Journal of Advanced Zoology
ISSN: 0253-7214
Volume 46 Issue 2Year 2025Page 55-60

"Incidence and Characterization of Insect Pest Damage on the Tropical Fruit Plant *Ziziphus jujuba* Mill. In Maharashtra, India"

P.R. Gaikwad[1]& A. R. Bhusnar[2*]

[1]Department of Zoology, Balasaheb Desai College, Patan, Satara, Maharashtra, India.Email-pradipgaikwad966@gmail.com
[2]Department of Zoology, Yahswantrao Chavan Warana Mahavidyalaya, Warananagar.Kolhapur, Maharashtra, India 416113Email- arbhusnar@rediffmail.com*

Abstract

An extensive field survey was conducted to assess the seasonal incidence and ecological relationship of insect pests associated with Ber (*Ziziphus jujuba* Mill.) plantations in the Solapur district of Maharashtra. The survey covered all 11 tehsils of the district, with four distinct Ber plantation sites selected in each tehsil. The study was carried out over a period of three years, from January 2022 to December 2024. Observations were primarily recorded during the rainy and winter seasons, which coincide with the fruiting phase of the crop. A total of 23 insect pest species were documented as being associated with Ber in the study area. Among these, six species were identified as major pests due to their significant impact on the crop, while the remaining 17 were categorized as minor pests. The present investigation highlights the diversity of insect pests infesting *Ziziphus jujuba* in the Solapur region and provides detailed insights into the nature and extent of damage caused by these pests.

Keywords: Ber, crop, Ecology, Temperature, Humidity.

Introduction:

The Ber (*Ziziphus mauritiana* Lam.) is a tropical fruit-bearing tree belonging to the family Rhamnaceae. Commonly referred to as desert apple, jujube, Chinee apple, Badari, Ber, Dongs, Boroi, Beri, and Indian plum, it is widely cultivated across arid and semi-arid regions. The ripe fruits of *Z. mauritiana* are highly valued for their nutritional content, possessing the third-highest concentration of vitamin C among fruits, following Barbados cherry and guava.In recent years, Ber fruits have gained popularity due to their considerable nutritional and therapeutic benefits. However, the crop is significantly affected by both insect and non-insect pests, which are estimated to contribute to approximately 30% yield losses. Effective management of these pests is therefore essential to enhance productivity and ensure sustainable cultivation of Ber(Singh. S *et al.,*2023). There are two primary domesticated species of jujube: the Indian jujube (*Ziziphus mauritiana* Lam.) and the Chinese or common jujube (*Ziziphus jujuba* Mill.). Both species are cultivated extensively across tropical and temperate regions, including countries such as India, Pakistan, China, Afghanistan, various parts of Africa, Malaysia, and Australia. These species are valued for their adaptability to diverse agro-climatic conditions and their nutritional and economic importance (Weber. E, 2003).
In India, Ber (*Ziziphus mauritiana* Lam.) is cultivated over a considerable area of approximately 22,000 hectares and is recognized as an important fruit crop, particularly well-suited to arid and semi-arid regions (Jamandar*et al.,* 2009). The major cultivation zones are concentrated in the states of Rajasthan, Haryana, Punjab, Gujarat, Maharashtra, and Uttar Pradesh.Ber fruits are nutritionally rich, serving as an excellent source of proteins, sugars, amino acids, calcium, phosphorus, iron, carbohydrates, ascorbic acid, and

vitamins A and C. The ascorbic acid content in the fruit pulp ranges from 70 to 165 mg per 100 grams, which is approximately two to four times higher than that of citrus fruits (Morton J., 1987). Despite its nutritional and economic value, Ber production in India has witnessed a significant decline in recent years, primarily due to damage caused by various insect pests. A total of approximately 130 species of insect and non-insect pests have been documented in Ber-growing regions across the country (Lakra and Bhatti, 1985). These pests pose a serious threat to Ber cultivation, leading to considerable yield losses and reduced fruit quality. Although a large number of insect and non-insect species have been reported to feed on Ber (*Ziziphus mauritiana* Lam.), only a few have attained the status of major pests, causing substantial economic losses. A comprehensive review of global literature reveals a total of 177 insect and non-insect pest species associated with Ber cultivation across major Ber-growing countries.

These pests are taxonomically distributed as follows: Diptera – 13 species, Lepidoptera – 41 species, Coleoptera – 38 species, Hemiptera – 57 species, Hymenoptera – 1 species, Thysanoptera – 7 species, Isoptera – 3 species, Orthoptera – 2 species, Acariformes – 12 species, Gastropoda – 1 species, and Psittaciformes – 2 species.Among these, five insect species have been identified as key pests due to their significant impact on Ber production. These include the ber fruit borer, *Meridarchisscyrodes* Meyrick; three species of fruit flies*Carpomya vesuviana* Costa, *Bactrocerazonata* (Saunders), and *Bactroceracorrecta* (Bezzi) (Balikai, 1999); and the mirid bug, *Lygus lucorum* Meyer-Dür (Zhang *et al.,* 2005). These species are regarded as major pests due to the severity of the damage they inflict on fruit yield and quality.Jothi and Tandon (1995) recorded 17 insect species on ber in Karnataka state of India. Later**,** Patil and Patil (1996a) documented 10 species.Kavitha and Savithri (2002) reported 23 insect species associated with Ber (*Ziziphus mauritiana* Lam.) from the state of Andhra Pradesh, India.Despite its significance in traditional medicine, lac production, and as a source of firewood, Ber is susceptible to numerous insect pests and diseases, which significantly reduce crop yield and quality.Earlier, Butani (1979) documented 80 insect species feeding on Ber trees in various parts of India. Similarly, Lakra and Zile Singh (1983) noted that the commercial cultivation of Ber in northern India has become increasingly challenging due to infestations by over 100 insect pest species. More recently, Haldhar*et al,.* (2016) recorded 12 insect pest species affecting Ber plants in the hot arid regions of Rajasthan. These findings underscore the extensive pest diversity associated with Ber and highlight the need for region-specific pest management strategies to ensure sustainable cultivation.

However, the existing literature on *Ziziphus jujuba* in Maharashtra, particularly in the Solapur district, indicates that limited research has been conducted on this important fruit crop. Therefore, the present study aims to document the diversity of insect pests associated with Ber and to characterize the nature of damage they cause. The findings from this study will provide valuable insights for Ber growers in the region, facilitating the development of effective and region-specific pest management strategies to improve crop productivity and sustainability.

Material & Methods

The present experiment was carried out in Solapur dist, Maharashtra, India, from January to December during 2022 and 2024.

1. Study area:

Geographically, Solapur district is located between 17.10° to 18.32° North latitude and 74.42° to 76.15° East longitude. It lies on the southeastern fringe of Maharashtra State and shares its borders with Ahmednagar and Dharashiv districts to the north, Dharashiv and Gulbarga (Karnataka) to the east, Sangli and Bijapur (Karnataka) to the south, and Satara and Pune to the west. The district covers an approximate area of 150,000 hectares and experiences an average annual rainfall of less than 750 mm. Solapur has a bimodal climate characterized by hot summers and mild winters, with maximum temperatures reaching up to 40.1°C and minimum temperatures falling to around 16.1°C. The region is irrigated primarily by two major canal systems: the Bhima Right Bank Canal and the Neera–Man Left Bank Canal.

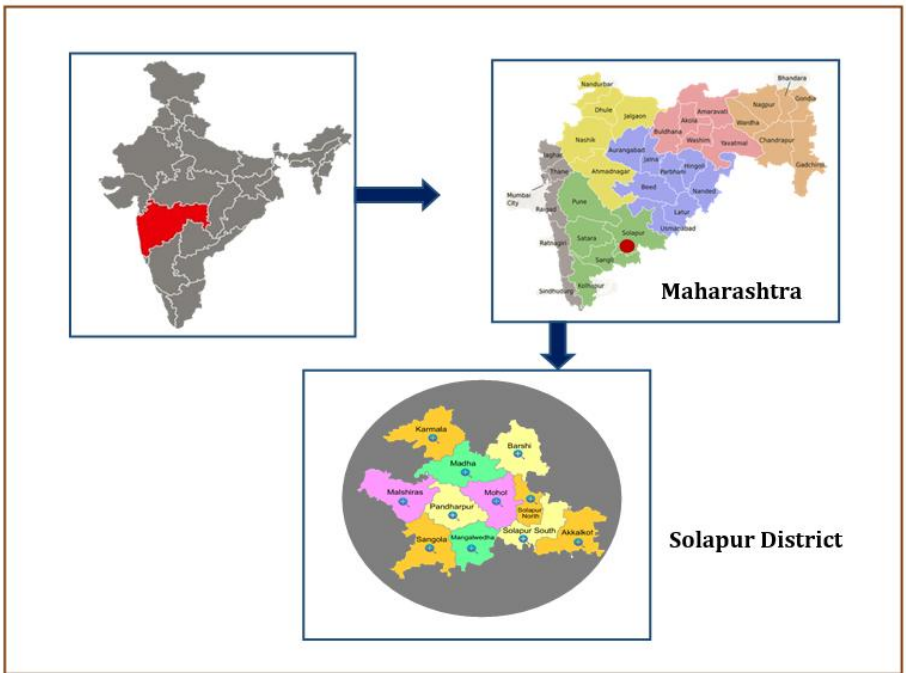

Fig: Consolidated Map of India- Maharashtra- Solapur

2. Material

The materials used during the study included insect collecting nets, forceps, and vials containing 70% ethanol and 4% formalin for specimen preservation. Plastic containers were employed for the temporary storage and transportation of collected samples. Robust field knives were utilized to open seed pods, twigs, bark, and insect galls. A fine brush was used for handling small and delicate specimens to avoid damage. Additionally, polythene bags were used to store plant material, rearing material, and other collected samples for further examination.

3. Method of data collection:

Insect pest collection was carried out from January 2022 to December 2024 across various locations in Solapur district, Maharashtra. Insect pests were collected using multiple methods, including pheromone traps, sticky traps, insect collecting nets, and hand-picking. Observations of sucking insect pests and bark-eating caterpillars were recorded fortnightly from selected Ber (*Ziziphus jujuba*) plants. Specimens were identified using standard taxonomic keys and available digital tools such as Google Lens, with subsequent verification based on literature and expert consultation when necessary. Collected specimens were preserved using both dry and wet preservation techniques to ensure long-term storage and reference.

Result:

Fig: Table showingseasonal incidence & Mode of damage of insect pest in Solapur district (Ms) associated with ber in year 2022 and 2024.

Sr. No.	Scientific name	Order	Nature of damage	Seasonal Incidence
1.	*Astygisa albopunctata* Swinhoe, 1891	Lepidoptera	Larva feed on leaves	Sept to Nov
2.	*Euproctis sp.*	Lepidoptera	The Hairy caterpillars feed on fruit & chlorophyll of young leaves resulting of skeletonization of leaves. Leaves damaged by scraping and biting.	Aug to Dec
3.	*Euproctis lunata*	Lepidoptera	The Hairy caterpillars feed on Fruit & chlorophyll of young leaves Leaves damaged by scraping and biting.	Sept to Dec
4.	*Inderbela sp.*	Lepidoptera	Larva feeding on bark & creates web at branch forks	Aug to Feb
5.	*Antheraea mylitta* drury	Lepidoptera	Larva feed on leaves &some time defoliate, remaining only ribs.	Aug to Oct
6.	*Bactrocera dorsalis*	Deptera	Larva feed on pulp of fruit	Sept to Jan

7.	*Paltypria erinaceus*(fabricius-1801)	Coleoptera	Larva feeds on mesophyll tissue. Adults were feeding by scraping the upper surface of leaf.	Oct to Jan
8.	*Holotrichia karschi* Brinske	Coleoptera	Beetles feed on the leaves. Defoliation of leaves	June to Aug
9.	*Adoretus versutus* Harold	Coleoptera	Adult feed on the leaves. Defoliation of leaves	June to Aug
10.	*Meridarches scyrodes* Meyrick	Lepidoptera	Larva feed on pulp of fruit	Nov to Jan
11.	*Perissopneumon tamarindus*	Hemiptera	Nymph & Adult Suck sap from leaves & shoot	Sept to Dec
12.	*Tricentrus bicolor* (Cow bug)	Hemiptera	Both Nymph & Adult suck the sap from tender shoots, leaves & Flower buds.	Sept to Nov
13.	Green shield metallic bug	Hemiptera	Both Nymph & Adult suck the sap from Young shoots, leaves & fruits leading to stunted growth.	July to Nov
14.	*Scirtothrips sp* (Thrips)	Thysanoptera	Cause scabby, grayish scars on fruit. Also scrape the surface of leaves. Feed on Flowers.	Sept to Dec
15.	*Synclera traducalis* (Zeller, 1852) (Leaf Webber)	Lepidoptera	Larva are voracious leaf feeder & creating hole leading to significant defoliation	Aug to Sept
16.	*Odentotermessp*.(Termites)	Isopetra	Termites feeding on various parts of roots & stems.	Feb to May
17.	*Myllocerus discolor* *Myllocerus blandus*(Grey weevil)	Coleoptera	Adult weevil cause damage both mature and immature leaves. They nibbled on leaves, from the margins and ate away small patches of leaf lamina causing various shaped holes	Sep to Dec
18.	*Laccifer lacca* (lac insect)	Hemiptera	-	
19.	*Thosea sp.* (green slug caterpillar)	Lepidoptera	Larvae feed on leaf surface at lower epidermis & later consuming entire leaf blade.	Sept to Oct
20.	*Machaerotidae sp.* (Tube Spittlebug)	Hemiptera	Infest inflorescences i.e. flowers of ber.	Sept to Oct
21.	*Cameraria sp.* (leaf miner)	Lepidoptera	June to Feb	June to Sept
22.	Jassid (Unidentified)	Hemiptera	Sucking sap from leaves resulting chlorosis & leaf curling.	Oct to Feb
23.	*Aceria cernuus* (Gall mite)	Acariformes	Mite induces formation of galls on floral buds & axillary buds.	July to Oct

The Ziziphus plant suffers damage from a wide variety of insect pests belonging to different orders, each affecting specific plant parts during various seasons. Among Lepidoptera, *Astygisaalbopunctata* larvae feed on leaves between September and November. *Euproctis* species, including *E. lunata*, are hairy caterpillars that attack from August to December, feeding on fruits and the chlorophyll of young leaves, resulting in leaf skeletonization due to scraping and biting. *Inderbela* species damage the bark and create webs at branch forks from August to February, while *Antheraea mylitta* larvae feed on leaves, often causing complete defoliation between August and October. *Meridarchesscyrodes* larvae feed on the pulp of fruits during November to January. *Syncleratraducalis* (Leaf Webber) appears from August to September, causing significant defoliation through voracious leaf feeding. *Thosea* species larvae feed initially on the lower epidermis and later consume the entire leaf blade during September and October. *Cameraria* species, as leaf miners, are active from June to February, particularly June to September.

Among Diptera, *Bactrocera dorsalis* attacks from September to January, with larvae feeding on fruit pulp. Several Coleoptera species cause defoliation; *Paltypriaerinaceus* larvae feed on mesophyll tissue while adults scrape the leaf surface from October to January. *Holotrichiakarschi* and *Adoretusversutus* beetles are active from June to August, feeding on leaves and causing significant defoliation. *Myllocerus discolor* and *Mylloceruslandus* (grey weevils) damage both mature and immature leaves from September to December by nibbling on margins and creating holes. In the order Hemiptera, *Perissopneumontamarindus*, *Tricentrus bicolor* (cow bug), and the green shield metallic bug suck sap from leaves, shoots, and flowers during July to December, leading to stunted growth and poor plant health. *Jassid* species, active from October to February, cause chlorosis and leaf curling. *Machaerotidae* species (tube spittlebugs) infest the flowers of ber between September and October. *Lacciferlacca* (lac insect) is also noted under Hemiptera, though no specific damage description is provided.

Other damaging pests include *Scirtothrips* species (Thysanoptera), which cause grayish scars on fruits and scrape leaves and flowers from September to December. *Odontotermes* species (Isoptera) attack the roots and stems from February to May. Finally, *Aceria cernuus*, a gall mite from Acariformes, induces gall

formation on floral and axillary buds between July and October. This diverse pest complex causes a range of damages such as leaf feeding, defoliation, sap-sucking, fruit pulp damage, and gall formation, necessitating careful monitoring and integrated pest management throughout the year.

Discussion:

Ram Karan Gaur *et al.*, (2020) conducted a comprehensive study on the occurrence of insect and non-insect pests associated with *Ziziphus mauritiana* (ber) fruits cultivated in the South-Western region of Haryana. Their investigation documented a total of fifteen pest species, comprising both insect and non-insect taxa, infesting ber during the study period. Among these, five species were identified as major pests due to their significant impact on fruit yield and quality. These included the ber fruit flies, *Carpomyiavesuviana* Costa and *Bactrocera dorsalis* Hendel; the fruit borer, *Meridarchisscyrodes* Meyrick; the lac insect, *Lacciferlacca* Kerr; the defoliating beetle, *Holotrichiaconsanguinea* Blanchard; and frugivorous bats belonging to the genus *Pteropus*.
Pooja Sharma *et al.,* (2024) conducted a systematic survey and surveillance of the ber fruit fly, *Carpomyiavesuviana* Costa, during the months of November to February in the cropping seasons of 2021–2022 and 2022–2023 across the semi-arid region of Jaipur district, Rajasthan. The study revealed that the average fruit fly infestation in various locations of the district ranged from 21.24% to 25.57% over both years of observation. Data analysis indicated that the highest infestation levels were recorded in Chomu tehsil, with 25.30% in 2021–22 and 25.83% in 2022–23. Conversely, the lowest infestation rates were observed in Amer tehsil, recording 20.80% and 21.68% during the respective study years.

V. Karuppaiah *et al.*, (2010) conducted a comprehensive study on the prevailing insect pests of *Ziziphus mauritiana* Lamk. (ber) and their associated natural enemies. The investigation recorded seven major insect pests infesting ber, namely: the fruit fly (*Carpomyiavesuviana* Costa), stone weevil (*Aubeushimalayanus* Voss), ber butterfly (*Tarucustheophrastus* Fabricius), leaf webber/roller (*Syncleraunivocalis* Walker), bark-eating caterpillar (*Indarbela* spp.), termite (*Odontotermes* spp.), and grey weevil (*Myllocerus* spp.). The incidence of foliar pests such as the ber butterfly, leaf webber, and grey weevil was observed to be prominent during the monsoon period, from June to September. Infestation by the stone weevil was reported between October and February, whereas fruit fly activity was confined to the period from November to February. In terms of natural enemies, the presence of fruit fly parasitoids belonging to the genus *Fopius*, hymenopteran parasitoids including *Apanteles* spp. (Braconidae), ichneumonid wasps, neuropteran predators such as green lacewings (*Chrysoperla* spp.), and various species of spiders were documented. Among the pests recorded, aside from the ber fruit fly, both the stone weevil and ber butterfly were identified as key pests causing significant damage to ber in the study region.Several researchers have investigated the insect pest complex of *Ziziphus mauritiana* (ber) across various geographical regions and under diverse climatic conditions, documenting a wide range of insect species associated with the crop. These studies have significantly contributed to the understanding of pest diversity, seasonal incidence, and their impact on ber cultivation in different agro-climatic zones.The present study is a focused effort to assess the current insect pests infesting ber orchards in the Solapur district of Maharashtra. The objective is to identify the prevailing pest species, document their nature of damage, and understand their temporal occurrence in the region. This information is vital for developing region-specific, effective pest management strategies. The findings from this study will serve as a practical guide for ber growers in Solapur, enabling them to adopt timely and appropriate pest control measures, thereby minimizing crop losses and improving fruit yield and quality. Furthermore, the study aims to contribute to the existing body of knowledge by recording the pest fauna associated with ber fruits in this particular agro-ecological region.

ACKNOWLEDGMENT

The authors are thankful to Yashwantrao Chavan Warana Mahavidyalaya Warananagar and Rayat Institute of Research& Development (RIRD) Satara for providing facilities.

References Cited

1. Singh, S. &etal. 2023 Integrated Management of Major Insect Pests of Ber (Ziziphus mauritiana Lamark) in Bundelkhand Region.

2. Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. Wallingford, UK: CABI Publishing.
3. Jamadar MM, Balikai RA &Sataraddi AR. 2009. Status of Diseases on Ber (*Ziziphus mauritiana*
4. Lamarck) in India and their Management Options. *Acta Horticulture*, 840: 383-390.
5. Morton J. Indian Jujube. In: Fruits of warm climates. Julia F. Morton, Miami, FL, 1987; pp. 272–275.
6. Lakra, R.K. and Bhatti, D.S. 1985. Third National Workshop on Arid Zone Fruit Research, Rahuri.
7. Balikai, R.A. 1999. Pest scenariao of ber (Zizyphusmauritiana Lamarck) in Karnataka. Pest Manage. Hort. Ecosystem 5(1):67-69.
8. Zhang, X.M, Liu, X.J., Yang, Y.M. and Duan, D.Y. 2005. Occurrence of Lygus lucorumBt cotton and jujube field. Entomological Journal of East China 10:1-5.
9. Jothi, B.D. and Tandon, P.L. 1995. Present status of insect pests of ber in Karnataka.
10. Curr. Res. 24(9):153-155.
11. Patil P, Patil BV. Insect pests of ber in north Karnataka. South Indian Horticulture. 1996a; 44(3, 4):113.
12. Balikai, R.A. 1999. Pest scenariao of ber (Zizyphusmauritiana Lamarck) in Karnataka. Pest Manage. Hort. Ecosystem 5(1):67-69.
13. Kavitha, Z. and Savithri, P. 2002. New record of some natural enemies on ber pests in Tirupati Region. South Indian Horticulture 50(4/6):513-514.
14. Butani, D.K. 1979. Insects and Fruits. International Book Distributors. Dehradun. p.415. Cai Ping, Cui ShiYing and KuohChungLin. 1995. A new species of Hishimonus injurious to Zizyphus jujuba (Homoptera: Cicadelloidea, Euscelidae). Acta Entomologica Sinica 38(2):217-219.
15. Lakra, R.K. and Zile Singh. 1983. Oviposition behaviour of berfruitfly, Carpomyiavesuviana Costa (Diptera: Tephritidae) in different Zizyphus sp. Haryana. Indian J. Ent. 45:261-269.
16. Haldhar SM, Deshwal HL, Jat GC, Berwal MK, Singh D. Pest scenario of ber (Ziziphus mauritiana Lam.) in arid regions of Rajasthan: a review. Journal of Agriculture and Ecology. 2016; 1:10-21.
17. Gaur, R. K., Kumar, M., Sharma, S., & Yadav, B. S. (2020). Survey studies on insects and non-insect pest associated with ber crop in South West Haryana. *J. Entomol. Zool. Stud*, *8*(2), 856-863.
18. Sharma, P., Bairwa, D. K., Sharma, S. L., Vyas, K. G., Meena, B. S., & Choudhary, S. (2024). Screening of ber (Ziziphus mauritiana Lamk) germplasm against Carpomyiavesuviana under Semi-arid condition. *Progressive Horticulture*, *56*(2), 163.
19. Karuppaiah, V., More, T. A., Sivalingam, P. N., Hanif, K., &Bagle, B. G. (2010). Prevailing insect pests of ber (Ziziphus mauritiana Lamk) and their natural enemies in hot arid ecosystem. *Haryana Journal of Horticultural Sciences*, *39*(3-4), 214-216.