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First report of the Indian date palm leaf miner, *Javeta pallida*, Baly (Coleoptera: Chrysomelidae: Cassidinae: Coelaenomenoderini) infesting Date palm, *Phoenix dactylifera*, L. in Gujarat

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Abstract
A study was conducted to identify the new pest infesting Yellow date palm, *Phoenix dactylifera*, L. in Gujarat, India. During the orchard visit in the month of October 2022, palm trees in experimental area of Regional Research Station (RRS) and Horticulture Farm, Anand Agriculture University, Anand, were found infested with this pest. The percent leaflet infestation was recorded 43.20, 40.82 and 16.22 percent and 36.86, 31.81 and 14.01 percent, respectively on bottom, middle and top fronds of *P. dactylifera* at RRS farm and Horticulture farm. Total 72.90 percent, 67.36 percent frond infestation was recorded on *P. dactylifera* in RRS farm and Horticulture farm, respectively. Palm infestation was recorded 55.33 percent in RRS farm while, 66.00 percent in Horticulture farm. Adult were collected and brought to the laboratory of Department of Entomology, B. A. College of Agriculture, AAU, and Anand for identification and further study. Based on morphological characterization, the pest was identified as Indian Date palm leaf miner, *Javeta pallida*, Baly. It is the first confirmed report of occurrence of the new pest infesting *P. dactylifera* in Gujarat, India.

Keywords: Yellow date palm, pest, *javeta pallida*, leaf miner, arecaceae

Introduction
Date palm, *Phoenix dactylifera* L. (Arecales: Arecaceae) is a vital food and cash crop thriving well in marginal area of the world (Wakil *et al.*, 2015) [11] and one of the first cultivated tree crops, being grown since early Bronze Age (late 4th/early 3rd millenia B.C.) (Tengberg, 2012) [10]. It is distributed throughout the Middle East, North Africa, and South Sahel, areas of East & South Africa, Europe, Asia and USA with approximately 150 Million trees worldwide. India is the largest country in import of Date Palm about 38 percent of the world market. Dates have a very good source of nutrition having 70% carbohydrates. It is also a good source of Vitamin-A, B-2, B-7, Potassium, Calcium, Copper, Manganese, Chlorine, Phosphorous, Sulphur and Iron, etc (Anonymous, 2010) [1]. 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) [5].

Date palm is commercially grown in Gujarat and Rajasthan in India (Radha and Mathew, 2007) [7]. Traditionally, the local varieties of Date Palm were grown from the seeds in Kachchh - Bhuj area of Gujarat. Around 80 percent of the orchards are situated in the coastal belt of Kachchh district of Gujarat, where there are about 1.9 million palms (18 thousand) mainly of seedling origin with a production of 175 thousand metric tons of fresh fruits (Anonymous, 2018a; 2018b) [2, 3]. Carpenter and Elmer (1978) [4] reviewed pests and diseases of *P. dactylifera* globally. In India, about 21 insect pests are associated with date palm (Muralidharan, 1993) [6]. Major date palm pests worldwide are the red palm weevil, *Rhynchophorus ferrugineus* (Olivier), date dust mite, *Oligonychus afrasiaticus* (MCGregor), lesser date moth, *Batrachedra amydraula* meyrick, long horn stem borer, *Jebusaea hammerschmidti* (Reiche) and almond moth, *Cadra cautella* (Walker). But one new pest, *Javeta pallida*, Baly, 1858 (Coleoptera: Chrysomelidae: Cassidinae) observed first time infesting *P. dactylifera* of Anand agriculture university, Anand located in Gujarat.

Recently, during the farm visit, an infestation of new type of infestation in leaflets of date palm was observed, hence to identify the infestation of this new insect pest, survey was carried out.

Materials and Methods

A survey was carried out at two locations, i. e., Regional Research Station (RRS) and Horticulture Farm, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand to record the infestation by the pest as well as to collect the adults of the pest. To record the infestation, 5–6 years old 30 palm trees showed distinguished damage symptoms were selected from these two locations and tagged them.

Fig 1: Infestation of *Javeta pallida*, Baly in Date palm at RRS farm, AAU, Anand

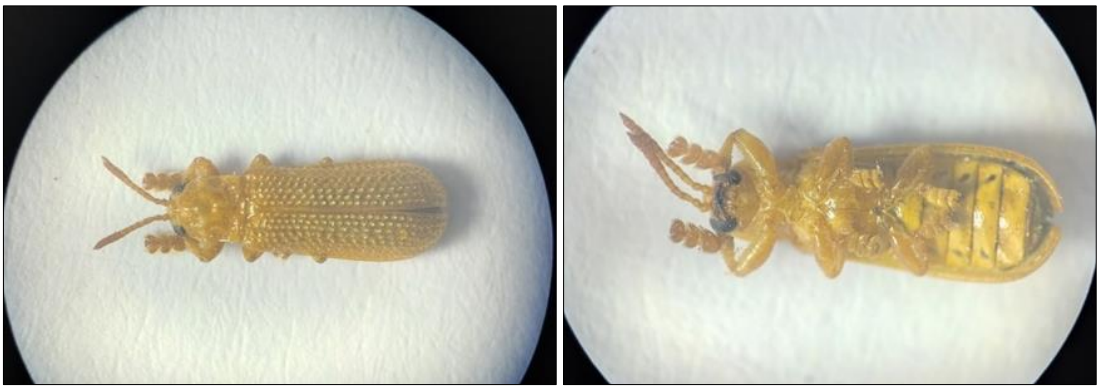
For the percentage of leaflet infestation and frond infestation, observations were recorded from the bottom, middle and top portions of each randomly selected two fronds from each palm as per the methodology given by Shameem *et al.*, 2017 [9]. The number of palm trees infested and the number of infested fronds per palm (Figure 1) were also recorded to work out the frond and palm infestation (%). During the survey, the adults of this pest was directly collected and brought to laboratory for further identification. 4 to 5 specimens preserved in 70 percent alcohol were send to the taxonomist, Dr. K. D. Prathapan, Kerala Agriculture University, Vellayani.

The damaged palm trees were showing characteristic small sized irregular holes approx. 2.0 to 3.5 mm with ragged leaflet symptoms. Damaged dry leaflets with dark coloration on the fronds were distinguishing characteristics of *P. dactylifera*. The number of adult emergences was determined by the exit hole on each leaflet (Figure 2).

Fig 2: Exit hole on leaflets of date palm

Results and Discussion

Based on morphological characters, the pest was identified as *J. pallida* (Figure: 3) and it was also confirmed by the identification report received from Dr. K. D. Parthian, Taxonomist, Kerala Agriculture University, India. The data on leaflet infestation (%) indicated that at the Regional Research Station, 33.41 percent of the leaflets were damaged, with the bottom region of the palm suffering the most damage (43.20%), followed by the middle and top portions, which suffered 40.82 percent and 16.22 percent, respectively. In the horticulture farm, 27.56 percent of the leaflets were damaged, including the bottom portion 36.86 percent, the middle portion 31.81 percent, and the top portion 14.10 percent.



Dorsal view of *Javeta pallida*, Baly Ventral view of *Javeta pallida*

Fig 3: Overview of adult of the date palm leaf minor

Overall, 30.49 percent palm leaflet damaged by the leaf minor at AAU. The proportion of leaf minor damage on the date palm varied, with the highest percentages of damage was found in the bottom portion (40.03%) followed by middle portion (36.32%), and top portion (15.11%). The middle portion of the date palm was 9.27% less damaged, while the top portion was 62.24% less damaged than the bottom portion (Table 1). Shameem *et al*. (2016) [8] also found that the date palm's bottom portion had the maximum damage, which was similar to our findings.

Table 1: Distribution of leaf minor damage on different proportion of palm at AAU

Location	Damaged leaflet per frond (%)			
	Bottom	Middle	Top	Average
RRS farm	43.20	40.82	16.22	33.41
Horticultural Farm	36.86	31.81	14.01	27.56
Average	40.03	36.32	15.11	**30.49**
Reduction of damaged percent over bottom damage	-	9.27	62.24	-

Note: On each palm, 2 fronds observed for each location (bottom, middle and top) and total number of palms observed 30

The difference in leaflet, frond and palm damage was also observed among both locations. The leaf minor adult emergence incidence was 3.06 adult per leaflet at RRS, with the maximum number of adults emerged was 4.51 adult per leaflet at bottom portion, 2.44 adult per leaflet at middle region, and 0.70 adult per leaflet at top portion of palm. At Horticulture Farm, the leaf minor adult emerged was 2.14 adult per leaflet, with 3.37, 2.44 and 0.6 adult per leaflet in the bottom, middle and top section of palm, respectively. Overall, 2.60 leaf minor adult per leaflet emerge from palm. The maximum adult emergence was 3.94 at the bottom portion of the palm, the middle portion of the palm had 3.21 adult per leaflet, and the top portion of the palm had the lowest (0.65) adult emergence (Table 2).

Table 2: Distribution of leaf minor adult emergence per leaflet on different proportion of palm at AAU, Anand

Station	No. of adult emergence per leaflet			
	Bottom	Middle	Top	Average
RRS farm	4.51	3.97	0.70	3.06
Horticultural Farm	3.37	2.44	0.60	2.14
Average	3.94	3.21	0.65	2.60

Note: On each palm no. of adult emergence whole counted and total number of palms observed 30

The damage on palm and frond per palm and leaflet per palm difference was observed on both locations. Leaf minor incidence was observed and recorded from 300 palm having 60.67 percent infestation. The data indicated that palm was observed with the Horticulture farm (66.00%) suffering the most damage, followed by RRS farm (55.33%). Maximum frond damage was recorded 72.90 percent at RRS, followed by a horticulture farm with a frond damage incidence of 67.36 percent, and an overall frond damage incidence of 70.13 percent. The lowest number of leaflet damage was found at a horticulture farm, where 27.56 percent of leaflets were damaged. RRS had 33.41 percent damaged leaflets, and overall leaf let damage was recoded at 30.49 percent on palm (Table 3). On the horticultural farm, palm leaf minor damage was most prevalent, but the damage intensity was lower, which was apparent in the damage to the fronds and leaflets. In contrast, RRS Farm had relatively less palm damage, but the damage intensity was higher, which was noticeable in the damage to the fronds and leaflets.

Table 3: Date palm leaf minor damaged on palm at AAU, Anand

Location	Damage percent		
	Leaflet/ Frond	Frond/ palm	Palm
RRS farm	33.41	72.90	55.33
Horticultural farm	27.56	67.36	66.00
Average	30.49	70.13	60.67

Note: Palm: 150 from each farm and total palm observed 300
Frond: Average of 6 frond per palm and total number of palms observed 30
Leaflet: Average of 6 frond per palm and total number of palms observed 30

Conclusion

The findings of morphological studies and taxonomical confirmation endorse the species as *J. pallida* and this is the first confirmed report of the date palm leaf minor, *Javeta pallida*, Baly (Coleoptera: Chrysomelidae: Cassidinae: Coelaenomenoderini) infesting yellow date palm in Gujarat State, India. The maximum leaflet damage (40.03%) and adult emergence (3.94 adult/leaflet) was observed on bottom portion of the palm compared to middle portion and top portion. The maximum (66.00%) palm were infested at Horticultural farm but damage intensity on frond (67.36%) and leaflet (27.56%) were less whereas comparatively lower damage was observed on palm (55.33%) due to intensity was higher the damage less on frond (72.90%) and leaflet (33.41%) at RRS.

Hence, the date palm leaf minor is first report on Gujarat and

the insect had potential cause significant damage to the date palm orchard farmers.

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