

Insect Pests of Date Palm, Current Challenges and Future Perspectives

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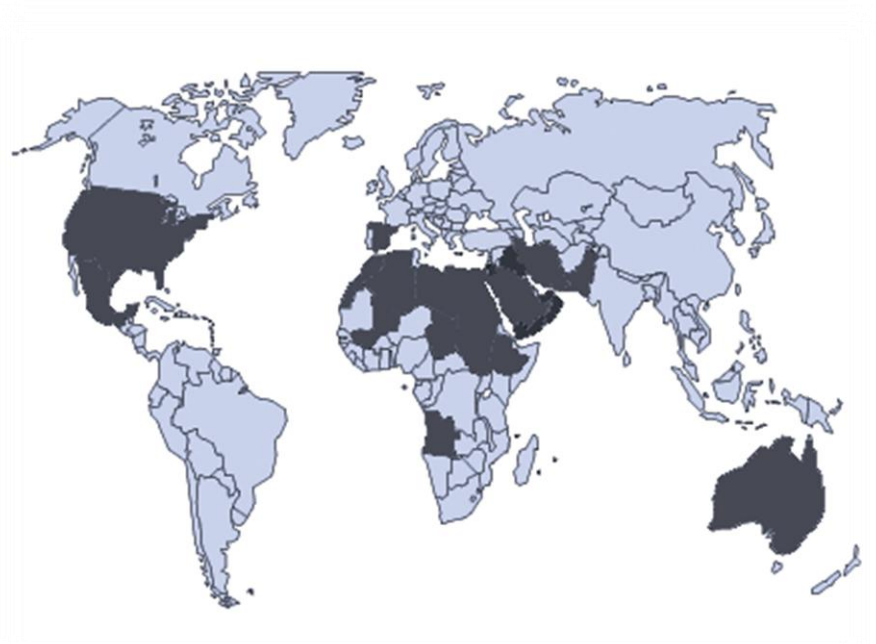
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Date palm Distribution

Mediterranean countries, Africa and part of Asia; introduced in North America and Australia

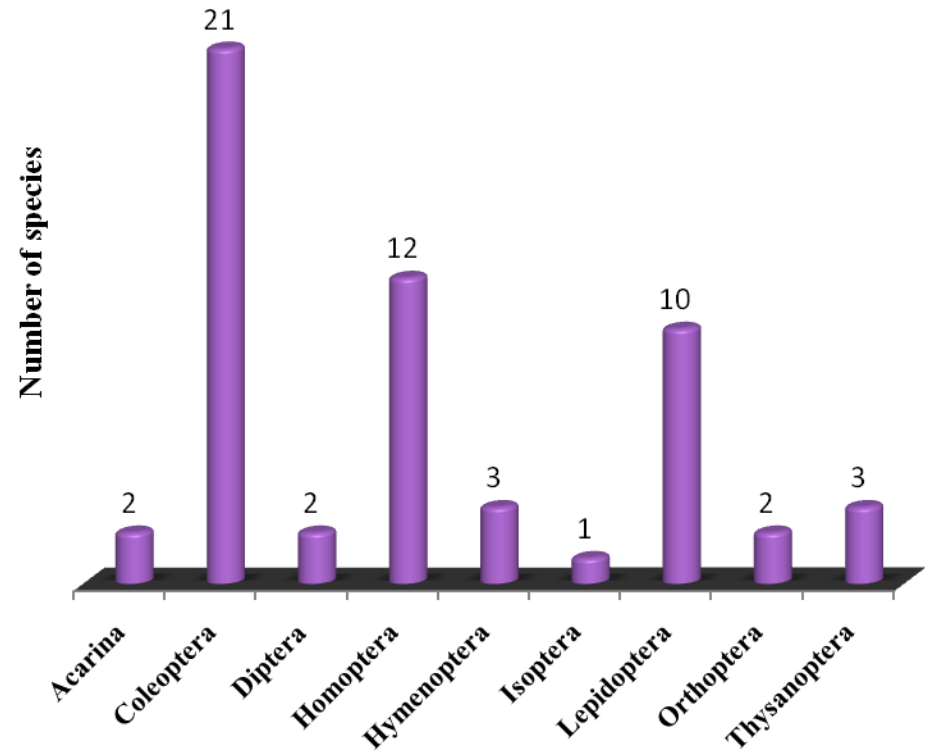
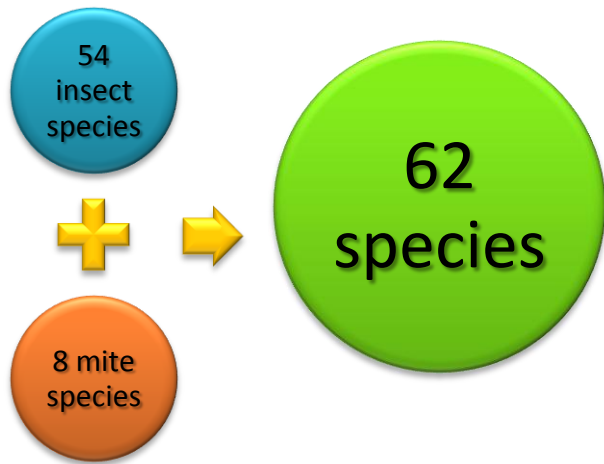
- 1 Pakistan
- 2 Iran
- 3 Iraq
- 4 Eritrea
- 5 Saudi Arabia
- 6 Oman
- 7 Egypt
- 8 Libya
- 9 Tunisia
- 10 Algeria
- 11 Morocco
- 12 Chad
- 13 USA
- 14 Mexico
- 15 Spain
- 16 Palestine/Israel/Jordan
- 17 South Africa
- 18 Namibia
- 19 Mauritania
- 20 Mali
- 21 Niger



I. Pests of Date Palm



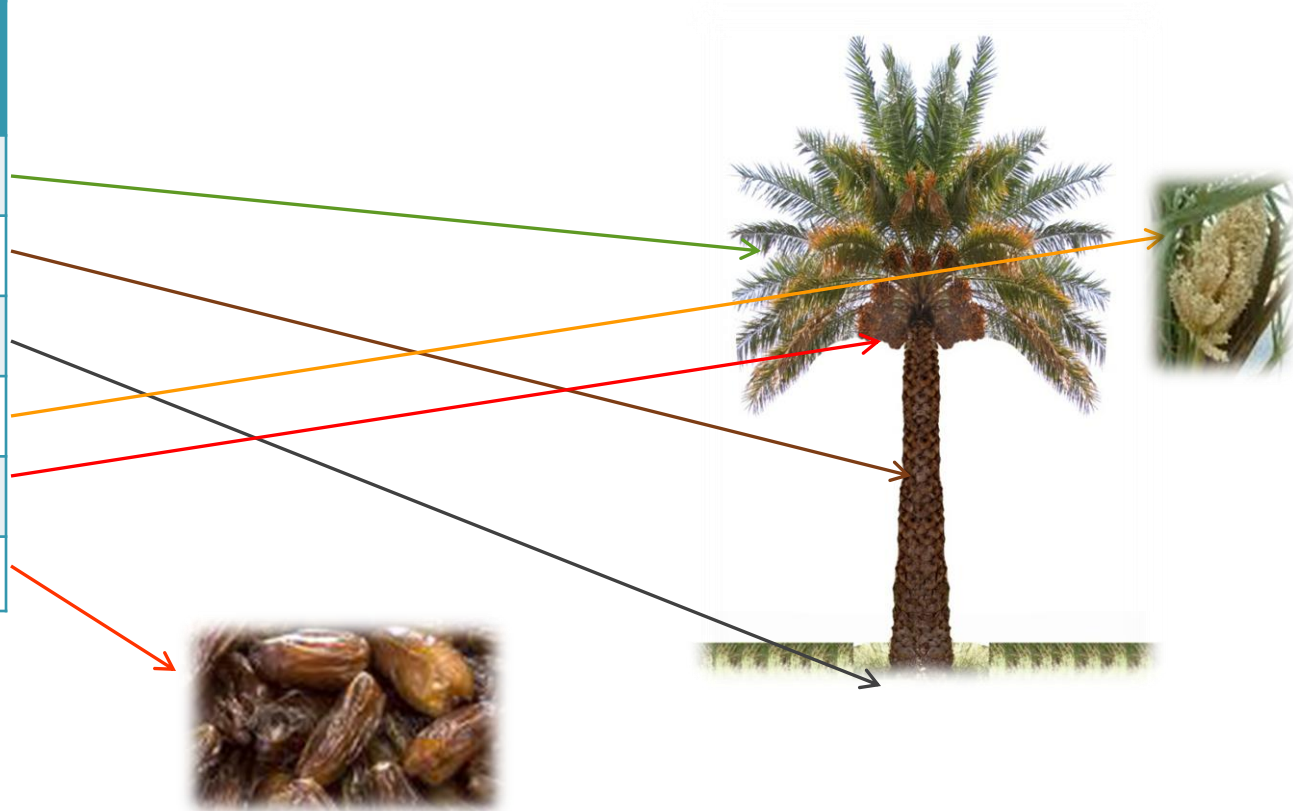
- About 62 species were reported on date palm around the world*



* El Haidari & Al Hafidh, 1986 ; Kinawy, 2005

Number of pest species recorded on different parts of date palm

Part of tree	No. of species
Leaves	23
Stem	3
Roots	1
Flower	5
Fruits	19
Stored date	11



Insect attacking date palm

● Sap-sucking species:

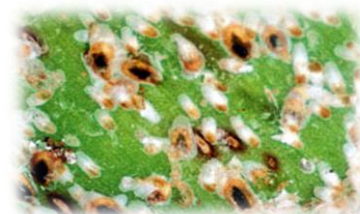
S. no.	Species	الإسم العربي	Family
1	<i>Aonidiella orientalis</i> (Newstead)	الحشرة القشرية الشرقية الصفراء	Diaspididae
2	<i>Asterolecanium phoenicis</i> (Ram. - Rao)	الحشرة القشرية الطرية الخضراء	Asterolecaniidae
3	<i>Fiorinia phoenicis</i> Balachowsky	حشرة نخيل التمر القشرية البنية المبطة	Diaspididae
4	<i>Maconellicoccus hirsutus</i> (Green)	بق الهبسكس الدقيقي القرنفلي	Pseudococcidae
5	<i>Nipaecoccus viridis</i> (Newstead)	البق الدقيقي الكروي	Pseudococcidae
6	<i>Ommatissus lybicus</i> Bergevin	دوباس النخيل (المتق)	Tropiduchidae
7	<i>Platypleura arabica</i> Myers	حشرة السيكاذا	Cicadidae
8	<i>Parlatoria blanchardi</i> (Targioni – Tozetti)	حشرة النخيل القشرية بارلتوريا	Diaspididae
9	<i>Perindus binudatus</i> Emeljanov	نطاطات أوراق فسانل النخيل	Cixiidae
10	<i>Phoenicoccus marlatti</i> (Ckll.)	حشرة النخيل القشرية الحمراء (الشمعية)	Diaspididae
11	<i>Planococcus citri</i> Risso	بق الحمضيات (الموالج) الدقيقي	Pseudococcidae



Planococcus citri



Ommatissus lybicus



Parlatoria blanchardi

All belonging to order Homoptera

Insect attacking date palm

- Borers:



Oryctes agmemnon



Rhynchophorus ferrugineus



S. no.	Pest species	الإسم العربي	Family
1	<i>Rhynchophorus ferrugineus</i> (Olivier)	سوسة النخيل الحمراء	Curculionidae
2	<i>Oryctes rhinoceros</i> (Linnaeus)	خنفساء وحيد القرن	Scarabaeidae
3	<i>Oryctes agmemnon</i> Burmeister	حفار عنوق النخيل	Scarabaeidae
4	<i>Oryctes boas</i> Fabricius	حفار عنوق النخيل	Scarabaeidae
5	<i>Oryctes monoceros</i> Olivier	حفار عنوق النخيل	Scarabaeidae
6	<i>Oryctes sahariensis</i> De Mire	حفار عنوق النخيل	Scarabaeidae
7	<i>Oryctes elegans</i> Prell	حفار عنوق النخيل	Scarabaeidae
8	<i>Jebusea hammerschmidtii</i> Reiche	حفار ساق النخيل ذو القرون الطويلة	Cerambycidae
9	<i>Phonopate frontalis</i> Fåhraeus	حفار سعف النخيل	Bostrychidae
10	<i>Coccotrypes dactyliperda</i> (F.)	خنفساء نواة التمر	Scolytidae

All belonging to order Coleoptera

Insect attacking date palm

- Pests attacking fruits:



Batrachedra amydraula



Oryzaephilus surinamensis

S. no.	Pest species	الإسم العربي	Order	Family
1	<i>Cadra (Ephestia) spp.</i>	دودة التمر أو دودة بلح الواحات	Lepidoptera	Pyralidae
2	<i>Carpophilus spp.</i>	خنفساء الثمار الجافة	Coleoptera	Nitidulidae
3	<i>Carpophilus hemipterus</i> (Linnaeus)	خنفساء الثمار الجافة ذات البقعين	Coleoptera	Nitidulidae
4	<i>Cryptolestes ferrugineus</i> (Stephens)	خنفساء الحبوب الصدئية الحمراء	Coleoptera	Cucujidae
5	<i>Ectomyelois (Myelois) ceratoniae</i> Zeller	دودة ثمار الخروب أو فراشة أكتوميلاويز	Lepidoptera	Pyralidae
6	<i>Ephestia dowsoniella</i> (Richard & Thompson)	فراشة داوسونيلا	Lepidoptera	Pyralidae
7	<i>Haptoncus luteolus</i> (Erichson)	خنفساء الننديولد الصفراء	Coleoptera	Nitidulidae
8	<i>Lasioderma serricorne</i> (Fabricius)	خنفساء السجائر	Coleoptera	Anobiidae
9	<i>Oryzaephilus surinamensis</i> (Linnaeus)	خنفساء الحبوب ذات الصدر المنشاري	Coleoptera	Silvanidae
10	<i>Drosophila melanogaster</i> Meigen	ذبابة الخل (ذبابة الدروسوفلا)	Diptera	Drosophilidae
11	<i>Bactrocera dorsalis</i> (Hendel)	ذبابة الفاكهة الشرقية	Diptera	Tephritidae
12	<i>Batrachedra amydraula</i> Meyer	الحميرة (دودة التمر الصغري)	Lepidoptera	Batrachedridae
13	<i>Oligonychus afrasiaticus</i> (McGregor)	عنكبوت الغبار (حلم تمر العالم القديم)	Acari	Tetranychidae
14	<i>Vespa orientalis</i> L.	الدبور الأحمر	Hymenoptera	Vespidae

II. Challenges In Pest Management



Challenges in pest management

1

Assessment of insect population

2

Chemical control



Assessment of insect population essential for:

➤ Monitoring the population dynamics of insects

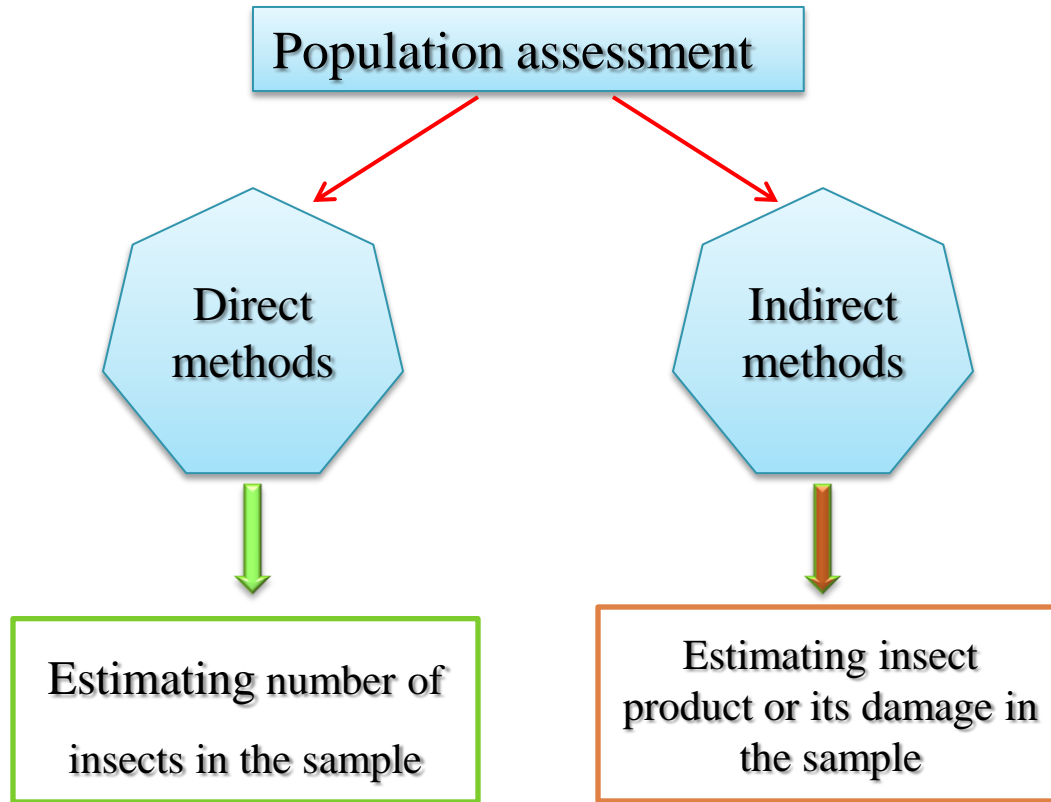
➤ Estimating efficiency of pest management

➤ Determining the economic threshold level of infestation



Threshold level is the point at which the pest or its damage becomes unacceptable.

Assessment of insect population



Assessment of insect population

Assessment of insect population on date palm mostly done by direct methods.



But

Height of date palm makes collection of samples very difficult



Ground application

- Ground power sprayers fail to cover the canopy of high trees

- In this photo, the main stream of sprayed solution reach to 6 m (A),
- Some drifts reach up to 8 m (B) away from the canopy

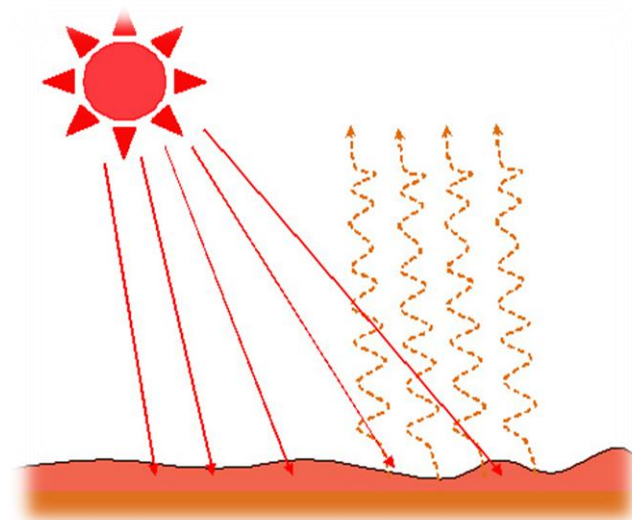


Aerial application

1. Inversion effect

Heating earth surface after sunrise generating temperature inversions.

Inversion causes the small droplets of pesticide to remain in the air and not deposited on the date palm canopy.



Aerial application

2. Under-dose of insecticide

Pesticide dosage for chemical control by aerial spray is mostly calculated upon the land area of the date palm orchards expressed in hectares.

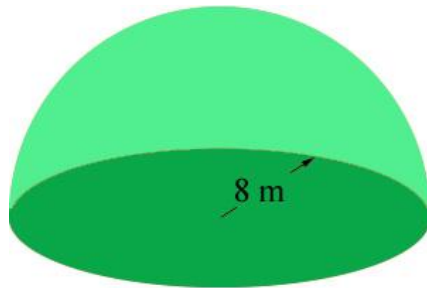


- Effective control requires 20-30 droplets per cm^2 of the targeted surface

Aerial application

- Under-dose of insecticide

- Crown of date palm tree is dome-like in shape.
- area of dome shape = $2 \pi r^2$



Aerial application

- Under-dose of insecticide

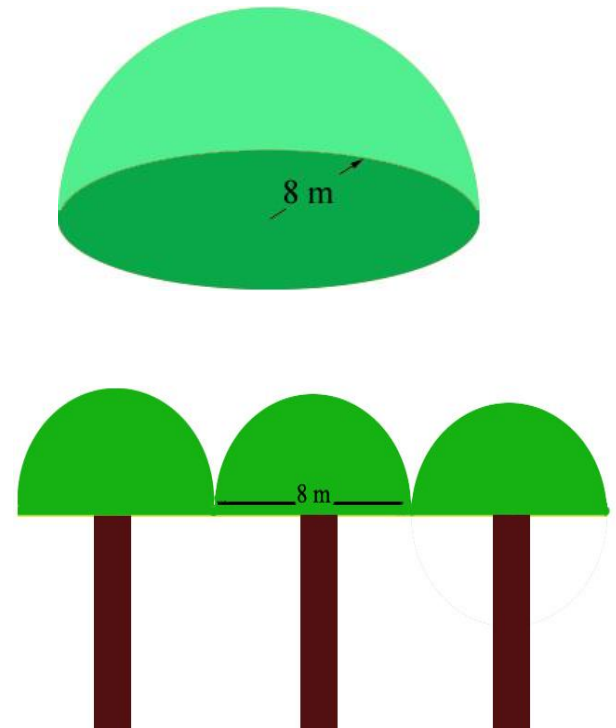
- Crown of date palm tree is dome-like in shape.
- area of dome shape = $2 \pi r^2$

Area of crown / mature tree = 100.5 m^2

Number of date palms per ha=150 trees

Total area of canopy per ha= $150 \times 100.5 = 15,072 \text{ m}^2$

Hectare = $10,000 \text{ m}^2$



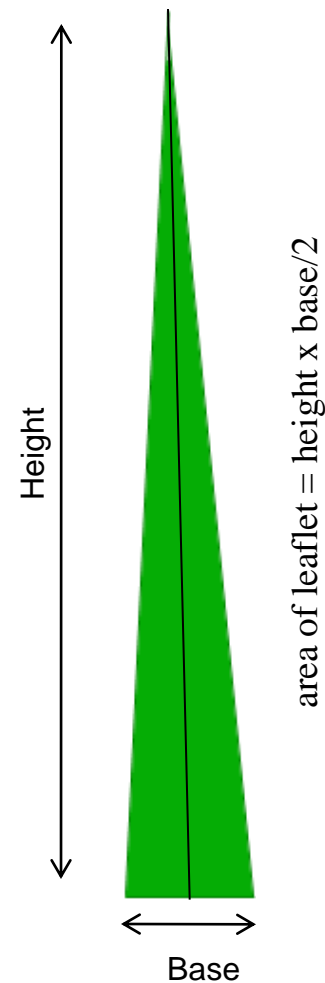
Aerial application

- Under-dose of applied insecticide

Calculation of canopy area by calculating the area of the leaflets.

No. fronds/tree	100*
No. of leaflets/frond	150*
Leaflet length	50* cm
Leaflet width	3* cm
Area of leaflet	0.0075 m ²
Total area of canopy/tree	112.5 m ²
No. of trees/ha	150
Total area of canopy/ha	16,875 m²

* Average figures according to FAO, 2002. Date palm cultivation, 156, Rev. 1.



III. Perspectives in Pest Management of Date Palm

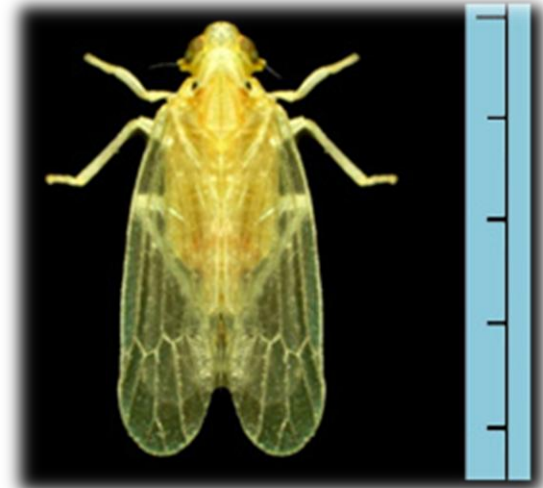
Dubas bug *Ommatissus lybicus*

As an example of foliage-feeding pests

Ommatissus lybicus

- Order: Homoptera
- Family: Tropiciduchidae

- Known as “Dubas” in Arab countries
- English name is “Dubas bug” or “Old world date bug”

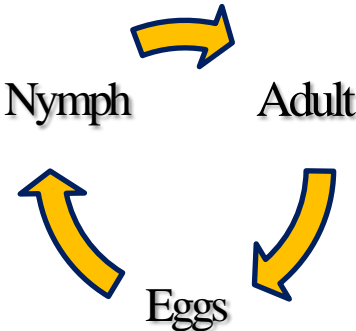


Ommatissus lybicus

Life cycle



5 instars



Ommatissus lybicus

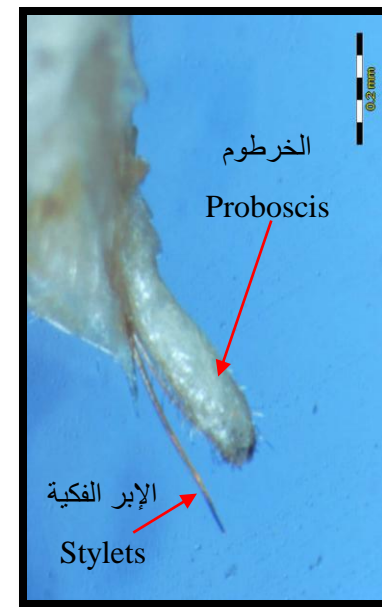
Direct damage: Nymphs and adults sucking copious amount of sap

150 liters
/ tree

Spring
gen.

130 liters
/ tree

Autumn
gen.



Ommatissus lybicus

Damage

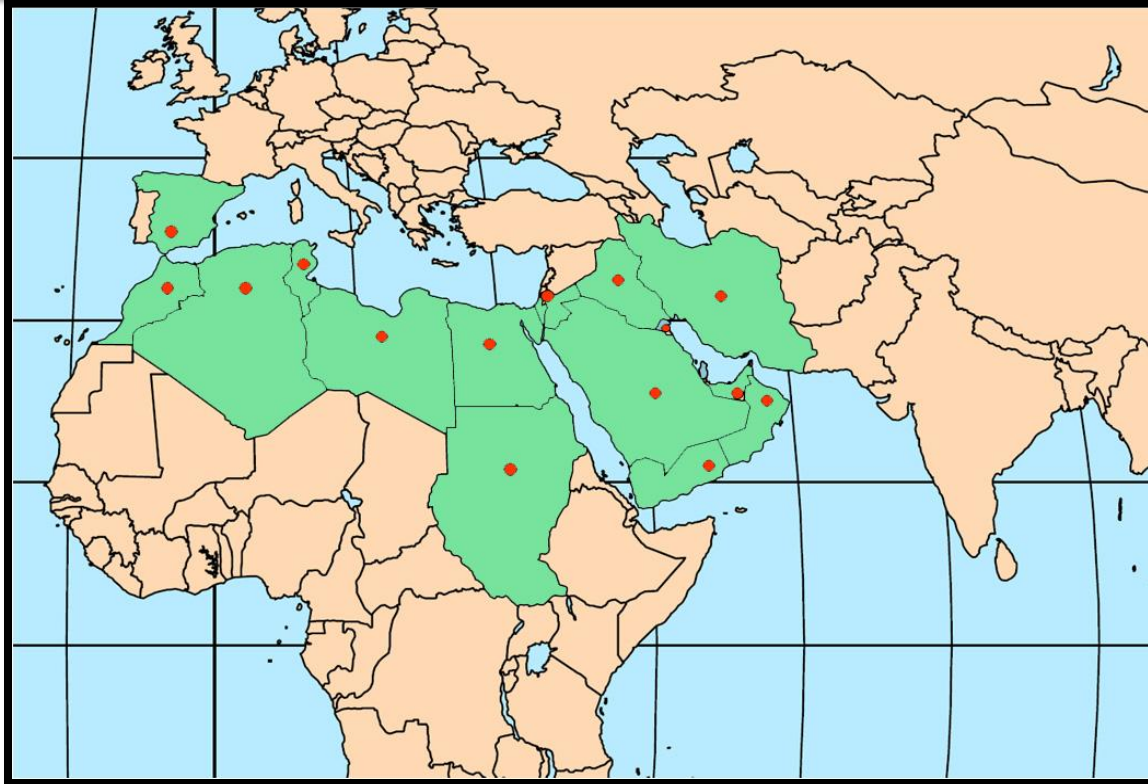
Indirect damage: egg deposition



Adult ovipositor



Geographical distribution of O. lybicus



Assessment of dubas population by using honeydew as indicator

Indirect assessment of insect population can be carried out by measuring the insect products (Southwood, 1978)

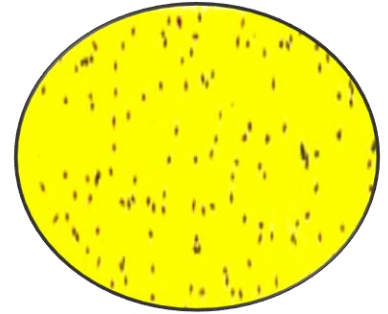
Honeydew secretion is a good indicator of dubas feeding activity (Al-Abbasi, 1988).



Honeydew droplets collected on Water sensitive paper and used as an index of dubas population (Mokhtar & Al Mjeni, 1999).

Honeydew droplets collected on Water sensitive paper

Droplets on impaction change the yellow dye on the paper to blue



Honeydew droplets as index for dubas population.

Number of honeydew droplets / water sensitive paper / (1 h)

significantly correlated with



Population of *O. lybicus* expressed as number of insects / leaflet
(Mokhtar *et. al.*, 2001)



Water sensitive paper

Honeydew droplets as index for dubas population.

Prediction for spring generation

$$y = 5.189 + 0.1696 x_1 + 0.2032 x_2 - 0.2244 x_3$$

y = the predicted no. of insects per leaflet;

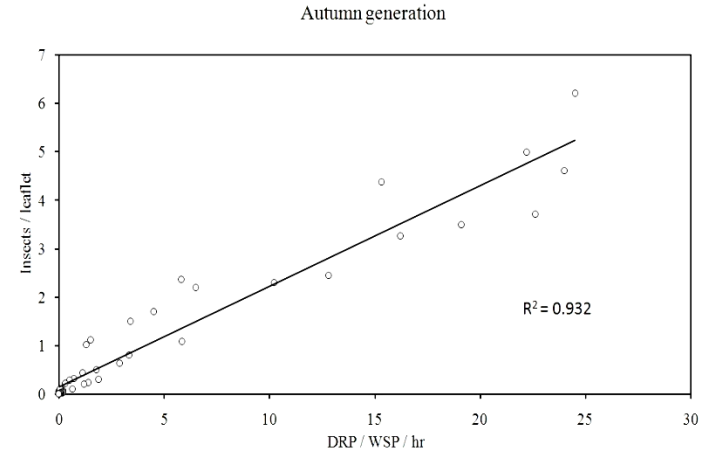
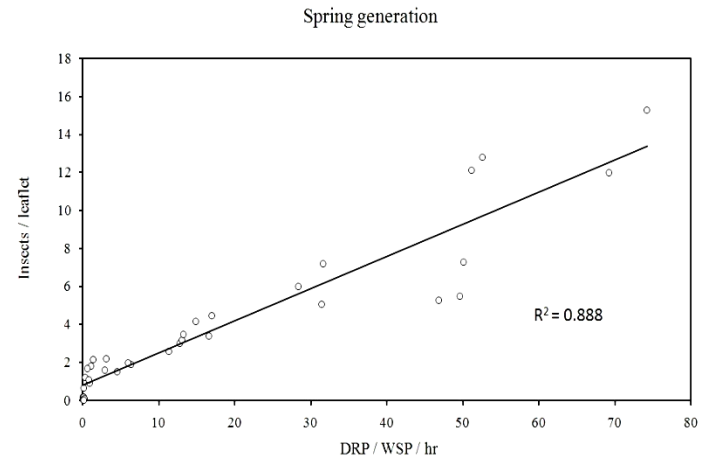
x_1 = observed no. of honeydew droplets / water sensitive paper / h

x_2 = no. of weeks after the first hatching;

x_3 = the mean temperature

Prediction for autumn generation

$$y = -0.4733 + 0.208 x_1 + 0.0092 x_2 + 0.0211 x_3$$



Conventional method

Honeydew method

Climbing the trees is needed

No climbing the is needed

Risk of underestimating is very high

No disturbance to insects

Harm caused by spines is possible

No touch with tree

Biological interaction as a promising tool

Date palm ecosystem consists many biological control agents.

Predators

Cheilomenes sexmaculata

Coccinella septempunctata

Coccinella undecimpunctata

Ischiodon aegyptiaca

Scymnus sp.

Chrysoperla carnea

Egg predator mites

Runcinia sp. & *Bocharita* sp.



Coccinella undecimpunctata



Jumping spider



Cheilomenes sexmaculata



Runcinia acuminata

Many Promising Biological Control Agents in Date Palm Ecosystem

Parasitoids



Bocchus hyalinus
(Hymenoptera: Dryinidae)

External parasitoid



Pseudoligosita babylonica
(Hymenoptera: Trichogrammatidae)



Aprostocetus sp.
(Hymenoptera: Eulophidae)

Egg parasitoids

Many Promising Biological Control Agents in Date Palm Ecosystem

In a field experiment a date palm grove was kept without any chemical treatment

❖ The population of dubas estimated in weekly interval for 16 generations

❖ Population averaged

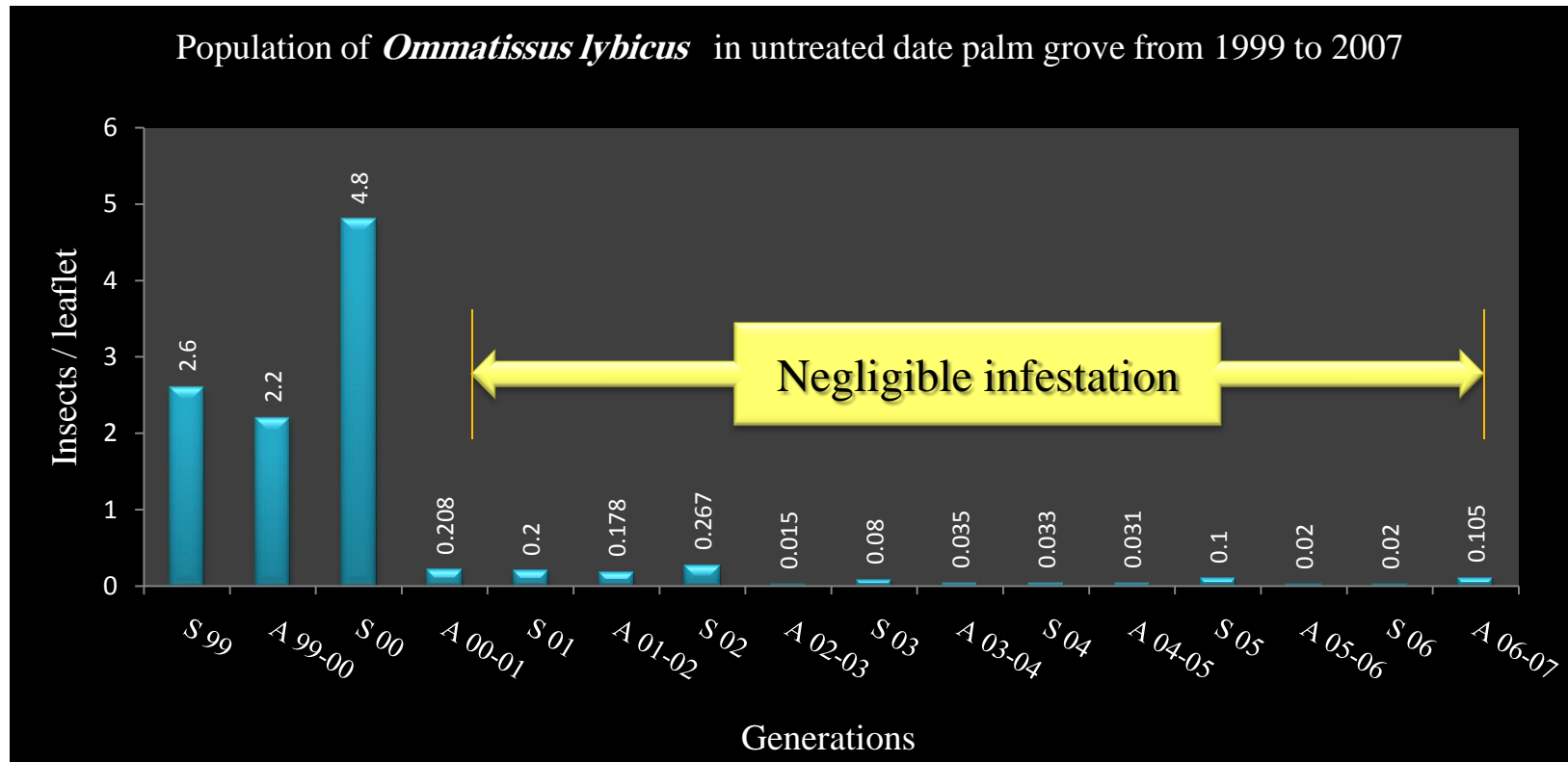
2.6 insects / leaflet in spring generation of 1999 (high infestation)

4.8 insects / leaflet in spring generation of 2000



Infestation became negligible from 2001

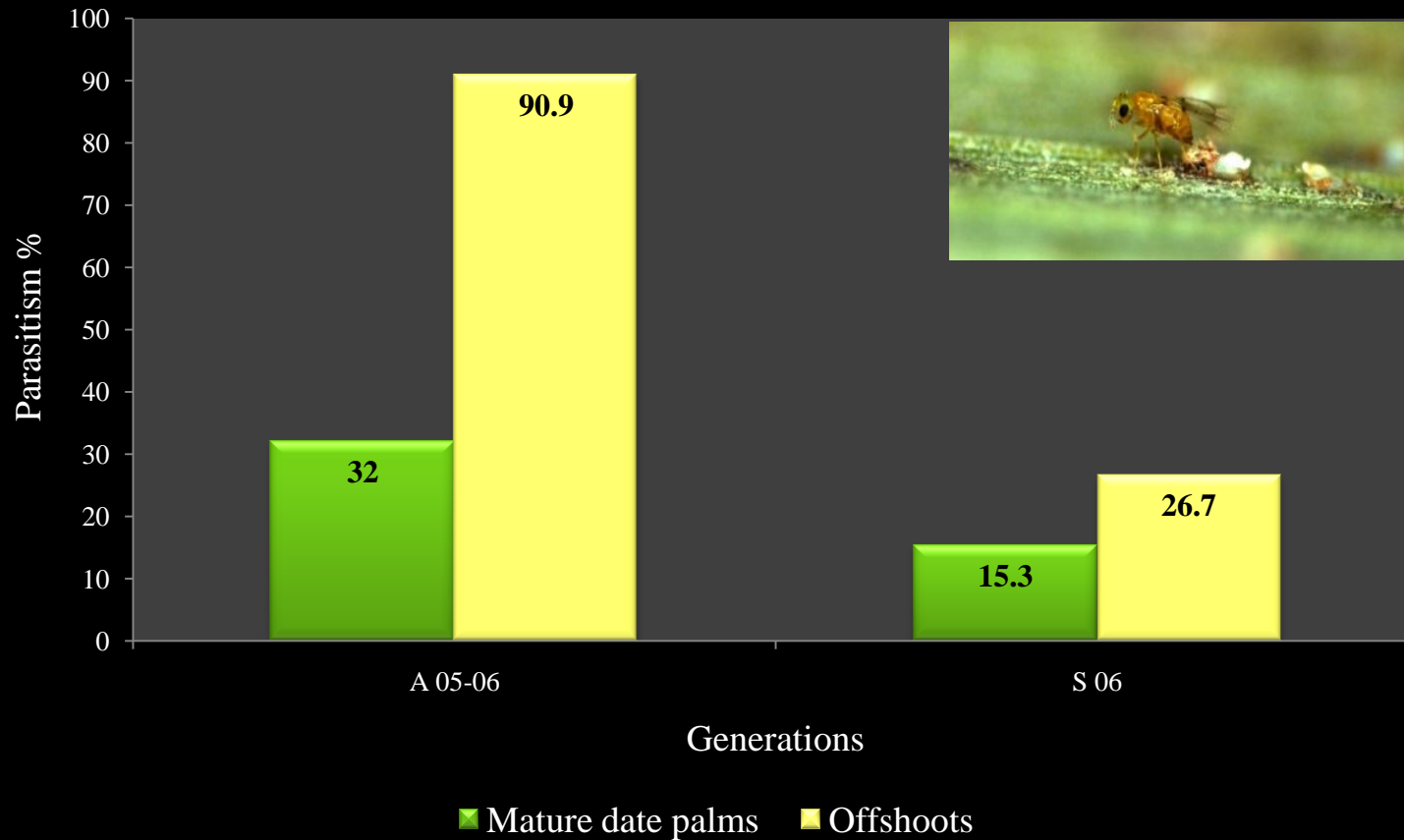
Preserving date palm ecosystem enable the biotic and abiotic factors to check pests.



Population of *Ommatissus lybicus* on date palm in untreated village (Al Fateh, Bahla- the Sultanate of Oman) for 16 consecutive generations. (Mokhtar *et. al.*, 2007)

Preserving date palm ecosystem enable the biotic and abiotic factors to check pests.

Parasitism percentage with *Pseudoligosita babylonica* on eggs of *Ommatissus lybicus*



Conclusion



Proper method for population assessment should be carefully selected



Modification of ground spraying machine is needed to match date palm



Calculation of insecticide dosage for aerial application should be verified



Date palm ecosystem should be preserved to activate the biological interaction

Thank you