field. A wait and watch attitude is a must in cotton pest management to succeed by doing nothing *e.g.* the decision of spraying insecticides against high population of aphids would be no use when heavy rains occur. The applied insecticide goes waste, but with natural reduction of pests due to rain. Spray of 5 % neem seed kernel extract prepared on farm or crude neem oil spray @ 1% suppresses also the aphid population in addition to other sucking pests during pre squaring crop stage. While using neem products, detergent / soap powder @ 1 gm/litre of spray fluid is to be added for getting uniform spray suspension. Chemical insecticides such as Imidacloprid 200 SL @ 0.5 ml/lit and Thiamethoxam 25 WG @ 1-1.5 gm/lit of water can be used only when there are symptoms, indicative of high aphid population. The conventional systemic insecticides should be alternated if more than one spray of systemic insecticides is to be sprayed. Sprays should be undertaken when the population of aphids is high. Aphid attack during late season coinciding with the boll opening can be managed using the conventional insecticides like Endosulfan @ two ml/ lit of water. Pyrethriods cause resurgence of aphids on the crop and hence care should be taken against control of pink bollworm. In such a situation a spray of any one organophosphorus insecticidal compound is to be followed for aphid suppression. Insecticidal control is more successful on late than early population of aphids. The table of the spray volumes for field use at different crop growth stages is given below.

Stage of the crop growth (Number of nodes above cotyledonary nodes)*	Required volume of spray fluid (l/ha)	Type of sprayer
< Four nodes	100-125	Hand operated knapsack sprayer
≥ four nodes to ≤ eight nodes	150-200	Hand operated knapsack sprayer
> 8 nodes to ≤ sixteen nodes	200-250	Power sprayer
> 16 nodes	250-300	Power sprayer

*** : Cotyledonary nodes are the first pair of nodes exactly opposite to each other on the main stem**

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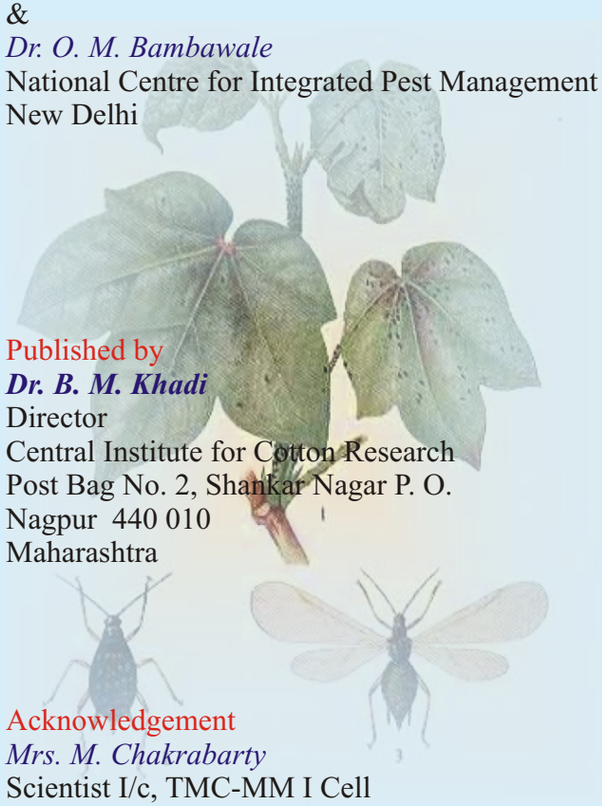

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English Version

Know Your Cotton Insect Pest
APHIDS

Common Name	:	Aphids
Local Name	:	Mawa
Scientific Name	:	*Aphis gossypii* Glover
Family	:	Aphididae
Order	:	Homoptera
Pest Category	:	Sap feeder

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Description of Insect Stages:

Nymph: Nymphs are small, yellowish or brownish on the undersurface of the leaves and on the terminal shoots and are mostly wingless. Adult: Adults are yellowish brown to black, 1.25 mm long with black cornicles and yellowish green abdominal tip. Both apterates (0.9-1.8 mm) and alates (1.1-1.8 mm) occur together.

Aphid nymphs

Nature of Damage:

Aphids are phloem feeders, causing direct leaf crumpling and downward curling with severe attack. Indirectly decreases cotton fibre quality as a result of sticky cotton due to deposits of honeydew on open bolls. Younger plants suffer more attack than older plants. Aggregating populations are seen at the terminal buds and largest populations are found below leaves of lower third of plants where they are partially protected from sunlight and higher temperature.

Field view of aphid infested plants

Symptoms:

Leaves show downward crumpling. Leaves are shiny with honeydew or darkened by sooty mould growing on the honeydew. Contamination of lint with honeydew and associated fungi leads to poor quality cotton. Activity of ants on the aphid-infested plants is common.

Deposits of honey dew

Lint contamination with sooty mould

Life History:

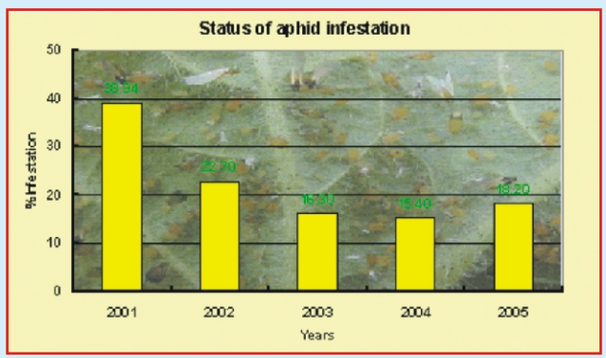
Aphids live in colonies and the alate as well as apterous females multiply parthenogenetically and viviparously. In a day female may give birth to 8-22 nymphs. Nymphal period lasts for 7-9 days and the adults live for 12-20 days. In all, the pest has 12-14 generations per year. It is a polyphagous pest. Aphids produce sugary excretion called 'honey dew' on which sooty mould grows. Ant activity is associated due to the honey excretion by aphids. Ants transmit aphids from plant to plant. Aphids have a large host range with varying durations of development and reproductive rate.

Ant association with aphids

Aphid colony (alates & apterates)

Seasonal Dynamics:

Aphid infestations on cotton commence after the true leaves emerge and their field distribution is often clumped



Typically aphid infestations will develop along areas down wind from bunds and occasionally spotty within fields. It is to be noted that fields receiving regular insecticide treatments continue to have damage due to aphids for a long period of time over the fields without insecticide applications where in aphid cause damage for a short period of time but quickly brought under control by natural enemies. High levels of aphid populations develop on late than early-planted cotton. Excessive nitrogenous fertilizer applications stimulate faster development of aphids.

Pest Management Options:

Management of aphids during very early crop growth stage should be attempted with a view to maintain optimum plant stand. Assessment of overall field conditions is necessary before opting for management against aphids. Insecticides of neonicotinoid group such as imidacloprid and thiamethoxam applied as seed treatment are efficient in suppressing the population of aphids on the crop for a maximum period of 45 to 50 days. However, the 'prevention is better than cure' approach of pre-sowing seed treatment with systemic insecticides aids in attaining proper plant stand however they also cause luxuriant plant growth leading to higher attack by thrips during pre flowering stage, especially when there are dry periods. Therefore, keeping a close watch of crop growth and weather conditions, post emergence sucking pest management should be done on need basis. Crops should not be sprayed with insecticides considering the populations of aphids on plants. This is because aphids occur in aggregations and distributed randomly in a field, initially. As they breed, the population spreads to adjacent plants and the proportion of aphid infested plants in the field increases. The aphidophagous coccinellids and syrphids, and the generalist predator *Chrysoperla carnea* offer significant control of aphids during early crop growth period. Under such situations, even if the pest numbers are high, insecticidal sprays need not be given. Spraying the crop should be done only when cupping and curling of the leaves on the top 1/3rd portion of the plant and aphids all over the plant are seen, and the active growth of the plants is inhibited in at least 25 % plants of the