Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 06, Issue: 04 (JULY-AUG, 2026)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

The Silent Invader of Mango Fruits: *Bactrocera dorsalis*

*Saurav Vats[1], Vikash Kumar[1], Rishabh Mishra[2] and Kunal Sarkar[3]
[1]PhD Research Scholar, Department of Horticulture (Fruit Science), Bihar Agricultural University, Sabour-813210, Bihar, India
[2]PhD Research Scholar, Department of Fruit Science, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110, Uttar Pradesh, India
[3]M.Sc. Research Scholar, Department of Horticulture (Fruit Science), Bihar Agricultural University, Sabour-813210, Bihar, India
*Corresponding Author's email: iamsaurav078@gmail.com

Mango (*Mangifera indica* L.), popularly known as the "King of Fruits", is one of the most cherished tropical fruits worldwide because of its exceptional taste, aroma, nutritional value and economic importance. India accounts for nearly 45% of global mango production and is home to more than 1,000 cultivars grown across diverse agro-climatic regions. Besides contributing significantly to farmer's livelihood, the mango industry generates substantial employment in production, processing, transportation and export sectors. However, achieving high productivity and premium fruit quality remains challenging due to several insect pests. Among which the oriental fruit fly, *Bactrocera dorsalis* (Hendel), is considered the most destructive pre-harvest pest of mango (Clarke et al. 2005; Drew & Romig, 2013). Unlike foliage-feeding insects, *B. dorsalis* directly attacks developing and ripening mango fruits. Female flies puncture the fruit peel using a sharp ovipositor and deposit eggs beneath the epidermis. After hatching, the maggots feed on the fruit pulp, causing internal deterioration long before external symptoms become visible. Consequently, affected fruits become unsuitable for fresh consumption, processing and export. Severe infestations may result in substantial fruit drop, poor fruit quality and heavy economic losses, particularly during the peak harvesting season (White & Elson-Harris, 1992). The significance of *B. dorsalis* extends beyond orchard losses. Since it is recognized as a quarantine pest by many importing countries, even a low level of infestation can lead to rejection of export consignments, reducing India's competitiveness in international mango markets (Vargas et al. 2015). Therefore, sustainable management of this pest is indispensable for improving mango productivity, ensuring fruit quality and enhancing export opportunities.

Biology of *Bactrocera dorsalis*

The biology of *B. dorsalis* is closely synchronized with mango fruit development. Adult flies begin appearing in orchards during flowering and increase rapidly as fruits approach maturity. Female flies prefer physiologically mature mango fruits for oviposition because they provide a favourable environment for larval development. Each female can lay several hundred eggs during her lifetime. Eggs hatch within one to two days under tropical conditions and the emerging larvae immediately begin feeding on the mango pulp. The larval feeding stage generally lasts one to two weeks, during which extensive internal tissue damage occurs. Mature maggots leave the fallen or harvested fruit and pupate in the upper soil layer beneath the tree canopy. Adults emerge approximately 8–12 days later and restart the reproductive cycle, allowing several overlapping generations during the mango season (Drew & Romig, 2013). Warm temperatures (25–30°C), high humidity and the availability of ripe

fruits create ideal conditions for rapid population growth. Consequently, fruit fly populations often reach their peak during the harvesting period.

Nature of damage in mango

Fruit infestation begins when female flies puncture the mango peel for egg laying. Initially, only tiny oviposition punctures are visible on the fruit surface. However, the internal feeding by maggots causes extensive destruction of the mesocarp, leading to pulp breakdown, fermentation and secondary microbial infection. As infestation progresses, mango fruits soften prematurely, emit a fermented odour and frequently fall before maturity. Externally healthy-looking fruits may harbour several larvae, making infestation difficult to detect during harvesting and grading. Such hidden infestations reduce consumer confidence and frequently result in rejection during export inspection (White & Elson-Harris, 1992).

Economic impact on mango production

Among all insect pests of mango, *B. dorsalis* causes some of the highest economic losses because it directly affects the marketable portion of the crop. Depending on cultivar susceptibility, orchard sanitation, climatic conditions and management practices, fruit losses may vary from 20% to over 80%, while unmanaged orchards may experience near-total crop failure during severe outbreaks (Vargas et al. 2015). In addition to yield reduction, growers incur significant expenses on monitoring, trapping, bait spraying, sanitation and post-harvest quarantine treatments. Exporters also bear additional costs associated with vapor heat treatment, irradiation, or hot water treatment required to meet international phytosanitary standards.

Seasonal incidence in mango

Fruit fly activity closely follows the fruiting period of mango. Adult populations generally begin increasing after fruit set and continue rising until fruits attain physiological maturity. Peak infestation usually coincides with the ripening stage when fruits become highly attractive for oviposition. The persistence of fallen fruits beneath trees allows larvae to complete development and serves as an important source of infestation for subsequent generations. Therefore, orchard sanitation during the harvesting season is one of the most effective preventive measures.

Integrated management in mango orchards

- Successful management of *B. dorsalis* in mango requires integration of several complementary strategies rather than dependence on insecticides alone (Vargas et al. 2015).
- Regular collection and destruction of fallen mango fruits interrupt the life cycle by eliminating developing larvae before they pupate in the soil. Deep burial or solarization of infested fruits substantially reduces the emergence of adult flies.
- Monitoring adult populations using methyl eugenol traps should begin before fruit maturation. These traps help determine the onset of infestation and guide timely intervention. Male Annihilation Technique (MAT), which combines methyl eugenol with an insecticide, effectively suppresses male populations and reduces successful mating (FAO & IAEA, 2020).
- Protein bait sprays are particularly effective because female fruit flies require protein for egg maturation. Localized bait applications attract adults while minimizing pesticide use and preserving beneficial insects.
- Fruit bagging approximately 45–60 days after fruit set provides excellent protection by preventing females from laying eggs on developing mangoes. In addition to reducing fruit fly damage, bagging improves fruit colour, minimizes pesticide residues and enhances export quality.
- Biological control through parasitoids such as *Fopius arisanus* and *Diachasmimorpha longicaudata* complements other IPM components by naturally suppressing fruit fly populations (Ekesi et al. 2016). Area-wide management involving neighbouring orchards further improves the long-term effectiveness of these practices.

Future perspectives for mango protection

Future management of *B. dorsalis* in mango will increasingly rely on precision agriculture and environmentally sustainable technologies. Smart pheromone traps equipped with artificial intelligence, drone-assisted orchard surveillance, climate-based forecasting models, RNA interference (RNAi), semiochemical-based attractants and improved biological control programmes are expected to strengthen integrated fruit fly management while reducing dependence on chemical insecticides.

Conclusion

The Oriental fruit fly, *Bactrocera dorsalis*, continues to pose one of the greatest threats to profitable and sustainable mango production. Its concealed larval feeding habit, rapid multiplication and quarantine significance make effective management essential for both domestic marketing and international trade. Adoption of integrated pest management practices—including orchard sanitation, methyl eugenol trapping, male annihilation, protein baiting, fruit bagging, biological control and area-wide community participation—offers the most sustainable approach to reducing fruit losses. Continued research, improved surveillance systems and wider adoption of eco-friendly technologies will play a crucial role in safeguarding mango production and ensuring the long-term sustainability of the mango industry.

References

1. Clarke, A. R., Armstrong, K. F., Carmichael, A. E., Milne, J. R., Raghu, S., Roderick, G. K., & Yeates, D. K. (2005). Invasive phytophagous pests arising through a recent tropical evolutionary radiation: The *Bactrocera dorsalis* complex of fruit flies. *Annual Review of Entomology*, *50*, 293–319. https://doi.org/10.1146/annurev.ento.50.071803.130428
2. Drew, R. A. I., & Romig, M. C. (2013). *Tropical Fruit Flies (Tephritidae: Dacinae) of South-East Asia*. CABI Publishing, Wallingford, UK.
3. Ekesi, S., De Meyer, M., Mohamed, S. A., Virgilio, M., & Borgemeister, C. (2016). Taxonomy, ecologyand management of native and exotic fruit fly species in Africa.

Annual Review of Entomology, 61, 219–238. https://doi.org/10.1146/annurev-ento-010715-023603

4. FAO & IAEA. (2020). *Guidance for Area-Wide Integrated Pest Management Programmes that Integrate the Sterile Insect Technique*. Food and Agriculture Organization of the United Nations and International Atomic Energy Agency, Vienna, Austria.
5. Nair, M. R. G. K. (1995). *Insects and Mites of Crops in India*. Indian Council of Agricultural Research (ICAR), New Delhi, India.
6. Vargas, R. I., Piñero, J. C., & Leblanc, L. (2015). An overview of pest species of *Bactrocera* fruit flies (Diptera: Tephritidae) and the integration of biopesticides with other biological approaches for their management. *Insects, 6*(2), 297–318.
7. Verghese, A., & Jayanthi, P. D. K. (2001). Integrated management of fruit flies in mango. In *Proceedings of the National Symposium on Pest Management in Horticultural Crops* (pp. 113–118). Bangalore, India.
8. White, I. M., & Elson-Harris, M. M. (1992). *Fruit Flies of Economic Significance: Their Identification and Bionomics*. CAB International, Wallingford, UK.