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The first authentic record of *Citripestis eutraphera* (Meyrick, 1935) on *Mangifera indica* L. in Pakistan (Lepidoptera: Pyralidae)

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Abstract

This is the first report on the occurrence of *Citripestis eutraphera* (Meyrick, 1935) (Lepidoptera: Pyralidae) from the Pakistani mainland causing extensive damage to mature and young mango fruits and leaves. Frequent surveillance in the district of Multan's mango-growing areas showed that reports of *Citripestis eutraphera* incidence on *Mangifera indica* L. had been made in recent years. This notorious pest may soon harm producing mangoes and other fruits. This data will be useful in developing sustainable management strategies to combat the mango pest in the country and its neighbouring countries.
Keywords: Lepidoptera, Pyralidae, *Citripestis eutraphera, Mangifera indica,* first record, Pakistan.

Primer registro auténtico de *Citripestis eutraphera* (Meyrick, 1935) sobre el *Mangifera indica* L. en Pakistán
(Lepidoptyera: Pyralidae)

Resumen

Este es el primer informe sobre la aparición de *Citripestis eutraphera* (Meyrick, 1935) (Lepidoptera: Pyralidae) en el territorio continental pakistaní, que causa grandes daños en frutos y hojas maduros y jóvenes de mango. La vigilancia frecuente en las zonas de cultivo de mango del distrito de Multan mostró que en los últimos años se habían recibido informes sobre la incidencia de *Citripestis eutraphera* en *Mangifera indica* L. Esta notoria plaga puede dañar pronto la producción de mangos y otras frutas. Estos datos serán útiles para desarrollar estrategias de gestión sostenibles para combatir la plaga del mango en el país y en sus países vecinos.
Palabras clave: Lepidoptera, Pyralidae, *Citripestis eutraphera*, *Mangifera indica*, primer registro, Pakistán.

Introduction

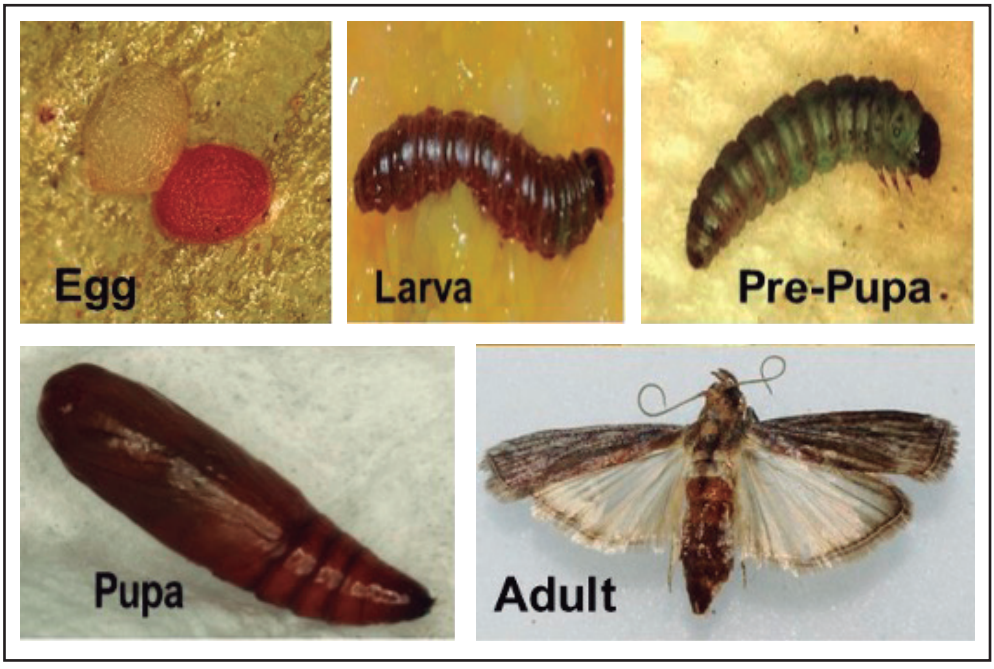
Mangifera indica L. is a member of the Anacardiaceae family. It is a tropical fruit that is native to the Indo-Burma region and is highly consumed by people (Majeed et al. 2024). Mangoes are produced and exported in large quantities by several countries, including Pakistan, Iran, Thailand, the Philippines, China, India, Egypt, Brazil, Mexico, Nigeria, Saudi Arabia, and Indonesia (Memon, 2016; Ullah et al. 2018). Due to the high consumption rate of *M. indica*, there is a significant demand for it. Because *M. indica* is a tasty fruit with a high consumption rate, there is a huge demand for it. Although only about 5% of the world's mango crop is currently exported, Pakistan has the potential to triple its mango exports. Since just around 5% of the world's mango crop is now exported, Pakistan has the potential to raise exports of mangos by three times. Pakistan is the 6th largest mango producer (Malik et al. 2018; Jing et al. 2020), and exports over

100,000 tonnes of mangoes, valued at approximately $100 million (Murtaza et al. 2021; Khan et al. 2023), which may increase dramatically.

Mangoes are primarily cultivated in the provinces of Sindh and Punjab in Pakistan. Mangoes are mostly farmed in the provinces of Sindh and Punjab in Pakistan. The mango output in Pakistan decreased by a significant 50% last year Mango output in Pakistan fell by a significant 50% last year (Zahid et al. 2023; Chandio et al. 2024). Farmers were optimistic about a bumper crop of mangoes in 2022, but their hopes were dashed when production in Pakistan declined sharply. Farmers had high hopes for a bumper crop of mangoes in 2022, but their hopes were dashed when production in Pakistan fell sharply. There are several factors contributing to the decline in mango production, with insect pests being the most significant. The several factors involved in declining mango production but among them, insect pests are the top one. Insect pests have had a major impact on *M. indica* production, despite a 110% growth in volume of exports between 2014 and 2021. Pakistan has the highest mango output in the world; however, by using good agricultural techniques to improve the quality of its mangos, it might increase its exports. To raise mangoes' market, share internationally and enhance their quality, a few issues must be resolved. The high production could be achieved by protecting the mangoes from insect infestation, particularly borers, which not only affect the photosynthetic system but also injure the fruits that become unfit for human consumption resulting in the rejection of the whole consignment. Mangoes must be protected from pests to keep their superior quality and visually pleasing look. The agricultural practices should be adopted by mango growers at small or large scales resulting increase in mango production and beneficial for the economy.

In 2019-2020, a survey was conducted in Multan (30.2º N and 71.4º E), Punjab, Pakistan, to know the problems faced by mango farmers in boosting mango production. There were several issues faced by mango growers in Multan, but among them, was a borer that was unidentified and caused high infestation in mango orchards. There was needed to identify it at the species level. To achieve this, infested fruits were collected from the fields and brought to the laboratory, where they were placed in plastic containers to facilitate the completion of the larvae's life cycle until they reached adulthood. For this purpose, the infested fruits collected from the field were brought to the laboratory and kept in plastic containers to allow the larvae to complete their life cycle till adult emergence. The identified insect was *Citripestis eutraphera* (Meyrick, 1935), and different stages are shown in Figure 1.

Figure 1. Different stages of *Citripestis eutraphera*.

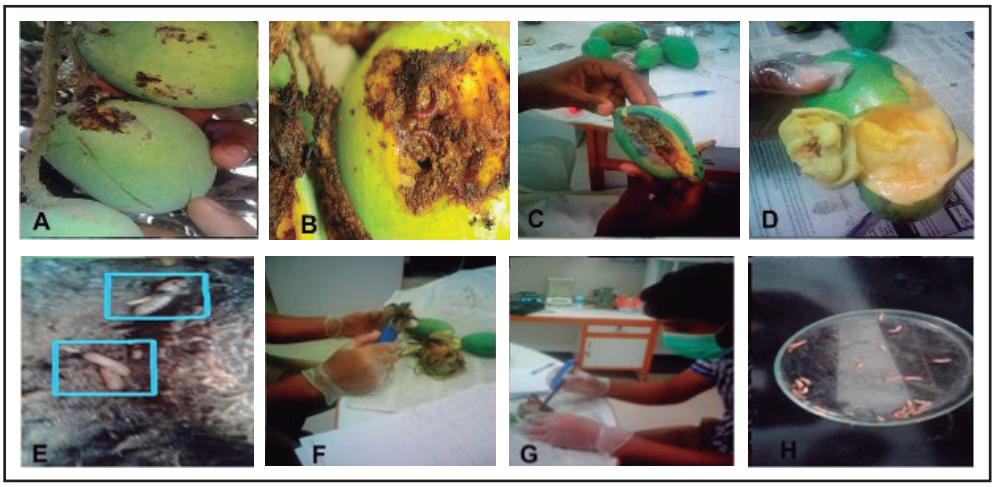


There were five larval instars. The larvae entered the fruits by making a hole and the first two instars fed on the fruit pulp, while later instars fed on the seeds. Additionally, newly hatched larvae also feed on the soft leaves and petioles of mangoes. To move between fruits, the larvae utilized silk threads created during feeding, and they either pupated inside the fruits or fell onto the soil near the tree trunk for pupation. Larvae move between fruits with the help of silk threads made by larvae during feeding and larvae pupate inside the fruits or fall on the soil for pupation near the tree trunk. A similar mode of damage was observed in both ex-situ and situ. Further research is necessary to develop effective pest management strategies and control the pest population on other crops. Further studies are needed to manage this pest and control the pest population on other crops.

Discussion and Conclusion

This is the first record from Pakistan, while it has been reported from neighboring countries like India in 1991 (Bhumannavar, 1991; Hiremath et al. 2017), and Indonesia in 1981 (Kalshoven, 1981). It has become a major pest of mango, cashew apples, and nuts with 12-15% yield losses (Bhumannavar, 1991; Jacob et al. 2004; Reddy, 2016; Singh et al. 2021; Reddy et al. 2022) in Indian states (Jayanthi et al. 2014; Soumya et al. 2016). This destructive pest poses a significant threat to various agricultural and horticultural crops in Pakistan. Without proper control measures, it could lead to substantial economic losses for the nation. This destructive pest can attack other agricultural and horticultural crops in Pakistan and if proper control measures are not adopted against this then it will become a serious issue with huge economic losses for the Pakistani nation. The mode of damage that occurs by larvae of *C. eutraphera* and *Bactocera* spp. can easily be confused, especially when they co-exist in single cropping systems, as the larvae are very similar at the initial stage. *C. eutraphera* is undoubtedly a serious threat to the mango industry in South and Southeast Asia and also in the Northern Territory of Australia. When sensitive leaves were supplied to the larvae in the lab, they bonded, ate the leaves, and eventually matured. The mango is pierced by larvae at the point where the fruit and the fruit stem alight. They started by scraping the outside of the mango fruit and creating frass before going inside and creating galleries. Excreta and frass were layered over the bore holes. According to the survey, the average damage percentage (%) caused by the insect in every mango field was rated between 90% and 100% (Figure 2).

Figure 2. *Citripestis eutraphera*. **A-D.** Mango fruits infested with larvae and larval frass. **E** larvae crawling on fruit skin after whole damage. **F-G** Collection of larvae and damage percentage record. **H** collected larvae.



Mango growers in Pakistan face a threat to their production costs because of the existence of *C. eutraphera* (Meyrick). The import and export of mango can be badly affected by the infestation of this notorious pest in Pakistan. Knowing what pests are present in a crop is a crucial first step in developing effective management strategies, hence it is necessary to record their presence in the nation. The most at-

risk groups will undoubtedly include home gardeners and small-scale farmers as many of them could not have the tools needed to deal with this pest. Therefore, it is essential to conduct urgent research, including studies into alternate control measures. These tactics might involve the use of pheromone traps for mass catching and monitoring, the utilization of native predators and parasitoids for natural management, and the significance of hygiene in reducing infestation levels. The following recommendations are made based on this paper: research institutions should work with other local or international organizations to develop and train growers and extension officers in environmentally friendly pest management techniques, which may involve importing or recruiting native enemies. Establishing local and regional systems for pest invasion alerts will also be crucial to prevent farmers from being caught off guard when a new pest invades their crop and causes such a significant loss in productivity. The information in this book should be used to comprehend why *C. eutraphera* (Meyrick), an invasive foreign fruit and shoot borer, is present in Pakistan.

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Conflicts of Interest

The authors declare that there is no known financial interest or personal relationship that could have influenced the work presented in this article.

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