Integrated Pest Management (IPM) Practices for Major Insect Pests of Mulberry

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Mulberry forms the basic food material for silkworms and the bulk of the raw silk produced in the world are from mulberry silkworms. Mulberry leaf protein is the source for the silkworm to bio-synthesize the silk which is made up of two proteins, fibroin and sericin. Nearly 70% of the silk proteins produced by a silkworm is derived directly from the proteins of the mulberry leaves.

The mulberry cultivation plays a vital role in determining the cost of production of cocoons quality and quantities of silk. It is estimated that about 60% of the cost of cocoon production goes to mulberry leaf production. It also forms an unlimited source of food and shelter for a variety of pests, which cause considerable damage to foliage in varying intensities. Although more than 300 species of pests (insect & non-insect) have been reported to infest mulberry, a few soft bodied insects such as pink mealybug, thrips, broad mites etc. and defoliators such as leaf roller & Bihar hairy caterpillar are considered as major pests causing significant qualitative and quantitative damage.

Pink mealy bug: *Macconellicoccus hirsutus* , Pseudococcidae : Hemiptera

Diagnostic symptoms

- Malformation of apical shoots, retarded growth.
- Wrinkling and curling of affected leaves become dark green in colour.
- Due to secretion of honeydew, sooty mould develops all over the leaves. Leaves become brittle. Leaves become yellow on severe infestation.
- Symptoms are collectively called as Tukra (Bushy top).

Nature of damage

- Nymphs and adults of *M. hirsutus* suck the sap from tender leaves and buds by piercing the plant tissue. It causes hypertrophy of cells. The infestation occurs in the nodal joints and succulent apical region.
- Nutritive value of leaves, leaf yield and plant height are drastically reduced.
- The affected leaves when fed to silkworm cause a significant reduction in larval weight, cocoon weight, shell weight and shell ratio.

Season: Prevalent throughout the year with higher incidence during summer.

Biology

The mealy bug lays eggs (=250 no) in a loose cottony terminal ovisac. Freshly laid eggs are orange in colour, smooth a smooth and oval with slightly tapering ends. Eggs turn pink before they hatch. Mealy bug completes its life cycle in 23 – 29 days. Egg: 5 – 6 days; Nymph: 2 –3 months.

Management

1. Mechanical method

- Remove and destroy infested portions by burning or dipping in 0.5% soap solution.
- To prevent further infestation, top clip and burn all the apical tips in the garden when the silkworms are in IV moult.

2. Biological method

- Release of predatory lady bird beetles *Cryptolaemus montrouzieri or Scymnus coccivora* @ 250 or 500 adults respectively per year in two split doses at an interval of six months.

Note: Bio-control agents are available at CSRTI-Mysore (Ph: 0821-2903285), NBAIR, Bangalore (080-

23511982) and S.R.K.Bio-control Centre, Hosur, T.N (Ph: 09994622647).

3. Chemical method

- Spray Dinotefuran 20% SG (Dominant) @ 0.25 g/lit of water, 15 days after pruning (Safety Period: 20 Days).

Thrips: *Pseudodentrothrips mori*, Thripidae. Thysonoptera

Diagnostic symptoms

- Thrips affect the leaves of mulberry plant.
- Affected leaves show streaks in the early stages and beetles in the advanced stage of attack. Leaves turn to yellowish brown on maturity.

Type of damage

- Thrips injure the epidermal shoots.
- Early maturity, depletion of moisture, reduction in crude protein and total sugars are noticed in the affected leaves.
- Leaves become unsuitable for silkworm rearing.

Season : Throughout the year but high in summer

Biology

Adult : ♂ - Brownish yellow ♀ are larger than males. A female adult lays 30 –50 bean shaped yellow coloured eggs on the ventral side of the leaves.

Egg period : 6-8 days .Egg is oblong. Nymphs: pale yellow coloured. Four instars. – Duration 15 – 18 days.

Management

- Sprinkler irrigation disperses nymphs and adults.
- Release of Chrysopids 1000 eggs/acre two times at an interval of one week. Eggs available in the form of egg cards, which may be stapled / tied to terminal leaves.

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- Spray DDVP @ 1 l/ha to kill nymphs and adults. (Safety period: 15 Days).

Broad mite: *Polyphagotarsonemus latus*, Tarsonemidae, Acari

Diagnostic symptoms and type of damage

- The broad mites prefer young, growing tips of mulberry and as a result the younger leaves are badly damaged.
- The pest mainly attacks on the adaxial surface of the young leaves, which tends to cause the leaf to turn brown and curl upwards or downwards.
- The highest degree of infestation results in the leaf and shoot growth severely damaged by way of curling of leaf margins, firmness of infested leaves, necrosis of growing points, aborted buds and growth inhibition.
- In heavily infested mulberry garden single mulberry leaf contains 1000 to 4000 mites population, where as the ETL for broad mites is 5 mites/leaf.

Season: Throughout the year but high in summer

Biology

The broad mites complete a generation in 4-7 days under optimal conditions (at 25°C temp. & high

humidity). The life cycle has egg, larva, and adult stages. An adult female can lay approx. 30-40 eggs.

Management

1. Mechanical method

- Remove affected apical shoots during early stage of infestation.
- Water spray on the underside of the leaves to suppress the population.

2. Botanical & biological control method

- Spray Vidi Greenpath: 2 ml/litre with Adpro Shootin 0.3 ml/litre of water. Two sprays @ weekly interval.
- At early stage of infestation, release Blaptostethus pallescens (anthocorid) @ 1000 nymphs or adults per acre at weekly interval

Note: Bio-control agents are available at CSRTI-Mysore (Ph: 0821-2903285), NBAIR, Bangalore (080-23511982) and S.R.K.Bio-control Centre, Hosur, T.N (Ph: 09994622647).

3. Chemical method

- Spray wettable sulphur 80% WDG @ 3 g/litre of water. (SP: 5 days)
- Spray Cyenopyrafen 30% S.C (Commercial name KUNOICHI) 0.5 ml/litre of water. (SP: 15 days) or
- Spray Fenazaquin 10% EC (Magister) 1.5 ml/litre of water (SP: 20 days).

Mulberry leaf roller: *Diaphania pulverulentalis* , Pyraustidae, Lepidoptera

Symptoms

- Webbing of leaves and tender shoots.
- Skeletonization: The larvae web the leaves together and feed from inside on soft tissues and skeletonize them.
- Grown up caterpillars feed voraciously on tender leaves.
- Apical leaves are preferred for feeding resulting in stunting.
- Apical shoots are destroyed due to egg laying.
- Quality of leaf and yield is severely affected.

Season : October to February

Biology

Egg : 0.7mm, semi-transparent; ♀ moth lays 100-400 eggs. Eggs are laid one each along the leaf vein on the underside of mulberry leaf. Larvae: 5 instars. Life cycle : 18 – 25 days. Adult : Pale brown spots on yellow back ground of wings.

Management

1. Mechanical method

- Deep ploughing and flood irrigation will kill the pupae present in the soil.
- Use light traps to attract and kill adults.

2. Biological method

- Release *Trichogramma chilonis* egg parasitoids @ 1 Tricho card/week for four weeks.

3. Chemical method

- Spray 0.15% DDVP (76% EC) (@2 ml/*l*) 12-15 days after pruning (SP: 15 DAS).

Bihar hairy caterpillar: *Spilosoma oblique* , Arctidae, Lepidoptera

Diagnostic Symptoms

- Branches of mulberry plant without leaves

- Gregarious young caterpillars (Bihar hairy caterpillars) feed upon chlorophyll layer leaving alone the veins.

Type of damage

Adult moth lays 1000 – 2000 eggs. Later instar larvae voraciously feed on the mulberry leaves.

Season: October to February

Biology

Adults light brown with brick red abdomen peppered with dark row of spots laterally and dorsally, lay 1000 – 2000 eggs are laid on batches. Eggs hatch in 5 –7 days. Larvae : 6-7 instars Life cycle : 48 days.

Management

1. Mechanical method

- Collect and destroy egg masses and gregarious young caterpillars by burning.
- Deep ploughing exposes the pupae to the birds & scorching sun.
- Flood irrigation kills the pupae.

2. Biological method

- Release *Trichogramma chilonis* egg parasitoids @ 1 Tricho card/week for four weeks.

3. Chemical method

- Spray 0.15% DDVP (76% EC) (@2 ml/*l*) 12-15 days after pruning (SP: 15 DAS).

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