

Pest alert

Occurrence of invasive insect pest, apple leaf blotch miner (ALBM), *Leucoptera malifoliella*, (Costa) (Lyonetiidae: Lepidoptera) in the Jammu and Kashmir UT of India



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PEST ALERT

Occurrence of invasive insect pest, apple leaf blotch miner (ALBM), *Leucoptera malifoliella*, (Costa) (Lyonetiidae: Lepidoptera) in the Jammu and Kashmir UT of India

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ICAR-NBAIR is entrusted in monitoring and reporting of alien invasive insect pests in the country. Based on the news circulation informing infestation of a pest ravaging apple crop and subsequent samples sent by AICRP-BC Centre, SKUAST-K. NBAIR could molecularly confirm the pest as apple leaf blotch miner (NCBI accession no. OR244421), *Leucoptera malifoliella* (Costa) (Lyonetiidae: Lepidoptera) as an invasive insect pest threat to apple production in the country.

In order to know the ground level infestation caused by apple leaf blotch miner, promptly a team of scientists from ICAR-NBAIR and SKUAST- K have undertaken a survey/surveillance programme from 31 July to 3 August 2023. The team could survey the four districts of south Kashmir namely, Shopian, Anantnag, Pulwama and Kulgam. In these four districts apple has been cultivated in an area of 74,548 ha. In Jammu and Kashmir Union Territory of India, apple is being cultivated in an area 1,70,743 ha in that 1,49,831 ha area is under Kashmir and 20,912 ha in Jammu region.

In entire south Kashmir the pest has caused significant losses to the tune of 13-100% leaf defoliation in apple orchards. The famous Shopian district known for growing of quality apple has witnessed very severe damage. The infestation of apple blotch leaf miner has been witnessed in almost all the cultivars grown in the Kashmir valley region. Severe defoliation of leaves caused by feeding of larvae on the parenchyma tissue of the leaves will affect the apple production. The team has envisaged an estimated loss of 20-50% depending on the level of defoliation caused by ABLM. However, it has to be ascertained by deployment of latest approaches like aerial imaging and terrestrial photogrammetry to know the accurate detection in the field.



Study location, Survey and surveillance team from ICAR-NBAIR & AICRP-BC, SKUAST-K

Surveyed areas and per cent leaf defoliation in apple orchards of Kashmir valley is enumerated hereunder,

District	*Village	(%)Leaf defoliation/branch
Shopian	ZAINAPORA	100.0
	Reshipora	71.0
	Babapora	100.0
	Mujhmarg	72.0
	Durpora	75.0
	Safanagri	100.0
	Aglar	80.0
	Awnera	40.0
	Mamnoo	43.0
	WACHI	100.0
	Kahjapora	52.0
	Chitragam	56.0
	Malhora	67.0
	Heff Shirmal	72.0
	Darbagh	71.0
	Imamsahib	62.0
	Rebban	71.0
Kulgam	KANGIKULLA	33.0
	Frisal	35.0
	Badura	42.0
	Kukergund	40.0
	Kantapora	37.0
	Yaripora	40.0
	Hangalbush	32.0
Anantnag	Sirhama	13.0
	Simthan,	17.0
	Kolgad,	24.0
	Shehlipora,	27.0
	GOPALPORA	73.0
	Larkipora	62.0
	Lukbawan	57.0
	Kuchpora	64.0
	Bijbehara	27.0
	Achabal	31.0
	Kehribal	47.0
	DIALGAM	23.0
Pulwama	Litter	67.0
	Lasipora	71.0
	Chakura	55.0
	Koil	27.0
	Lajura	16.0
	Malangpora	13.0
	Renzipora	72.0
	Wakharwan	72.0
	WASOORA	83.0

*The villages in capital letter indicate the team has visited the place and damage infestation has been recorded. Normal font indicates the information has been received from the Department of Horticulture, J&K

The team observed the late instar larvae of ABLM dropping by fine thread, a behaviour mechanism exhibited by the pest, ready for the pupation. In a tree several hundreds of larvae have already pupated on the bark, trunk, under surface of the leaves. Even the pupation was witnessed in the weed plants like amaranath, *Solanum nigrum*, wild radish without any damage to the weed plants in the apple orchard. The H or boat shaped white silken cocoon with slits is mostly seen on cracks and crevices of the bark, trunk and under surface of the leaves to a larger extent. Pupation of larva is also seen on upper surface of the leaf as well as fruit in low number. The infestation of leafminer has been observed only in apple. No overlapping generations of apple blotch leaf miner was observed in any of the study locations. From the literature, it has been reported that, ABLM, *L. malifoliella* is known to occur on the other pome fruits namely, pear, quince, sweet cherry, hazelnut but during our survey/ surveillance we did not observe occurrence of *L. malifoliella* other than apple crop.

The surveillance team also observed feeding of the mesophyll tissues of leaves by ABLM also paves a way for secondary build up of *Alternaria* disease in the orchard. Any high intensity winds at the time of pupation may displace the larvae to new locations for easy spread. The team also observed apple blotch leaf miner infestation on the fruits that has been kept for selling. This will favour spread of the ABLM to new areas as the leaves are detached from fruits before consumption.



Severely infested apple plants by ABLM



Blotches of single to complete defoliation



Pupation on different parts of apple plant and a. weed



Larvae prepares for pupation on the tree trunk

Biology and damage symptoms of ABLM

The apple blotch leaf miner (ABLM) has four life stages, egg, larvae, pupae and adult. The lifecycle completes 25-30 days. It is envisaged that attack of the ABLM is severe in summer and autumn months. The oval shaped translucent egg is minute (0.24 mm), usually seen on the abaxial surface of the leaves. The hatched out larvae will start feeding on the leaf mesophyll leading to development of mine/ blotches resulted in development of necrosis that eventually result in affecting the photosynthesis of plants. Infestation may also lead to premature leaf loss and the lower photosynthetic rate in the plant will affect the yield and bloom in the next season. Severe defoliation by this pest without any remedial measures may result to death of young plants in the nursery as well as in the main field. In the unmanaged orchards, the infestation of this pest leads to severe defoliation and burnt up appearance of the crop.



Eggs on the undersurface of the leaf Egg on higher magnification



Egg on the undersurface and its corresponding injury on the upper surface of the leaf

The larvae have four instars before it goes for pupation. The young larva is pale white translucent in colour. While the last instar larvae is pale whitish yellow, flattened head with 11 segmented body of well developed thoracic and prolegs. Crochets are well developed in the prolegs. The larvae of late instar larvae has a well developed mandibular type mouth parts.



Late instar larva with blotches



Late instar larva with developed a. thoracic legs and b. prolegs

The pupae are brownish yellow with prominent eyes and antennae, measure about 3.0 mm length. After one week period of pupation, the adult emerges and measures about mean body length of 2.8-3.0 mm.



Late instar larva



Silken cocoon



Naked pupa



**Silken cocoon
with slits for
adult emergence**

The male can be distinguished from female based on the prominent fringes of hairs in the vertex region of the head. The antennae are very long usually kept in a horizontal position to the body. The size of both male and females are almost same except a wider abdomen in the females. In the field conditions, moth activity was not that visible during the day time because the larvae had just started pupation.

Based on the samples collected from the survey, we observed mating occurred few hours after emergence. The female released her pheromone gland to attract males there after copulation takes place for few minutes. The mated female lays its egg singly on the abaxial surface of the leaves. In some cases, two eggs were laid side by side by the female.



L. malifoliella
♂



***L. malifoliella* ♀
(ventral view)
with pheromone
gland**



***L. malifoliella*
mating pair**

Global distribution and probable pathways of ALBM introduction to India

ALBM is considered as significant temperate pest of apple in 32 European nations namely, Albania, Austria, Belarus, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Spain, Sweden, Switzerland, Ukraine, and the United Kingdom.

In Asia, the occurrence of apple leaf blotch miner has been recorded in eight countries namely, Armenia, China, Iran, Russia, Kazakhstan, Turkey, Turkmenistan, and Uzbekistan.

ALBM might have introduced to India along with apple germplasm imported from Italy and Netherlands / other European nations either for higher production or pollination purpose.

Advisory

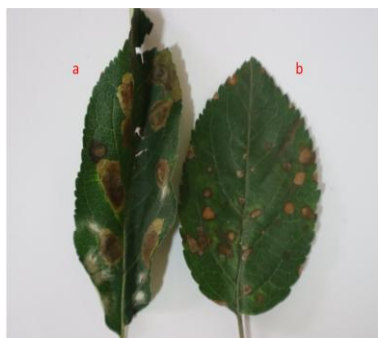
- Field sanitation is very important. Weed free orchards will result in avoiding carryover of the pest to next generation.
- Use pest free planting material.
- Collection and burning of affected leaves.
- Mechanical destruction of pupae from the bark and trunk region of the apple trees.
- Domestic quarantine to be strengthened, any plant material and fruits to be thoroughly fumigated if it is shipped to other apple growing states.



Apple leafminer infested produce in the market aids in spread of the pest to new area

- Overwintering generation of moth emergence during April-May has to be carefully monitored and should be controlled efficiently to keep the level of infestation under control throughout the year.
- Covering of tree trunks with gunny bags will enable the larvae to pupate on it. Later the overwintering pupae in the gunny bags can be removed/destroyed.
- Installation of yellow sticky traps in apple orchards 0.5m above ground level to catch the adult moths. Long yellow gum tapes/oiled tapes can be placed in orchards for trapping of moving moths.

- Awareness on the occurrence of leafminer in the apple orchard to be sensitized to farmers of the Kashmir valley. Many of the farmers are confusing with the initial blotches as *Alternaria* disease, hence spraying of rounds of fungicides, predisposes infestation of leafminer to build up more due to resurgence. Rounds of sprays also pose a great risk to environment and human health.



a. Leafminer infestation b. *Alternaria* disease

- Several natural enemies/ parasitoids have been reported from foreign countries checking leafminer infestations. From our survey, we could observe hemerobiid grub feeding on the apple blotch leaf miner. Hence, conservation of these predator in the orchard is recommended. ICAR-NBAIR is already on look out for possible indigenous parasitoid emergence from the samples collected from the study locations, this will enable to tackle the pest through biocontrol approaches.



Hemerobiid grub devouring cocoon of apple leafminer

- In case of no potential indigenous parasitoids from the study locations, ICAR- NBAIR will explore the possibilities to import suitable host specific parasitoids from the foreign countries.
- As per the available literature, spraying of NSKE 5% would give desired result in management of the pest.
- Spraying of insecticides may not give the desirable result as the larva resides inside the blotch. However, systemic insecticide spray concentrated towards the trunk, bark region will check the emerging subsequent generations of moths from further spread.
- Since there is no label claim of insecticides to be used for the management of ALBM. Temporary label claim for some of insecticides based on the global experience may be sought from CIB & RC, Govt. of India.