equivalent to 40 kg.

To measure production efficiency in agriculture, the usual procedure is to compare the costs and returns of the individual farms with a group or regional "average" and sometimes with the "most efficient" level. (Davis (1976) has pointed out two drawbacks of this methodology.

(a) It is not a normative comparison, since it only shows what has been achieved in practice and can not indicate what the level of efficiency should be.

(b) On an interregional basis it is only meaningful to make comparisons between "broadly similar" farm types.

However, in the end he concluded that it was a "workable" approach to the problem of efficiency measurement.

Due to lack ot precedent data, it is difficult to know if a date orchard is operating at the "maximum attainable production efficiency" or "lying within it" and even what the "lowest costs" are for a given production process. Despite these drawbacks, the methodology is valid and useful for analysing whether the efficiency of resource use in one size group or district is better in relation to other size groups or district. It is also one means by which a quantitive association between structure, conduct and performance may be determined. Therefore, considering the limited data available, the only practical method for measuring efficiency at the date orchard level is to compare the efficiency between the different size group orchards on a total input-output basis during the same time period.

Firstly, this methodology was applied to the Khairpur district (within different size groups) because date orchards in this district are of a "broadly similar" type and, thereafter, a comparison was made between efficiency in two districts (viz Khairpur and Sukkur). A straight comparison of this kind between the different size groups in the two districts needs to take account of the following limitations.

(a) Khairpur district is popular for the "Asil" variety whereas, most of the plantings in the Sukkur district are of the "Fasli" variety and yields here have been declining. The date growers in the Sukkur district were therefore reluctant to incur high production costs in these old orchards. In contrast, growers in the Khairpur district were keen to invest, in order to get better yields. Therefore, the differences between date variety, yield and costs, prohibit a straight comparison between the date orchards of the two districts.

(b) Khairpur has a natural advantage in date production due to superior soil. The water table is high in this district and irrigation has a significant impact on the date output.

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1. Karachi division has 3 districts, but here is counted as one district.

Wholesale Level

At wholesale level, due to non- availability of pricing data from each district market, the analytical coverage extends to the three main wholesale markets viz Sukkur, Hyderabad and Karachi[1], which together account for 62.4 per cent of the total quantity marketed through Sind auction markest. The remaining quantity was sold through the other ten district markets in Sind. The efficiency of the procurement centres, who handled 18 per cent of the total production in Sind, has been omitted due to lack of authentic costs/benefit data from these centres.

The three aspects of efficiency at wholesale level evaluated are, labour productivity, economies of size and capacity utilisation. For analytical purposes, comparisons are made between Sukkur, Hyderabad and Karachi wholesale markets using as a unit of measurement rupees per maund handled by each wholesale firm. The reason for comparing these geographically separated markets in Sind province, is the lack of a "standard" measure upon which to base such an analysis of efficiency. In order to restrict the comparisons to the "broadly similar" wholesale firms, the calculations for the two main types of wholesale firms ie.

Types A and B[1] are made separately (Rizvi and Davis, 1985). A straight comparison between two types of firms could be misleading due to differences in their marketing functions, methods and costs of business operation. Similarly, the firms handling unprocessed (fresh) dates exclusively were not included in this study because: (i) there is a significant difference in the prices and costs between processed (dry and dehydrated) and unprocessed dates, and; (ii) the trade period for the unprocessed dates is limited to the date season only.

Retail level

Measurement of efficiency at retail level is rather difficult. The analysis is therefore limited to two components of the operating costs-total fixed costs[2] and per maund variable costs.

1. Both these firms are distinguished by their marketing functions. Type "A" wholesale firms work as auctioneers in the same market and provide loan and other market facilities to the date sellers and buyers exclusively.
2. The fixed costs incurred exclusively on date trade by a retailer could not be easily separated, due to the typically diversified nature of retail shops coupled with their poor accounting records.

EMPIRICAL FINDINGS

1- EFFICIENCY IN THE PRODUCTION SECTOR

1.1 Khairpur district

Table 1 shows that the lower average operating costs (ie. Rupees 65/87 per maund) of the largest size group which suggests superior efficiency in this group. However, at Khairpur date orchard level, there are many external factors influencing yields over which managerial decisions of date growers have little direct control. Interestingly, the smallest size group earned higher average revenues (ie. Rupees 201.07 per maund) than the two larger groups. This was a consequence of the outlet to which date growers in larger size groups sold their output ie. to the procurement centres. If the date growers behave rationally[1], it would be expected that they would sell their surpluses to the most rewarding outlet. However, such choice depends also on the feasible outlets available and the financial conditions prevailing in the Sind date market.

It is apparent that the average fixed production costs incurred by the smallest size group (ie. Rupees 25/34 per maund) are lower than the larger size groups. This suggests that further research is required to determine the relationship between size and efficiency. Whether or not such a relationshop does exist, one can not assume that the largest size group had the greater efficiency, since a lot of other natural and individual factors can influence production efficiency. Nevertheless, the lower unit costs of the largest size group does suggest that economies of size do exist although the precise magnitude of these economies due to size alone would require further research.

1.2 Comparative production efficiency of Khairpur and Sukkur districts

Table 2 shows measures of overall efficiency in each district. This analysis shows that the fixed production costs (ie. Rupees 25/88 per maund) incurred by the Khairpur date growers are 142.3 per cent higher than the Sukkur date growers. However, net income per maund (ie. Rupees 135/51) of Khairpur district is 25.5 per cent higher than the Sukkur district, which suggests better overall performance by the Khairpur date growers. This relatively superior performance of Khairpur district is likely to improve in future, due to faster increasing yields of and prices for the Asil variety in this district.

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1. It was not the purpose of this study (being concerned with improving the performance of marketing) to dictate seller choice. Rather, the task is to suggest ways in which the results desired by sellers could be accomplished ie. higher returns with the same cost.

2- EFFICIENCY IN WHOLESALE SERCTOR

2.1 Labour Productivity

Table 3 shows that the Sukkur assembly market is more efficient than the two urban markets viz Hyderabad and Karachi. This reflects the relatively high quantity handled coupled with a lower number of employee. Average quantity per employee of the type "A" wholesale firms was 58.7 per cent higher than the average for the three markets.

In Hyderabad and Karachi it was lower at 59.7 and 81.6 per cent respectively.

Sales per employee and value added per employee in Sukkur market were 149 and 139 per cent respectively of the three markets average. In Hyderabad and Karachi markets these ratios were enhanced to some extent to 68 and 67 per cent and 83 and 94 per cent respectively. The somewhat smaller gap in performance between Sukkur and the other two urban markets using these two measures reflects differences in the selling prices (and possibly in the cost-price margins) and in the variety and forms of dates sold[1].

Similarly gross output per 100 rupees labour cost indicates the relative efficiency of Sukkur assembly market, which is 175 per cent of the average. In Hyderabad and Karachi. it remained 48 per cent and 77 per cent respectively. By comparing measures 1 and 4, it is evident that in measure 4, Sukkur assembly market is about 1.8 times the average, whereas, with measure 1 it is only 1.6 times which reflects the relatively low wage costs in Sukkur market. The same position seems to hold for type "B" wholesale firms who show even better relative efficiency at Sukkur market in comparison to Hyderabad and Karachi markets in all the sfficiency measures employed.

The labour productivity of Karachi wholesale market was better than the Hyderabad wholesale market.

2.2 Economies of size

To evaluate the second aspect of wholesale efficiency, a cross-sectiona method has been employed, which provides some indication of the size/cost relationship. Figure 1 shows that in type 'A' group firms, no firm was working in the lowest size category (ie. below 15,000 maunds) in these three markets. It is evident that the unit costs incurred by the largest group of firms (mostly working ir Sukkur market) were significantly lower than the costs incurred by the firms working in the lower size groups (those working mostly in the other two markets o

1. Handling of higher value date variety and forms coupled with lower unit costs will provid higher margins and thus labour productivity measured in monetary terms will be enhanced.

Sind province).This analysis suggests a relationship between size and unit costs for both types of wholesale firms. It is not possible to reach definite conclusions based on this analysis about the significance of economiss of size that, according to production theory, are practically always available. Nevertheless, these results demonstrate superior efficiency of type 'A' wholesale firms compared to type 'B' firms. The results also suggest that the costs seem to converge as the size of firm increases.

Bain (1966) has enumerated three possible relationships between a firm's size and its efficiency. In the situation described in this paper the largest firm size group has evidently[1] not become "bigenough" to suffer perceptible diseconomies of large size. The reason would appear to be that the largest size group has not yet fully exploited all of available size economies. Therefore, it would be a "rational" interpretation of the data to conclude tentatively that firms in the largest size group are more efficient and that an "unknown" range of "optimum" size exists. The lower limit of this range would be at least the largest size group analysed here (ie. 65,000 maunds and above). Caution is needed in interpreting these findings because many of these firms may not be working at the optimal point on their short run average cost curves due to underutilisation of capacity. However, the fact that a size/ efficiency relationship seems to exist is an inescable conclusion from this analysis.

2.3 Capaity utilisation

In terms of efficiency it is desirable at wholesale level for firms to operate at least at the minimal optimal size. The extent towhich firms are able to achieve this size of operation has a significant effect on production efficiency and therefore influences not only the unit cost of operation but the profit position as well. In evaluating this aspect of efficiency, 65,000 maunds, has been assumed to be th desired minimum efficient size (m.e.s.). The extent to which firms handled quantities below the m.e.s. level would provide some indication of the likely loss in production efficiency.

Figure 2 shows the extent to which type 'A' and 'B' wholesale firms were able to achieve their target during the date season (ie. between july and September) and in the rest of the year during the 1983- 84 season. It is apparent that, in Sukkur market, type 'A' and 'B' firms were both to operate close to m. e.s. during the date season, particularly type 'A' firms whose average throughput was about 94 percent of m.e.s. In all the three markets type 'A' firms were superior to type 'B' However, in Karachi and Hyderabad in particular their aveage throughput was only 69 and 30 per cent of m.e.s. respectively, considerable below the Sukkur average. This analysis does not lead to definite conclusions ab

out losses in porduction efficiency as a result of small size firms. However, it does suggest that there were substantial inefficiencies at wholesale level, particularly in Hyderabad and Karachi markets. Utilisation of capacity remained very low during the off-season in all three markets.

3 EFFICIENCY IN RETAIL SECTOR

Table 4 shows the relative importance of the two measured components of efficiency at Sukkur, Hyderabad and Karachi retail markets.

The variable costs per maund at Sukkur retail market were 14.8 per cent higher than the average variable costs of the three markets. This may reflect market externalities caused by narrow and congested Sukkur market streets which would increase waiting and loading times of traders. The "effectiveness" of Sukkur retail market was better with regard to total fixed costs-reflecting lower wages and rent and rates in this market. However, the performance of retailers in Hyderabad and Karachi markets was superior with regard to unit variable costs.

CONCLUSIONS

(a) The fragmented structure of the date production sector seems to be associated with relatively inefficient resource use. If this structural position continues and no measures are taken to protect the crop against natural climatic factors, it is unlikely that production efficiency will improve significantly in the near future. Nothing was observed to suggest that means of realising size economies, such as co-operatives, were being utilised. It would be worthwhile to investigate the desirability and feasibility of such co-operative development measures both at grower level and for the processing and distribution stages.

(b) Evalauation of efficiency in the wholesale sector has revealed evidence of inefficient use of resources. In Hyderabad all the date throughput was marketed by firms of a size equivalent to less than 50 per cent of m.e.s., and in Karachi, the figure was 20 per cent. However, in Sukkur market, all wholesale firms were found to be operating at a size greater than half of the m.e.s., and only 20 per cent were operating below the m.e.s. This efficiency evaluation was confirmed by comparing labour productivity.

The present limitation on total date supplies and their highly seasonal nature are seen to be the major constraints on improving productivity. Morever, nonrationalisation of capacity at wholesale level indicates inadequate competitive forces in the Sind date market.

(C) Efficiency in the highly fragmented and multiple product retail shops was not easy to measure. Although the evidence obtained at the three retail markets was inconclusive, it nevertheless demonstrates the effectiveness of Sukkur market with regard to total fixed costs and the superiority of Karachi retail market with regard to per maund variable costs.

BIBLIOGRAPHY

1- Bain, Joe. S., 1968. Industrial Organisation. Wiley.
2- Davis, J. 1976. Competition in the N. Ireland Beef Market. phD Thesis, Queen's University, Belfast (unpublished).
3- Gibbon, E.T. 1970. The Evaluation of Market performance. Irish Journal of Agricultural Economics Research Sociology, Volume 3 No 1: 29-42.
4- Kohls, R.L. and Uhl, J.N. 1980. Marketing of Agricultural products. 5th Edn. Collier MacMillan.
5- Rizvi, M.A.S. and Davis, J. 1985. Structural Features of the Date Market in Sind-Pakistan. F.A.O., Date Palm Journal, Volume 4 No. 1.
6- Rizvi, M.A.S. and Davis, J. 1986. An Analysis of Market Conduct in the Date Marketing System of Sind-Pakistan. F.A.O., Date palm Journal, Volume 4 No. 1.

Table 1

Average efficiency of Khairpur district date orchards during 1983-84

Size of date-orchard (Acres)	Av. per acre output in Mds	Av. revenue per Md (Rs)	Av. costs per Maund (Rupees)			Av. net income per Md (Rs)	Net incom as % of gross revenue	Av. costs as % of av. revenue
			Av. fixed Production costs[1]	Av. variable costs	Av. total costs			
30-49	124.75	201.07	25/34	36/51	61/85	139/22	69.24	30.76
50-69	116.18	193.31	27/13	35/23	62/36	130/95	67.74	32.26
70 and >	116.78	184.71	25/82	31/05	56/87	127/84	69.21	30.79
Average	121.11	196.83	25/88	35/44	61/32	135/51	68.85	31.15

1. Fixed establishment costs are not included in the fixed production costs as most of the date orchards in Sukkur district are very old, and even in Khairpur district plantation periods very greatly. As the total commercial life of a date palm extends to 52 years, it was difficult to compute the annual depreciation charges of each date orchard separately.

Table 2

Performance of Khairpur and Sukkur districts date orchards during 1983-84

District	Av. per acre output in Mds	Av. revenue per Md (Rs)	Av. costs per Maund (Rupees)			Av. net income per Md (Rs)	Net income as % of gross revenue	Av. costs as % of av. revenue
			Av. fixed prod. costs	Av. variable costs	Av. total costs			
Khairpur	121.11	196.83	25/88	35/44	61/32	135/51	68.85	31.15
Sukkur	109.94	149.85	10/68	31/20	41/88	107/97	72.05	27.95

Table3

Productivity of labour employed at Sukkur, Hyderabad and Karachi wholesale markets, 1983-84

Efficiency measures	Sukkur		Hyderabad		Karachi		Average	
	A	B	A	B	A	B	A	B
1. Average quantity handled per employee (Maunds)	9524	8214	3583	2500	4900	3350	6002	4688
2. Sales per employee (Rs 000)	2920	2462	1333	859	1622	1060	1959	1460
3. Value added per employee[1] (RS 000)	1302	1095	628	415	878	571	936	694
4. Output per 100 rupees labour costs (Maunds)	185	160	51	36	82	56	106	84

1. Sales less cost of dates purchased.

Table 4

Retailers average cost structures at Sukkur, Hyderabad and Karachi markets, 1983-84

(Rupees)

Market	Total fixed costs	Av. variable costs (per maund)
Sukkur	22,200	23.90
Hyderabad	34,800	19.65
Karachi	46,680	18.90
Average	34,560	20.82

Figure 1.
Relationship of average unit cost to scale of firms size 1983-84

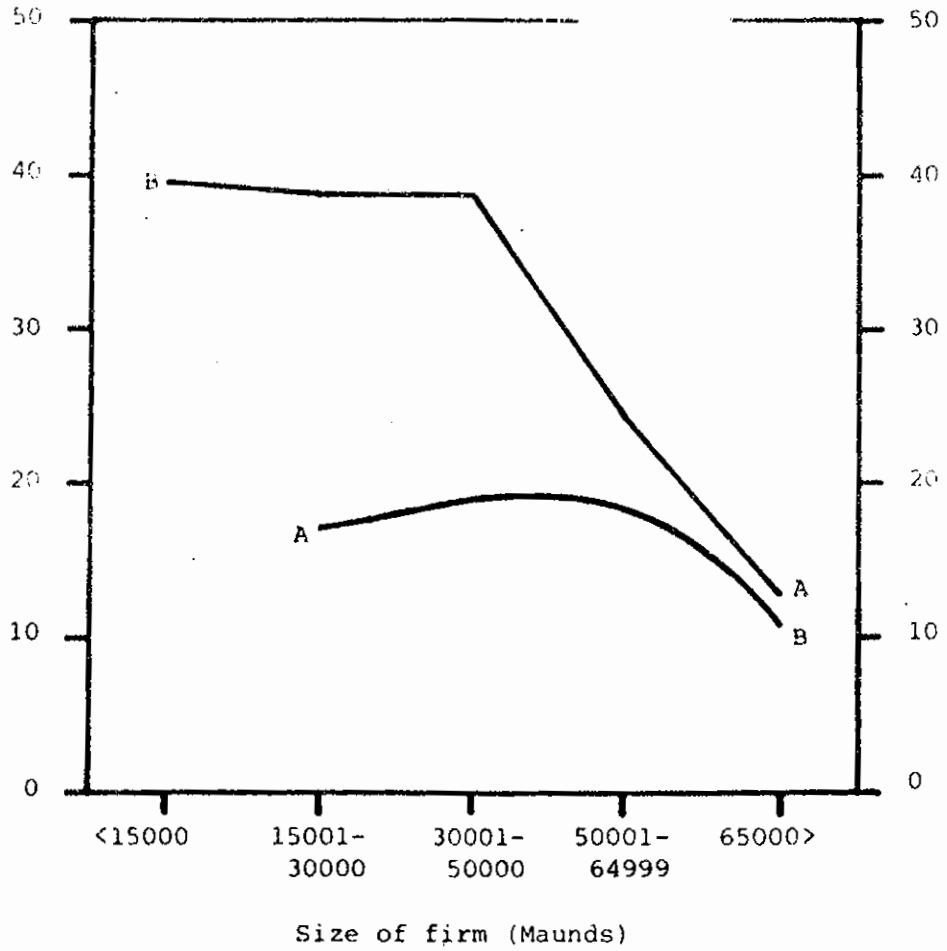
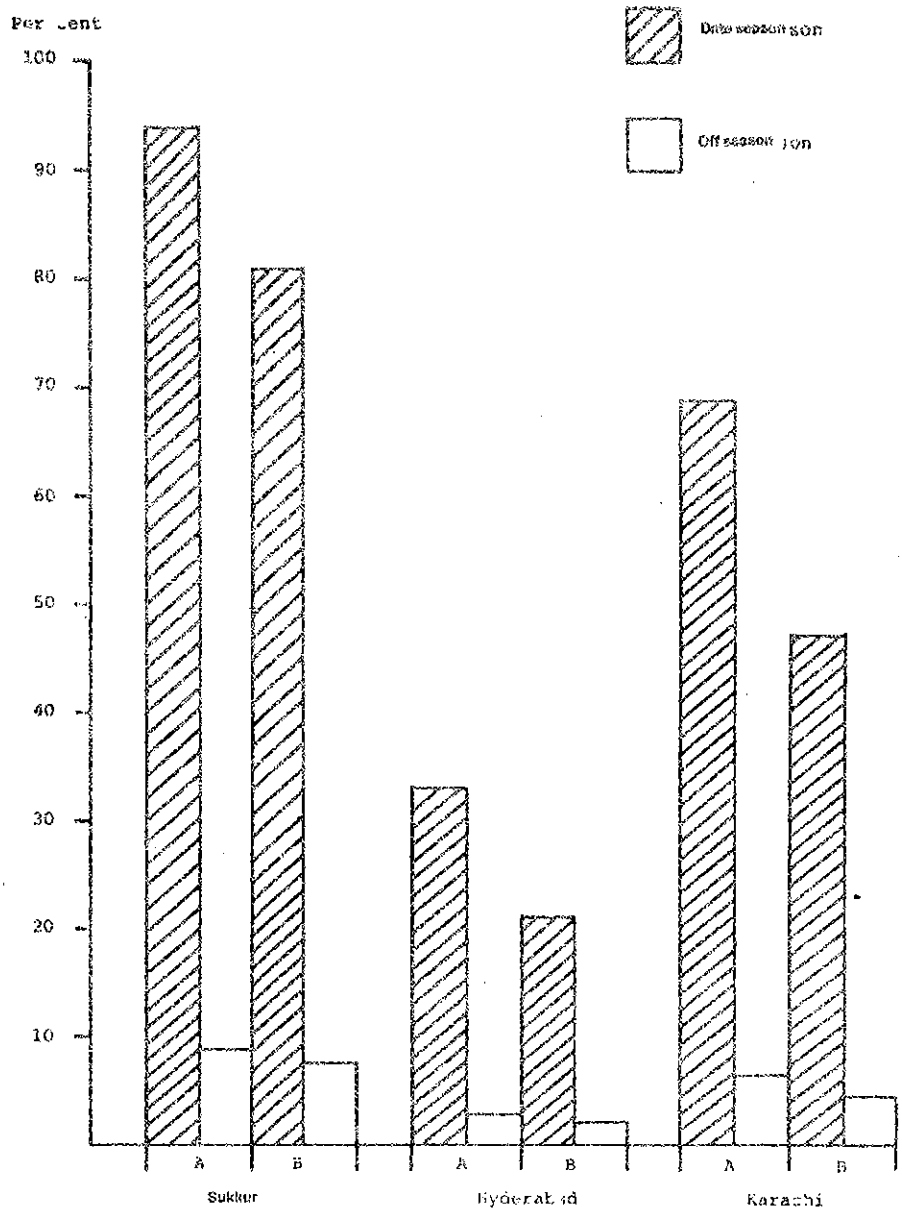


Figure 2. Average size of operation of Type A and B wholesale firms as a percentage of minimum efficient size during 1983/84



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Short Communication

Humidity Adaptation of Phoenix

Pramond Dhanmasakti
Date Program Consultant to:
The Nongnooch Village &
The Udorn Agricultural College, Thailand
175, Moo 9, Tambon Wat That, Amphur Muang, Nongkhai Province, 43000,
Thailand 1 February 1988

Introduction

The Date palm (Phoenix dactylifera) is a very interesting fruit tree. A type of its fruits, the Dry Dates, is especially of high staple food value to both humans and animals. Its productivity could be very high e.g. the Samani variety of Egypt produces over 200 kilograms per palm per year and a palm of the Shahani variety of Iran reached 347 kilograms.

The author started a study in 1969 and met with overwhelming obstacles. However, in this year of 1988, we are launching a substantial program. We expect that the program will give interesting results from fruitings of the hybrids of Date palms and the hybrids of Date palms crossed with several phoenix species.

Premises & Hypotheses

In 1969, doubts and confusion of thoughts deriving from misleading concepts prevailing at that time strongly faced the author. Thanks to the inspiration of scientific curiosity and the great value of the Dry Dates, the author enthusiastically threw himself and all his efforts on the search for a clear and precise answer to the problem of creating, by planned hybridization of germplasm of phoenix, the greatly accelerated evolution of new forms of Dry Dates adapted to the humidity of Thailand. The new Dry Dates will become in the Future a major answer to the very great shortage of food caused by World population explosion, in being the type of very intensive and highly competive staple food production.

Now in 1988, we have come to a new line of concepts presenting more creative interpretation of premises and more dynamic hypotheses. These premises and hypotheses will be put to the tests by which our program is being spe-

cifically designed for the purpose of gaining insights into the depths of the problem. It is expected that the fruitings of three (3) generations of Phoesix hybrids will effectively give a clearer and more precise knowledge of the above problem in 16 years i.e. in 2003 A.D. ------- at that time several thoudsand phoenix hybrid females will be fruiting lixuriantly.

The following is a brief statement of the essential points of the program so that an idea of the program can be grasped and its evaluation can be made.

The goal or rather the immediate objective is represented by a Vision of an image of Prototype Dry Dates considered to be as follows: its characteristics should be:

1. Sufficient content of sugars or carbohydrates in relation to volume of fruit, requirement of moisture transpiration is in equilibrium with the ambient humidity and temperature, firm texture of pulp, proper type of ripening enzymes, etc. so that it will either ripen on palm or by processing.
2. Sufficient staple food value to both humans and animals.
3. Sufficient productivity of fruits per palm and per unit area of planting.

Accelerated Evolution

In fruit breeding, especially this program, the time frame of 3 generations of planned hybridization taking a period of 16 years i.e. 1988-2003 A.D. is reasonably adequate, practical and effective. The decisive factors which greatly contribute to the acceleration of evolution of forms of Dry Dates including other possible forms, with far-reaching effects in evolution, are:

1. The germplasm of phoenix has high potentials for variability and therefore for great plasticity of forms of fruits. The Date palm will contribute the quality of fruits. Other phoenix species will contribute even greater increase in variability and plasticity of forms of fruits. The stress is placed in selection of the types of date varieties and phoenix species having characteristics pertinent to the objectives of the program.

2. The stress is placed in using the methods of hybridization which will amplify the variability and plasticity to the greatest fegree and also on the greatest amplification of combining abilities of each selected female by the use of mixed pollens from a considerable number of selected males to pollinate each selected female. This will give greater probability to hit the desired hybrids in the crossing having the desired combination of characters and characteristics.

3. The program will start the hybridization in 1988 with 4 lines of single crosses of individuals planted from seeds of 8 date varieties and 6 lines of date seedlings crossed with 6 phoenix species: P. pusilla, P. reclinata Race Pittha Bun-

nag, P. acaulis, P. ruplcola, P. Hanceana and P. humilis.

In 1993 double crosses will he made in these 10 lines. Mixed pollens from all other 3 lines will be used to pollinate each female of the 4 date lines. The 6 (Date x species) lines will be crossed in the same way.

In 1998 the F1 of these double crosses will be crossed in the same way as above.

In 2003 initial phase evaluation of fruitings of these hybrids will be made.

Implementation

1. The program will be carried out at The Udorn Agricultural College, Udorn Province, Thailand and at the Nongnooch Village, Chonburi province, Thailand.

The College will maintain a population of 400 indivduals. The useless palms will be removed and new interesting palms will replace them.

The Nongnooch Village has a land area of 128 hectares and will plant several thousands of these phoenix hybrids. Mr. Kampol Tansajja is the Landlord. He will introduce the types of date varieties such as dry dates, sweet khalal dates, dates resistant to high humidity, dates of which khalals can be processed to ripen into cured tamars, etc. by getting the offshoots of these varieties for varietal tests and for breeding.

Mr. Kampol Tansajja is making the Nongnooch Village to be the largest palm Collection Garden in Asia. He will collect representatives of the 15 Major Groups of palms from the most primitive line, the Coryphoid Line to the most advanced line i.e. the phytelephantoid Line. Other interesting palms such as the edible fruit palms, the sap palms, the cabbage palms, etc. including the native palms of Thailand will be collected. The Nongnooch Village is a modern resort and should be visited by tourists who come to Thailand.

The author would like to ask for cooperation and assistance to this program of Humidity Adaptation of Phoenix, in whatever way possible. This is an appleal to all World Date Experts and Agencies working on the development and evolution of the Date palm and the Genus of phoenix.

This program will contribute to the Great Future of the Date palm and phoenix. Thanks.

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DATE PRODUCTION AND MARKETING BEHAVIOUR OF DATE PRODUCERS IN IRAQ WITH SPECIAL REFERENCE TO CO-OPERATIVES*

LAITH SAIMAN AL-Ali
Section of economic research and studies
Agriculture & Water Resources Research Center, Scientific Research Council
P.O.Box 2416 Baghdad, Iraq

As the most important date-growing area, Iraq supplies three quarters of the world date exports. Despite this leading market share, dates from Iraq fetch relatively low prices on the world market, and, over the last few years, the percentage of Iraq's Date exports has been decreasing. This situation results mainly beacuse the required terms of export contracts regarding quality and timing have not been-fulfilled. This is caused primarily by difficulties in the domestic market: late delivery as well as unfavourable conditionlay and insufficient storage on the farms.

The low export prices determine the price in the domestic market. Thus, there is no incentive to improve production. Attempts made by the government marketing organization to break this vicious circle by raising buying prices have not been very successful until now.

The objective of this investigation was to analyse the marketing behaviour of date producers, to explain their marketing decisions and to determine their readiness to react to market-oriented actions. A decision oriented approch was used as a framework. The analysis of marketing decisions was carried out in three steps: basis (date production), process (decision maker, goals, field), and determinants with special reference to interpersonal communication. The focus was on date producers organized in co-operatives because of their particular significance in Iraq's date production. The data were collected during an empirical survey conducted in 12 villages having 6 co-operatives in the provinces of Babylon and Kerbala, and from the evaluation of statistics and relevant publications

* This is an abstract of ph.D. Dissertation, Goettingen Univ., F.R. Germany, published in the socioeconomic studies on Rural Development Vol. 74, F.R. Germany, 1987.

For the analysis, additive scoring scales were established and served to evaluate the direction of marketing decisions, the physical market access as well as the intensity of personal communication between members and management of co-operatives. There are hardly any farms producing dates exclusively. Additional farm activities are undercropping of the palm gardens, cultivation of other farm land, and animal husbandry. The farm structure is determined above all, by the size of the palm garden, land tenure, availability of labour and the educational level. Negative influences exercised by the additional farm activities on date production could not be proved in the statistical tests. There is a main deficit in date production with regard to all date palm cultivation practices. This deficit could be mitigated by appropriate mechanization and improved training and extension. High planting densities, fields of small sizes and the farmers' lacking inclination hamper mechanization. Soil salinity as well as pests and diseases cause reductions in yields on most farms. Under the prevailing cost/price relations, date production only offers a low contribution margin as compared with other farm activities.

In marketing, late delivery and reluctance to sell to the Dates Committee were observed. It was a scertained that the causes thereof were the bad condition of the physical infrastructure, late procurement of price information, long waiting times in the market transactions, delayed payment of the sales' proceeds, impersonal atmosphere at the buying centres, lack of (family) labour and the farmers' low educational level. Generally, the date producers included in the survey showed a rational marketing behaviour. Thus, it can be expected that the instruments of price, market and structural policies will be effective. The elimination of restraints could increase the producers' readiness to change their marketing decisions in favour of the date marketing organization.

Measures for extending the supply of appropriate machines and implements as well as other production inputs, for improving water mangement, especially drainage, for intensifying extension, for increasing the number of buying centres and the Intensity of Interpersonal communication, and for restructuring the rural roads network should be considered particularly positive. Co-op-eratives should be more closely involved into the implementation of the appropriate measures.

The outcome would improve not only the date economy, but also the whole agricultural sector and, moreover, accelerate general rural development.

التسويق، ضعف قوة العمل العائلي على مستوى المزرعة واخيرا انخفاض المستوى التعليمي والتدريبي للمزارع نفسه.

وقد اظهرت الدراسة ان المنتج يسلك سلوكاً رشيداً الامر الذي يعني امكانية استخدام الادوات السعرية للسوق بفرض توجيه الانتاج وتطوير سوق التمور، ومن الجدير بالذكر ان تجاوز العوامل السلبية المذكورة اعلاه يؤدي الى رفع الكفاءة التسويقية للتمور لكل من المنتج الفرد والمؤسسات القائمة بعملية التسويق. وقد اتضح من الدراسة ان هناك قصوراً في بعض العوامل التي تؤدي الى تطوير انتاج وتسويق التمور كعدم توفر المكائن الملائمة، وعدم توفر بعض مستلزمات الانتاج والتأخير في تعميم مشاريع البزل وانخفاض مستوى الخدمات الارشادية، وعدم نشر مراكز تسويق التمور بمناطق الانتاج وانخفاض العناية بشبكة المواصلات ورفع كفاءتها لذا كان من الضروري على المؤسسات المعنية بصفة عامة، والجمعيات التعاونية بصفة خاصة ان تؤدي دورها بفعالية اكثر من اجل التغلب على جوانب القصور لهذه العوامل.

وفي النهاية نوهت الدراسة على ان توثيق العلاقة بين الاعضاء المنتجين للتمور وقيادة التعاونية لا يساعد فقط على تحسين انتاج وتسويق التمور، بل يمتد ايضاً الى كل فروع الانتاج الزراعي ومن ثم فان اثره الموجب يمكن ملاحظته على التنمية الريفية المستهدفة.

(صفات متخذ القرار ـ اهدافه ـ الحقل التسويقي) في حين تضمنت الثالثة دراسة العوامل المحددة لاتجاه القرار التسويقي. ولاهمية الدور الذي تلعبه التعاونيات في انتاج وتسويق التمور، فقد ركزت الدراسة على ابراز دورها في القرار التسويقي للاعضاء وخاصة من خلال تحليل عملية الاتصال فيما بين قيادة التعاونية واعضائها. ولقد اعتمدت الدراسة بالاساس على بيانات البحث الميداني الذي اجراه الباحث في محافظتي بابل وكربلاء والذي تمثل في عينة احصائية من الزارعين يقطنون اثني عشرة قرية وينتمون الى ست جمعيات تعاونية، بالاضافة الى الاستعانة بالبيانات المنشورة وغير المنشورة. وجرى تحليل البيانات باستخدام الاساليب الاحصائية المختلفة وتم بناء ثلاثة مقاييس مختلفة من المقاييس التجميعية يختص اولها بتقييم اتجاه القرار التسويقي، بينما يختص ثانيهما بتقييم شبكة الاتصال بالسوق، في حين يختص ثالثهما بتقييم قوة الاتصال بين اعضاء الجمعية وقيادتها. ولقد تبين من الدراسة ندرة وجود نمط المزارع المتخصصة في انتاج التمور، ووجد ان المزارع غالباً ما يمارس انشطة زراعية جانبية بهدف معظمة دخله كاستثمار وحدات زراعية خارج البستان او القيام بتربية الحيوانات او استخدام اسلوب الزراعة البينية داخل بستان النخيل، وعموماً فقد ثبت التأثير الموجب للزراعة البينية على انتاجية النخيل.

ومن خلال دراسة العمليات الزراعية اتضح ان هناك قصور في كل عمليات خدمة النخيل على ان هذا القصور يمكن تجاوزه باستخدام اسلوب المكننة الزراعية، وتطوير المستوى التعليمي للمزارع مع ملاحظة ان استخدام المكننة في حد ذاته يواجه بعقبات تتمثل في صغر حجم المزرعة وكثافة الغطاء الخضري للمزروعات واخيراً ضعف ميل المزارعين نحو استخدام المكننة.

وقد اتضح ان تملح الاراضي الزراعية، ارتفاع منسوب الماء الارضي، وانتشار الاصابة بالآفات من اهم المشاكل التي تواجه المزارع والتي تؤثر على الانتاج كماً ونوعاً.

وبدراسة التكاليف والعائد اتضح ان العائد المتحصل عليه من النخيل يعتبر منخفضاً بالمقارنة بنظيره من المحاصيل الاخرى وعدم رضاء المزارعين عن مستوى الاسعار التي يحصلون عليها.

ولقد بينت الدراسة ان هناك مجموعة من العوامل تعتبر مسؤولة عن تأخير توريد التمور الى الاسواق مع جنوح المزارع اساساً الى عدم التوريد لمراكز التسويق والتي من اهمها رداءة طرق المواصلات، ضعف المعلومات التسويقية، طول فترة الانتظار لحين تسليم المحصول ولحين تسلم المستحقات، سيادة مناخ غير اجتماعي بمراكز

انتاج التمور والسلوك التسويقي لمنتجيها في العراق مع التركيز على دور التعاونيات

ليث سلمان العلي الربيعي
شعبة البحوث والدراسات الاقتصادية ـ مركز البحوث الزراعية والموارد المائية
مجلس البحث العلمي / ص. ب ٢٤١٦ بغداد ـ العراق

يحتل العراق مركز الصدارة في انتاج التمور على مستوى العالم، وعلى الرغم من انه يشارك بما يزيد على ثلاثة ارباع صادرات العالم منها الا ان التمور العراقية لاتحصل على السعر المناسب لها مقارنة باسعار بقية الدول الاخرى المصدره للتمور هذا بالاضافة الى ان حصة العراق في السوق الدولية قد بدأت في الانخفاض خلال السنوات الاخيرة، ويرجع ذلك في المقام الأول الى ضعف القدره التسويقية للتمور العراقية والتي يمكن ابرازها بصورة اساسية في وصولها الى مستهلكها النهائي بالسوق الخارجي في الوقت والشكل الغير مناسبين. ويرجع انخفاض القدرة التسويقية على مستوى سوق التصدير في الاساس الى انخفاضها في السوق المناسب الداخلي والاخيرة تعزي بدورها الى تأخر المزارعين في توريد المحصول في الوقت المناسب بالاضافة الى ارتفاع نسبة الاصابة والتلف في التمور الموردة نتيجة لسوء معاملتها في مراحل المجني والتخزين والنقل. وقد حاولت الدولة التغلب على المشاكل التسويقية السابقة ليحتل العراق المكانة المناسبة في السوق الدولية للتمور وبما يتناسب مع حجم مأينتجه منها وذلك باستخدام اسلوب الأسعار التشجيعية للمنتجات عالية الجودة، الا ان النتائج المتحصل عليها باتباع هذه السياسة السعرية لم تكن مشجعة، ولمعالجة هذا الامر استهدف البحث دراسة السلوك التسويقي لمنتجي التمور بغية معرفة ردود افعالهم ازاء ظروف السوق واحداثه وما ينجم عن ذلك من تأثير على قراراتهم التسويقية. ووصولاً لهذا الهدف اعتمدت الدراسة على نظرية اتخاذ القرار، حيث جرى تحليل القرار التسويقي على ثلاثة مراحل، تضمنت الاولى دراسة الانتاج كأساس للقرار التسويقي، بينما تضمنت الثانية مدى تحقيق القرار التسويقي

* موجز رسالة دكتوراه من جامعة كوتنكن ـ المانيا الاتحادية، منشورة في سلسلة الدراسات الاقتصادية والاجتماعية للتنمية الريفية ـ مجلد ٧٤، المانيا الاتحادية ١٩٨٧ (باللغة الالمانية).

Acomparative application of date juice extraction process on industrial scale

N.D. Benjamin
Sen. Sci. Res.

N A Mohammad
Assist. Res.

S.A.Al- Shakir
Sci. Res.

A.S. Moroki
Agri. Assist.

S.M. Ali
Agri. Assist

Dept. Palms and Dates, Agric. Water Reso. Res. Center Sci. Res. Council, Baghdad, P.O.Box 2416, Iraq.

Abstract:

The colloid materials consider one of the main factors effecting filtration and clarification process.

In order to determine the optimal conditions for maximum rate of sugar extraction, minimum non sugar compounds, and with lowest percentage of sugar losses.

A comparison of three process of date sugar extraction (Enzyme treatment, Hindia Liquid sugar, and the modified process) were studied. The results revealed that the use of commerical pectic enzymes (pectin estrase and polygalacturonase) in date juice preparation are necessary in order to obtain a higher sugar extraction rate (91.0%) and juice clarity value of 72.0% and losses of sugars less than 3.4%, When compared to the modified process with values of 86.6, 70.8 and 4.1% respectively, While for the Hindia liquid sugar process the values were, 75.8, 70.0, and 11.0% respectively. It was found that a relationship between concentration of soluble pectin and fine filtration rate is existed, with a critical concentration range of 0.090-0.095%.

The development of colour intensity in the juice of Hindia Liquid sugar process was more noticable with an increase of 24% when compared to the enzyme and modified process respectively. While furfural and 5- hydroxy methyl furfural increased in the enzymatically treated juice and the modified process.

It was concluded from the comparative applied research that the enzyme treatment process, gave an increase in the yield and prove the quality of the juice with reducing the cost by I.D. 15.00 per ton of date.

17- محمد، نوزاد عبدالله، نظام الدين، عبدالمحسن وفرحان، احلام عبدالرحيم. دراسة التفاعلات اللونية في بعض مراحل نضج ثمار الزهدي. مجلة البحوث الزراعية والموارد المائية، 4, 2, 195-207 (1985)

18- Vukov, K. Juice purification in: Physical and chemistry of sugar-beet in sugar manufacture. Elsevier Scientific Publishing Com., Amsterdum-Oxford-New York (1977).

19- Eskin, N.A.M., Henderson, H.M. Biochemistry of foods. Academic Press, New York and London (1971).

20- Meyer, L.H. Vegetables and fruits in: Food chemistry. Affiliated East-West Press. PVT. L.T.D., New Delhi (1973).

21- Aurand, L.W. Food glycosides in: Food chemistry. The Avi Publishing Com., Inc. Westport, Connecticut (1973).

22- Auet, E.F.L.J. Degradation of carbohy drates. III-Unsat-urated hexosones. Aust. J. Chem., 15,503 (1962).

23- Kelly, F.H.C., Brown, D.W. Thermal decomposition and colour formation in aqueous sucrose solution. Sugar Tech. Rev., 6,1-48 (1978/1979).

المصادر

1- Benjamin, N.D., Johnston, M.R. Effect of comerical enzymes on chemical composition and physical characteristice of date- juice. First Scientific conference, Scientific Research Foundation, Baghdad Iraq (1972).

2- Benjamin, N.D., Abbas, M.F., Shubber, B.H. Preparation and clarification of a date-juice. 1-Preparation. J.Agric. Water Reso., 1,2,75-87 (1982).

3- Benjamin, N.D., Abbas, M.F. Clarification of date-juice by chemical and enzymatic processes. J. Agric. Water Reso., 4,3,153-168 (1985).

4- العكيدي، حسن خالد حسن، زهير سلمان العبيدي، امنه ذا النون جراح وتريا صادق الحكاك انتاج مشروب غازي من عصير التمر -1-اضافة هيدروكسيد الكالسيوم لترويق العصير. مجلة نخلة التمر. العدد 2، مجلد 5 (1987).

5- AOAC. Official methods of analysis. Association of official Analytical Chemists. Washington D.C., 12th edn. (1973).

6- Booth by, M.A. Methods in food analysis. 2nd edn., Academic Press, New York, Sanfransisco, London, 565-593 (1970).

7- Ropertson, G.L. The fractionation and quantitative determination of pectic substances in grape and musts. Am. J. Enol. Vistic., 30,182-185 (1976).

8- Lawrence, J.M., Groves, K. Determination of a soluble pectin in apples. J. Agr Food Chem., 2,17, 882-885 (1954).

9- Josivn. M.A. Methods in food analysis. 2nd edn., Academic Press, New York Sanfransisco, London, (1970).

10- Amerine, M.A., Ough, C.S. Methods for analysis of nusts and wines. John wiley and Sons, Inc., U.S.A. (1980).

11- Ranganna, S. Manual of analysis of fruit and vegetable products. Tata McGraw-Hill Publishing Company Limited, New Delhi (1977).

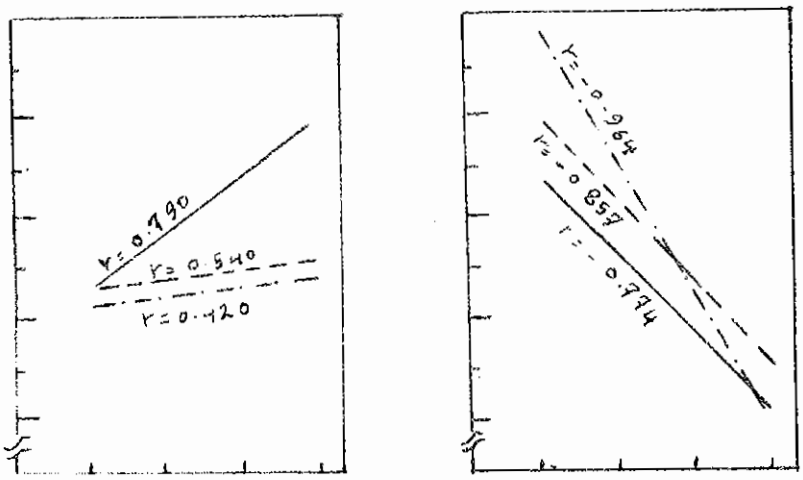
12- Delaney, H.R., Kennedy, A.M. and dezouza, L.J. Treatment and recycle of ion exchang regenerant. Sugar Int. Tech., 37, 67-87 (1978).

13- Pearson, D. The chemical analysis of food. Churchill livin astonc, Edinburgh, London and New York (1976).

14- الراوي، خاشع محمد وخلف الله، عبدالعزيز محمد. تصميم وتحليل التجارب الزراعية، وزارة التعليم العالي والبحث العلمي - جامعة بغداد/ كلية الزراعة. (1980)

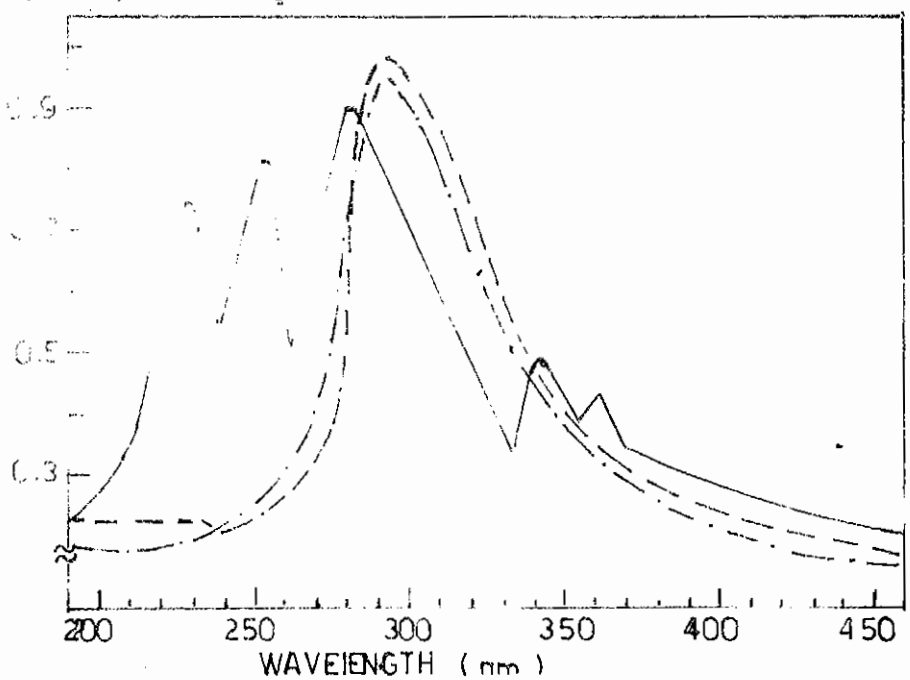
15- Spiegel, M.R. Theory and problems of statistic Sham Publishing Co., New York (1961).

16- Saeed, A.R., El-Tinay, A.H., Khattab, A.H. Characterization of pectic substances in mango marc. J. Food Sci., 40, 205-206 (1975).



شكل ١ : تأثير الاسلوب المستخدم على لزوجة ودكنة العصير خلال مراحل الاستخلاص.

ـ اسلوب معمل الهندية. ـــ اسلوب المعمل التجريبي. ـــ الاسلوب المحور



شكل ٢ : تأثير الاسلوب المستخدم على اضافة امتصاص العصير النهائي المستخلص

ـ اسلوب معمل الهندية. ـــ اسلوب المعمل التجريبي. ـــ الاسلوب المحور

جدول 3 : تأثير الاساليب الثلاثة المستخدمة على بعض المكونات المسببة للتلون خلال مراحل استخلاص وترويق عصير التمر

المكونات ملغم/100غم عصير	المرحلة	الاسلوب			أقل فرق معنوي على مستوى 5%		
		معمل الهندية	المعمل التجريبي	المصور	الاسلوب .	المرحلة	الاسلوب
الهيدولات الذائبة الكلية	A	156	170	163	0.864	1.566	2.712
	B	135	136	136			
	C	131	133	131			
	D	115	112	114			
المتوسط		134.25	137.75	136.00			
5 - هيدروكسي ميثيل فورفورال	A	5.0	5.0	5.0	0.113	0.070	0.121
	B	5.3	5.1	5.2			
	C	5.7	5.5	5.9			
	D	6.3	6.6	6.3			
المتوسط		5.575	5.550	5.600			
الفورفورال	A	0.20	0.19	0.20	0.011	0.015	0.026
	B	0.20	0.20	0.20			
	C	0.23	0.21	0.23			
	D	0.35	0.25	0.37			
المتوسط		0.245	0.212	0.250			

حسبت المكونات على أساس الوزن الطري (ملغم / 100 غم عصير تمر) .

حسبت المكونات على أساس الوزن الطري (ملغم / 100 غم عصير تمر).

جدول 2 : تأثير الاساليب الثلاثة المستخدمة على بعض الخواص خلال مراحل استخلاص وترويق عصير التمر .

الخواص (%)	المرحلة	الاسلوب			أقل فرق معنوي على مستوى 5%		
		بمعمل الهندية	المعمل التجريبي	المحور	الاسلوب	المرحلة	الاسلوب x المرحلة
المواد البكتينية الذائبة الكلية	A	0.194	0.191	0.191	0.0006	0.0014	0.0018
	B	0.096	0.095	0.119			
	C	0.095	0.090	0.115			
	D	0.048	0.050	0.094			
المتوسط		0.108	0.106	0.129			
السكريات الكلية	A	14.5	14.6	14.6	0.312	0.129	0.225
	B	13.7	14.4	14.4			
	C	13.6	14.3	14.3			
	D	12.9	14.1	14.0			
المتوسط		13.675	14.350	14.325			
المواد العالقة	A	21.6	21.4	21.6	0.054	0.248	0.431
	B	20.0	20.1	20.4			
	C	18.7	19.2	19.5			
	D	18.0	19.1	19.1			
المتوسط		19.60	19.95	20.15			
النقاوة الفيزيائية	A	67.1	68.2	67.6	0.139	0.161	0.279
	B	68.5	71.6	69.1			
	C	72.7	74.5	73.3			
	D	71.7	73.8	73.3			
المتوسط		70.0	72.0	70.8			
كفاءة الاستخلاص	C	75.8	91.0	86.6	1.241	-	-

- حسبت المكونات على أساس الوزن الطري (غم / 100 غم عصير تمر) .
- تمثل الحروف الابجدية لهذا الجدول وما يتبعه المراحل المختلفة للاستخلاص حيث :

A = الطبخ ولكل الاساليب ، B = المعاملة بالنورة الشديدة في اسلوب معمل الهندية . المعاملة الانزيمية في اسلوب معمل التجريبي والمعاملة الكيميائية (نورة - فوسفيت) في الاسلوب المحور ، C = الترشيح الاولي و D = الترشيح النهائي .

جدول 1 : يبين تراكيز البكتين وأقسامه الثلاثة ، وكل من المجاميع المتأسترة والكربوكسيلية في ثمار تمور الزهدي الطازجة والمخزنة .

المكونات / 100 غم تمر جاف	تمور الزهدي	
	الطازجة	المخزنة
البكتين الكلي	1.194	1.124
حامض البكتينيك (الذائب في الماء)	0.482	0.500
حامض البكتيك (الذائب في الاوكسالات)	0.217	0.267
البروتوبكتين (الذائب في هيدروكسيد الصوديوم)	0.495	0.357
المجاميع المتأسترة «ملليمكافىء»	4.369	0.561
المجاميع الكربوكسيلية «ملليمكافىء»	13.066	10.187
* درجة الاسترة	33.437	5.507

أقل فرق معنوي على مستوى 5% حسب أختبار L.S.D لعامل التمر = 0.110 ، لعامل المكونات = 0.112 وللتداخل التمر × المكون = 0.173 .

$$\text{*درجة الاسترة} = \frac{\text{المجاميع المتأسترة}}{\text{المجاميع الكاربوكسيلية}} \times 100$$

السكر السائل وأن الدراسات والبحوث الموجهة في هذا المجال هو في سبيل الحصول على أعلى كفاءة للاستخلاص وبأقل محتوى لوني للعصير وخلو من المواد غير السكرية في المنتوج النهائي .

الاستنتاجات :

أظهرت النتائج أمكانية التخلص من المواد البكتينية عند أستخدام الانزيمات المحللة للبكتين والحصول على أعلى كفاءة أستخلاص قدره 91.0% مقارنة بأسلوب معمل الهندية والاسلوب المحور. ومن خلال تتبع تراكيز البكتين أثناء مراحل الاستخلاص لوحظ ضرورة خفض المحتوى البكتيني في العصير الى 0.090-0.095% عصير لمنع أختناق وأنسداد المرشحات النهائية المستعملة في معمل الهندية، ولا يمكن تحقيق هذا التركيز في معمل الهندية الا بعد رفع الاس الهيدروجيني للعصير الى 10.0 . كما أمكن من خلال التطبيق خفض الفقد الحاصل في السكريات الكلية من 11.0% في أسلوب معمل الهندية الى 3.4% و 4.1% في أسلوبي المعمل التجريبي والمحور على التوالي . أن الاحتفاظ بالمحتوى السكري من بداية التصنيع الى نهايته له دوراً اقتصادياً في المصانع الخاصة لانتاج سكريات التمور للاحتفاظ على نقاوة العصير العالية وجودة لون المنتوج . حيث لا يمكن تحقيق هذا عند أستخدام المعاملة بالنورة الشديدة لتأثير القواعد على تصافي المحتوى السكري ولون العصير مع حدوث الهبوط السريع في كفاءة المبادلات الايونية .

لما سبق ذكره نوصي بأستخدام تقنية المعاملة الانزيمية المتضمنة خليط من أنزيمات البكتين أستريز والبولي كالاكتيورونيز (بنسبة 18 غم / 100 كغم تمر وبنشاط أنزيمي 500 FDU/ غم أنزيم) كبديل للاسلوب المستخدم حالياً في معمل الهندية بعد أجراء تبديل لجميع خزانات وتوصيلات معاملة العصير في مراحل الاستخلاص الى حديد غير قابل للصدأ، مع أضافة خزانين للمعاملة الانزيمية، حيث يوفر هذا الاسلوب ما يعادل 15 دينار لكل طن تمر مستخدم .

أقصاها في اسلوب المعمل التجريبي والتي بلغت 34.1% ، وأقلها في أسلوب معمل الهندية وبواقع 26.3% . أن أزالة المركبات الفينولية الذائبة اثناء مراحل الاستخلاص يعزى لعدة عوامل ، كدرجة حرارة ماء الاستخلاص ومحتواه الايوني الذي يؤدي لتكوين النظام الغروي وترسيبه ، أو حدوث تفاعلات جانبي بين الكالسيوم والمركبات الفينولية لتكوين معقدات بسيطة مترسبة (20) ، أو تكون مركبات تامة البلمرة لدرجة الترسب (21) . أن ترسب المركبات الفينولية سيساعد في خفض شدة دكنة لون العصير وفي التالي خفض الجهد على المبادلات الايونية لأزالة المواد الملونة . أما مركبي الفورفورال و5- هيدروكسي ميثيل فورفورال لوحظ زيادة تركيزهما خلال مراحل الاستخلاص ولجميع الاساليب . بلغ أقصى زيادة في الاسلوب المحور وبنسبة 85% للمركب فورفورال و 26% للمركب 5- هيدروكسي ميثيل فورفورال نتيجة لحدوث الهدم الحامضي للسكريات السداسية (22) . أن تكون المركبين السابقين ليس مقتصرا على الظروف الحامضية بل ممكن حدوثه ببطيء في الظروف القاعدية وخاصة عند أرتفاع قيم الاس الهيدروجيني (23) كما هو ملحوظ في أسلوب معمل الهندية .

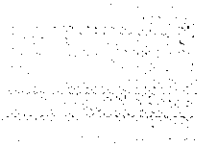
كما نرى في شكل 2 : زيادة في تطور دكنة لون العصائر المستخلصة وللاساليب الثلاثة ، حيث بلغت أقصاها 24% في أسلوب معمل الهندية وأدناه 5% في أسلوب المعمل التجريبي . هذا يشير الى أن التفاعلات اللونية يمكن حدوثه في الوسط الحامضي أو القاعدي ، وأن سرعة التفاعلات تزداد مع أرتفاع الاس الهيدروجيني نتيجة حدوث التكثيف بين المركبات الوسطية للكيتونات والالديهيدات المتكونة خلال الهدم القاعدي للسكريات المختزلة أضافة الى تفاعلات ميلرد (23) . عموماً أن الاس الهيدروجيني 10.0-10.5 سيؤدي الى الفقد في المحتوى السكري وزيادة تطور دكنة لون العصير المستخلص الذي سيضيف عبأ على المبادلات الايونية لازالة هذه المركبات مع تكون مركبات جديدة في العصير والتي لازالت غير مشخصة . ومن قراءة أطياف أمتصاص العصائر المستخلصة ، لوحظ من شكل 3: بأن أسلوب معمل الهندية (نتيجة للظروف القاعدية المستخدمة) أعطى قيم امتصاص مختلفة عند الاطوال 220-240 و 250-260 و 270-280 نانوميتر (nm) . هذا يعني تكون عدة مركبات لونية جديدة في العصير مقارنة بعصير المستخلص بأسلوب المعمل التجريبي أو الاسلوب المحور حيث أعطى كل منهما قيمة للامتصاص الضوئي وعند الطول الموجي 280-290nm . عليه يلزم الاشارة بأن اللون أحد المشاكل الهامة في صناعة

رى عند استخدام نفس أسلوب معمل الهندية (المعاملة بالنورة الشديدة) اخذين
ظر الاعتبار التقليل في كمية النورة المضافة للحصول على أقل اس هيدروجيني
مكن استخدامه وحسب تصميم المعمل ودون احداث أي تغيير. وجد أن جميع
الاسس الهيدروجينية المتراوحة بين 8.0-9.5 قد سببت الاختناق ايضاً، لهذا لزم
بالضرورة أستخدام الاس الهيدروجيني البالغ 10.0-10.5 للحصول على التركيز
الامثل للبكتين الذائب في العصير دون حدوث أختناق في المرشحات النهائية. بيد
ان رغم انخفاض المحتوى البكتيني في أسلوب معمل الهندية، لوحظ (شكل ١)
انخفاض معامل أرتباط لزوجة عصيره (كذلك الاسلوب المحور) نتيجة لاحتواء
بكتينه على المجاميع المتأسترة. في حين أعطى اسلوب المعمل التجريبي معامل
أرتباط عكسي أعلى من حيث خفض لزوجة العصير، نتيجة لفعالية الانزيمات
المحللة للبكتين العالية في أزالة المجاميع المتأسترة والكربوكسيلية المسببة للزوجة
بالاضافة الى استخدام المعاملة الكيمياوية في هذا الاسلوب خلال مرحلة D .

كما أظهر جدول 2 : فروق معنوية واضحة بين الاساليب الثلاثة على محتوى السكريات الكلية في العصير المنتج، وأن أعلى فقد سكري كان في اسلوب معمل الهندية والذي بلغ نسبته 11.0% أما في أسلوبي المعمل التجريبي والمحور أنخفضا الى 3.4% و 4.1% على التوالي. ان وجود تأثير التداخل (الاسلوب × المرحلة) يشير بأن أقصى استجابة للفقد السكري كان عند المعاملة بالنورة الشديدة (الظروف القاعدية)، لذا فأننا لا نوصي بأسلوب معمل الهندية علما بأن الهدم القاعدي محفزا قويا لتكوين حوامض عضوية ومركبات وسطية مكثفة ولونية (19) غير مرغوبة في صناعة السكر السائل. أن فقد المحتوى السكري سيقلل من تصافي السكر السائل ورفع كلفته من الناحية الاقتصادية، مع خفض نسبة نقاوة العصير المستخلص والذي بلغ متوسطه 70.0% رغم ظهور أقصى أنخفاض في نسبة المواد الجافة في عصيره البالغ متوسطه 19.60%. هذا يفسر سبب أرتفاع نقاوة العصير المستخلص الى 72.0% بأسلوب المعمل التجريبي رغم الزيادة المعنوية في متوسط نسبة المواد الجافة البالغة 19.95% مقارنة بأسلوب معمل الهندية. اما الانخفاض المعنوي في متوسط نسبة نقاوة العصير المستخلص بالاسلوب المحور الى 70.8%، يعزى الى ارتفاع متوسط نسبة المواد الجافة الى 20.15% ولاسيما ان النقاوة عبارة عن العلاقة النسبية بين تركيز السكريات الكلية والمواد الجافة.
يوضح جدول 3 أنخفاض معنوي واضح في تركيز فينولات العصير، وكانت

(المعاملة بالنورة ـ فوسفيت) في معمل الهندية . يبين جدول 2 أنخفاض معنوي للبكتين أثناء مراحل الاستخلاص ففي مرحلة B تبين ان المعاملة بمحلول النورة الشديدة (أسلوب معمل الهندية) أعطى اعلى ازالة للبكتين قدرها 50.52% في حين أظهر اسلوب المعمل التجريبي والأسلوب المحور نسبة ازالة قدرهما 50.26% و 37.70% على التوالي . ان أرتفاع كفاءة اسلوبي معمل الهندية والمعمل التجريبي يعود الى الاختلاف في خصوصية كل معاملة فمحلول النورة الشديدة يجعل وسط الملاط (Slurry) قاعديا مما ينجم عنه أرتباط أيونات الكالسيوم الثنائية التكافؤ مع كل من حامضي البكتيك والبكتينيك مكونا بكتات الكالسيوم (أملاح بكتينية) المترسبة (4) . أما المعاملة بالانزيمات المحللة للبكتين تعتمد اساسا على تحليل المواد البكتينية من خلال تكسير المجاميع المتأسترة ووحدات حامض الكلاكتيورنيك المتعددة (لحامضي البكتيك والبكتينيك) نتيجة لاحتواء الانزيم المستخدم في هذه المعاملة (Ul trazvme) على أنزيمات البكتين ايبتريز والبولي كالاكتيورينيز. عند امرار ملاط كل أسلوب على المرشح الاولي (مرحلة C) .

لوحظ ان اسلوب المعمل التجريبي اعطى أعلى نسبة أستخلاص من العصير خلال المرشح قدره 91.0% نتيجة للتكسر النسبي للمجاميع المتأسترة ووحدات الكالاككتيورنيك المتعددة الى وحداته الاولية (حامض الكالاكتيورنيك الذائب) مما يساعد على أنخفاض لزوجة الملاط مع أنخفاض في كمية الرواسب البكتينية في البثل وفي التالي زيادة نسبة الاستخلاص . أن انخفاض كفاءة الاستخلاص في الاسلوب المحور الى 86.6% وأسلوب معمل الهندية الى 75.8% يعزى الى أرتفاع نسبة ترسب المواد البكتينية في البثل على سطح المرشح مما يقلل من نفاذية طبقة البثل ويزيد من صعوبة عملية الترشيح نتيجة لتكون الاملاح البكتينية المتأسترة مع السلاسل الخطية من حامضي كالاكتيورنيك المتعدد (18) . ولوحظ عند امرار العصائر المرشحة بالاساليب السابقة الذكر خلال المرشحات النهائية (مرحلة D) أختناق العصير المعامل بالاسلوب المحور لانسداد مسامات المرشحات ، مشيرا الى عدم ملائمة تركيز وطبيعة النظام للمرشحات الدقيقة المصممة لترشيح عصير رائق في معمل الهندية . كما يبدو وجود نسبة حرجة لتركيز البكتين في العصير تراوح بين 0.090 -0.095% (مرحلة B) ممكن مروره خلال المرشحات النهائية ، وفي حالة وجود التركيز الاعلى (0.115% في الاسلوب المحور) بالاضافة الى النظام الغروي غير الملائم سيؤدي الى اختناق المرشحات . لهذا السبب فقد أجريت عدة محاولات



لاضافة الى المشاهدات في معمل الهندية، تم تحديد ضوابط عمليات لاستخلاص وترويق عصير التمر باستخدام الاساليب التالية :-

اولاً - اسلوب معمل الهندية (المعاملة بالنورة الشديدة)

مرحلة الطبخ :- وضعت اكياس التمر على شكل وجبات متعاقبة وبواقع 50 كغم / 1-2 دقيقة في اوعية الطبخ ، بالمقابل تم اضافة ماء التحلية (0.5 % سكريات كلية) من خلال عداد للتحكم في نسبة خلط الماء والتمر (1.0:1.0) ، ترفع درجة حرارة الخليط الى 100 م لمدة 20 دقيقة . بعد نزع النوى والالياف والاقماع الخشنة من الملاط (Slurry) ، جمع العصير الخام في خزان سعة 26 م3 .

مرحلة المعاملة بالنورة والبرلايت :- خفض درجة حرارة الملاط الى 55-60 مo وأضيف مسحوق البرلايت بتركيز 3.0-3.5% ومحلول النورة بتركيز 11% لرفع الاس الهيدروجيني للملاط الى 10.0-10.5 .

مرحلة الترشيح :- سحب الملاط من خزان المعاملة بالنورة (سعة 6 م3) الى خزان الترشيح الاولي ثم الى المرشح الاسطواني الدوار (Vacuum Drum Filter) مساحته السطحية 39 م 2 وتحت ضغط مخلخل قدره 350-400 ملم زئبق . بعد جمع العصير المرشح (Filtrate) تم سحب 1 م 3 الى خزان مزود بخلاط دوار وأضيف اليه 22.7 كغم من المادة المساعدة للترشيح (Celite Diatomite) لدفعه مع العصير المتبقي (28-29 م3) الى المرشح تحت ضغط (Press Filter) للحصول على عصير رائق ، جاهز للامرار على المبادلات الايونية ثم المبخر.

ثانياً : - أسلوب المعمل التجريبي (المعاملة الانزيمية)

أجريت هذه المعاملة في المعمل التجريبي وعلى النحو التالي : -

مرحلة الطبخ : - حضر الملاط بأستعمال خليط من التمور والماء بنسبة 1.0 :2.5 على التوالي ، وهرس على 65 مo بواسطة المجنس . بعد 20 دقيقة ، تم امرار الملاط على أجهزة نزع التمر والاقماع ، ونقله الى خزان المعاملة الانزيمية (سعة 400 لتر

المعاملة الانزيمية : تم اضافة الانزيمات المحللة للبكتين (Ul trazyme 100) بتركيز 18 غم/ 100 كغم تمر (كان النشاط الانزيمي gm/5000 FDU) وخفض حرارة الملاط الى 40-45 مo ، والاس الهيدروجيني الى 4.0-4.5 بواسطة حامض الفسفوريك 2 عياري .

مرحلة الترشيح : - بعد 30 دقيقة من المعاملة السابقة تم اضافة المادة السليلوزية المساعدة للترشيح (Diacel) بتركيز 2 كغم / 100 كغم تمر لاجراء عملية الترشيح باستخدام المرشح الافقي تحت ضغط مخلخل تراوح بين 100-400 ملم زئبق . يليه

المقدمة :

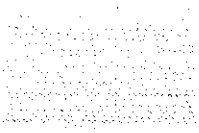
تدخل تمور الزهدي كمادة أولية لبعض الصناعات المحلية كالدبس ، الخل الطبيعي ، الكحول والبروتين والسكر السائل لكونه مصدر غني بالمواد السكرية ، ووفقا لهذه المتطلبات يلزم اجراء عدة معاملات لاستخلاص وترويق العصير. حيث اشارت الدراسات الى ان كفاءة استخلاص السكريات تتأثر بدرجة الحرارة ، الوقت ، نسبة الماء المضاف الى التمر والمساحة السطحية للمادة الاوليه (١) . كما وجد ان أعلى نسبة استخلاص واقل محتوى من المواد غير السكرية في المستخلص يمكن تحقيقها عند خلط التمر مع الماء بنسبة 2.5:1 داخل المجنس (Homogenizer) عند درجة حرارة 85 م ولمدة 20 دقيقة (2).

ان ادخال المعاملة الانزيمية في عمليتي ترشيح وترويق العصير اصبح ضروريا لانتاج مركزات سكريات التمور (الدبس والسكر السائل) (3) ، وان هذه المعاملة متبعة في المعمل التجريبي لسكريات التمور (مركز البحوث الزراعية والموارد المائية) على نطاق شبه صناعي . اما على النطاق الصناعي فقد تم استقصاء الخطوات التصنيعية لاستخلاص عصير التمر في معمل السكر السائل في الهندية . وجد ترشيح وترويق العصير يتم بأستخدام المعاملة بمحلول النوره الشديدة (High Liming) ، تسبب مشاكل تصنيعية ، أهمها الفقد في المحتوى السكري وزيادة دكنة لون العصير. وبناءا عليه هدف هذا البحث التطبيقي في مصنع السكر السائل في الهندية على تحقيق زيادة كفاءة الاستخلاص مع خفض كمية الفقد الحاصل في المحتوى السكري ومنع زيادة تطور دكنة لون العصير ، مع اجراء مقارنة بين الاساليب المختلفة المستخدمة من حيث ترشيح وترويق عصير التمر.

المواد والطرق :

أجري هذا البحث في كل من المعمل التجريبي لسكريات التمور (مركز البحوث الزراعية والموارد المائية) ومعمل السكر السائل في الهندية التابع للمنشأة العامة للتعليب في كربلاء .

تمت مواكبة العملية الانتاجية لمعمل الهندية ولمدة ثلاثة اسابيع ابتداءا من 17 / 5 / 1985 للتعرف على الاسلوب الانتاجي المعمول به . من خلال البحوث والدراسات التي أجريت على النطاقين المختبري وشبه الصناعي (Pilot Plant) ،



جدول رقم (8) يبين الأوزان الجافة للكتل الحيوية المتحصل عليها من تنمية بكتريا **Cellulomonas** في المواد السليلوزية بمحلول **Dioxan** غم / 100 سم^3.

المواد الخام السليلوزية	فترة الحضن (أيام)		
	3	5	6
الكرب	0.682	1.004	1.151
مخلفات صناعة السكر السائل	0.782	1.107	1.322
مخلفات الرز	0.771	0.984	1.183
العثق	0.724	1.135	1.103
الساق (الجريد)	0.725	0.979	0.729
الورق	1.143	1.464	1.324

جدول رقم (3) يبين فعالية بكتريا Cellulomonas في النمو وانتاج بروتين الخلية الواحدة (ملغم 100 سم^3)

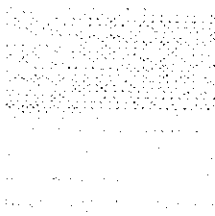
المواد الخام السليلوزية	فترة الحضن (أيام)		
	3	5	6
الكرب	40	85	60
مخلفات صناعة السكر السائل	22.5	240	205
مخلفات الرز	160	190	132.5
العثق	145	185	125
الساق (جريد)	180	230	201
الورق	120	195	180

جدول رقم (4 يبين الأوزان الجافة (غم / 100 سم^3) من الكتلة الحيوية المستحصل عليها من تنمية بكتريا Cellulomonas في المواد السليلوزية الخام.

المادة السليلوزية	فترة الحضن (أيام)		
	3	5	6
الكرب	0.220	0.370	0.284
مخلفات صناعة السكر السائل	0.695	0.745	0.629
مخلفات الرز	0.475	0.603	0.585
العثق	0.436	0.566	0.562
الساق (الجريد)	0.543	0.708	0.680
الورق	0.471	0.628	0.596

جدول رقم (5) يبين الاوزان الجافة للكتل الحيوية (غم / 100 سم^3) المستحصل عليها من تنمية بكتريا Cellulomonas في المواد السليلوزية المعاملة بمحلول هيدروكسيد الصوديوم.

المادة السليلوزية	فترة الحضن (أيام)		
	3	5	6
الكرب	0.746	1.033	1.282
مخلفات صناعة السكر السائل	0.903	1.278	1.702
العثق	0.960	1.346	1.320
الساق (الجريد)	1.900	1.545	1.037
الورق	1.510	2.356	2.001
مخلفات الرز	0.502	1.365	1.560



هيدروكسيد الصوديوم اعطت اعلى كمية من السكريات المختزلة والتي بلغت 59.5 ملغم/ 100 سم مكعب، ويعزى ذلك الى زيادة تركيز مادة التفاعل (cellulose) (Spano & et al. 1976) كذلك ان كفاءة محلول هيدروكسيد الصوديوم ازالة اللكنين اعلى من كفاءة محلول Dioxan في انجاز ذلك.

اما في الشكل 2 والذي يمثل كمية البروتين المستحصلة عليها من تنميه بكتريا Cellulomonas flavigens في الاوساط السليلوزية نجد ان ورق النخيل المعامل بمحلول هيدروكسيد الصوديوم اعطى اعلى كمية والبالغة 727.5 ملغم/ 100 سم^3 ويعود ذلك الى نفس السببين المذكورين انفاً والمتعلقين في كفاءة ازالة اللكنين وتركيز مادة التفاعل.

جدول رقم (2 يبين فعالية بكتريا Cellulomonas في تحليل المواد السليلوزية الخام والسكريات الناتجة (ملغم/ 100 سم^3) عن ذلك.

المادة الخام السليلوزية	فترة الحضن (أيام)		
	3	5	6
الكرب	7.5	10.5	13.5
مخلفات صناعة السكر السائل	26	41	34.5
مخلفات الرز	20.5	3.5	35.5
العثق	11	12.5	12
الساق (جريد)	9.5	9.0	11.5
الورق	8.5	9.0	10.5

ان الناحية الاقتصادية في هذا البحث لا تكمن فقط في انتاج بروتين الخلية الواحدة، بل يتعداه لاستغلال السكريات المختزلة الناتجة من تحليل السليلوز، وذلك في تنمية بكتريا او خميرة الى جانب البكتريا المحللة للسليلوز للحصول على كمية اكبر من الكتلة الحيوية. ومن البروتين جدول ٤، ٥، ٦ ان كمية البروتين المستحصل عليها في هذا البحث الذي بلغت اقصاها 727.5 ملغم/ 100 سم^3 هي اعلى مقارنة بالكمية التي استحصلت عليها الباحثة Banno, I.S. 1981 والتي بلغت 250 ملغم/ 100 سم^3 عند استخدامها لمخلفات البيرة، في حين ذكر الباحثون Thayer & et al. 1975 انهم حصلوا على 70 ملغم بروتين لكل 1000 سم مكعب عند تنمية Cgtophaga sp في وسط غذائي يحتوي على 5% من خشب المسكيت. اما الباحث Updegraff 1971 حصل على 1.4 غم لكل 1000 سم^3 عند تنمية الفطريات M. verrucaris في وسط غذائي يحتوي على 4% من اوراق الصحف المطحونة.

النتائج والمناقشة :

يتضح في الجدول رقم 3 وهي ان كمية السكريات المختزلة الموجودة في الوسط الغذائي المتخمر وكمية البروتين الناتجين عن نموبكتريا Cellulomonas اختلفت باختلاف المادة السليلوزية الخام ، ويمكن تفسير ذلك الى المحتوي المتباين للمواد السيليلوزية الخام من مادة اللكنين الذي يلعب دورا مثبطا للفعالية الانزيمية في تحليل السليلوز. اذ يكون المصدر الكاربوني (السليلوز) المرتبط مع اللكنين اقل تقبلا من قبل النظام الانزيمي والحيوي للبكتريا Cellulomonas ولهذا فان مادتي مخلفات الرز ومخلفات صناعة السكر السائل واللتين تحتويان على نسبة منخفضة من مادة اللكنين (جدول رقم 1) مقارنة ببقية المواد السليلوزية الاخرى المستخدمة في هذه الدراسة اذ اعطتنا نتائج افضل من حيث كمية السكريات المختزلة والبروتين .

يتضح من النتائج المبينة بالشكل (1) والذي يبين كمية السكريات المختزلة .

جدول (١) يبين التحليل الكيمياوي ونسب المكونات لبعض اجزاء النخلة السليلوزية :

المادة السليلوزية الخام	Cellulose %	اللكنين %	الرطوبة %	Pentosans %
الكرب	22.50	27.05	55.60	23.55
العذق	26.00	12.00	26.65	24.42
الساق (جريدة)	27.60	21.00	65.70	33.50
الورق	28.00	28.10	37.50	15.72
مخلفات صناعة السكر السائل	27.80	1.20	27.32	12.5
مخلفات الرز	25.30	3.54	24.70	20.80

كميات السكريات المختزلة المقدرة في الوسط الغذائي المتخمر والناتجة من تحليل السليلوز المعامل بمحلولي هيدروكسيد الصوديوم والـ Dioxan

ان هناك اختلافات واضحة اذ نجد ان المواد السليلوزية المعاملة بمحلول هيدروكسيد الصوديوم اعطت نتائج افضل مقارنة بتلك التي عوملت بمحلول Dioxan باستثناء مخلفات السكر السائل ، ويعزى هذا الاستثناء الى احتواء هذه المادة على نسبة ضئيلة من مادة اللكنين مقارنة ببقية المواد السليلوزية الاخرى بحيث ان كمية السكريات المختزلة متقاربة عند المقارنة بين معاملة هذه المادة بمحلولي هيدروكسيد الصوديوم والـ Dioxan ، كذلك يتضح ان ورق النخيل المعامل بمحلول

المقدمة . . .

اتجهت كثير من دول العالم في السنوات الاخيرة الى معالجة النقص المتزايد في مصادر البروتين نحو انتاج بروتين الخلية الواحدة ويتطلب هذا الانتاج تنمية الاحياء المجهرية (البكتريا الخمائر، الفطريات، الطحالب) في اوساط غذائية ذات كلفة واطئة . ان المخلفات السليلوزية هي المواد الرخيصة الثمن والمستخدمة في انتاج بروتين الخلية الواحدة اذ يمثل السليلوز مصدرا للكاربون والاحياء المجهرية المحللة للسليلوز مثل

Skinner 1960 (Alexander 1977) Bacillus, Cytophaga, Celluiomonas

ان البكتريا اللاهوائية لها القابلية على تحليل السليلوز مثل

Clostridum thermocelium, Clostridum Cellobioparum,

ان هذه القابلية تتصف بها انواعا من الاكتومايستس مثل

Streptomyces sp (Alexander 1977) Nocardia, sp

وهناك عدد كبير من الفطريات

Fusarium, penicillium,

Sporotrichum, Trichoderma, (Enari & Markana 1977, Mandels 1975) Chrysoporum.

كما ان هناك دراسات من قبل Thayer atal 1975 لانتاج بروتين الخلية الواحدة عن طريق تنمية البكتريا المعزولة من خشب المسكت وباستخدام بكتريا Cytophaga sp في وسط غذائي يحتوي على 5 % من مسحوق خشب المسكيت وقد درس محتوى البروتين من الحوامض الامينية والذي كان يقارب بروتين البيض .

قام (Chahal & Gray 1968) بانتاج بروتين الخلية الواحدة بتنمية Trichoderma في وسط غذائي يحتوي على لب الخشب .

يعتبر النخيل من الثروات الهامة في القطر، ويقع العراق في قمة الدول المنتجة اذ يمتلك عدد كبير من اشجار النخيل والتي يجري لها سنويا عمليات متعددة ، منها ازالة بعض الاجزاء كالورق والكرب والجريد وهذه الاجزاء تحتوي على السليلوز بكمية عالية يمكن ان تكون مصدرا جيدا لانتاج بروتين الخلية الواحدة، ولعدم وجود دراسات حول انتاج بروتين الخلية من المواد اعلاه داخل او خارج القطر اجرى هذا البحث .

Production of Single cell protein from Date waste and some part of palm.

ABSTRACT

This study was carried out to investigate the growth, celluiytic activity and production of single cell protein of Cellulomonas isolated in The Biol. Dept. (Bano 1981) College of Science, BAGHDAD. Univ.) on different cellulosic material Date cake, Rice husks and four datepalme parts.

Bacterial activity to hydrolysis cellulose in crude material and compared with chemical hydrolysis material with (caustic soda and Dioxan solutions).

The best results were obtained when date palm leaflets were treated with caustic soda, it gave a high amount of protein (727.5mg/ 100 cm3) and high amount of redusing sugar (59.5 mg/ 100 cm3).

«انتاج بروتين الخلية الواحدة من مخلفات بعض المعامل وبعض أجزاء النخلة»

حسن خالد حسن العكيدي
باحث علمي اقدم
صالح خليفة
م. باحث
شفاء النقاش
بايولوجي

مركز البحوث الزراعية والموارد المائية / مجلس البحث العلمي. . .

الخلاصة. . .

تم دراسة قابلية بكتريا Cellulomans flavigens المعزولة في قسم علوم الحياة / كلية العلوم / جامعة بغداد على النمو وتحليل السليلوز وانتاج بروتين الخلية الواحدة في اوساط سليلوزية مختلفة، تمثلت في بعض المخلفات (مخلفات صناعة السكر السائل ومخلفات الرز) وبعض اجزاء النخلة (الكرب، الساق، الورق، العثق).

اختبرت فعالية بكتريا Cellulomans flavigens على تحليل المواد السليلوزية الخام المذكورة اعلاه وكذلك تحليل المواد السليلوزية بعد معاملتها بمحلول هيدروكسيد الصوديوم وكذلك دراسة فعاليتها في تحليل هذه المواد بعد معاملتها بمحلول Dioxan . اوضحت النتائج ان ورق النخلة المعامل بمحلول هيدروكسيد الصوديوم هو افضل المواد السليلوزية المدروسة في هذا البحث، حيث تم الحصول على اكبر كمية من بروتين الخلية الواحدة والبالغة 727.5 ملغم 100 سم^3 عن طريق تنمية هذه البكتريا وكذلك تم الحصول على اكبر كمية من السكريات المختزلة والبالغة 59.5 ملغم / 100 سم^3 وذلك عن طريق تنمية هذه البكتريا في وسط غذائي يحتوي على ١ ٪ من ورق النخلة المعامل بمحلول هيدروكسيد الصوديوم.

واتضح من النتائج ان المعاملة بمحلول هيدروكسيد الصوديوم هي افضل من المواد الخام الغير معاملة وافضل من المواد السليلوزية المعاملة بمحلول Dioxan اذ تم الحصول على كمية اعلى من بروتين الخلية الواحدة والسكريات المختزلة من المواد السليلوزية المعاملة بمحلول هيدروكسيد الصوديوم.

جدول (2) يوضح معدل عدد البيض ونسبته المئوية لكل دور سعفي

الدور السعفي	معدل عدد* البيض لكل 5 خوصات S.E ±	%
الاول	76.24 ± 0.0413	27.79
الثاني	69.68 ± 0.0637	25.40
الثالث	57.03 ± 0.0298	20.79
الرابع	40.17 ± 0.0307	14.64
الخامس	31.21 ± 0.0511	11.38
المجموع	274.33	100.00

* عدد البيض على السطح العلوي والسفلي .

جدول (1) يوضح حياتية حشرة الدوباس

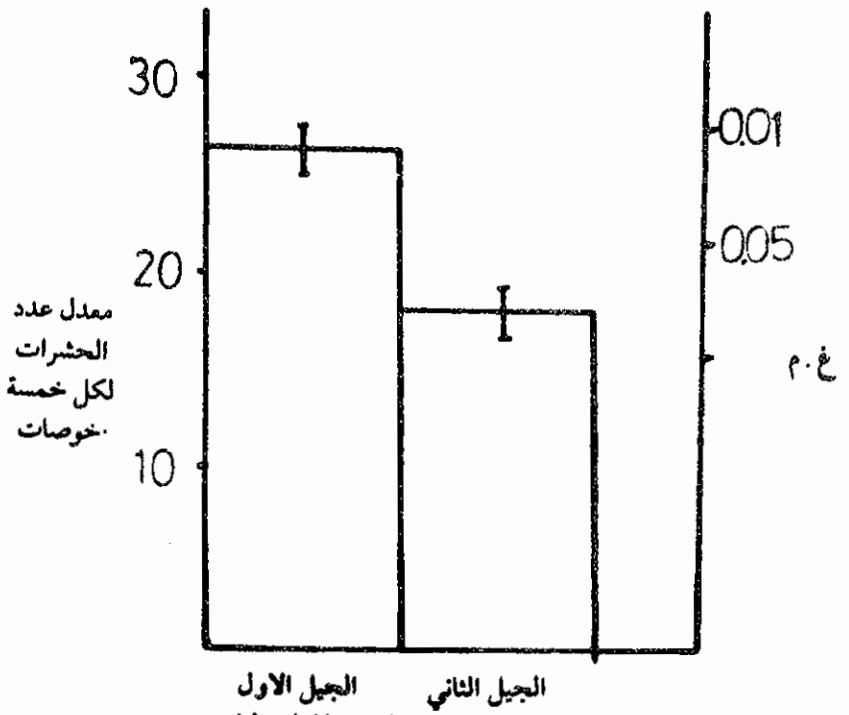
حياتية الاعمار المختلفة للحشرة	الاجيال			مستوى المعنوية لقيمة ت
	الاول	المعدل (المدى)	الثاني / المعدل (المدى)	
طور البيضة (يوم)		176.472 (167-180)	61.734 (59-65)	***
العمر الحوري الاول (يوم)		7.162 (6-8)	5.792 (5-7)	غ.م.
العمر الحوري الثاني (يوم)		7.086 (6-8)	6.461 (6-8)	غ.م.
العمر الحوري الثالث (يوم)		8.793 (8-10)	8.327 (7-9)	غ.م.
العمر الحوري الرابع (يوم)		8.587 (7-10)	8.962 (8-11)	غ.م.
العمر الحوري الخامس (يوم)		9.853 (9-12)	12.471 (11-14)	غ.م.
مدة الطور الحوري (يوم)		41.481 (36-45)	42.013 (38-46)	غ.م.
مدة الطور البالغ (يوم)		18.768 (16-22)	24.99 (21-26)	*
		11.252 (9-13)	15.164 (12-17)	*
		7.613 (6-9)	9.825 (8-11)	غ.م.
معدل عدد البيض / انثى		91.471 (84-107)	112.594 (96.118)	**
نسبة فقس البيض / 100 بيضة		0.326 (63-78)	87.483 (81-93)	*
النسبة الجنسية (عدد)		32.141:13.413 (2.396:1)	23.638:21.523 (1.098:9.002)	**
مدة الجيل (يوم)		236.721 (219-247)	128.737 (118-138)	***

غ.م. : غير معنوي

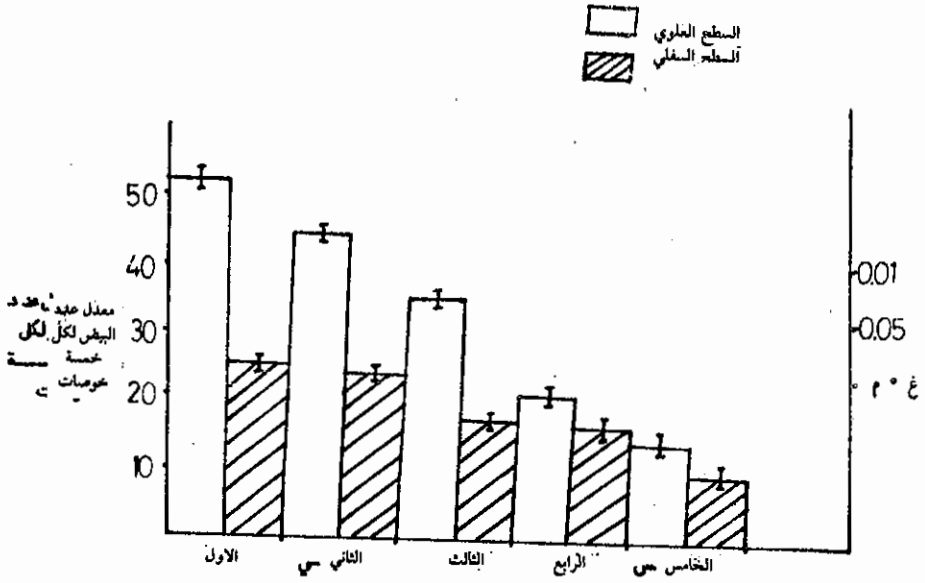
* : معنوي بمستوى 0.05

** : معنوي بمستوى 0.01

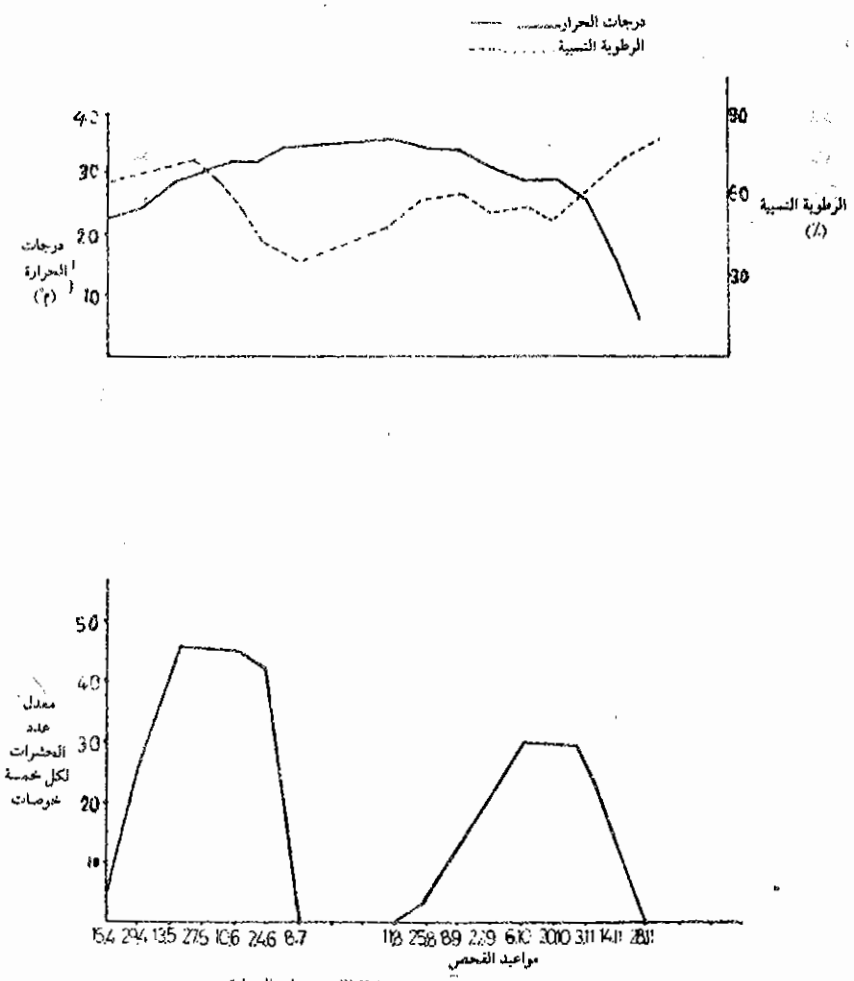
*** : معنوي بمستوى 0.001



شكل 2): يوضح معدل عدد الحشرات خلال الجيل الاول والثاني



شكل (3 : يوضح معدل عدد البيض على سطحي الخوصة (الوريقة) العلوي والسفلي في الادوار السفية المختلفة



شكل (١) : يبين الكثافة العددية لحشرة الدوباس خلال السنة وعلاقة ذلك بدرجات الحرارة

المصادر

1- الحيدري، حيدر صالح والحفيظ، عماد محمد ذياب 1986 . آفات النخيل والتمور المفصلية في الشرق الادنى وشمال افريقيا. المشروع الاقليمي لبحوث النخيل والتمور في الشرق الادنى وشمال افريقيا، بغداد.

2- عبدالحسين، علي 1963 . آفات النخيل والتمور وطرق مكافحتها في العراق. مطبعة الادارة المحلية، بغداد.

3- ميماريان، البير 1947 . حشرة دوباس النخيل في البصرة. مديرية الزراعة العامة، بغداد. (تقرير غير منشور).

4- Dowson, V. H. W. 1936. A. serious pest of date palms, Ommatissus binotatus Fiicb. Trop. Agric. Trin. 13:180.

5- Rao, Y. R. and Dutt, A. 1922. The pests of the date palm in the Iraq. Dep. Agric. Mesopo- tamia. Memoir No.6. Times Press, Bombay.

الربيعي والخريفي بالاضافة الى العمليات الحيوية لدى مراحل نضج النخلة خلال هذه الفترة. فقد وجد في شكل (1) ان لدرجات الحرارة والرطوبة النسبية تأثير مباشر على الكثافة العددية للحشرة خلال الجيلين. حيث ان بداية فقس البيض للجيل الاول (الربيعي) يكون في بداية الاسبوع الثالث من شهر نيسان ويستمر تطور الآفة لغاية الاسبوع الاول من شهر تموز حيث نهاية فترة وضع البيض وموت البالغات ليدخل البيض بعد ذلك في فترة بيات صيفي حيث ارتفاع درجة الحرارة وانخفاض الرطوبة النسبية ثم يبدأ الفقس بعد ذلك خلال الاسبوع الثاني من شهر آب حيث بدأ انخفاض درجة الحرارة وارتفاع الرطوبة النسبية ليبدأ الجيل الثاني (الخريفي) ولغاية نهاية شهر تشرين الثاني حيث نهاية وضع البيض وموت بالغات الجيل الخريفي، ولقد لوحظ في عدد من البساتين الكثيفة الزراعة وجود افراد قليلة جدا من بالغات الدوباس تبقى حية عند اجزاء الورقة القريبة من الليف المحيط بها وقد تهيء هذه الاماكن من النخلة عوامل بيئية ملائمة فتبقى البالغات حية فترة اطول الا انها سرعان ما تموت مع انخفاض درجات الحرارة خلال شهر كانون الاول. ووجد ايضا فرق معنوي في معدل عدد الحشرات خلال الجيل الربيعي والخريفي بمستوى 0.05 (شكل 3). وقد اوضحت النتائج ايضا وجود فرق معنوي في عدد البيض الموضوع على السطح العلوي من الخوصة في عموم الادوار السعفية المختلفة التي تم دراستها عدا الدور السعفي الرابع والخامس حيث لايوجد فرق معنوي بين السطحين وقد يعود ذلك الى ضعف العوامل البيئية المؤثرة على وضع البيض ويعتقد ان لأشعة الشمس دور في ذلك بالاضافة الى الحرارة والرطوبة ويلاحظ ايضا من النتائج في الجدول (2) ان اعلى نسبة مئوية لعدد البيض في الدور السعفي الاول 27.79 عن عدد البيض في باقي الادوار السعفية، ووجد ايضا ان مجموع النسبة المئوية لعدد البيض في الدور السعفي الاول والثاني كان 53.19 من مجموع البيض الكلي اي عند قص سعف هذين الدورين سنعمل على تخفيض الكثافة العددية للآفة بمقدار يزيد على 50% وبالتالي يؤدي الى تقليل الضرر الذي تحدثه افراد هذه الحشرة وقد نستعيظ عن المكافحة الكيمياوية في هذه الحالة وعلى ان تجري عملية القص قبل فترة فقس البيض مع اتلاف السعف المقصوص للقضاء على البيض.

وفي حالة المكافحة الكيمياوية فيجب ان تكون في بداية شهر مايس وليس كما هو معمول به الآن في الاسبوع الثالث من شهر مايس لتقليل ضرر هذه الحشرة.

من الجيل الخريفي للحصول على يالغات حديثة الخروج من الطور الحوري . ثم جمعت عشرة ازواج من البالغات هذه ليوضع كل زوجين (ذكر وانثى) في قفص مصنوع هيكله من سلك معدني رفيع ومغلف بقطعة قماش وذلك لدراسة معدل عدد البيض لكل انثى ملقحة وكذلك مدة حياة كل من الذكر والانثى طول هذا القفص 15 سم وقطره 10 سم حيث يثبت على سعفة (ورقة) النخلة وبداخله 4-5 خوصات (وريقات) كما تم اختيار بيضة حديثة الوضع ليوضع على كل منها انبوب بلاستيكي شفاف مثبت بمشبك معدني ليسهل تثبيته على الخوصة ، يبلغ ارتفاع هذا الانبوب 1.25 سم وبقطر 2سم ليعطي حرية الحركة للحوريات اما الطرف الثاني من الانبوب فقد ثبت عليه قطعة قماش لتسهيل عملية التنفس بالنسبة للحشرة والتبادل الغازي والعمليات الحيوية الاخرى لانسجة الخوصة ، وبذلك تم متابعة نموتطور الطور الحوري بعد القفس لحساب مدة كل طور حوري ولحين خروج البالغات لمعرفة النسبة الجنسية . وقد استعملت هذه الطريقة لدراسة تطور الآفة خلال الجيل الربيعي والخريفي .

كما تم حساب عدد البيض في الادوار السعفية الخمسة الاولى واعتبارا من الاسفل الى الاعلى اي باتجاه قمة النخلة وعلى سطحي الخوصة السفلي والعلوي للتعرف على نسبة توزيع البيض ومفاضلة الانثى الملقحة في ذلك . حيث يتم جمع خوصات من كل دور سعفي وعلى اربعة مكررات (نخلات) من صنف الزهدي . استخدمت طريقة دانكسن وقيمته في تحليل النتائج احصائيا .

النتائج والمناقشة :-

يوضح جدول (1) فترات نمو طور البيضة ، الحوري ، الكامل في كل من الجيل الاول والثاني حيث وجد ان هناك فرق معنوي في مدة فقس البيض بين الجيلين وبمستوى 0.001 . اما الاعمار الحورية المختلفة فلم يكن هناك فرق معنوي وكذلك بالنسبة لمدة الطور الحوري وهذه النتائج تتفق مع (2,1) . كما وجد ان هناك فرق معنوي في مدة الانثى البالغة مدة الطور البالغ ، عدد البيض/ انثى ونسبة الفقس/ 100 بيضة بمستوى 0.05 . ووجد فرق معنوي ايضا في النسبة الجنسية (الانثى : الذكر) لدى الجيلين وبمستوى 0.01 ، اما مدة كل من الجيلين فقد كان يوجد فرق معنوي ايضا بمستوى 0.001 وهذا يتفق مع (2) .

وان الاختلاف في هذه النتائج قد يعود الى اختلاف العوامل البيئية خلال الجيل

دراسات حياتية وبيئية على حشرة الدوباس

Ommatissus binotatus lybicus De Bergevin

عماد محمد ذياب الحفيظ
دائرة البحوث الزراعية التطبيقية

المقدمة :

تعتبر حشرة الدوباس Ommatissus binotatus lybicus De Bergevin (Homoptera ; Tropiduchidae) من الحشرات المهمة على اشجار النخيل في العراق بشكل خاص ومناطق زراعة النخيل في العالم القديم بشكل عام .

تم تسجيل هذه الآفة في كل من الإمارات العربية ، السعودية ، الكويت ، البحرين ، سلطنة عمان ، مصر ، ليبيا ، الجزائر ، السودان ، وايران (١) .

لقد ذكر هذه الحشرة (5) في مدينة البصرة عام 1922 ولكنهما لم يشخصاها . تتغذى حوريات وكاملات هذه الآفة على العصارة النباتية من الاجزاء الخضرية للنخلة خلال فصلي الربيع والخريف فتسبب ضعف الشجرة وتدهور نوعية انتاجها (4,3,2,1) .

مازال تاريخ حياة هذه الحشرة غير مدروس وكذلك تأثير العوامل البيئية عليها ، وانما مانشر عنها كان عبارة عن ملاحظات ومشاهدات حقلية .

لذلك اجريت هذه الدراسات للتعرف على نمو وتطور افراد هذه الحشرة خلال الجيلين الربيعي والخريفي وعلاقتها بدرجات الحرارة والرطوبة النسبية بالاضافة الى الكثافة العددية خلال الجيلين للتعرف على اي منهما اهم من الناحية الاقتصادية كما تم توزيع البيض على الادوار السعفية (الورقية) المختلفة للتعرف على مفاضلة الحشرة في وضع البيض على هذه الادوار .

الطرق والمواد المستعملة :-

اجريت هذه الدراسة على اشجار النخيل في محافظة بغداد ابتداءا من الجيل الخريفي في عام 1985 ولغاية الجيل الخريفي لعام 1986 . حيث تم تربية 50 حورية

دراسات حياتية وبيئية على حشرة الدوباس

Ommatissus binotatus lybicus De Bergevin

عماد محمد ذياب الحفيظ
دائرة البحوث الزراعية التطبيقية

الخلاصة :

تعتبر حشرة الدوباس Ommatissus binotatus lybicus من الحشرات المهمة اقتصاديا على اشجار النخيل في العراق والعديد من دول الشرق الادنى وشمال افريقيا .

تم دراسة تاريخ حياة هذه الحشرة في بساتين بغداد لتحديد الفترات المختلفة لاطوار الحشرة خلال الجيلين الربيعي والخريفي ، فوجد ان هناك فروقات معنوية بين هذين الجيلين كما درست الكثافة العددية لهذه الحشرة خلال السنة حيث وجد ان عدد افراد الحشرة خلال الجيل اول اعلى من عدد افراد الحشرة في الجيل الثاني وذلك لاختلاف درجات الحرارة والرطوبة النسبية .

ووجد فروقات معنوية في عدد البيض الموضوع في الادوار السعفية المختلفة وان 53.19% من عدد البيض كان موجود في الدور السعفي الاول والثاني مما يساعد في استخدام اسلوب الخف لتقليل ضرر هذه الأفة .

Biological and ecological studies on Ommatissus birotatus lybicus De Bergevin

E. M. T. Al-Hafidh

ABSTRACT

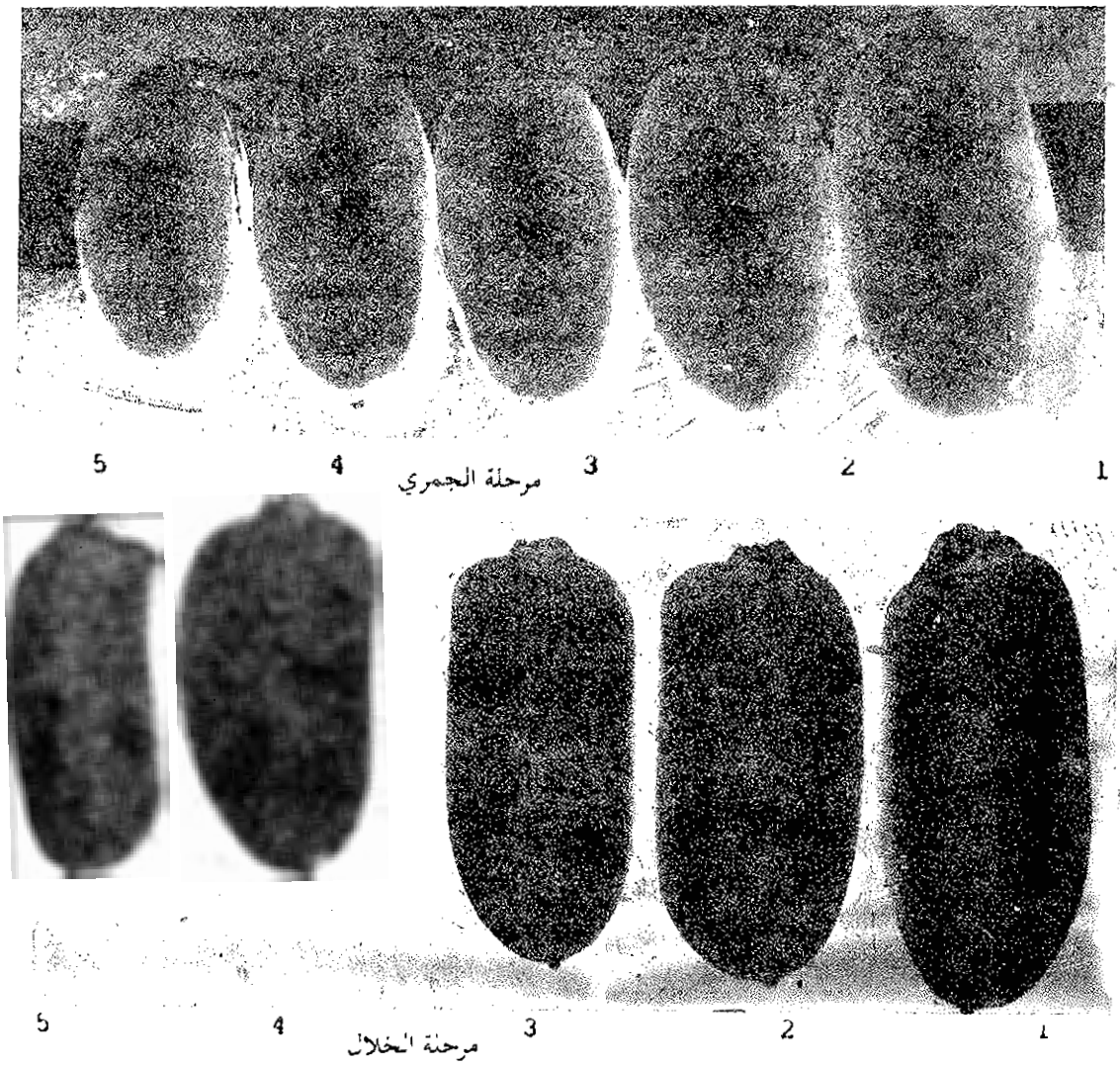
Ommatissus binotatus lybicus De Ber. is one if the most important pests on date palm.

The life eycle of this insect eas determined in the field for the two generations.

The population density of Dubas was studied also. The results showed that the population during the first generation was higher the than the second generation.

There is a significant difference between the number of eggs laid on the different frond rows.

1. ثمرة غير مكيسة (مكشوفة).
2. ثمرة مكيسة لفترة أسبوع واحد من التلقيح .
3. ثمرة مكيسة لفترة أسبوعين من التلقيح .
4. ثمرة مكيسة لفترة ثلاثة أسابيع من التلقيح .
5. ثمرة مكيسة لفترة أربعة أسابيع من التلقيح .



(شكل 4) تأثير معاملات التكييس المختلفة على معدل طول وقطر ثمار نخلة التمر صنف حلاوي خلال مرحلتي الجمري والخلال.

(جدول 4)

تأثير معاملات التكييس المختلفة على معدل قطر ثمار صنف نخلة التمر ـ حلاوي خلال مرحلتي الجمري والخلال للموسمين 1986, 1985 (بالمليمتر)

المعاملات		مرحلة الجمري			مرحلة الخلال		
		1985	1986	معدل المعاملات	1986	1987	معدل المعاملات
الشاهد (المقارنة)	T1	21.24 e	22.0 e	21.5 d	28.0 d	30.5 c	29.2 c
تكييس لفترة أسبوع واحد من التلقيح	T2	25.5 d	26.5 d	26.0 c	35.6 c	33.9 c	34.6 c
تكييس لفترة أسبوعين من التلقيح	T3	32.9 b	29.2 e	31.0 b	42.8 b	42.18 b	42.4 b
تكييس لفترة ثلاثة أسابيع من التلقيح	T4	33.25 b	31.9 bc	32.6 b	45.6 b	45.6 b	45.5 ab
تكييس لفترة أربعة أسابيع من التلقيح	T5	33.7 a	39.6 a	36.6 a	53.8 a	45.3 b	48.63 a
معدل السنوات		24.3 a	24.8 a		41.2 a	39.4 a	

ـ قورنت متوسطات كل عامل على انفراد.

ـ المتوسطات التي تحمل أحرف متشابهة لا تختلف معنوياً. أما التي تحمل احرف مختلفة فتوجد فروقات معنوية بينها وفق إختبار دنكن متعدد الحدود وعلى مستوى 5%

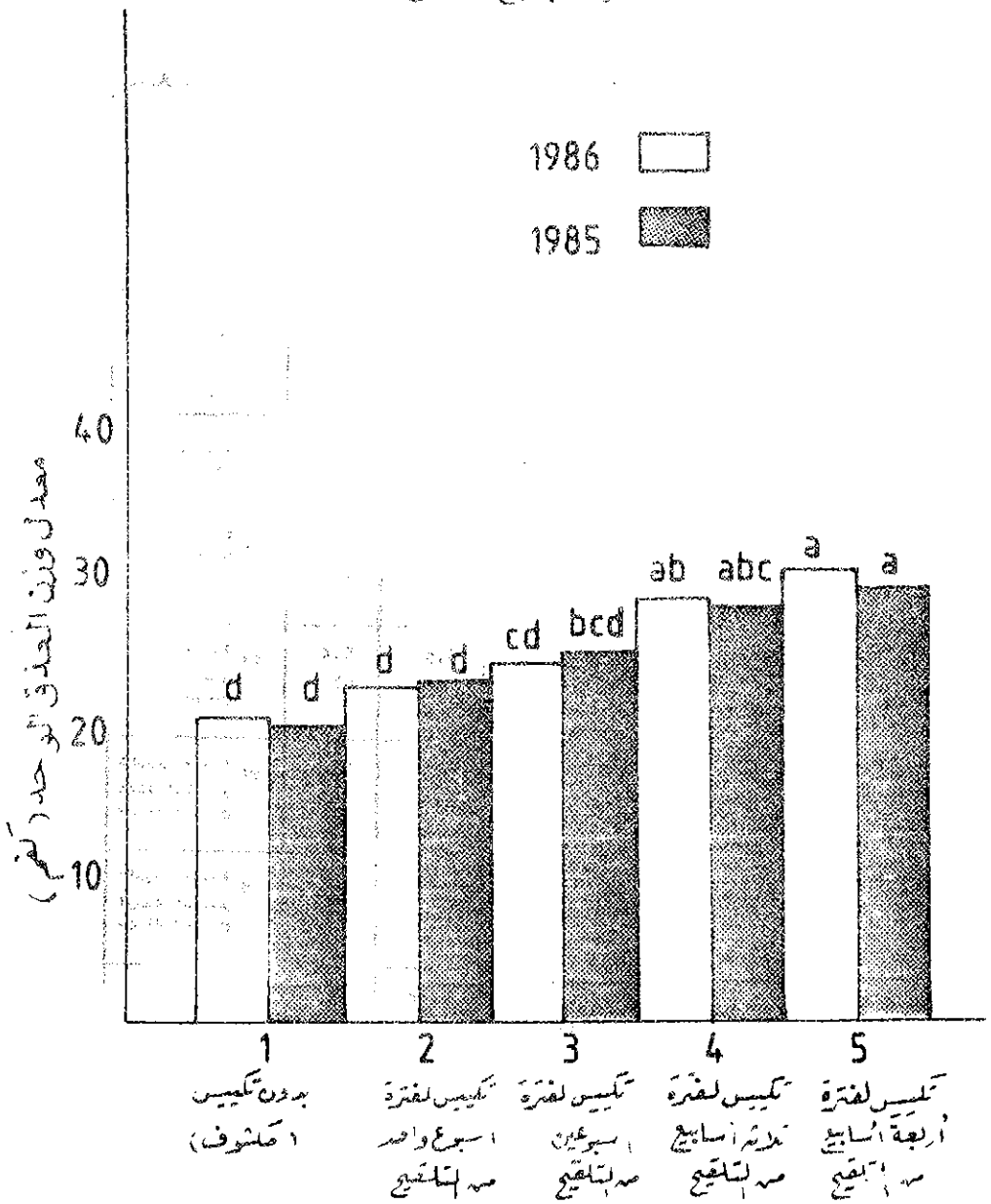
(جدول 3)

تأثير معاملات التكييس المسلفة على معدل طول ثمار صنف نخلة التمر - حلاوي خلال مرحلتي الجمري والخلال للموسمين 1985, 1986 (بالمليمتر)

المعاملات	مرحلة الجمري		مرحلة الخلال			
	1985	1986	معدل المعاملات	1985	1986	معدل المعاملات
T1 المكشوفة (المقارنة)	28.61 g	32.41 f	30.51 d	43.4 f	46.2 f	44.8 e
T2 تكييس لفترة أسبوع واحد من التلقيح	37.97 e	39.11 e	38.52 c	55.2 e	57.2 e	56.2 d
T3 تكييس لفترة أسبوعين من التلقيح	44.19 d	45.17 cd	44.68 b	69.2 d	69.9 c	67.57 c
T4 تكييس لفترة ثلاثة أسابيع من التلقيح	58.11 ab	48.90 c	50.50 a	74.5 b	75.4 b	74.9 b
T5 تكييس لفترة أربعة أسابيع من التلقيح	54.88 a	51.18 bc	52.93 a	,78 ab	80.7 a	79.8 a
معدل المستوى	43.50 a	43.35 a		62.4 a	65.7 a	

- قورنت متوسطات كل عامل على انفراد.
- المتوسطات التي تحمل احرف متشابهة لا تختلف معنوياً أما التي تحمل أحرف مختلفة فتوجد فروقات معنوية بينها وفق اختبار دنكن متعدد الحدود وعلى مستوى 5%.

تأثير تكييس الوليع بعد التلقيح



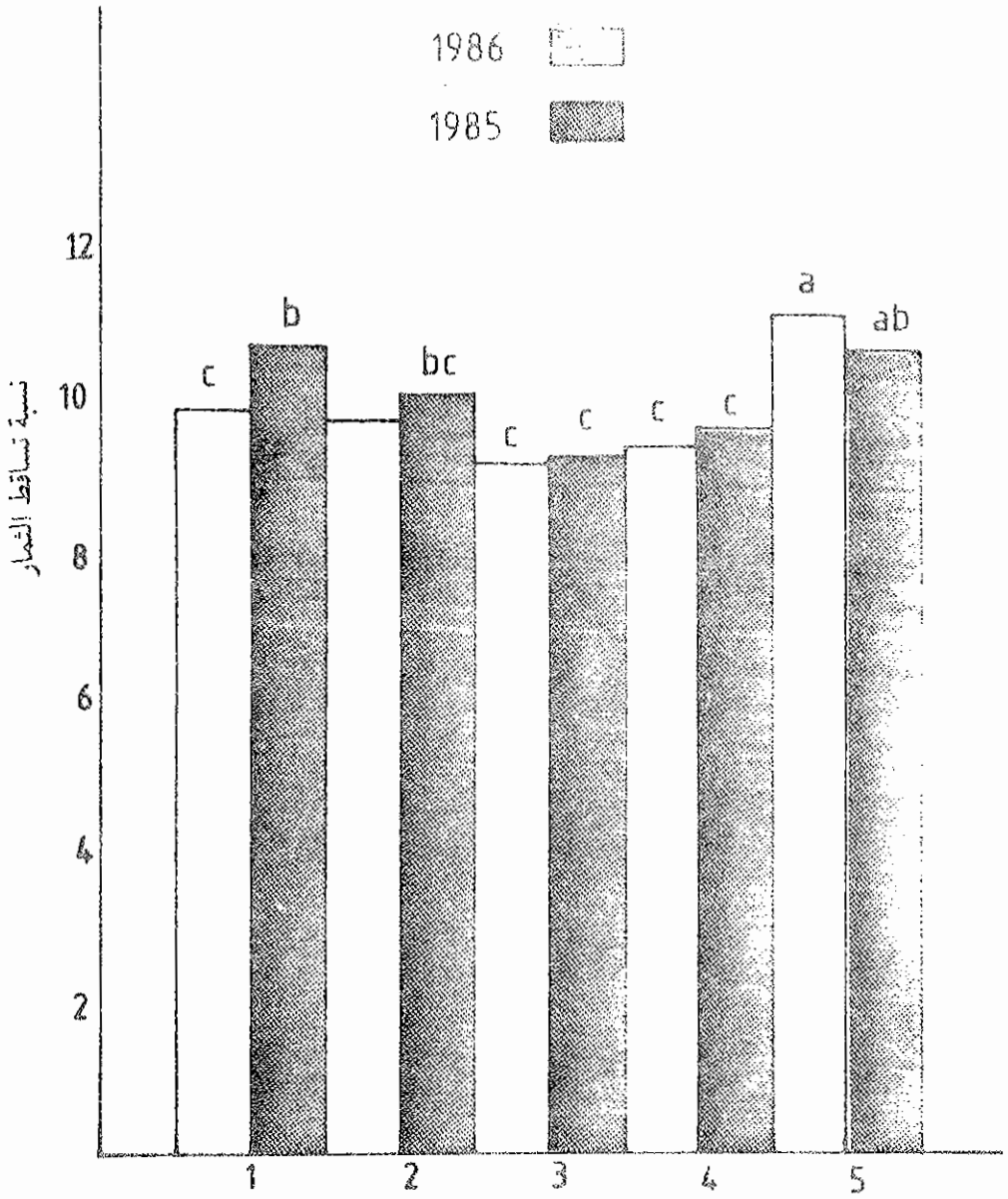
(جدول 2)

تأثير معاملات التكييس على معدل وزن ثمار صنف نخلة التمر ـ حلاوي في مرحلتي الجمري والخلال للموسمين 1986، 1985 (بالغرام)

المعاملات	مرحلة الجمري			مرحلة الخلال		
	1985	1986	معدل المعاملات	1985	1986	معدل المعاملات
T1 المكشوفة (المقارنة)	4 d	4.1 e	4.05 e	8.8 c	8.9 c	8.85 d
T2 تكييس لفترة أسبوع واحد من التلقيح	5 bc	5.1 b	5.05 b	10.2 bc	10.1 bc	10.15 cd
T3 تكييس لفترة أسبوعين من التلقيح	5.4 ab	5.5 ab	5.35 b	10.8 abc	11.6 ab	11.2 bc
T4 تكييس لفترة ثلاثة أسابيع من التلقيح	5.8 ab	5.5 ab	6.65 ab	12.5 ab	12.1 ab	11.75 ab
T5 تكييس لفترة أربعة أسابيع من التلقيح	6.2 a	5.8 ab	6 a	12.2 a	12.9 a	12.8 a
معدل الحشوات	5.28 a	5.22 a		11 a	11.12 a	

ـ قورنت متوسطات كل عامل على إنفراد.

ـ المتوسطات التي تحمل احرف متشابهة لا تختلف معنوياً. أما التي تحمل احرف مختلفة فتوجد فروقات معنوية بينها وفق إختبار دنكن متعدد الحدود وعلى مستوى 5% .


1986
1985
نسبة تساقط الثمار
12
10
8
6
4
2
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c
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ab
1
2
3
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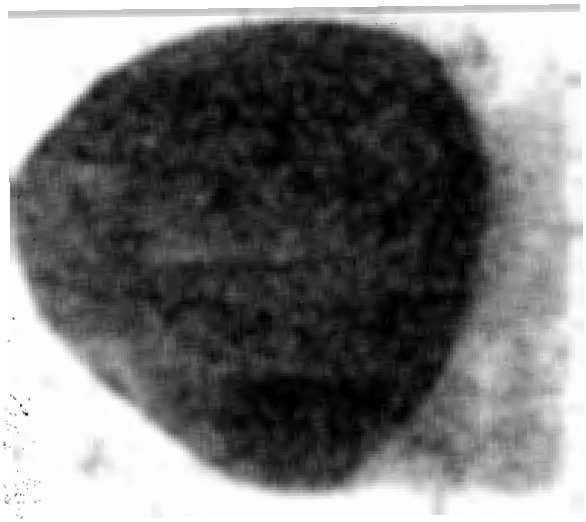
5



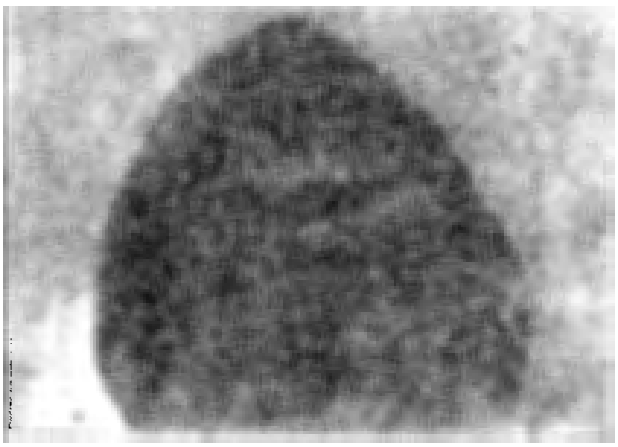
(ب) مقطع عرضي لزهرة غير مكيسة أسبوع بعد التلقيح .

(جـ) مقطع عرضي لزهرة مكيسة أسبوع بعد التلقيح .

(جدول ١)

تأثير معاملات التكييس على نسبة عقد ثمار صنف الحلاوي في مرحلتي الحبابوك والجمري للموسمين

المعاملات	نسبة العقد في نهاية مرحلة الحبابوك			نسبة العقد في نهاية مرحلة الجمري		
	1985	1986	معدل المعاملات	1985	1986	معدل المعاملات
T1 المكشوفة (المقارنة)	74.0 E	81.9 d	78.0 E	62.9 d	71.1 c	67.0 d
T2 تكييس لفترة اسبوع واحد	81.53 d	83.5 c	82.50 d	71.9 bc	73.9 abc	72.6 c
T3 تكييس لفترة اسبوعين	84.3 bc	84.5 bc	84.4 c	74.8 abc	74.7 abc	74.7 B
T4 تكييس لفترة ثلاثة اسابيع	86.4	85.3 b	85.8 b	76.6 a	75.1 ab	75.8 AB
T5 تكييس لفترة اربعة اسابيع	87.7 a	86.8 a	87.6 a	77.00 a	75.8 a	76.4 a
معدل السنوات	82.99 B	84.1 A		72.5 B	74.6 A	



(شكل ١). تأثير التكييس على نمو وتطور كرابل زهرة صنف نخلة التمر ـ حلاوي.
(أ) مقطع عرضي لزهرة قبل التلقيح مبيناً شكل الكرابل الثلاثة.

9. Al-Salih, A. and Ibrahim Al-Sadawi (1975): Influence of pollination on the quantative level aspect of endogenous auxin- anti-auxin in the date palm flower and fruit. Bull. College of Science 16 (2): 255-273. Bag. Iraq.
10. Bliss, D.E. (1949): Date bunch covers and their relation to the fruit spoilage complex of Deglet Noor dates, Date Grower's Inst. Rep. 26: 7-15.
11. Bliss, D.E., D.L.Lindgren and L.E.Vincent (1950): Second report on date bunch covers and their relation to the fruit spoilage complex on Deglet Noor dates. Date Grower's Inst. Rep. 27: 7-12.
12. Clor, N.A., T.A.Al-Ani and M.Shukur (1974): Seed and Fruit development of (Phoenix dactylifera L.D. as influenced by Type of Pollination and some growth substances, Sci. Res. Founet, Tech. Bull. 2/74. Baghdad, Iraq.
13. Nixon, R.W. (1932) Observation on the Occurance of Blacknose, Date Grower's Inst. Rep. 9: 3-4.
14. Nixon and W.Reuther (1947): The effect of environmental conditions prior to ripening on maturity and quality of date fruit. Amer. Soc. Hort. Sci. Proc. 49: 81-91.
15. Nixon, R.W. (1955): Size and checking of Deglet Noor dates as affected by fruit thinning and pollen. Date Grower's Inst. Rep. 32: 8-10.
16. Reuther, W and C.L.Crawford (1946): The effect of temperature and bagging on fruit set of dates. Date Grower's Inst. Rep. 23: 3-7.

الاستنتاج :

مما تقدم ، نستنتج بأن عملية التكييس بصورة عامة أدت الى زيادة نسبة العقد ووزن وطول وقطر الثمار اضافة الى وزن العذوق بصورة اجمالية . إن هذه الزيادة تتناسب طردياً مع فترة الاكياس حيث انفردت معاملة رفع الاكياس بعد اربعة اسابيع من التلقيح باعطاء اعلى نسب لعقد الثمار وكمية متميزة للصفات الثمرية الاخرى عن بقية المعاملات . لذا فأن تكييس صنف الحلاوي بعد اتمام عملية التلقيح من شأنه تحسين انتاجية تحت ظروف منطقة البصرة .

المصادر :

1. البكر، عبد الجبار (1972) نخلة التمر ماضيها وحاضرها والجديد في زراعتها وصناعتها وتجارتها، مطبعة الوطن ـ لبنان .
2. الراوي ، خاشع محمد وعبدالعزيز خلف الله (1980) . تصميم وتحليل التجارب الزراعية ، مطبعة جامعة الموصل ـ الموصل ـ العراق .
3. حسين ، فرعون احمد وصالح محسن بدر وسهى العطار (1985) ، تأثير طرق مختلفة من التلقيح على نوعية ثمار نخلة التمر (phoenix dactylifera L.) ـ مجلة البحوث الزراعية والموارد المائية ـ المجلد ٤ ـ العدد 1 . بغداد ـ العراق .
4. عبدالحسين ، علي (1985) ـ النخيل والتمور وآفاتها ، مطبعة جامعة البصرة ـ البصرة ـ العراق .
5. العاني ، عبدالاله (1985) . فسلجة الثمار بعد الحصاد ـ مطبعة جامعة بغداد ، بغداد ـ العراق (الجزء الأول) .
6. العطار، عدنان وسهيلة العلاف وكواكب المختار (1982) ، التحضيرات المجهرية (الجمهورية العراقية ، وزارة التعليم العالي والبحث العلمي) .
7. غالب ، حسام حسن علي (1984) تأثير فترات التكييس على عقد ووزن وحجم ثمار صنفي الحلاوي والزهدي ـ المؤتمر العربي للبساتين الثالث المنعقد في ١٠ الى ١٢ تشرين الثاني في القاهرة ـ جمهورية مصر العربية .
8. محمد ، عبدالعظيم وعبدالهادي الريس (1982) فسلجة النبات ـ مطبعة جامعة الموصل ـ الموصل ـ العراق .

المقارنة (8.9, 8.8) غم، ولموسمي التجربة على التوالي . ان هذه النتائج تتطابق مع نتائج البكر (1972) ,Clor (1974) وحسين (1985) ويعود السبب في ذلك الى ان التكييس يوفر الظروف المناخية الملائمة في حرارة ورطوبة مناسبة لنمو وتطور ثمار النخيل بشكل اسرع من تلك غير المكيسة .

رابعاً: وزن العزوق

يبين شكل (3) ، بأن معاملات التكييس ادت الى زيادة معدل وزن العذق وبفارق احصائي من معاملة عدم التكييس . وقد اخذت معاملة رفع الاكياس بعد اربعة اسابيع من التلقيح اعلى معدل احصائي في وزن العذق بالمقارنة مع رفع الاكياس بعد اسبوع واحد واسبوعين من التلقيح ومعاملة المقارنة (المحايدة) ان هذه النتائج تتفق مع ما وجده حسين (1985) ويعود السبب في ذلك الى ان عملية التكييس ادت الى حصول زيادة في نسبة عقد الثمار (جدول 1) ووزن الثمار (جدول 2) كما انها قللت من تساقط الثمار (شكل 2) .

خامساً: معدل طول وقطر الثمار

تشير الجداول (3,4) والشكل (4) الى أن معاملة رفع الاكياس بعد ثلاثة وأربعة اسابيع من التلقيح أدت الى انتاج ثمار طويلة وبفارق احصائي في مرحلة الجمري عن بقية المعاملات خصوصاً معاملة المقارنة (المحايدة) . اما في مرحلة الخلال فقد تفوقت معاملة رفع الاكياس بعد اربعة أسابيع من التلقيح احصائياً عن بقية المعاملات .

ومرة اخرى، فإن معاملة التكييس لفترة اربعة اسابيع ادت الى زيادة اقطار الثمار بصورة معنوية مقارنة بالمعاملات الاخرى . ان هذه النتائج تتماشى مع ما وجده Nixon (1955), Bliss (1955) وحسين (1985) ، في أن التكييس يؤدي الى تحسين نوعية الثمار . وقد يرجع ذلك الى أن التكييس يسرع في نمو الثمار عن طريق زيادة انقسام الخلايا . كما أن الاكياس تساهم في تقليل كمية الاضاءة النافذة من خلال الكيس الى العذق الثمري وهذا بدوره يؤدي الى استطالة خلايا الثمار (محمد والريس 1982) .

بعد أربعة اسابيع من التلقيح اعطت معدلات عالية لنسب عقد الثمار لموسمي التجربة (76.4, 87.6) مقارنة بمعاملة رفع الاكياس بعد اسبوع واحد من التلقيح (72.6, 82.5) لمرحلتي الحبابوك والجمري على التوالي . فيما تخلفت معاملة المقارنة (المكشوفة) عن بقية المعاملات بصورة معنوية (67, 78) لمرحلتي الحبابوك والجمري على التوالي . إن هذه النتائج توضح بصورة جلية على أن التكييس بعد إجراء عملية التلقيح يوفر ظروفاً مناسبة لرفع نسبة العقد بصورة اسرع من المعاملات المكشوفة (غير المكيسة) حيث وجد أن درجة الحرارة داخل الاغازيض المكيسة ترتفع بمقدار (8-10 م) عن الأغاريض المكشوفة (الغير مكيسة) وهذا أدىٰ الى زيادة نمو الازهار الملقحة (شكل ١) .

ثانياً : نسبة تساقط الثمار العاقدة

يوضح شكل (2) بأن معاملات التكييس قد أدت الى تقليل نسبة سقوط الثمار العاقدة بين مرحلة الحبابوك والجمري بصورة معنوية مقارنة بالثمار الغير مكيسة وخاصة معاملة رفع الاكياس بعد ثلاثة اسابيع من التلقيح لكلا موسمي الدراسة . ان هذه النتيجة يمكن ان تعزي الى ان التكييس ادىٰ الى توفير ظروف مناسبة من حرارة ورطوبة لاتمام عملية التلقيح والاسراع بنمو الثمرة وهذا بدوره ادىٰ الى حدوث زيادة في المحتوىٰ الهرموني (الأوكسني) الداخلي للزهرة الملقحة (Endogenous Auxins) إستناداً الى ما اشار اليه Al-Salih (1975) . إن زيادة تركيز هذه الاوكسنات يؤدي الى زيادة قوة ارتباط الثمرة بسويقها (العاني 1985) . من ناحية اخرىٰ فإن عملية التكييس تقلل من فرص إصابة الثمار بحشرة الحميرة التي تنشط خلال هذه الفترة والتي تسبب سقوط نسبة كبيرة من الثمار العاقدة (عبد الحسين 1985) .

ثالثاً : وزن الثمرة

أدت معاملات التكييس الى زيادة وزن الثمار احصائياً عند مقارنتها بمعاملة المقارنة (المحايدة) خلال مرحلتي الجمري والخلال كما في جدول (2) . ومرة ثانية ، فقد أدت طول فترة تكييس العذوق الى زيادة وزن الثمار معنوياً سواء كان ذلك في مرحلة الجمري او الخلال ولموسمي التجربة . فعلى سبيل المثال ، أعطت معاملة اطول تكييس العذوق وزناً لثمار مرحلة الجمري قدره (5.8, 6.2) جم مقارنة بالثمار غير المكيسة (4,2, 4) غم لموسمي التجربة على التوالي ، ولقد اخذ وزن ثمار مرحلة الخلال نفس السياق السابق في زيادة الوزن (12.9, 12.7) غم للثمار المكيسة اربعة اسابيع في حين كانت اوزان ثمار

٢ ـ نسبة تساقط الثمار:

قيست هذه النسبة باستخراج الفرق الناتج بين نسبة عقد الثمار في مرحلة الجمري ونسبة العقد في مرحلة الحبابوك.

٣ ـ وزن التمرة:

أخذت خمسون تمرة من كل مكرر ووزنت بواسطة ميزان حساس واستخرج معدل وزن التمرة الواحدة.

٤ ـ وزن العذق:

تم استخراج المعدل الكلي لوزن العذق الواحد.

٥ ـ طول وقطر التمرة:

أخذ معدل طول وقطر التمرة من خلال قياس طول وقطر الثمار من كل مكرر بواسطة المقدمة (Vernier).

بعدها قورنت متوسطات المعاملات بعد استخراجها بواسطة اختبار دنكن متعدد الحدود (Duncans Multiple Range Test) استناداً الى الراوي وعبدالعزيز (1980).

كما درس نمو وتطور كرابل جميع المعاملات وذلك بأخذ نماذج من الأزهار قبل وبعد التلقيح حيث حفظت وثبتت العينات بمحلول الفورمالين وحامض الخليك 75% والكحول الأثيلي بنسبة (1:1:18) حجماً واعتمدت الطريقة الموصوفة من قبل العطار (1980) في غسل العينات والتشريب والطمر بشمع البرافين، وباستخدام المشراح الدوار عملت مقاطع طولية متسلسلة بسمك (7-13) مايكروميتر وصبغت القطاعات بالسفرافين والأخضر السريع وحملت بلسم كندا ثم فحصت مجهرياً باستخدام المجهر العارض نوع (Projectina) ومن ثم صورت بعض المقاطع.

النتائج والمناقشة

أولاً: نسبة عقد الثمار:

تشير النتائج المبينة في (جدول ١) بأنه هناك تفاوتاً في نسبة عقد الثمار لمرحلتي الحبابوك والجمري حيث ان هذه النسبة كانت اقل في مرحلة الجمري عنها في مرحلة الحبابوك لموسمي التجربة وأن نسبة العقد في الموسم الثاني كانت اعلى من الموسم الاول لكلا مرحلتي الحبابوك والجمري كذلك هنالك زيادة في نسبة عقد ثمار العذوق المكيسة عن الغير مكيسة لكلا الموسمين والمرحلتين. وان إطالة فترة تكييس العذوق قد ساعدت بصورة معنوية في رفع نسبة العقد حيث أوضحت النتائج الى أن معاملة رفع الاكياس

النامية في محطه البستنة (شط العرب) التابعة لوزارة الزراعة والاصلاح الزراعي حول تأثير فترات التكييس على عقد ووزن وحجم ثمار الصنفين المذكورين.

وإستكمالاً لهذه الدراسة فقد هدف هذا البحث الى معرفة تأثير التكييس على تطور الكرابل بعد التلقيح واستجابة نوعية الثمار وكمية الحاصل لذلك على الصنف الحلاوي النامي في محطة كلية الزراعة للبحوث والتجارب الزراعية في منطقة الهارثة في محافظة البصرة.

الطرق والمواد المستعملة

نُفذ هذا البحث على أشجار نخيل صنف الحلاوي بعمر (20) سنة والمغروسة في تربة طينية مزيجية في محطة كلية الزراعة للبحوث والتجارب الزراعية التابعة لجامعة البصرة والكائنة في منطقة الهارثة (محافظة البصرة). إنتخبت خمس نخلات متجانسة في العمر والنمو الخضري وأجريت عليها العمليات الزراعية بالتساوي.

أتبع تصميم القطاعات العشوائية الكاملة حيث اعتبرت النخلة الواحدة قطعة احصائية (Block) ووزعت المعاملات المبينة أدناه على عشرة عذوق (عذقين لكل معاملة) للنخلة الواحدة:

(١) المعاملة المكشوفة (محايدة Control).
(٢) تكييس لفترة اسبوع واحد بعد التلقيح.
(٣) تكييس لفترة اسبوعين بعد التلقيح.
(٤) تكييس لفترة ثلاثة اسابيع بعد التلقيح.
(٥) تكييس لفترة اربعة اسابيع بعد التلقيح.

استعملت اكياس ورقية بنية اللون بطول (60 سم) وعرض (45 سم) مثقبة بمعدل عشرين ثقب بأقطار متساوية (1/2 سم) وموزعة بصورة متساوية على الكيس الواحد. تم قياس درجات الحرارة في بستان التجربة في الساعة (11-12) ظهراً ولمدة اسبوع من التلقيح وكذلك قيست درجات الحرارة داخل الكيس ولمدة اسبوع واحد من التلقيح للمعاملات المكيسة وغير المكيسة ودرست الصفات التالية:

١ ـ نسبة عقد الثمار في مرحلتي الحبابوك والجمري:

قدرت النسبة وفق المعادلة الآتية:

$$\text{نسبة العقد} = \frac{\text{عدد الثمار العاقدة}}{\text{العدد الكلي للازهار}} \times ١٠٠$$

المقدمة

يتـرامن موعـد تلقيـح التمر (phoenix dactylifera) في أغلب مناطق انتشارها مع الاختلافات الحادة للظروف المناخية وخاصة بالنسبة لدرجات الحرارة وهبوب الرياح التي قد يصـاحبهـا هطـول الامطـار التي ينتـج عنهـا غسـل حبوب اللقاح من مياسم الازهـار الانثـويـة وقـد عمـد مزارعوا النخيل في اغلب المناطق من العالم الى اجراء عمليـة التكييس حالـة معرفتهم بعدم ملائمة الظروف المناخية . فقد عالج (Reuther and crawford 1946) التـذبـذب الحـاصل في نسبة عقد ثمار صنفي نخلة التمر دقلة نور والخضـراوي من خلال اجـراء عملية تكييس العذوق الثمرية بعد التلقيح مباشرة ولحين عمليـة التـركيس حيث ساعـدت هذه العمليـة في إعطـاء نسبة عالية من عقد الثمار وذلك من خلال رفع درجة حرارة الاغاريفي داخل الكيس بزيادة مقدارها (5-15 ف) كذلـك أدى التكييس الى زيـادة طراوة ميـاسم الازهار الانثوية والتقليل من ضياع حبوب اللقاح فيما لو حصلت رياح شديدة .

لقـد جربت أنـواع مختلفـة من الاكياس لاختيار افضلها ، فقد استعمل الموسلين الابيض وأكيـاس اخـرى مطليـة بالشمـع ومن ثم الاكياس الورقية وقد استعمل النوع الاخيـر لسهـولة لف العذوق وتوفرها في الاسواق.ورخص ثمنها (Nixon and Reuther 1947; Bliss 1949 & 1950) كما وجد بأن تثقيب الاكياس يساعد على تهوية العذوق وصولاً الى تقليل الضرر الذي قد ينجم بسبب زيادة الرطوبة (Nixon 1934) من ناحية ثانية ، قام (Bliss 1950) باستعمال حلقات خاصة للتهوية مصنوعة من الموسلين ومادة (Thiomate) لتفادي حصول الاصابة بالفطريات .

أمـا على نطـاق القطـر العـراقي ، فقـد ذكـر البكر (1972) بأن مزارعي النخيل في منطقة شط العرب (محافظة البصرة) يقومون بتكييس العذوق منذ زمن بعيد باستعمال أكياس من نسيج شباك صيد السمك ذي الفتحات الضيقة حيث ان هذه العملية أدت الى زيـادة نسبـة عقد الثمار وذلك لتوفيرها ظروف ملائمة من درجات الحرارة (20-25 م) والرطوبة اللتين تساعدان على عملية التلقيح .

بصورة عامة ، بين كل من كلور (1975) وحسين (1985) أن التكييس ادى الى زيادة عقد ووزن وتحسين نوعية ثمار صنف الزهدي . كما حصل غالب (1984) على نتائج مشجعـة من خلال اجـراؤه دراسـة أولية على أشجار نخيل صنفي الحلاوي والزهدي

The Jnfluence of Bagging on Fruit Set and Fruit Characteristics in Date Palm Cv. Hillawi

Hosim H.A Galib
Lecturar
Agri College. Basr
Unv.

Essam A.Mawlod
Senior Sci. Rese.
Agri. Wat. Rec
Res Cent

Hamza H. Hamood
Assi. Researcher
Agri. Wat. Rec. Res
Cent

Abstract:

The study was carried out at Hartha region the expermental station of the college of agriculture. Basrah Unv. for the two season 1985 and 1986 on Hallawy Date Palm Cv. The spadices were bagged immediately after pollination. Four different periods were used for bagging 1.2.3 and 4 weeks. in addation to the unbagged spadices taken as control. The objective was to study the effect of bagging the spadices on fruit set and development of fruit. yield and some other characteristics.

In general, the results indicated. that the bagging treatment had a significant increase in fruit set. yield and fruit dimensions. The period of bagging of four weeks gave superior results in those characteristics compared with other treatments. Moreover. growth of the pollinated carpels in the bagging treatment was faster than the unbagged treatment.

تأثير تكييس الوليع بعد التلقيح على عقد الثمار وصفات الثمرة في نخلة التمر صنف «حلاوي»

حسام حسن علي غالب
مدرس
قسم البستنة والنخيل
جامعة البصرة

عصام عبدالله مولود
باحث علمي ـ مركز البحوث
الزراعية والموارد المائية
مجلس البحث العلمي

حمزة حسن حمود
م. باحث علمي ـ مركز البحوث
الزراعية والموارد المائية
مجلس البحث العلمي

الخلاصة

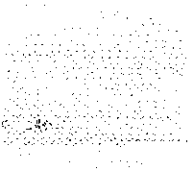
أجريت الدراسة في محطة كلية الزراعة للبحوث والتجارب الزراعية التابعة الى جامعة البصرة والكائنة في منطقة الهارثة في محافظة البصرة ـ جنوب العراق في موسمي 1985 ,1986 ، على صنف نخلة التمر ـ حلاوي . كان الهدف منها معرفة تأثيري تكييس الوليع بعد التلقيح وفترة بقاء الكيس على نمو وتطور الثمرة ونسبة العقد ومعدل كمية الحاصل للعذق الواحد ووزن الثمرة وطولها وقطرها ونسبة سقوط الثمار في مرحلتي الحبابوك والجمري .

أظهرت النتائج بأنه هنالك زيادة في نسبة العقد ووزن وطول وقطر الثمرة ومعدل كمية الحاصل للعذق الواحد في الثمار المكيسة عنها في الثمار الغير مكيسة .

وقد اعطت معاملة إبقاء الكيس لفترة أربعة اسابيع بعد التلقيح اعلى المعدلات في الصفات المذكورة اعلاه وبفارق احصائي عن معاملة المقارنة والتكيس لفترة اسبوع واسبوعين بعد التلقيح . وكانت النتائج متماثلة في مرحلتي الجمري والخلال لموسمي الزراعة وكذلك أظهرت النتائج بأن نمو وتطور الكرابل الملقحة في معاملات الازهار المكيسة اسرع واكبر من الازهار الغير مكيسة .

رقم الايداع
في المكتبة الوطنية ببغداد
440 لسنة 1981

المحتويات



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مجلة نخلة التمر

مجلة نصف سنوية تصدر عن مركز البحوث الزراعية والموارد المائية ـ مجلس البحث العلمي

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