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Research Article

Survey of Date Palm (*Phoenix dactylifera* L.) Insect Pest at Afar Region of Ethiopia

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ABSTRACT

Date palm, *Phoenix dactylifera* L. (Arecales: Arecaceae) is produced in many countries used for food and raw materials in pharmaceutical and food industries. Beside its use date palm is damaged by many arthropod insect and mite pests. The survey was done for one year with the objective of to assess and identify insect pest attacking date palm tree in Afar region of Ethiopia. The survey was done using purposive sampling method and random sampling was used to choose trees within Date palm orchards. The survey was carrying out in three districts during 2018 year. Observation and examination enclosed all plant parts (e.g. roots, stem, leaflets, leaf mid-rib, spathes, female flowers and fruits). The survey showed that 11 insect species belonging to nine families from the orders Isoptera, Hemiptera, Acari, Diptera, Lepidoptera and Coleoptera were documented. The four most common and economically vital insect pests were palm weevils, palm borer, lesser date moth and termite. Frequently attacks of red scales, white scales and Inflorescence beetle while rare infestation of fly, mealy bug and spider mite were recorded on leaves, stem and roots. Other pests like apes and rodents from vertebrate and scorpion and ant from Scorpionidae and Formicidae family was also recorded. Those insect pests result considerable yield losses on date palm crop. Further studies on developing management practices for economically important insect pests of date palm are recommended.

Key words: Date palm, Insect pests, Survey

INTRODUCTION

Date palm, *Phoenix dactylifera* L. (Arecales: Arecaceae) is a vital food and cash crop thriving well in marginal area of the world (Chao *et al*., 2007; FAOSTAT, 2012; Wakil *et al*., 2015). The tree tolerates relatively harsh climatic and soil condition. It is unique tree in desert lands and plays a big role n combating desertification. Date palm offers countries a practical solution to improve food security and rural livelihood (Mohammed Al-abide, 2007.)

The annual world production of dates is around 7.4 million tons and it has increased from approximately 2 million tons in 1962 to almost 7 million tons in 2005 (FAO, 2006). 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, 2009).

In Ethiopia date palm tree introduced about 200 years ago from Middle East countries of Yemen and Sudan (Demeli, 2013). Since introduced the tree cultivated by agro-pastoralists in Afar, Somali, Gambella, Dira Dawa, and Benishangul-Gumuz Regions. Hussen (2010) and Salah (2015) reported that the production of date palm tree in Afar region has long history where it well-known as an undomesticated crop. The region especially Afambo, Asayita, Gewane and Amibara district are suitable for date palm plantation and expansion due to the availability of Awash River (Salah, 2015).

Date palm contains high amounts of essential nutrients: minerals, carbohydrates, vitamins, dietary fibers, fatty acids and proteins (Chandrasekaran and Bahkali, 2013). It also has several medicinal properties (El-Hadrami and Al-Khayri, 2012). Raw date palm and date seeds is used to generate a number of new products through pharmaceutical and food industries (Chandrasekaran and Bahkali, 2013). Date seeds are used in animal feed due to their high protein, fat and dietary fiber contents (Besbes *et al*., 2004). Furthermore, date palm trees have also environmental importance. It plays a significant role in the control of desertification and as a means of land reclamation and shade in towns in arid climates (Aregawi *et al*., 2018).

Date palm insect pest was documented by Buxton (1920) before one hundred years. Later, Carpenter and Elmer (1978) listed 54 species of insect pests and mites on date palms. Recently, El-Shafie (2012), listed 112 species of mites and insects including 22 species attacking stored

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dates and El-Shafie *et al.* (2017) lists 132 species of insects and mites have been reported worldwide associated with date palm. Surveys of date palm insect pests reported from different countries Israel (Blumberg, 2008), Libya (Bitaw and Ben Saad, 1990b), Egypt (Bodenheimer, 1923), Palestine (Ben-Dov, 1985), Iraq (Al-Jboory 2007,), Qatar, Kuwait, Bahrain, United Arab Emirates and Yemen (EI-Haidari, 1981), Sultanate of Oman (Salim Al Khatri, 2009), Saudi Arabia (Hammad and Kadous, 1989), Pakistan (Sharif and Wajih, 1982), Sudan (Yousof, 2010), Tunisia (Dhouibi, 1991), Jordan (Bitton *et al.,* 2007) and California, USA (Cook, 1914) shows that date palms are attacked by various insect pests and mites. The infestation of the insect pests varies within cultivar used, weather condition and cultural practice (Zaid *et al.,* 2002). In Afar region weevil goes behind by stock borer and scale insects for home date palm varieties were more economical than enhanced ones (Aregawi *et al.,* 2018). But, Dubas Bug and Red Palm Weevil were the serious pests in Arabian Peninsula (Al-Yahyai and Manickavasagan, 2012).

Therefore, survey, surveillance and understanding the distribution and the extent of pest attack are basic to generate information's for the producers to assist pest management. The present study was aimed to assess, identify and set priorities of the most important insect pests of date palm across the major growing areas of Afar Region.

MATERIALS AND METHODS

Study area: The study was done in Amibara, Asayita and Afambo Districts in Afar region within within an elevation range of 330 to 750 meters above sea level (m.a.s.l). The area has bimodal rainy seasons with average annual rainfall of 122mm. The primary rain is beginning February ends March (*sugum* rains) while the following July- September (*karma* rains). Sixty percent of the annual rainfall is received in July-September, and about 20% in March-April. The Awash River is the most important source of water for irrigated crop production. Depending on the ease use of irrigation water, Pastoralists in these areas grow Cotton, Maize, and other horticultural crops (Assefa *et al*., 2010).

Survey and sampling method: Study districts were chosen purposively in discussion with the Afar regional agricultural office, generally by associating the relative vastness of Date palm production in all the districts. Similarly, kebeles within districts were chosen in argument with the respective district agricultural offices by taking into account, nearness, ease of access, and the ease use of a reasonable number of orchards in the kebeles. Uniformly, orchards within kebeles were chosen by observing the occurrence of more than ten trees per orchard. Moreover, random sampling was used to select trees within Date palm orchards. The study was carried out in three districts during flowering and fruiting of 2018 cropping season. A systematic survey methodology was used and the total number of kebeles and orchards assessed were 15 and 75 respectively. Additionally, observation and sampling were made on 375 Date palm trees that were on active vegetative growth or flowering/fruit-set stages. At every selected location, five random trees-together with their offshoots-were carefully examined. Examination covered all plant parts (e.g. roots, stem, leaflets, leaf mid-rib, spathes, female flowers and fruits). The stems are cut down and dissected for the search of insect pests. Any existing insect or infestation symptoms were recognized on-site as far as possible. In case of uncertainty, samples of the occurring insects were transferred in suitable containers to the laboratory for proper identification.

Pest identification: To determine the main insect pests, samples were characterized both on the field and in the laboratory using Date palm pest identification guidebooks. Laboratory detection of the specimens was made either under the stereoscopic binocular or after mounting on microscopic slides.

RESULTS AND DISCUSSION

Lists of insect pests recorded on date palm trees in the study areas were 11 insect pests belongs to ten families from orders of Coleoptera (4 species), Lepideoptera (1 species), Isoptera (1 species), Diptera (1 species), Hemiptera (3 species), Acari (1 species) and one Ant and Scorpion from class Arachnida (Table 1). Other vertebrate pests like Ape and Rodents were recorded in the study areas.

Common Pests: The most common and economically vital insect pests on date palm trees in the study areas were Palm weevil (*Rhynchophorus spps*, Homoptera, curulionidae), Palm borers are (Frond borer, *Phonapate frontalis* Coleoptera: Bostrichidae and Stem borer *Orycetes spps* Coleoptera Scarabaeidae), lesser date moth (*Batrachedra amydraula* (Meyrick), Lepideoptera, cosmopterygidae), and Termites (*Odontotermes* spps., Isoptera, Termitidae). These insect pests are from orders of Homoptera, Coleaptera, Lepidoptera and Isoptera.

Palm weevil is recorded in all location and also the infestation level is high at Asayita and Afambo districts. Palm weevil causes tunneling of Date palm tissue by grubs, drying of outer leaves and fruit bunches, drying of infested offshoots and toppling of the trunk in the case of very severe and extensive tissue damage on date palm. This finding is in line with (Abraham *et al*., 1998 and Aregawi *et al*., 2018).

Palm frond borer recorded in all locations and causes damage both at larvae and adult stages by feeding on green fronds and also feed inside tunnels resulting in the sticky materials at its entrance. These insects also attack the fruit stalk by borrowing and make the fruit stalk weak for carrying the fruit. Palm stem borer was recorded at Asayita and Afambo distracts and the larvae cause's damages to the palm tree stem by attacking inside the stem by making tunnel.

Lesser date moth damages fruits both at fields and stores were recorded in all locations. The infestation level in Asayita and Afambo district were high while, lower in Amibara district. After hatching, the larva begins attacking small fruits and borrows through the cap inside the fruits to feed on contents. Lesser date moth damaged on fruits was identifiable via the black feces attached to the penetration site. This result is supported by (Ali and Hama, 2014 and Kinawy *et al*., 2015).

Table 1: Insects pests documented on date palm trees in Afar region, Ethiopia, 2018 cropping season

No	Scientific Name	Common Name	Family	Order	Parts of attack	Pest Status
1	*Rhynchophorus spps*	Palm weevil	Curculionidae	Coleoptera	Base and Stem	+++
2	*Phonapate frontalis*	Frond borer	Bostrichidae	Coleoptera	Stem/trunk	+++
3	*Orycetes spps*	Palm stem borer	Scarabacidea	Coleoptera	Frond and Stem	+++
4	*Odontotermes* spps	Termites	Termitidae	Isoptera	Base and Stem	+++
5	*Parlatoria spps*	White scale	Diaspididae	Hemiptera	Leaves	++
6	*Phoenicoccus spps*	Red scale	Diaspididae	Hemiptera	Leaves	++
7	*Phenacoccus solenopsis*	Mealy bug	Pseudococidae	Hemiptera	Leaves	+
8	*Cerattitis capitata*	Mediterranean fruit fly	Tryotidae	Diptera	Leaves and fruits	+
9	*Batrachedra amydraula*	Lesser date moth	Batrachedridae	Lepidoptera	Fruits	+++
10	*Prionus unipectinatus*	Inflorescence beetle	Chrysomelidae	Coleopteran	Inflorescence and fruit	++
11	*Eutetranychus spps*.	Spider mites	Tetranychidea	Acari	Leaves and Fruits	+
12	*Pandinus imperator*	Scorpion	Scorpionidea	Scorpiones	-	-
13	Solenopsis spps	Ants	Formicidae	Hymenoptera	-	-

NB. +++ = Common pests, ++ = Frequent pests and + = Rare pests

Fig. 1: Date palm farm at Asayita and Afambo districts

Fig. 2: Date palm research field at Werer Research Center (Amibara)

Termite infestation was recorded in all districts and the infestation was severing in Asayita and Afambo but low infestation at Amibara district. The damage of termite on date palm starts from the roots and attacks the trunk internally or externally by attacking the bark and branches. Several authors have reported economic damages caused by termites on date palm (Zaid *et al.*, 2002; Ahmed and Mohany, 2008).

Frequent insect pests: Frequent insect pest occurred in the areas were Spider mite (*Eutetranychus spps*. Acarina, Euteranychidae), White scale (*Parlatoria spps*. Homoptera, Diaspididae) and Red scale (*Phoenicoccus spps*. Homoptera, Dactylopidae). Spider mites are recorded

Fig. 3: (A) Palm borer larvae, (B) Inflorescence Beetles, (C and D) Termite damage, (E) Palm stem borer damage (F) Lesser moth damage on fruit, (G and H) Frond borer damage, (I) Finding insect pest in date palm stem through cutting and dissecting, and (J) Sample collected insect

in all districts of Asayita, Afambo and Amibara with high level of infestation frequently. This pest attacked developing fruits and leaflets. Date mites start infestation from fruit development to fruit setting by sucking the sap. This finding is supported by El-Shafie (2012). White scale was frequently recorded mainly on palm tree leaves at Asayita and Afambo districts but not at Amibara district. Nymphs and adults of white scale are the damaging stages and suck sap from the leaflet, midribs and the fruits and causes damage by sacking the sap. Red scale was recorded in all districts frequently by infesting the bases of fronds and fruit benches.

Rare insect pests: These are insect pests recorded rarely on the palm tree and also infest the palm tree rarely in the study areas and also not well known as the above-mentioned insect pests. The rarely recorded insect pests are Inflorescence beetle (*Prionus unipectinatus*, coleopteran, Cerambycidae) Mediterranean fruit fly (*Cerattitis capitata* Wied, Diptera Tryotidae), Mealy bug (*Phenacoccus solenopsis* Tinsley, Pseudococcidae) and Scorpion. Inflorescence beetle was recorded at Amibara district during flowering on the inflorescence of palm tree and causes high damage on the inflorescence. Mediterranean fruit fly adult was recorded at Asayita and Afambo districts on palm tree leaves and the maggot was recorded on stored fruits. The infestation of Mediterranean fruit fly starts in the field and causes high fruit lose after harvest in the storage at Asayita and Afambo districts. Mealy bug was recorded on stem, fronds and leaves and the Scorpion and ants was recorded in the palm tree fields at Asayita and Afambo districts. Additionally, damages by vertebrate pests of apes and rodents were recorded in Afambo district.

DISCUSSION

Five common, three frequent and three rare insect pests and one ant and Scorpion was recorded across the study areas. The prevalence of common insect pests causes more damage at all locations across the study area. The frequent and rare insect pests are frequently and rarely across the study areas. Different authors reported studies on date palm tree insect pest around the world. El-Shafie *et al.* (2017) reported there are about 132 species of insect and mites related with date palm. EI- Haidari (1981) reported the occurrence of 11 species in Bahrain, Kuwait, Qatar and Yemen; Talhouk (1982) reported 6-20 species in Saudi Arabia, Sharif and Wajih (1982) reported 7 major species in Pakistan and Aly and Elwan (1995) reported 17 species in Oman.

Based on the part of date palm attack five insect pest was recorded on leaves, three on fruits, two on base and stem one on inflorescence, frond and stem respectively (Table 1). However, some insect species are not specific they can attack more than one part at the same time. Most of the insects recorded are from Coleoptera and Hemiptera order. El-Shafie (2012) reviewed that 34 most important insect and mite pests on date palm leaves, thirty species in 4 orders and 11 families are on bases, stem and shoot, twenty-six species belonging to 8 orders and 15 families are listed from Mite and insect pests on inflorescences, bunch stalk, green and ripening fruits and two orders that contain 23 species of insect pests damage on date during harvest and storage.

Conclusion: Production of Date palm trees are the better choice for combating desertification in the study areas due to the accessibility of resources (Irrigation water and land). Despite its importance the tree faced a number of biotic and abiotic factors. The current study confirmed that there were invertebrate and vertebrate pests that affect the date palm production in all the study areas. The pastoralist has no sufficient knowledge about the damage of insect pest and its management method with the exception of smoking when insect pest occurred. In future, studies should be done to minimize the damage caused by economically vital palm insect pests like weevils and palm borer (Frond borer and palm stem borer), lesser date moth and termite to increase the Date palm tree yield through developing appropriate insect pest and production management practices.

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