

MANGO LEAF WEBBER MANAGEMENT USING LEAF- WEB REMOVING DEVICE COUPLED WITH INTEGRATED APPROACHES

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Date of Receipt: 12-08-2025

Date of Acceptance: 29-09-2025

ABSTRACT

Leaf webber (*Orthaga* spp., commonly *O. exvinacea* Hampson) is an important defoliator of mango (*Mangifera indica* L.), reducing canopy photosynthetic area, weakening shoots, causing extensive defoliation and a characteristic “burnt” appearance of the canopy, ultimately leading to substantial yield losses. Mechanical removal of webbed shoots and burning of collected material is a recommended and effective component of integrated pest management (IPM). To develop a sustainable and effective management strategy, an integrated pest management (IPM) approach was evaluated under field conditions in Adilabad district of Telangana. The study assessed a combination of mechanical and judicious chemical management methods. The ICAR-Central Institute for Subtropical Horticulture (CISH), Lucknow, has developed a simple leaf-web removing device intended to safely and efficiently remove webbed leaves and shoots from mango trees for destruction. The perusal of the data indicated that the implementation of an IPM module, combining cultural practices like the mechanical removal and destruction of infested webs and shoots followed by targeted insecticidal applications, significantly reduced the leaf webber incidence and increased B:C ratio 2.59:1 compared to farmer's practice 1.79:1. Mechanical control was found to be highly effective in initial reduction of larval populations (recorded minimal larvae per tree shortly after application). The IPM strategy provided a significant yield increment 27.12 % compared to farmers' traditional practices. This integrated strategy offers a viable and robust solution for mango growers to mitigate the damage caused by the leaf webber and ensure sustainable mango production.

Keywords: *Mangifera indica*, leaf webber, *Orthaga exvinacea*, mechanical control, CISH, leaf-web removing device, IPM.

Mango (*Mangifera indica* L.), the “king of fruits,” is one of the most economically significant horticultural crops in India, a country that accounts for a major share of the global mango production. The area under mango cultivation in India is about 23.17 lakh ha with the production of 20.386 lakh MT with an average productivity of 8.8 MT ha⁻¹ (2020-21). In India, amongst all the states Uttar Pradesh is the leading in mango production followed by Andhra Pradesh and Karnataka. India is the leading exporter of mangoes, wherein the exporting quality of mangoes depends on the newness and its pulp quality. In Telangana state, mango is cultivated over a considerable area, serving as a primary source of income for mangogrowers.

In India, Telangana stands at 21st place in mango cultivation. With an area of 1.242 lakh ha with the production of 11.490 lakh MT and production of 9.25 MT ha⁻¹ (Horticultural Statistics at a regard, 2021). Adilabad occupies an area of 300.4 hectares with production of 1841.31 metric tonnes and productivity of 4.10 MT ha⁻¹ (2020-21) (Horticulture Statistics Division, Department of Agriculture & Farmers Welfare.)

However, the productivity and quality of this fruit are severely hampered by a complex of insect pests. The mango tree is attacked by various pests like scale insect, mealy bug, fruit fly, leaf webber, mango hopper etc. Across the world the mango plants are attacked by 492 species of insects, 17 species of mites and around 26 species of nematodes. According to Tandon and Verghese (1985) and Srivastava (1998) out of these pests around 188 are reported from India.

Mari AK., *et al.*, (2020) reported that Around 260 species of insects and mite pests attack the tree of different stages. Historically, pests like the mango hoppers (*Amritodus atkinsoni* Leth and *Idioscopus* sp.) and fruitfly (*Bactrocera dorsalis* Hendal), and leaf gall fly (*Procontarinia matteiana* Keiffer and Cocconi) cause considerable damage to mango (Pena and Mohyuddin, 1998). In recent years, a shift in the pest scenario has been noticed, with the mango leaf webber, *Orthaga exvinacea* Hampson (Lepidoptera: Pyralidae), emerging as a serious and widespread threat responsible for low productivity (Verghese, 1998) which damages mostly old mango trees.

Orthaga exvinacea caterpillar is very typical, on hatching it feeds on tender leaves nearby and feed gregariously on leaf chlorophyll by scrapping the leaf lamina. Kasar *et al.*, (2017) reported that during larval stages, the caterpillars webs two to three leaves together by feeding on internal portion of the leaves from edges towards the midrib leaving behind the network of veins. These leaves are assembled and woven with a web and made via nest-like structure.

The leaves loose from their stalks, frequently detach but remain entangled in webs on the tree. Multitudinous dried bunches of shoots and leaves are easily visible from a distance on oppressively attacked mango tree. The webbed leaves give a small roof- suchlike appearance, so it's also popularly called as the Tent caterpillar. There are numerous species of leaf webber observed on mango in India of which *Orthaga euadrusalis* (perambulator), *Orthaga exvinaceae* (Hampson) and *Orthaga mangiferae* are considered as major species.

The feeding activity leads to extensive defoliation, giving the trees a burnt appearance, which severely impacts photosynthesis and new flush development. The infestation is particularly severe during the post-monsoon period (September to December) and has been observed to cause yield losses ranging from 20% to complete crop failure in heavily infested orchards in Telangana. Webber infestation began from June and continued up to December and also Tandon and Srivastava (1982) reported the increasing of Webber the month of October to November in Uttar Pradesh. Soumya *et al.*, (2017) investigated that the months between October and December had high population. After January till about April there was no population that occurred on the leaves.

While chemical interventions have shown promise, their standalone application is not a sustainable long-term solution. Singh (1999) stated that the chemical approach is the last line of defense to control the pest in case other methods fail. This method is advised if the infestation and damage are economical. Botanicals like nemactine, nimbidine, etc. can be used to manage the pest without much collateral damages.

The growing concerns over conventional pest control methods necessitate the development and implementation of sustainable and ecologically sound management strategies. Integrated Pest Management (IPM) offers a holistic approach that combines cultural, mechanical, biological, and chemical methods in a compatible manner to maintain pest populations below economically damaging levels. Ehler (2006) reported that IPM can be best utilized for the management of the pest.

Therefore, the present study was conducted at Adilabad district of Telangana, to evaluate the efficacy of leaf web removing device with an objective to find out effective, farmer friendly and economical practice which can reduce the impact *O. exvinacea*, thereby enhancing mango productivity and sustainability.

MATERIAL AND METHODS

The On farm field demonstration was conducted in villages namely Pittlaguda, Jeeyar Nagar and Laxetipet of Adilabad district of Telangana state (Utnoor Mandal of Adilabad district) over two consecutive seasons for 2023-24 and 2024-25. The selected orchards comprised existing mango trees (e.g., variety Banganpalli) of uniform age (10-15 years old) and canopy size, maintained under standard agronomic practices but without any insecticidal sprays for at least one year prior to the study to ensure a natural pest population. Selected Orchards are sandy in nature, planted with a spacing of 10 x 10 m apart.

Before conducting OFTs a list of farmers was prepared from group meetings and specific skill training was imparted to the selected farmers regarding different aspects of cultivation. The trials were specifically timed to coincide with the peak activity period of the mango leaf webber, typically from September to December.

The treatments evaluated included both individual components and a full Integrated Pest Management (IPM) module.

T1: Farmers Practice: Spraying of only chlorpyrifos @ 2 ml/lit after.

T2: Removal of leaf webs by leaf web removing device developed by CISH, Lucknow. Spraying of chlorpyrifos @ 2 ml/lit + Azadirachtin (10000 ppm) @ 1 ml/lit and spraying of lamdacyhalothrin @ 1 ml/lit at 15 days after first spray. Treatments involving sprays were applied using a foot sprayer, ensuring uniform coverage of the tree canopy.

Data was recorded on the selected trees from all four directions (North, South, East, and West). The number of active webs and the larval population per web/tree was recorded one day before the application of treatments to establish initial pest load uniformity across plots. Efficacy was assessed by recording the number of live larvae per web/tree after treatment application at 20 days after treatment (DAT). Webs were gently opened without jerking, and the number of live larvae was counted under a polythene sheet to prevent any from falling to the ground. Fruit yield (in kg ha⁻¹) was recorded at the time of harvest to determine the economic benefits of each treatment.

RESULTS AND DISCUSSION

Based on the results presented in Table 1, the trial plots exhibited the highest benefit cost ratio, maximum gross returns, and net returns compared to the farmer's practices.

The average yield for the IPM demonstration (T₂) was high (9960 kg ha⁻¹) compared to farmer's practice (T₁) (7835 kg ha⁻¹) and followed fields were and in the year 2023-24 and 2024-25, respectively. The average gross returns and net returns for the demonstration fields were Rs. 2,98,800 and Rs.

1,83,450 respectively with gross cost Rs. 1,15,350. On the other hand, farmers' practices generated gross returns of Rs. 2,35,000 net returns of Rs. 1,03,850 and gross costs of Rs. 1,31,150. The implementation of these technologies, Integrated Crop Management techniques and regular field inspections were all credited with the higher net returns in demonstration fields. A mean cost benefit ratio of 1:2.59 was recorded in demonstrations with an increase of Rs. 79,600 net returns and with 17.66% increase of net returns than farmers practices. The benefit-cost ratio increased reflecting the positive impact of OFT on both fruit yield and profitability.

Similar findings were reported by Anonymous (2014c) wherein removal of infested twig/webbed mass along with the larvae farmed pruning and burning of infested shoots by mechanically was effective in containing webber damage.

The present findings are also in agreement with Archana *et al.* (2024) study of Insecticide evaluation and mechanical removal of mango leaf webber indicated that it was the most effective treatment against leaf webber recording lowest larval population of 12.90 larva per tree.

Timely removal of mango leaf web not only reduces the pest incidence but also increases mango yield. As per the field observations number of fruits per plant, colour and quality of mango fruits. Mango Leaf Webber Management using Leaf- Web Removing Device was quite effective and fetched better price in the market.

Table 1. Yield (kg ha⁻¹), Gross return (Rs. ha⁻¹), Cost of cultivation (Rs. ha⁻¹), Net return (Rs. ha⁻¹) and Benefit cost ratio of mango orchards as influenced by leaf webber management using leaf-web removing device in Adilabad district.

Year	Treatments	Yield (kg ha ⁻¹)	Gross Returns (Rs. ha ⁻¹)	Cost of Cultivation (Rs. ha ⁻¹)	Net returns (Rs. ha ⁻¹)	B:C Ratio
2023-24	T1	7620	228500	129500	99000	1.76:1
	T2	9550	286500	113500	173000	2.52:1
2024-25	T1	8050	241500	132800	108700	1.81:1
	T2	10370	311100	117200	193900	2.65:1
Mean	T1	7835	235000	131150	103850	1.79:1
	T2	9960	298800	115350	183450	2.59:1

CONCLUSION

Mechanical removal of webs using leaf web removing device was to be as most ideal method to contain leaf webber. Based on two years study it may be deduced that Mango leaf webber removing with web removing device improved number of fruits and results in increased yields. This practice not only increased the yield but fetched higher net returns to the farmers. Facilitating large such adoption in future.

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