

# The calendar of date palm care in Abu Dhabi Emirate

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## ABSTRACT

**This paper highlights the most important care priorities of Date Palm (DP) tree as one of important loops that aimed enhancing the quality of the performance and develop maintenance operations for greening projects in Abu Dhabi (AD), in line with the social responsibility of the municipality and embodies its vision to ensure the better quality of life and sustainable environment for AD residents. At the beginning, it reminds the importance of this blessed tree, which mentioned in the Holy Koran and the Sunnah. It touches the latest monitoring of DP varieties in UAE, and their groups according to the date maturity, explains and deals with clarifying local scheduling operations for DP care. The paper shows the importance of periodic emphasis on correct applications care according to their scheduled time that leads to stronger growth and better production which are the important components of mechanical and biological control against various pathogens or insects that can affect the DP tree at all stages, the paper presents the most mistaken practices in the performance of DP care and utilize them positively on behalf of the development of DP care. At the end, the paper shows most of the DP services throughout the year in calendar table. To replace the notion “that there is a pesticide for each disease or insect by concept “that each disease has its causes that must be limited”, therefore the calendar warns about the importance of periodic emphasis on correct applications care according to their scheduled time. As a conclusion, it can be adopted as a guide for developing the DP care practices in Abu Dhabi Emirate.**

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**Keywords:** local scheduling operations, Rachis Base, Bunch Curving, pollination, fruits thinning technique,, fruit bunching. DP Sanitary Care.

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## INTRODUCTION

The date palm (*Phoenix dactylifera* L.), which includes more than 1,500 varieties, is one of the Arecaeae family that includes 225 genera and around 2600 species. It's one of the oldest fruit trees, said it may sprouted at least more than ten thousand years ago. DP cultivated in ancient Mesopotamia, Sumer and Assyria, as well as in ancient Egypt (between the Nile and the Euphrates). Its wild origin is unknown, but the fixed belief and excavations signs confirmed that it's cultivation in the east of the Arabian Peninsula, including UAE, back to 4000 years BC, from which spreads to other parts of the world . Some sources indicated that the palm family is the oldest among the flowering plant families, as confirmed by some of the discovered fossils to being back to nearly 120 million years.

Due to the high viability of this species to withstand harsh environmental conditions, it has spread to extendible areas of the Islamic and Arabic world, where extending from North Africa (Morocco), to Egypt up to latitude 17 north to the south, also extends to latitude 15 north in Sudan to fall thereafter to the latitude 10 to the north and along the Red Sea and the Aden Gulf, including the northern parts of Somalia and it's south border extends within Asia to include the south shore of the Arabian Peninsula up to Pakistan, where the palm belt extends to the north up to latitude 32 north in Iraq and Iran. It is also widely grown in the tropics and subtropics of the both parts of our planet.

In United Arab Emirates it is considered one of the most important commercial fruit species, as well as it enjoys under the exceptional promise because of its social importance and heritage prestige.

Due to this stature and unique beauty its cultivation have spread across the country for many purposes

on public and private farms and parks, protective windbreaks and forest shelterbelts around cities and along internal and external roads.

The latest monitoring to inventory DP varieties in UAE revealed the existence of more than 225 varieties of pistillate ones: about 70 varieties from seed origins (Jish) focused in Ras Al Khaimah Emirate. It has also been monitoring unlimited number of Male (Fahal) varieties from which studied nearly 20 variety.

For more clarification, the varieties have been divided into: too early (as Naghal), early (Halawy, Sayre, Gura, Heri), moderate early (Prem, Khenazy, Khadrawy, Thwaira Nmici), In the mid-season (Boumaan, Baglat Mtawah, Boscri, Khalas, Derry, Zamili, Shbibbi, Sage, Soufri, Madjool, Nabhtat Saif, Maktoum, Red Hilali, Shishi, and Aljishosh: as Alawan, Ramli, Estooah, Soeah, Alaq and Tabaq), moderate delay (Barhi, Khashrm, Khesab Liwa, Sulhtana, Rziz, Lulu, Deglet Nour, Shakhul) and late (Algebri, Jish Makran, Red Farhd –Liwa, Yellow Farhd –Al Ain, Naghal Hilali and Saudi Hilali) and too late (Khesab, Hilali, and Um Al Fanajeen).

The variation in the maturity periods of date's varieties, stretching from late May to late October, has a great importance in organization of harvest works and on controls the operations of dates marketing.

To take the advantage of this positive feature in reducing the size of the works, it is vital important to conduct scheduling operations for fruit harvest according to their proper association with variety and followed health conditions. This helps to minimize the extent of the damage and losses that can cause fruits due to the attack of many insects. It also considering that the professional commitment, in charge of the performance level of all operations and services for the palm care, is the basic substrate relying upon its development and giving longevity.

## OPERATIONS AND SERVICES FOR THE DATE PALM CARE

### Irrigation Control

Is one of supporting essentials for the DP growth, its productivity and safety if its quantities adopted properly. That's where the disadvantages of water excess (preferred by the red weevil): the spread of fungal diseases, nutrient deficiency, level rise of the ground water and delayed growth and fruit ripening... and others. The disadvantages of water deficit (preferred by borers): leading to weakness, slow growth, flowering delay, small and low quality fruits and get phenomenon of alternate fruit bearing... and others.

So take into account the attention of appropriate amounts of irrigation during the formative stages of pollen and

fruiting as they have a vital influence on the amount of the crop, and are reduced during the winter season and the start of fruits coloring depending on the stages of maturity of the crop until the end of harvesting.

Generally, there are two irrigation periods determined by the outcome of the general and local environmental conditions and the norms related to the quality and quantity of water, location, adopted irrigation method, palm age and its variety, soil properties and level of its preparation, the intensity and novelty of cultivation and the operations of care and maintenance, namely:

- 1) Summery (04/01 to 10/31): the amount of irrigation at a rate of one cycle every 3-5 days.
- 2) Wintry (11/1 to 3/31): the amounts of irrigation at a rate of one cycle every 6 -7 days, which is reduced by at least 25%.

The omission of any factor would upset the accurate calculation of DP water requirements exposing them to the problem of inadequate suitability that contribute to the deterioration of DP status and declining their growth and productivity. It is also necessary to act on the maintenance of irrigation systems before each period (semiannual) to ensure the supply of required irrigation amounts.

### Palm, Basins & Site Cleanliness

DP with all its parts requires regular monitoring of cleanliness through the stages of fruit development. It's especially after the end of Beesir stage and while entering into Tamar stage, as well as through fruits ripening and harvesting, which increases the chances of their fall on all DP parts and around the basins and of its beauty distortion. All of which will form safe food haven for many insects (red palm weevil, DP borers, Dubas, spiders, scales).

The presence of these insects on the different parts of DP trees leads to infection .It is therefore recommended to collect all larvae, pupae, nymphs, complete insects to eliminate them and prevent their reproducing.

It takes into account the periodic care of basins and site cleanliness by the immediate removal of all vegetative, organic green and dried litters caused by the different DP service operations as well as the fallen fruits. It also requires to get rid of any infected or sick DP and deteriorating plants within the site by applying the proper means, which would constitute hotbeds for the outbreaks of disease or pests. Note that the proper implementation of this process would enhance the degree of benefit from all of these residues in many industries.

This application will ensure the maintenance of a healthy environment free from any harmful pathogens that would prejudice the safety of DP growth and its development.

### Digging, Weeding & Root Covering

Includes the surface hoeing of the soil, weeds and alien plants removal that growing on the DP basins periodically, by extraction from their roots and collected with other organic waste for preparing an organic fertilizer. Attention to soil hoeing could provide the appropriate medium within the DP basin by improving soil ventilation, moisture, improve its texture, avoiding any competition effect on nutrients and removal the safe reproductive hot beds of insects.

Taken into account in the case of revealed roots or their appearance, at the base the DP trunk, working on aggregating the soil on and around it. This process is a very important within the basin area (especially in terms of DP plantations) to encourage the production of offshoots around their mothers in the early stages).

As always taken into account after the completion of this process to install the irrigation bubblers to ensure the uniformity of water distribution in the whole basin. It is advisable to use the organic mulch materials for the purpose of reducing water consumption.

### Fertilization

The fertilization program should be based on the results of samples analyzes of soil, water and plant tissues that derived scientifically to represent the target site or farm.

1. **Organic Fertilization (OF):** The sandy soil properties highlight the importance of mixing the decomposed treated organic fertilizer with it. The DP needs a rate not less than 5 kg / yr of its age, and with proportionate amount according to the age and variety (over 10 years by rate not more than 50 kg / Palm).

We can start adding OF at the end of October-December through circular spreading in the DP basin then mixed with surface soil up to depth, which does not affect the root system. The goal is to encourage the DP growth and strengthen its immunity against diseases and resistance to pests and configured to good production.

2. **Chemical Fertilization(CF):** The adding of CF in addition to the OF, in particular the compound one enriched with trace elements, will work to increase the productivity of palm significantly compared with non- fertilized. This has its effect on improving the fruit quality in terms of weight, size, and the fruit flesh. They can be added during the same period for the organic fertilizer by:

- 150 g / year of offshoot's age for ages younger than 10 years.
- 1.5 kg compound fertilizer / mature palm for ages greater than 10 years.

This means that the total amount of fertilizers for trees greater than 10 years is:

- 50 kg / palm organic fertilizer + 1.5 kg / palm compound fertilizer with trace elements

Notes:

- The DP generally needs: 200 g nitrogen +75 g phosphorus +100 g potassium / year of age (high nitrogen fertilizer).
- When require to support the growth of female spathes we can add during January 100 g of urea / year or 1 kg per palm that exceeded 10 years.
- The following element's compounds can be mixed with the compost as it's added :
  1. Superphosphate for phosphorus supplies.
  2. Potassium sulfate for potassium supplies.
  3. Copper sulfate for copper supplies.
- Urea can be mixed with compost only before its usage. It considered avoiding mixing the nitrate compounds or ammonium sulfate with compost.
- Avoid using untreated compost from unknown origin, being one of the sources of infections.

### Pruning

It is preferably to conduct and complete the operations of frond removal and rachis base cutting during December - January, when the numbers of weevil insects as little as possible, while avoiding cutting any green frond.

### Frond Removal

The process of cutting dry fronds (after 3-7 years of their life) from the bottom of the DP canopy (can be made after Fruit bunching when required), or the damaged or diseased ones.... and any other reasons.

It's done to the level that supports the above green fronds and facilitates the process of climbing and working in the surround heart of DP canopy. It includes the bunch's removal and the old Rachis Bases. The pruning works to liberate the crown, increase its ventilation and exposure to the sun and facilitate working through it to discover any injuries or infections. (Generally the mature and good cared DP tree produces 15-20 fronds annually).

To protect the DP canopy and the bases of the lower green fronds against the climatic fluctuations, it is recommended to leave at least two lines of pruned dry fronds without cutting their rachis bases and consider not cutting any green frond.

## Rachis Base Cutting

It done by cutting the outer part of the remaining rachis after the pruning process (1-2 years after pruning) in a sloping cut to the outside. Such a process can spare the palms from the insects attack (red palm weevil and bunch's borer), which prefer to hide and lay their eggs in such places (where dark, safe and appropriate niche thermally).

Note: Rachis base cutting not recommended to conduct for the new DP trees only after 7 years from their cultivation and upon reaching the height of 1.5 –2 m, taking into account not to remove any green fronds from them (except when necessary to facilitate their care or when they touching the soil surface).

## Spine's Removal

Usually take place before flowering to facilitate the pollination services; bunch's care and their distribution within the areas surround the heart of DP. During this operation, taking into account the full care to avoid any offences against the fronds.

## Offshoot's Removal & Planting

It is always necessary to liberate the DP mother trees from aerobic offshoots that grown on the trunk and the offshoots around it (their ages above 3 years). It is recommended not to leave more than three offshoots around each palm to encourage the growth of other offshoots, facilitate the services of mother palms, minimize the attack by the insects, especially the red weevil (which prefers fleshy offshoots), maintain their health and safety and exclude the nutritive depletion.

Usually the process of offshoots removal from their mothers and their planting may conduct in the spring: March-May or in the autumn: August-October. The preferable season under the local environmental conditions is autumn, where the survival percentage can exceed 80%.

## Treatment of Cutting & Wounds Areas

It is necessary, after the pruning or rachis base cutting or offshoots removal or for any broken fronds and bunches, taken into account to close or treat the injured areas to prevent the odor emissions that attract the insects, especially the red palm weevil.

## Pollination

Pollination is one of the most important and delicate biological processes that could limited the level of date's quality and productivity. Therefore it is necessary to pay a serious attention from the beginning of the emergence of early mature spathes (end of January - February) to proceed the male palm trees from dry fronds and spines and

facilitate their collection before pollen's blowing out. After the confirmation of good analysis of pollen's efficiency, whether stored or new, we have to prepare the pollens for pollination. For the purpose of pollen's preservation, it is preferable to use the paper bags to cover the male spathes while monitoring the female spathes bloom especially for early flowering varieties in order to pollinate them successively, this operation also continue during March.

Pollination process takes place, usually in the morning and within the range of 25-35 °C, during February-March and April and in accordance with the blooming-time of female spathes. This varies according to different varieties and environmental areas. Some are required immediate pollination after the cracking of the female spathes cover (sage and Ashrasi) and the other can be extended from 10-15 days ( Lulu, Jish Habash, khistawi). Although stigmas of female flowers remain receptive for several days, it is better to pollinate the inflorescences as soon as cracks open. Most of varieties must pollinate during the 2-4 days and before strand's greening. It is advisable to refrain pollination during rainy or windy weather. After the verification of the quality of male varieties and their spathes ripeness, and providing the entire requirements of pollination we can be setup to carry out the process.

During the manual pollination, we inserted 6-24 strands of male flowers in each inflorescence and covered all directly with punched paper bags (Bagging) to support the fruit hold percentage, increase the quantity and quality of production and reduce the incidence of Lesser Date Moth insect (Humera).

The automated pollination contains the processes of pollens' extraction and their automated delivery to the stigmas of female spathes. The amount of used pollens varies depending on their vitality and varieties, noting that the effect of pollens on the fruit quantity and quality also linked with used male variety.

The pollination is one of the most effort processes in comparison with other DP care services. Therefore, it requires action to reduce these efforts through the use of skilled labor in order to ensure high success rates in shortest time and through the adoption of automated pollination, which has the effective impact on raising the economic returns of DP cultivation.

## Fruit thinning

### 3. Strand's thinning

This first stage conducted during February - March and after 2-3 days of cracking of the female spathes (before pollination). It is a favorite stage for varieties that have long strands, and are either:

- To cut off the end of the strands by 25% (7.5 -10 cm) and leave approximately 50-60 strands per each spathes.
- Remove the strands by 30% from the heart of spathes.

The general advisable practices to remove strands from different places of each spathes or cut their ends by a third for long strands varieties, such as: Barhi, Khesab and Deglet Nour or cut a fraction of the strands or do not cut anything, as in short strands varieties, such as: Khalas, Hallaway and Khadrawy. Later it also advised to remove a number of the fruit per each strand as in varieties: Naghal, Barhi, and Madjool.

#### 4. bunch's thinning

This second stage conducted, during the period from mid-March until mid-May depending on DP varieties and after insuring the completion of pollination, by thinning the bunches and maintaining 6-8 bunches per each mature healthy palm that has 9-12 green fronds per each bunch and this rate will vary according to variety, age and service.

In order to minimize the load of the DPs and for investment purpose, it's advisable to direct their energy consumption towards improving the fruit volume and quality by taken into account to remove the following bunches during this phase:

- Bunches with small and weak fruits load and which close to DP heart.
- Non-pollinated and poor-pollinated bunches.
- Infected and late emerged bunches.
- Bunches emerging between the old fronds sites (weaken growth)

The process of bunch's thinning requires into account the balance of bunches' distribution (load distribution) to prevent the possibility of any impact on palm curve, especially for fast-growing varieties such as: Barhi and Lulu.

To estimate the size of this process we have to consider the impacts of many variations; DP age, variety and growth status that affected by general and local environmental conditions.

This has been proven that the highest yield and the best fruit qualities can be obtained when the thinning is 25% of the bunch's number and 10% from the length and the number of strands in the bunch.

### Bunch Curving and Support

It is conducted by bending the bunches via pulling them among the fronds located on the perimeter of the DP canopy, making a regular and balanced distribution around it to facilitate care services, harvesting and confirming its safety .

It is carried out on the early stages of fruit ripening - during the two phases of Kimri and Khalal ( Beesir )

from the mid or the end-April to mid-July ( April-July ), so after a month to a month and a half on the process of pollination, depending on the variety and particularly before wooding or hardening the stalks of long bunches.

The bunch supports complementary and enhanced bending process, where it conducted by linking the bunches (prefer fibrous cords) from their stalks with the upper fronds or carry them (whichever is the best to support the bunch safety in the right position.

The advantages of this process are; to examine and observing the bunches health and fruits, make sure they are free from any injuries (especially Lesser Date Moth) and to avoid any breakage that may happened as with non- supported bunches.

### Fruit Bagging

This process conducted, at the beginning of fruits discoloration while entering into Beesir stage, by covering bunches by net bags in order to avoid fruits fall, facilitate their collection and maintain the cleanliness of all parts of DP trees and the basin areas, as well as protect them from birds and reduce the chances of being attacked by insects

### DP Sanitary Care

It is necessary to perform a periodic monitoring for the health status of palm plantations with adoption a calendar for integrated control operations: bio-mechanical as well as protective, when needed to use organic pesticides. As it is not advisable in any case to use chemical pesticides in the cases of minor injuries, note that the usual spraying of pesticides has no significant effect on these pests, especially when the infection inside the Palm.

To rehabilitate the neglected farms should be adhered to implement the following acts:

- Get rid of all dead, diseased and weak growth trees and all dead organic waste according to the approved rules.
- Emphasis on sterilization of wounds after pruning the affected vegetative parts and spraying appropriate fungicides according to the approved conditions. With a constant concern for sterilization machines and tools used in pruning especially during the transition from sick to healthy tree.
- Implement all the operations of DP care according to the approved schedule calendar. Making sure to remove the fiber and all the dead waste and tissue from the hidden media of rachis bases also it is advisable to choose a good treated organic fertilizer.
- Work to ensure the regularity of palm spacing depending on the variety and site requirements to facilitate mechanization and maintenance services.

- Monitor the quality of water sources for irrigation and their suitability in terms of freedom of any neither pathogen nor Insect cause.

### Notes:

- Emphasize exceptional choice of strong male varieties donating good fertility and compatible with planted varieties because of their impact on the quantity and quality of the yield and harvest period.
- On DP farms, the intercropping may contribute in minimizing the palm attraction to insects on condition that the soil has prepared well and the planting spaces of DP are adequately for grown varieties.
- Need to adhere strictly to the timing and the terms of correct control. Commonly, it is conducting randomly after symptom onset, the pests have disappeared and achieved their damages, and may be laid eggs (most resistant stage) that enhances in repeating the pest cycle.

### Yield's harvest

The yield of date palm trees passes through the following stages of growth and ripening:

- Hababok: 4-5weeks after pollination of female flowers (February- mid of March).
- Kimri stage: 5 - 6weeks after the former, it considered the longest stages of growth (mid of March -end of April).
- Beesir or Khalal stage: 3 - 4 weeks after Kimri (to end of May), like: Barhi, Khesab, khenazy, Lulu, Hilali, Samani, Zaghlool, Hayany and Khalas.
- Rutab stage: 3 - 4weeks after Khalal (June - the beginning of August), like: Naghal, Manaz and the varieties of high-value marketing like: Deglet Nour, Madjool, Segae, Sukkari, Anbara and many others that can be matured industrially.
- Tamor stage (full maturity): as in most varieties, like: Dayri, Halawy, Khadrawy, Thoori, Zahidi, Sayer and Aliig.

Therefore, on the months of May-June start preparing for yield's harvest operations and once the very early varieties entering the Rutab stage to prevent the loss of their marketing value. And, following these operations at the end of July for the moderate early varieties and for the most varieties in August - September where the preferred harvest at the beginning of Tamor stage. In order to maintain the quantity and quality of the dates yield and at the lowest loss level requires an attention to the following basics:

- The dates harvesting must conducted according to the priorities of maturity periods of varieties and consumer desire for the particular variety in order not to lose their market value.

- Preparation of all supplies, equipment and machinery for this process, collection, sorting and drying of the crop before marketing fundamentalist.
- Noted, if operations of harvesting, collecting and drying are not set up well according to the proper rules, the crop would be subjected to damage in quantity and quality.

### Negative Consequences Of Negligence The Scheduling Of DP Care

The absence of schedule of DP care will work on providing suitable hidden media or environments to stimulate the spread of many pathogens and insect. For example: neglect hoeing operations and good soil preparation would provide a middle course of many Borers proliferation within the DP basin, and the use of bad compost can be a major source for the spread of Bunch Borer.

It is worth noting, that the vulnerable and neglected palm farms provide suitable environments for exposure to many insect injuries, such as: Red Palm Weevil, Dubas, Lesser Date Moth, Date Spider Mite and many Date Palm Beetles, in addition to the risk of many fungal diseases, such as: Black Scorch Disease and Belaat Disease.

In addition to that these farms provide more encouraging and possibility of exposure to some physiological diseases (functional) through the interference of their degraded conditions with the effects of the local environment factors, for example: head curvature (top) and apex abnormality and fruits wilting and falling.

### Some mistaken and common practices

- Negative professionalism of laborer (adapted to unintentional negative practices) that contributes to decline the performance of care services.
- Improper care services, like: cutting the green fronds, left what intrudes and inhibits the DP growth and not caring to do all the services according to their norms.
- Pollinate the small new cultivated offshoots as well as the aerial offshoots that growing on and around their mothers.
- Wrong pollination that linked with low performance level, incorrect timing process and bad quality and incomplete maturity of the male spathes.
- Left the weaken bunches without thinning or those with very little fruit load and which have unbalanced scatter or bunches grown from the DP heart.
- Left bunches numbers that not commensurate with DP vegetative system (the total number of health green fronds).
- Bad investigation of the health status of palm plantation.

- Weak hiring of security and public safety controls during the maintenance operations.

### Basic measures in regularity of DP care services

- Secure of skilled manpower (foremen and workers), proportional to the size of DP care services (DP numbers and their varieties and age).
- Apply professional practices for all DP services according to their annual calendar taking into account the effects of variety and location.
- Provide all the supplies, equipment and techniques for facilitating the perfect performance of all DP services, proportional to the size of manpower.

### Recommendations

- Periodical verification to give the priority to add treated organic fertilizer to support soil fertility and improve its mechanical properties for the drainage and moisture retention, with permanent thought to invent or introduce any technologies that have economic feasibility.
- Apply preventive and protective controls through strict implementation of agricultural quarantine controls, as well as non-trading of any offshoots or infected palms (especially from and to nurseries or between different palm plantations) for the purposes of planting or marketing.
- Serious thinking to create adopted windbreaks designs to be established around the DP plantations, due to their significant impact in reducing the evapo-transpiration inside the protected farms that reflected positively on DP productivity.
- For the purpose of improving DP growth and production, it needs to adopt a study project to evaluate all DP marketing varieties and according to their environmental distribution across the emirates.
- To avoid the DP farms from many problems, researchers should work to identify cultivation zones of DP varieties according to the appropriate outcome of the environmental conditions for each definite variety.

The interest in such measures and others would contribute to cover the costs of water irrigation and various care services and can achieve a good return from the exports of various DP products which flows into support of food security and the national economy.

### As a general rule:

Replace the notion says: “for each disease or pest there is a pesticide”, by adopting the practical concept “that each disease or injury has its causes that must be treated and limit their impact.”

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Services	1		2		3		4		5		6		7		8		9		10		11		12		
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	
Irrigation Control	[Shaded]																								
Irrigation System Maintenance																									
Palm, Basins & Site Cleanliness	[Shaded]																								
Digging, Weeding	[Shaded]																								
Organic Fertilization																									
Chemical Fertilization																									
Pruning																									
Old Fronds & Bunches Removal																									
Rachis Base Removal																									
Spine's Removal																									
Offshoots removal and planting																									
Treat wounded areas																									
Collect Mature Male Spathes																									
Pollination & Bagging																									
Fruit thinning																									
Strand's thinning																									
Bunch's Thinning																									
Fruit Bunching																									
Fruit Covering																									
DP Sanitary Care	[Shaded]																								
Growth Stages of Palm Fruit																									
Hababok																									
Kimri																									
Bessir (Khalal)																									
Rutab																									
Tamor																									
Fruit Harvesting																									
Pest & Disease Control	Controllable by adoption of this calendar of DP care and by conducting the safe applicable measures of Integrated Pest Control (IPC)																								

