

found free from insect pests then the field will be considered fit for export.

### III. Integrated Pest Management strategies

The following Good Agricultural Practices should be adopted for the management of various pests of Basil:

- Destruction of debris, crop residues, weeds & other alternate hosts
- Deep summer ploughing
- Frequent raking of soil beneath the crop to expose and kill the eggs, grubs & pupa.
- Hand collection and destruction of infested leaves and fruits.
- Adoption of proper crop rotation and avoid growing of cucurbit crops in sequence.
- Use of resistant and tolerant varieties recommended by the State Agricultural Universities of the region. Early maturing varieties are less affected by fruit flies than later ones.
- Slight raking of soil during fruiting time and after the harvest to expose pupae from the soil.
- Use well decomposed FYM @ 8-10 tones per acre or wormi-compost @ 5 tons per acre treated with *Trichoderma* sp. and *Pseudomonas* sp. @ 2 kg per acre as seed / nursery treatment and soil application for controlling soil borne disease such as root rot, wilting.
- Apply neem cake @ 100 kg per acre for reducing nematode population.

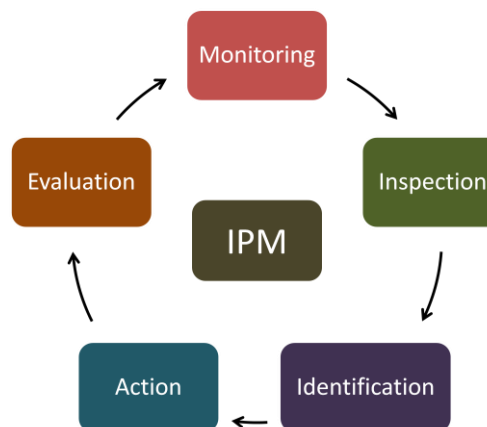


Biodiversity in natural enemies: **Parasitoids**



Biodiversity in natural enemies: **Predators**

Important activities for pest free basil production for export



**Integrated Pest Management (IPM) in Basil (*Cyamopsis tetragonoloba*) for export purpose**



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**B**asil is a popular herb grown for its aromatic leaves which are used either fresh or dried. It is a member of mint family and is popularly used in beverages in Southeast Asia. Its seeds are used in culinary purposes. Although it is a perennial adapted to warm growing conditions; it is frequently grown as an annual. Essential oil extracted from the leaves is used in cosmetics, dental products and perfumes.

## **I. Identification pest of Basil**

### **1. Leafminer (*Liriomyza sativae*):**

Adult is a small fly with black and yellow colours and eggs are inserted into the tissue just beneath the surface and adult flies feed on the plant secretion due to oviposition. Eggs are off white and translucent. Larva is a legless maggot with three instars, transparent when newly hatched and later instars develop yellow-orange colouration. Entire leaf can be mined in case larval population is high and it reduces the crop value. Heavy mining can result in white blotches on leaves and leaves drop from the plant prematurely. Mature larvae drop from leaves into soil for pupation. Entire life cycle is completed within 2 weeks



### **2) Lace bug (*Cochlochila bullita*):**

The bug is black to dark brown in colour with hyaline wings. Nymph sucks the sap from leaf tissues resulting in curling and drying of leaf tips, leaf dehiscence, and lowering the inflorescence production. Adult bugs usually feed on tender shoots of the herb causing them to wilt. Feeding scars can be seen as tiny

black spots on the upper surface of the leaves. Eggs are inserted into the veins of the leaf leaving the operculum exposed and 4-5 nymphal instars are present.



### **3. Pentatomid bug (*Eusarcocoris capitatus*):**

*E. capitatus* are darker brown having black punctuations dorsally and darker punctuations ventrally. Male bugs are darker brown than female. Eggs are initially white and later changes to dark brown before hatching. It sucks sap from leaves, flowers and seeds.



### **4. Aphid (*Aphis gossypii*):**

This is a cosmopolitan pest and highly polyphagous. It prefers to feed on cotton, cucurbits, eggplant, and okra. The adult color is highly variable and it varies from light green to greenish brown. The adult color is highly variable and it varies from light green to greenish brown. Both wingless and winged forms occur. They possess a pair of black-colored cornicles on the dorsal side of the abdomen. Aphids mostly are found in groups. Both the nymphs and adults possess piercing and sucking mouthparts. They occur in large numbers on the tender shoots and lower leaf surfaces, and suck the plant sap. Slightly infested leaves exhibit yellowing.

Severe aphid infestations cause young leaves to curl and become deformed.



### **5. Slugs & snails (Gray garden slug, Spotted garden slug, Brown garden snail, European garden snail) *Decoratus reticulatum*, *Limax maximus*, *Helix aspersa*, *Cornu aspersum*:**

Slugs and snails prefer moist, shaded habitats and will shelter in weeds or organic trash; adults may deposit eggs in the soil throughout the season; damage to plants can be extensive. Irregularly shaped holes in leaves and stems; flowers and fruit may also be damaged if present; if infestation is severe, leaves may be shredded; slime trails present on rocks, walkways, soil and plant foliage; several slug and snail species are common garden pests; slugs are dark gray to black in color and can range in size from 2.5 to 10 cm (1-4 in); garden snails are generally smaller and possess a rounded or spiral shell.



## **II. Pest Surveillance**

Weekly monitoring should be done through pest scouting with the help of monitoring devices. For field scouting 100 plants per acre should be observed. Minimum 15 spots at reasonable distance with each other following a cross diagonal pattern moving zig zag manner for counting all type of insects. If 95% plants are