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Economic importance of date palm pests in Aljouf region, Kingdom of Saudi Arabia

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Abstract: The Insect pests attacking date palm trees at Aljouf region,Kingdom of Saudi Arabia, were surveyed throughout two successive years in Sakaka. Survey covered existing insect species, stage(s) causing damage, frequency of occurrence, period of occurrence and attacked plant parts).Eleven insect pests belonging to nine families from the orders Homoptera, Coleoptera, Lepidoptera and Hymenoptera were recorded. The most dominant and economically important pests were four scale insects (*Asterolecanium phoenicis* Rao., *Parlatoria blanchardi*, *Phoenicococcus marlatti* and *Fiorinia phoenicis* Bal.,) and *Batrachedra amydraula*, *Ommatissus binotatus lybicus*Bergevin, *Oryctes spp*. and *Phonopate frontalis* Fahraeus. Fermented or decayed damaged plant parts hosted Drosophila larvae and/or adults.
Key word: *Phoenix dactylifera*, Date palm tree, Insect Pests, Economic importance.

Introduction

Date palm tree *Phoenix dactylifera* L. is mentioned in the holy Quran. It has a special consideration in our hearts as Muslims and Arabs. This tree is an important component of Arab World Flora. Date palm tree is considered one of the fruit trees that belong to Arecaceae. Date palm is one of the oldest known fruit crops and has been cultivated in North Africa and the Middle East for at least 5000 years (Zohary and Hopf, [1]). The exact center of origin of date palm is unknown, but it is most likely originated from ancient Mesopotamia (Southern Iraq) or western India (Wrigley, [2]). From the center of origin, date palm cultivation spread throughout the Arabian Peninsula, North Africa, and the Middle East. Date palm culture had apparently spread into Egypt by the middle of the second millennium BCE, the spread of date palm cultivation later accompanied the expansion of Islam and reached Southern Spain and Pakistan. The Spanish were the first to introduce date palms outside the Arabian Peninsula, North Africa, the Middle East, South Asia, carrying them to America (Nixon, [3]). During the past three centuries, date palms were introduced to new production areas in Australia, India/Pakistan, Mexico, southern Africa, South America, and the United States (Chao and Krueger, [4]). Arab countries possess 70% of world's date palms and responsible for 67% of the global date production (Juhany, [5]). The 10 top date producing countries in the world are Egypt, Saudi Arabia, Iran, United Arab Emirates, Pakistan, Algeria, Sudan, Oman, Libya and Tunisia (Kader and Hussein, [6]).

Date palms are attacked by many pests and diseases and their nature and severity vary with cultivar, location, weather and cultural practices (Zaid *et al.*,[7]). Factors that negatively affect date palm production,

particularly in traditional date cultivation include crowding of trees, retention of old or unproductive trees, planting of mixed cultivars or seedlings, salt accumulation, poor drainage, insufficient irrigation, fertilization or tillage, lack of insect pests and diseases control, competition with other crops and weeds, soil degradation and water scarcity (Carpenter, [8]). The most comprehensive publication available on pests and diseases of date palm was given by Carpenter and Elmer (Carpenter and Elmer, [9]) who reported 54 species of mite and insect pests of date palm worldwide. Iraq (Al-Jboory, [10]), Kuwait, Bahrain and United Arab Emirates and Yemen (El-Haidari, [11]), Saudi Arabia (Hammad and Kadous, [12]). The objective of this work is to make an updated, list of date palm mite and insect pests worldwide that can serve as baseline for more comprehensive data base. In this work, the date palm arthropods are classified into pests and are listed, according to their preferred part on the tree and economic importance.

Materials And Methods

Survey of the insect pests attacking date palm trees in Aljouf region, Kingdom of Saudi Arabia, was carried out at Sakaka city, from September2015 until October 2016. Several palm growing locations, scattered all over the region, were inspected for insect infestations once every month. At any selected location, five random trees-together with their offshoots-were carefully examined. Inspection covered all plant parts (e.g. roots, stem, leaflets, leaf mid-rib, spathes, female flowers and fruits). Any existing insect stage(s) or infestation symptoms were identified on-site as far as possible. In case of uncertainty, samples of the occurring stage(s) were transferred in suitable containers to the laboratory for proper identification. Laboratory identification of the specimens was made either under the stereoscopic binocular or after mounting on microscopic slides. Whenever further identification assistance was required, the specimens were referred to the appropriate taxonomist(s) at the Entomological Collection Division, Department of Pests and Plant Protection, National Research Centre, Dokki, Cairo, Egypt. Monthly examination of the trees further included an arbitrary evaluation of the frequency of occurrence of the surveyed insects (as rare, frequent or common).The period of occurrence of every surveyed insect pest was also approximately determined.

Results

A list of the insects recorded on date palm trees in Sakaka , Kingdom of Saudi Arabia, is given in (Table 1). The obtained results show that, date palm trees were subject to infestation with 11insect pests belonging to 9 families from the orders Homoptera (3 species), Coleoptera (3 species), Lepidoptera (2 species) and Hymenoptera (1species). Larvae and adult flies of *Drosophila melanogaster* Meigen. (Drosophilidae: Diptera) were also seen during autumn (September-November) on the fermented fruits primarily attacked with other pests.

Table (1): Insect pests associated with date palm cultivated at Sakaka in Aljouf region, 2015 and 2016.

No.	Common name	Scientific name	Family	Order	Attacked plant parts	Occurrence
1.	Date palm Dubas bug	*Ommatissus binotatus* lybicusBergevin	Tropiduchidae	Homoptera	Lt, Ft & Mr	Apr.- May
2.	Green Soft Scale	*Asterolecanium phoenicis* Rao.	Asterolecaniidae	Homoptera	Lt & Mr	Sep. - Dec.
3.	Date palm White scale	*Parlatoria blanchardi* Targ.	Diaspididae	Homoptera	Lb, Lt, Ff & Ft	Mar. - Dec.
4.	Date palm Red scale	*Phoenicoccus marlatti* Cockerell.	Diaspididae	Homoptera	Lb, Lt, Ff &Ft	Mar.- Dec.
5.	Date Palm Brown Flat Scale	*Fiorinia phoenicis* Bal.	Diaspididae	Homoptera	Lt & Mr	Mar.- Dec.
6.	Frond Borer	*Phonopate frontalis* Fahraeus	Bostrychidae	Coleoptera	Ff &Mr	Jan.- Dec.
7.	Fruit Stalk Borer	*Oryctes spp*.	Scarabaeidae	Coleoptera	Mr & Ft	Apr.- May

8.	Red flour beetle	*Tribolium castaneum*(Herbst)	Tenebrionidae	Coloeptera	Ft	Dec.- Jan.
9.	Lesser date moth	*Batrachedra amydraulaMeyrick*	Cosmopterygidae	Lepidoptera	Ff &Ft	Apr.- Aug.
10.	Ephestia moth	*Ephestia spp*	Pyralidae	Lepidoptera	Ft	Sep.- Dec.
11.	Oriental wasp	*Vespa orientalis*Fab.	Vespidae	Hymenoptera	Ft	Sep.- Oct.

Lb: leaf base. Lt: leaflet. Ff: female flower. Ft: fruit. Mr: mid- rib


Fig. 1


Fig. 2

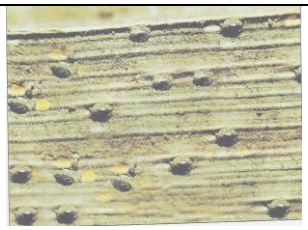
Fig.3


Fig.4

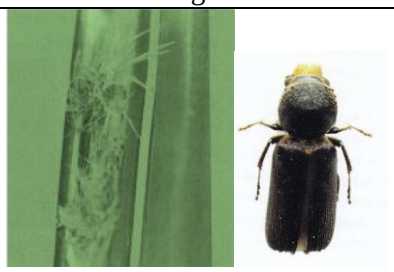
Fig. 5


Fig. 6

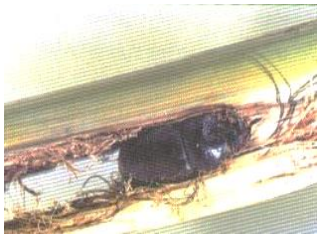
Fig. 7


Fig. 8


Fig. 9


Fig. 10


Fig. 11

***Ommatissus binotatus lybicus Bergevin* (Homoptera: Tropiduchidae).** Adult and nymph are the Infesting stages; it was observed that it suck the sap from the leaflets, midrib of the frond and the fruit stalk (Fig.1). The part attacked exuded sap from the punctures made by the insect mouthparts. The insects excreted honeydew (Fig. 2). Few adults and nymphs were found during the survey between 2015 and 2016, particularly in Apr. and May.

***Asterolecanium phoenicis* Rao (Homoptera: Asterolecanidae).**

Adult is the Infesting stage, it was observed that it suck the sap from the leaflet, midrib and bunches (Fig. 3); infested places became discolored, turning yellowish green. This scale was found mainly on the midrib of the leaves and on upper side of the leaves. It was noticed in all visited fields in Sakaka2015 and 2016 but with inconsiderable damage.

***Parlatoria blanchardi* Targ. (Homoptera: Diaspididae).**

Adult is the Infesting stage, it was observed that it suck the sap from the leaflet, midrib and the dates, under the scale, a discolored area was observed on leaflet, turned yellowish then darker as a sign of dryness. Heavy infestation caused the frond to prematurely drying. This scale was found mainly on the leaflet specially the basal part. It was noticed in all fields in Sakaka2015 and 2016.

***Phoenicococcus marlatti* Cockerell (Homoptera: Diaspididae).**

Adult is the infesting stage, it was observed that it suck the sap from the green frond bases leaving grey to brown spots. It was mainly found at the fronds that cover with the fiber material of the tree. It was found in all visited places in Sakaka between 2015 to 2016. It could be considered a secondary pest.

***Fiorinia phoenicis* Bal.(Homoptera: Diaspididae).**

Adult is in the Infesting stage, it was observed that it suck the sap from the green frond bases leaving brown spots(Fig. 4). It was found in all visited places in Sakaka between 2015 to 2016.

***Phonopate frontalis* Fahraeus(Coleoptera: Bostrychidae).**

Adult is the Infesting stage,It was observed that the adult made a surface mine in the midrib. It was found in all visited places in Sakaka between 2015 to 2016 (Fig. 5).

***Oryctes* spp. (L.) (Coleoptera: Scarabidae)**.

BeetleInfesting stage is adult and larvae. It was observed that the adult made a surface mine in the midrib of fruit stalk; the mine was dark in colour (Fig. 6). The dates in the unattacked side did not die but became smaller in size. The fruit stalk was dried and died and then no production. Larvae were found in the root system causing a hole leading to death of the small plant (one year old). It was a key pest. Several larvae were collected from the date palm farms in Sakaka in April and May in 2016. (Fig.7).

***Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae)**.

It was observed that this pest was a stored product insect. Kalal and Tamur were infested in the field during September and early October season (Fig. 8).

***Batrachedra amydraula* Meyrick (Lepidoptera: Cosmopterygidae).** Larvae are inthe infesting stage, it was observed in the visited fields that the larvae attack Chemri, Khalal and early Rutab stages. Larvae entered the fruit at base of the fruit near the perianth (cap) or through it. Larvae fed on the placenta mainly and on fruit flesh (Fig. 9 and 10). Seeds in Chemri were attacked but not in later stages, larvae at the Chemri stage connected the attacked fruits by white threads with the source, so the fruit remained hanged. The fruit colour became reddish then dried and fell down (Fig. 11). Later stages were not seen, became reddish in colour or dried after infestation but fell down. Samples examined were collected from June to August, 2016 in Sakaka.

***Ephestia* spp. (Lepidoptera: Pyralidae).**

Infesting stage are Larvae.This is a stored product insect. It was observed that Tamur fruits were infested in the field, during September and early October. Very few numbers of larvae were found in fallen fruits and harvested fruits, which would continue in the storage.

***Vespa orientalis* Fab. (Hymenoptera: Vespidae).**

Infesting stage is the Adult. It was observed that the wasp fed on matured dates. Chemri and Khalal were only attacked. It fed on small bits of the fruit surface on the plant or during harvest on the ground, increasing the possibility of secondary disease infection, lowering the marketable value of the product and then indirect effect by annoying the workers. It is very common in different parts of Sakaka in September and October.

Discussion

The actual number of species that occurred in Sakaka can be closely estimated only by a survey for a long time, collecting materials from all date palm planted areas in Sakaka. Also it should be taken in consideration that new species might be introduced into the region with the introduction of plant materials from any area that could be infested with pests.

Sixteen species were recorded in Iraq, 15 in Egypt, 14 in Saudi Arabia (El-Haidari and Al-Hafidah, [13]), in Libya (Bitaw and Ben Saad, [14]), and 8 in Palestine (El-Haidari and Al-Hafidah, [13]). However, in Jordan, (Mashal and Abiedat, [15]) surveyed 36 insect pests on date palm trees; red palm weevil (RPW), greater date palm moths (GDM), lesser date palm moths (LDM) and frond palm borer (FPB) were found to be the most destructive pests to date palm trees in Jordan. These pests caused an important loss in the fields. Other recorded moths, weevils, mites and flies were found in the fields under various intensities.

In Saudi Arabia, (El-Shafie, [16]) reported that ten species are considered as major pests viz., the red palm weevil, *Rhynchophorous ferrugineus*, Old World date mite, *Oligonychus afrasiaticus*, lesser date moth, *Batrachedraamydraula*, dubas date bug, *Ommatissus binotatus*, green pit scale, *Palmapsis phoenicis*, carob moth, *Ectomyelois ceratoniae*, longhorn date palm stem borer,*Jebusaea hammerschmidti*, rhinoceros beetle,*Oryctes agamemnon*, fruit stalk borer, *Oryctes elegans* and almond moth, *Ephestia cautella*. In addition, (Juhany,[5]) stated that 30% of production can potentially be lost as a result of pests.

In the Gulf Countries and Egypt, the red palm weevil has recently become one of the major date palm pests, while it did not recorded during this work in Sakaka. The economic importance of the recorded species differs from one to another; consequently the discussing of the recorded species will be depending on the degree of their importance. Lesser date moth was considered one of the main economically important pests in Jordan. 11% and 19% of fruits were found to be infested. This means that 11% and 19% of the production were lost by this pest. 250,000 trees were found infested in Al-Madina-Basra, Iraq. This pest recorded as a main pest in Palestine (Blumnberg, [17]), Bahrain (Abdul-Jabbar *et al*., [18]), and other countries in the Near East and North Africa (El-Haidari, [11]).

The major scale insect recorded attacking date palm in the whole visited places, weakened the vegetative growth. These results agree with (Kehat, [19]) findings. He considered this pest as the main pest attacking date palm in Palestine (before the introduction of red palm weevil).

Green scale was observed in all visited orchards, attacking leaves and bunches. This result agreed with several authors (El-Haidari and Al-Hafidah, [13]). They added that it also attacked fruits. It was not a serious pest in the field, although it might be treated as a potential pest that needs monitoring during the season.

The wasp ate small bits of the fruit surface decreasing the marketing value of the product. These results agreed with several authors (El-Haidari and Al-Hafidah, [13]). They found that this pest attacked fruits on the trees, in addition to, those falling on the ground specially semi dried and wet fruits in the late of the season. Ephestia moth was found in very low numbers in the field and in the product gathered after harvesting. This was considered as a main stored date pests in the surrounding countries (Hussain,[20]; El-Haidari and Al-Hafidah, [13]).

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