

## **Frequently Asked Questions (FAQs) about Sugarcane Insect-Pest & Diseases**

### **Grassy shoot disease**

1. What pathogen is responsible for the grassy shoot disease?
  - Phytoplasmas.
2. What are the characteristic symptoms of grassy shoot disease?
  - Profuse tillering with lean, lanky and chlorotic tillers. Stunting of affected canes with axillary bud sprouting.
3. How to differentiate grassy shoot disease symptoms with other common deficiency symptoms?
  - Excess tillering with chlorotic leaves (partial or complete) is the typical symptom of GSD. In deficiency symptoms the excess tillering will not be seen. Further the axillary buds show sprouting only in GSD affected canes. Chlorosis due to iron show recovery of symptoms when sprayed with ferrous sulphate whereas in case of GSD no recovery will be there. Further, GSD appears in isolated clumps whereas chlorosis due to deficiencies appears in patches.
4. Why is grassy shoot disease more severe in ratoons?
  - Due to low pathogen load in plant crop, the crop suffers less. Once ratooned, the pathogen in the stubbles initiates disease in the newly emerging shoots and such clumps will not any millable canes.
5. How does the pathogen of grassy shoot disease spread?
  - Infected seed cane serves as primary source and insect vectors spread the pathogen cane to cane in the field.
6. Is grassy shoot disease amenable for heat therapy?
  - Yes. Aerated steam therapy (AST) eliminates the pathogen in the seed canes.

### **Internode Borer**

1. Even after release of *Trichogramma chilonis*, the dead heart formation by INB is not reduced. Why?
  - *Trichogramma chilonis* is not an efficient parasitoid to control INB. So, its release may be dispensed with for INB management.
2. Can detrashing be effective for INB management?
  - Not as a sole method. That is detrashing alone may contribute to only 2 to 4 %reduction in incidence.
3. Are pheromones effective for INB management?
  - Of the available methods this gives better results, provided, the number of traps is set at 25 per hectare, traps are set at 90 to 120cm height deployed on 5<sup>th</sup> month of

the crop, water and kerosene /diesel level is maintained at weekly interval without fail and the lures are changed once in 45 to 50 days. In addition, the quality of pheromone lure supplied and the method of storage of spare lure by the farmer governs the efficacy. Even if anyone of the aspects is not met with, the control will not be achieved.

4. Since only male moths are attracted to the traps it will not be of any use? Why not we attract the female moths also?
  - Reproduction of an insect is by mating of male and female moths. In nature for INB the male and female ratio is 50:50. Also, female mates only once in its life span of 8-10 days. So, it is sufficient that anyone sex is destroyed. Since in nature only female moths produce the pheromone it can be exploited economically to our advantage.
5. When already mated male moths are attracted to the pheromone traps how the trap will be effective?
  - Unlike the female moths of INB, a male moth is able to impregnate one fresh female daily for up to 4 to 6 days in its average life span of 7 days. Thus, males caught on any day prevent subsequent mating with fresh females. So when a male moth is trapped its subsequent mating is prevented. Sooner they are caught, the better would be the control and so timely deployment of trap and proper maintenance of trap is essential.
6. Why is INB attack increasing more nowadays?
  - Previously INB confined its attack to the formative inter-node and did not produce dead hearts. So farmers will not know the INB attack unless they detrash the cane. However, INB has changed its mode of attack since 1989 wherein it destroys the meristem and causes dead hearts and bunchy tops similar to that of top borer damage. This symptom is very glaring and eye catching. Besides, the variety Co 86032 is highly susceptible particularly to meristem damage when the crop is 7 months onwards. Since this variety is grown in 80% of Tamil Nadu almost all sugarcane growers have become aware of such damage.
7. How to differentiate the INB and top borer dead hearts?
  - In INB dead hearts the spindle leaves and one or two leaves below will dry. In top borer dead hearts inner most leaf alone will dry. INB dead hearts will be very prominent and straw coloured and when pulled will slide from the spindle and come away. The lower part will show the drying symptom, discolouration and sometime saprophytic maggots. In top borer dead hearts the colour will be generally dark brown, small in size, may or may not have feeding puncture holes and when pulled will snap and a part of dry leaf will come. The immediate green leaves may show shot holes of one or two rows and the lower green leaf may show the mid tunneling. This is the most distinguishing symptom.

## Mealy bug

1. How to control mealy bugs?
  - Mealy bug is another minor pest and does not cause any appreciable loss. It is prevalent in all cane growing areas and will be seen as a regular pest wherever cane is grown. Detrashing will help to minimize the incidence but as in scales since the crawlers settle on tender top internodes they cannot be eliminated.

## Pyrilla

1. How should pyrilla be controlled?
  - In peninsular India, pyrilla had never assumed a pest status. The nymphal instars have five stages and the skin moulted at each stage sticks to the leaves persistently giving an illusion of severe pyrilla population. Moreover, in all parts of peninsular India its parasitoid *Epiricania melanoleuca* is present which will (automatically) naturally control the pest. It is very important not to spray any insecticide in pyrilla affected field where *Epiricania* is present.

## Ratoon Stunting disease (RSD)

1. Does ratoon stunting affect ratoon crop only?
  - No. It also affects plant crop. But the severity is more in ratoons.
2. How the ratoon stunting disease (RSD) can be recognized in the field
  - Slow decline of varietal performance with cane thinness and poor vigour.
3. Is there any diagnosable symptom of ratoon stunting disease?
  - Reddening of nodal tissue (internal) in the form of streaks, dots or commas. No symptoms can be seen in internodes.
4. Why the canes become thin due to RSD?
  - The pathogenic bacterium systemically colonizes the xylem vessels. If the same seed source is used for many years the pathogen titre increases and causes decline in varietal performance.
5. How does the ratoon stunting disease spread?
  - Through infected seed canes and left over crop debris in the field.
6. What are the suggested control measures for ratoon stunting disease?
  - Aerated steam therapy (AST) eliminates the pathogen from the infected canes. Use of disinfectants to clean seed cane cutting tools would reduce chances of spread of pathogen from infected to healthy setts.

## Rats

1. How to control rats?
  - First it has to be ascertained whether the rats come from outside the sugarcane field or live inside the sugarcane fields. Generally, if they are coming from outside the cane fields, the attack will start from the boundaries. If they have

burrows inside the field, the attack will be in patches at the beginning itself. After the cane harvest, the live burrows in and around the sugarcane fields are to be identified. This is done by first plugging the rat holes with mud and inspecting them the next day to check whether they are opened. The opened burrows indicate rat activity. These burrows should be applied with half a tablet of celphos and the burrow mouth plugged with mud. Since celphos is a fumigant with odourless poisonous gas it should be handled only by experienced persons and two persons should handle it. The soft rind varieties such as Co 86032 may be avoided in rat attack prone areas and hard rind varieties may be grown.

2. Which is the best chemical for Poison baiting of rats?
  - In general poison baits will not be of much use in fields that have abundant food supply. If zinc phosphide is used in baits, the rats will develop bait shyness after a few feeding and baiting will become ineffective. Moreover, the baits will kill birds such as peacock, partridge, quail etc.
3. Are there any predators available for use against rats?
  - Available but not practicable. Wild cats, snakes, owls, mongoose, jackals etc. are effective but cannot be brought to cane fields. Domestic cats besides being not so effective will become used to the feeds provided by human beings or would hunt easier prey such as lizard and may not effectively hunt rats.
4. Can we use cats, snakes, owls for rat control?
  - They are natural predators of rat. However, to colonise them in sugarcane fields is difficult process. Even if they are colonized the danger of snake bite and the hooting of owl is considered inauspicious. Except jungle cats, domestic ones may not be effective hunters of rat in the field and may pose danger to domestic birds. Besides, the predators in general have strong territorial behaviour and so it is not possible to have any number of predators than destined ones in a unit area. Because of this the desired result will not be achieved in the expected time frame. Moreover, once the rat problem is solved these predators may be danger or nuisance to us.

## **Red rot disease**

1. At what stages of the crop the disease is expected?
  - The disease occurs in all the stages of crop in the field from germination to harvest.
2. What are the typical symptoms?
  - Orange / yellow discolouration of leaves followed by drying of canes in a clump. External rind discolouration as dull brown patches on nodes and internodes. Splitting of the canes reveal the typical reddening of internodal tissues with intermittent white spots. At later stage mycelial growth is seen in pith region.
3. What type of symptoms can be seen on leaves?

- Usually leaves in the infected canes show orange to yellow discolouration before drying. In highly susceptible varieties reddish brown lesions on the mid ribs can be seen.
4. How it affects the crop yield?
    - Infected stalks result in death of canes, leading to reduced cane yield. Inversion of sucrose into glucose and fructose due to pathogenic invertases cause loss in sugar recovery.
  5. How to identify disease infection in seed canes?
    - While cutting partially infected canes cut ends will show reddening and nodal region may show necrotic patches.
  6. Will it cause more damages in ratoon?
    - Yes. Since the initial inoculum to cause the disease is high, more damage to the crop is noticed in ratoon crop than in plant crop. However, in case of epidemic situations plant crop also suffers more damage.
  7. Does the pathogen survive in the soil?
    - Yes. It survives for a limited period in the soil, but in the leftover infected stubbles it survives for many months.
  8. In which season the disease spread fast?
    - During monsoon seasons the spread is more
  9. What are the factors enhancing disease severity?
    - Monsoon months with cyclonic winds favour spread of the disease very fast. Flooding of sugarcane fields over large areas favour dispersal of inoculum through flood water. Even a limited seed cane infection favours disease build up in plant and ratoon crops.
  10. What are the resistant varieties available for cultivation?
    - Co 86032, Co 86249, Co 93009, Co 94008, Co 97008, Co 99004 and Co 99006.
  11. Is it advisable to plant sugarcane in red rot affected fields?
    - No. Once red rot infection is noticed, planting of susceptible sugarcane varieties should not be done. If resistant varieties are available planting can be taken up.
  12. What is to be done after noticing the first symptoms?
    - The infected dumps should be uprooted and burnt immediately to prevent spread of inoculum. Uprooted areas should be drenched with 0.05% Carbendazim to arrest the inoculum spread.
  13. What is the effectiveness of fungicide control?
    - Spraying of fungicides is not effective since the pathogen is deep seated in the cane. Dipping of setts in systemic fungicides before planting will help to prevent soil-borne infection in causing disease in the germination phase.
  14. Can we cultivate red rot susceptible varieties with proper plant protection methods?
    - Yes. It can be cultivated in red rot free areas. By practicing integrated approaches of clean seed, field hygiene, disease surveillance and water management it can be

controlled effectively. However it is suggested to avoid susceptible varieties in epidemic situations.

15. What care can be taken in seed nurseries?

- The nursery crop should be raised in red rot free area. In any case red rot infected fields should not be considered for seed purpose. The seed crop should be monitored regularly to ascertain that it is free from the disease.

## **Scale insect**

1. What is the control measure for scale insect?

- Scale is not a serious pest to take up control measures. The feeding by scale is from the storage cell that contains sugar. It may use negligible amount of sugar for its development and so the damage is not severe. Because, the dead remains of the scale insect continue to stick to the internodes till harvest it will give an illusion of severe infestation of entire cane at the given time but in fact the encrustation has built up over several months. Any contact insecticides such as endosulfan or dichlorvos etc. when applied to the infested cane stalk after detrashing will only kill matured scales as young ones would have already settled on tender internodes that are covered by undetrashable leaf sheaths from which the infestation will continue.

2. What insecticide is best for sett treatment against scale insect?

- If the setts are to be planted *in situ* there is no need for sett treatment with any insecticide as scale insect cannot develop on setts below the soil for four months till internodes are formed. However, if the setts are to be taken from infested places to new areas for planting such setts may be dipped in dichlorvos at 1 ml per litre water and placed in cement bags with the mouth tied and transported. The quick acting Nuvan with fumigant action will effectively kill the scale population on the setts.

## **Sett rot disease**

1. Why the germination phase is vulnerable to sett rot infection?

- Surviving pathogen in the soil enters the sett tissue through cut ends and causes rotting if they are not protected with fungicide. Delay in germination due to deep-planting or water stagnation in the field enhance the chances of pathogen entry into the setts and pathogenesis.

2. Is sett rot amenable for fungicide control?

- Yes. Dipping of setts in the fungicide solution (Carbendazim, 0.05%) protects the cut ends from the surviving fungus in the soil.

3. How to prevent sett rot disease?

- Avoiding deep planting during monsoon and preventing water stagnation during germination phase. Dipping of setts in fungicide has to be done as a prophylactic measure before planting.

## **Shoot Borer**

1. Why was not shoot borer controlled even after applying half litre endosulfan per acre by power sprayer?
  - The quantity of insecticide used is sub-lethal dose and power sprayer should not be used. Chlorpyrifos 20EC is a better insecticide than endosulfan for shoot borer control. The quantity of chlorpyrifos to be used is 2 lit per acre at a concentration of 50ml in 10 litre water. The 10 litre of insecticidal solution should be applied to the shoots in 100 meter row length. Thus the 2 litres of insecticide and 400 litres of water are required to cover shoot in one acre area. High volume sprayers such as knapsack or rocker sprayers should be used and the leaf whorls and the collar region of shoots should be covered with the spray.
2. Why should not power sprayer be used for applying insecticides for shoot borer control?
  - For effective control of shoot borer, the Insecticide should cover the site targeted by shoot borer in the plant which is the inner of the leaf sheath and collar region of the shoots. To cover such an area in each and every shoot, only high volume sprayers will be of use as the spray fluid can be directed precisely to the target region of each and every shoot. Moreover, the quantity of spray fluid to be used for the given length of row can be achieved correctly. Power sprayer is more suitable for foliage feeding pests.
3. Is not Sevidol 8G effective against shoot borer?
  - Granular insecticides, in general, can only give less coverage to target parts of plants than EC formulations for contact action. Moreover application of granules on leaf whorls of very small shoots numbering about one lakh in an acre is extremely difficult. More so, because sand is to be used as diluent with the granules, due to improper mixing of granules and sand, many a time shoots will receive no granule or sublethal dose only. Further, the slight fumigant action of carbaryl as fumigants will not be effective in the open and the slight systemic action of gamma BHC of Sevidol is not of any consequence as even the fully systemic Furadon or Temik are not effective against shoot borer. Also, using a combination insecticide like sevidol is unscientific as it would render both insecticides useless due to development of resistance in course of time, besides leading to development of cross resistance. Also, one of the components of Sevidol, viz gamma BHC is already banned by the government.
4. Why is not shoot borer controlled even after the application of lindane or chlorpyrifos?
  - If the application procedure described earlier is followed it will certainly give control of the borer. Further, dead heart formation by shoot borer takes a few days

to a few weeks depending on the instar attacking the shoot, age of the shoot, prevailing weather and varietal ability. So, if new dead hearts are noticed even after the insecticidal application, they would have been the shoots already damaged by the borer and were in the process of drying at the time of insecticide application.

5. What are the control measures other than insecticide for shoot borer?

- Frequent irrigation and deployment of pheromone traps. Shoot borer attack kills the shoot which would naturally induce formation of compensatory shoots. If irrigation is given, the formation and growth of compensatory shoots are encouraged. In fields where frequent irrigation is not possible compensatory shoots will not be formed and the infested parts of the fields will remain gappy.

6. What are pheromone traps?

- In nature a female insect attracts a male insect of their own species by secreting a chemical called pheromone. The male moths at a distance of even a kilometer will perceive the odour and reach the female. Pheromones produced by some borers have been identified by 5BI and synthesized. These synthetic pheromones are impregnated on rubber septa to form lures, which in turn are held above a water trap with little kerosene or diesel. When placed in the field, male moths are attracted to the lure and are trapped in the kerosene or diesel / water mixture.

7. Where from the pheromone traps could be obtained?

- The Rajshree sugars and Chemicals Ltd, Varadharaj Nagar, Vaigai dam 625 562, Theni and Pest control India Ltd., Bangalore are producing the pheromones. The former firm recommends eight traps per acre while the latter recommends four per acre. But 10 traps per acre, 45cm trap height and weekly filling of water and kerosene in the trap are essential for the method to be effective against shoot borer.

8. Can we use the same pheromone for any pest?

- We can use the same trap for any pest but not the same pheromone lure. Each species has different pheromones and hence only specific ones are to be used.

9. There is no special smell in the rubber septa supplied by the firms. How to find out they are genuine?

- The smell will be known only to the individuals of the particular insect species and even the other pest species will not be able to identify it. From the collection of moths in the traps the genuineness of the septa can be ascertained provided there is moth emergence when deployed.

10. What are the side effects of pheromones?

- No side effects at all at the quantity of 3 mg used in a lure. On the other hand, it has some advantages that are not there even in biological control or in resistant varieties.

11. In fields set with pheromone traps for internode borer, its attack was more while the adjacent fields where pheromone traps were not set was having less INB. Could the reason be that moths are attracted from that field to our fields?
  - Not possible. When moths can get attracted from adjacent fields it is more probable for the more attraction in pheromone deployed field itself.
12. Suppose the maintenance of pheromone traps is poor in deployed field, the moths attracted from adjacent fields will not be killed and so the population of the moth in the pheromone deployed field will raise which could have increased the Incidence?
  - No. The attracted moths are only males and not females. So even if they were not killed they cannot lay eggs and also the females once mated with the local males will not mate again. So there is no possibility of increase in pest incidence.
13. Will trash mulching reduce shoot borer incidence?
  - Yes. The trash acts as mechanical barrier to the tiny and just emerged shoot borer larvae which have to move from one clump to another only through the soil surface as leaves of adjacent clumps will not touch each other during that age of crop. Moreover, the trash will encourage development of general predators such as spiders, carabid beetles etc. which increase chances of predation of the moths and the dispersing larvae. However, the possibility of cut worm or rat damage in mulched fields is more.
14. Will a light earthing up on 35th day reduce shoot borer incidence?
  - No. It will not because, the larvae are so tiny that they can find their way to the lower part of the shoot below the soil in the gaps present in between the leaf sheaths .and the shoots which can never be covered by any amount of earthing up.
15. The dead shoots of plants have a lot of small white larvae. Are they the causative agents?
  - No. shoot borer larvae are big and only one and rarely two will be present in a shoot. Several tiny larvae seen in dead shoots are saprophytic maggots that develop on decaying plant matter and never be able to attack a plant. If you want to collect shoot borer larvae, select the shoots showing wilting of spindle (and not dried ones) which will have shoot borer larva.
16. Should an extra sticking agent added with insecticide solution for better sticking on foliage?
  - No. The insecticide itself contains the sticking agent. For instance, if you take Chlorpyrifos 20Ec, of the one litre of insecticide purchased, only 200ml (20%) is the actual insecticide and the remaining 80% are the wetting, sticking, spreading emulsifying agents to make the insecticide effective. So is the Malathion 50EC or Nuvan 76EC etc.

## **Smut disease**

1. What are the diagnostic symptoms in the field?

- Conversion of growing apex region into a blackish whip-like structure containing millions of black powdery spores covered by translucent white silvery membrane.
2. When the symptoms will be manifested?
    - The symptoms can be seen at all the stages. More symptoms can be seen during cane formation. In ratoons symptoms can be seen much earlier. In severe cases sprouts from the ratoon would show whips.
  3. Why the smut affected canes show whips?
    - Smut fungus infects the cane systematically including apical meristem. After infecting apical meristem, the fungus converts the growing shoot into a whip-like structure with millions of smut spores covered with silvery membrane.
  4. How does the disease spread?
    - Primary transmission takes place through infected seed canes. In the field through air the spores from the whips are transmitted from cane to cane in the field.
  5. Why do the affected canes turn bushy?
    - Since the pathogen infection in the meristem breaks the apical dominance numerous side shoots are induced in the smut infected plant, which gives the bushy appearance.
  6. At what situations smut causes severe yield losses?
    - When severe smut infection occurs during early stage of the crop of the ratoon, significant yield reduction is expected.
  7. Is it amenable for heat therapy?
    - Yes. Hot water combined with fungicide (Tridimefon 0.1%) at 52°C; 30 min effective in eliminating pathogen infection in the setts.
  8. Can the affected crop be ratooned?
    - Crop showing more than 2.0% of smut infection should not be ratooned.
  9. Up to what level of disease seed selection can be permitted?
    - Up to 1% smut infection level the seed selection can be permitted.

## **Termites**

1. Will termite attack be more in light soils?
  - Not necessarily. There are 13 species of termites in sugarcane. Some will be in light soil and some in heavy soil. So attack can be in any soil type.
2. Will the termites be controlled if irrigated?
  - No. Irrigation temporarily stops termite attack due to excess moisture and when the optimum moisture level is reached the attack will revive.
3. Even if termite mounds are not there in the vicinity, termite attack is seen in the field?
  - Of the 13 species of termites in sugarcane not all form above ground mounds. Five species form below ground mounds and hence will not be visible.
4. How should termite mounds be eradicated?

- Toss one celphos tablet and plug all the holes with mud. If the mounds are without chimneys a hole is made, celphos tablet tossed in and the hole plugged.
- 5. Will mixing of used engine oil or kerosene in irrigation water give protection against termites?
  - No. Termite attack will be in patches here and there. The oil mixed with irrigation water will not spread uniformly to all places and required quantity of oil cannot be mixed to cover a large area. But though applying engine oil on termite affected spots will certainly control termite, the control will be temporary and the oil will spoil the soil structure which is more damaging than termite attack.

## **White Fly**

1. How should whitefly be controlled?
  - Spraying acephate 2g per lit water will control whitefly. The spray has to be repeated after a month to kill the nymphs emerging from eggs.

## **White Grub**

1. How to control white grub of sugarcane?
  - The best way to control white grub is when the adult stage comes above ground and congregate in a particular tree (neem tree) at a particular time (immediately after summer showers). The important point is that we should be alert and ready to collect the beetles on the very day of receipt of summer showers and continue the collection for up to a week. In this way, the problem can be economically and effectively solved.
2. How to control white grubs in standing sugarcane crop?
  - It is very difficult and a costly operation to control white grubs in standing crop of sugarcane. No insecticide is effective against white grubs. Stagnating water for 24hrs in the cane crop will bring the grubs above ground which may be handpicked and destroyed. Care to prevent lodging of crop due to water stagnation should be taken.

## **Wilt disease**

1. What are the diagnosable symptoms?
  - External - gradual yellowing and drying of foliage, shrinkage and withering of canes.
  - Internal - infected canes show light to dark reddish brown discolouration of ground tissue, pithiness and boat shaped cavities in the middle of the internode.
2. How to differentiate the stalk symptoms with red rot?
  - Reddening of ground tissue with characteristic white spots as red rot are absent in case of wilt. Further wilt affected cane would show pithiness with boat shaped cavities with reddish brown discolouration.

3. Whether sugarcane is infected by both red rot and wilt same time?
  - Yes. Such canes show symptoms of both the diseases.
4. What aggravates wilt severity?
  - Extended drought in the summer followed by water logging in the monsoon. Damages to roots, especially by root borer and other root pests increase wilt severity.
5. How to control wilt?
  - Healthy seed, crop rotation, optimizing soil moisture status and reducing root borer infestation are recommended to control wilt in an integrated approach.

## **Woolly Aphid**

1. Does Sugarcane Woolly Aphid (SWA) cause itching on the body?
  - No. The neonate nymphs that crawl over the body of the person may give a tickling sensation but not known to cause any allergic irritation.
2. Is it true that SWA can spread to the entire field within 10 days?
  - Not true. If the climate is favourable, it would take a minimum of two to three months to spread to entire field.
3. Is Thimet granule application very effective for SWA?
  - No. It will give only 50 per cent control which is not sufficient to minimize SWA population.
4. Is it true that since Thimet granules have powerful odour, SWA is effectively controlled even when they are placed in perforated polythene bags and the bags are hung at different places in the cane field?
  - Not true. The respiratory system of human and that of insect is entirely different. Unless the chemical has specific fumigant action and when it could be used in air tight places then only the fumigant action will work, Since, Thimet is not a fumigant it cannot be effective against SWA when suspended on sugarcane plants and even if it is a fumigant it cannot work in the open.
5. Is methyl parathion dust very effective for SWA?
  - Not so. Dusts in general are less effective than EC formulations because it cannot be applied thoroughly to cover the lower surface of leaves and are not systemic.
6. Is there any microbial agent for SWA control?
  - No. There are no microbial agents native to SWA. The pathogens of other insects are not effective also. Moreover spraying the pathogen in sugarcane field is very difficult as they have to be sprayed only on the under surface of the leaves to facilitate contact with the pest.
7. Where we can get predators of SWA?
  - They will be available in the SWA infested field itself and not commercially available anywhere. However a method to rear it in trays by farmers themselves has been developed by Sugarcane Breeding Institute.

8. Can SWA attack any other crop?

- Though there are some reports that it develops in maize and sorghum it is not recorded widely. Moreover, because of the long duration and continuous availability of sugarcane crop and the ability of SWA to attack any stage of sugarcane crop, there is no pressure on the aphid to switch or seek other hosts as alternatives.

## **Yellow Leaf Disease (syndrome)**

1. What are characteristic symptoms of yellow leaf disease (syndrome)?

- Yellowing of mid ribs in the 3 to 5 leaves during and after cane formation stages. Laminar yellowing along the discoloured midrib and drying of leaf along the midrib from the tip.

2. Will yellow leaf disease (syndrome) affect the crop yield? If so to what extent?

- The disease affects cane yield significantly in susceptible varieties as well as in uncared fields. Expression of the disease in the early stage would cause more damages to the crop. In the affected canes inter-nodal elongation gradually decrease and show bunching of leaves in the apex. In addition to loss in cane yield, sugar recovery is also affected in the infected canes.

3. How does the yellow leaf disease spread?

- Through infected seed canes and insect vectors.

4. How to control the yellow leaf disease (syndrome)?

- Through meristem tip culture, the virus can be eliminated from the cane. Later proper seed nursery programmes are to be followed to ensure supply of disease free seed canes.