

# Management Strategy against Melon Fruit Fly of musk melon in Kargil, Ladakh

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## ABSTRACT

The melon fruit fly, *Bactrocera cucurbitae* (Coquillett), is a major pest of cucurbitaceous crops causing severe yield losses worldwide. Climate change has further increased its prevalence even in cold arid regions. To evaluate effective management strategies against melon fruit fly in musk melon (*Cucumis melo*), on-farm testing was conducted in farmers' fields across five villages of Kargil district, Ladakh during the 2020–23 and 2021–24 seasons by Krishi Vigyan Kendra (KVK), Kargil-I. Three management practices were evaluated: spray of azadirachtin 1500 ppm @ 5 ml L<sup>-1</sup> of water (T1), installation of cue-lure traps @ 25 traps ha<sup>-1</sup> soon after flowering (T2), and farmer's practice of collecting and disposing of infested fruits (control). Cue-lure traps were prepared using ethyl alcohol, cue-lure, and chlorpyrifos in a 6:4:2 ratio and installed in water-bottle traps for monitoring and mass trapping of male flies. Results indicated that the mean number of fruit flies trapped was higher in the first lure (53.39 flies trap<sup>-1</sup>) compared to the second lure (43.06 flies trap<sup>-1</sup>). Higher male catches were observed in warmer villages such as Mangbor and Pashkum, showing a positive correlation between temperature and fruit fly population. Economic analysis revealed that cue-lure traps recorded the highest marketable fruit yield (196.74 q ha<sup>-1</sup>) with a net profit of ₹515,590, followed by azadirachtin spray (137.66 q ha<sup>-1</sup>; net profit ₹309,810), whereas the farmer's practice recorded the lowest yield (76.58 q ha<sup>-1</sup>; net profit ₹98,030). The study demonstrates that cue-lure traps are an effective, eco-friendly, and economically viable strategy for managing melon fruit fly in musk melon under cold arid conditions. Their adoption can significantly reduce pest infestation, improve fruit quality and yield, and minimize reliance on chemical pesticides.

**Keywords:** Melon fruit fly, *Bactrocera cucurbitae*, cue-lure traps, musk melon, pest management, cold arid region, Kargil.

## Introduction

*Bactrocera cucurbitae* (Coquillett), commonly known as the melon fruit fly, is a major pest that affects a wide range of cucurbitaceous vegetables. It is prevalent worldwide, particularly in temperate, tropical, and subtropical regions. Due to climate change, insect infestation is now prevalent in cold arid zones too [3,4]. This pest is notably harmful to crops such as bitter melon (*Momordica charantia*), muskmelon (*Cucumis melo*), snap melon (*C. melo* var. *momordica*), and snake gourd (*Trichosanthes anguina*). According to Dhillon *et al.* (2005), the melon fruit fly can damage up to 81 different host plants. The extent of crop loss varies significantly depending on the season and type of cucurbit, with potential losses ranging from 30% to 100% [6,9]. Managing fruit flies is challenging because third instar larvae leave decaying fruits and drop to the ground to pupate in the soil; thus, both larvae and pupae are protected from surface-applied insecticides [2]. Early monitoring and detection of pest infestation are essential for effective management. Pheromone traps are among the best tools available for both monitoring and mass trapping in pest management. The relationship between pheromone trap catches, field infestation, and environmental factors is crucial for the decision-making process. Cue-lure traps have been used for monitoring and mass trapping of *B. cucurbitae* males [7, 11]. The melon fly causes three types of damage i) Females inflict oviposition injuries on fruits and vegetative parts, ii) Larvae feed on the ovaries and fruit pulp, iii) Fly-damaged fruit tissue decomposes due to invading sap [6, 10].

Pheromone traps can indicate and determine the need to initiate IPM measures.

To address this issue, on-farm testing was conducted at multiple locations in farmer's fields across different villages in Kargil district of Ladakh. This testing was carried out by the Krishi Vigyan Kendra, Kargil I during the 2022-23 and 2023-24 seasons to identify effective management strategies against the melon fruit fly infesting musk melon (*Cucumis melo*), which belongs to the Cucurbitaceae family.

## Material Method

To select the farmers, a group meeting was organized with farmers from musk melon growing areas, from which five farmers were chosen based on their production systems and farming situations. The study utilized 21-day-old seedlings of the hybrid musk melon. The seeds were planted under a black polyethen mulching method. All recommended agronomic practices were conducted in the cultivation of musk melon. Three technologies/treatments were tested, viz spray of azadirachtin 1500 ppm @5ml/l of H<sub>2</sub>O, Placement of lure trap @ 25 Ha-1 soon after flowering (lure was changed only two times) and Farmer practice collection and disposal of infested fruit.

The Cue-Lure is a parapheromone which attract males of *B. cucurbitae* [8]. The Cue-Lure can be used for monitoring and mass trapping of male flies, and baiting with pesticide helps to kill them immediately.

**Preparation of cue lure:-** Mix ethyl alcohol, Cue-Lure [4-(p-acetoxyphenyl)-2-butanone], and Chlorpyriphose 50EC (Insecticide) in the ratio of 6:4:2 in a glass container. Add plywood pieces of size 2"×2"×1" (l×b×h) into the above prepared mixture. Soak the plywood pieces in the Cue-Lure for 24-48 hrs.

Cue lure and Chlorpyriphos-impregnated blocks suspended in water-bottle traps were installed in musk melon fields for both population-estimation and fruit-fly control.

## Result and Discussion

**Number of fruit fly trapped per trap:-** The results on the mean number of fruit flies trapped from the five selected locations revealed that all traps caught a significant number of fruit flies. The results showed that fruit fly catches were significantly higher (53.39/trap) in the first lure compared to the second lure (43.064), which was installed 25 days after the first trap. In Mangbor village, male catches of fruit flies were higher in 2023 (82.33 in the first lure and 63.00 in the second lure) compared to 2024 (60.33 in both lures); Mangbor is the hottest place among all five villages after Pashkum, where male fruit fly catches were also higher (62.66 in the first lure and 55.00 in the second lure in 2023, and 59.33 and 49.00 in 2024) than in the other villages. Temperature showed a significant correlation with the trapped population of male fruit flies, which coincides with bitter gourd field cultivation [5].

**Economics of different management:-** The result on marketable fruit yield in musk melon of among different management revealed that a significant higher yield was recorded in both the treatment over the control. The mean marketable fruit yield recorded in cue lure (T<sub>2</sub>) 196.74 q/ha with net profit of Rs. 515590, followed by a spray of Azadirachtin (0.05%) (T<sub>1</sub>) with 137.66 q/ha with net profit of Rs. 309810 compared to control where the least fruit yield 76.58 q/ha with net profit Rs. 98030 were recorded.

**Table 1: No of fruit flies trapped per trap**

Location	2023		2024	
	1 <sup>st</sup> lure	2 <sup>nd</sup> lure	1 <sup>st</sup> lure	2 <sup>nd</sup> lure
Kurbathang	43.66	33.33	46.00	37.66
Pashkum	62.66	55.00	59.33	49.00
Lotsum	32.66	24.33	29.33	15.33
Poyen	45.33	39.66	51.66	43.66
Mangbore	82.33	63.00	60.33	60.33
Mean	53.39	43.064	49.33	41.196

**Table 2: Economics of different management options against melon fruit fly (mean of two years study 2022-23 and 2023-24)**

Technology Assessed	Yield (per/ha)	Cost of production(Rs/ha)	Net profit(Rs/ha)	B:C ratio
T1: Azadirachtin 5ml/l of H <sub>2</sub> O	137.66	172000	309810	1.80
T2:Cue-lure	196.74	173000	515590	2.98
T3: Control	76.58	170000	98030	0.58
Mean	136.99	1,71,666.67	3,07,810	1.79

**Conclusion:-** The present study concludes that the melon fruit fly causes significant damage to musk melons, particularly during their early, and immature stages, leading to yield losses of approximately 60%. The use of cue lure traps has been shown to enhance yield by improving both fruit size and quality while effectively reducing melon fruit fly infestation in musk melons. Cue lures are easy to prepare locally and provide an efficient,eco-friendly alternative to pesticides, which do not require frequent applications that result in higher labor costs. Therefore, future research should focus on improving the efficiency and scalability of cue lure applications to make musk melon cultivation more profitable and sustainable while safeguarding the environment and human health.

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