

ORGANIC GROWING

FOR ORGANIC GROWTH NATURAL NUTRIENTS, WATER, SUNLIGHT & BIO DIVERSITY ARE ESSENTIAL.

NUTRIENTS - SOLID FORM - [KHUBA SOIL CONDITIONER](#)

- That natural nutrients function as currency for the bacteria, fungi etc in the soil to exchange them with the plant for carbon & sugar. Which is known as carbon exchange by the live soil.
- The live soil kills predators which attack the plant and simultaneously converts those predators to nutrients to continue its carbon exchange.
- If the same live soil is unable to get the nutrients to exchange they themselves become predators and promote to attack the plants which are known as disease from the soil.
- If we provide natural nutrients, the soil becomes fertile and live, and such soil becomes porous leading to increase in water holding capacity, softer soil etc which in turn avoid infestation by rodents like rats etc and also keep the surrounding cool thus helping the plants.
- The plant which are provided with nutrients, in turn generate sugar, which is converted to protein. The protein converts to different enzymes are generated which function for overall growth, health & yield of a plant.
- A healthy plant is able to protect itself from any pest, disease and any variations in the climate.
- Therefore it becomes quite essential to provide sufficient natural minerals in sustained manner for overall growth of the plants. Such a product is provided as Khuba Soil Conditioner.
- Therefore providing a proper fertilizer becomes most essential.

NUTRIENTS - LIQUID FORM - [GROWTH PROMOTER](#)

- Liquid fertilizers are to be used for drip irrigation and as supplement to make available the nutrients for a healthy plant.

PEST & DISEASES - [NATURAL HORTICULTURE OIL](#)

- How do we define a healthy plant? A healthy plant is the one which is capable of producing 12+ brix of sugar to further manufacture proteins & enzymes as mentioned above.
- Nature has provided food for every living being, therefore the food suitable for humans is not desired by insects or pests. Basically the digestive systems are different as you can see that cow can convert grass to milk, which cannot be done by humans. Similarly no insects / pests can eat from a healthy plant, because their digestive system is designed to eat plants producing sugar below 12 brix. A leaf eating insect can only eat a leaf which has sugar content between 6 to 8 Brix and grass hopper between 7 to 11 Brix. If the insect eat high sugar food they die. Hence they avoid eating plants producing high level of sugar above 12 brix.
- But the plants under stress conditions, like lack of sunlight etc start producing sugar below 12 brix. Under such conditions they are susceptible to pest and disease attacks.
- Such effects can be controlled by good sanitation, by use of natural oils which can be delivered through the roots and also used for spraying.
- Natural horticulture oil strengthens it from within and kills any predator which attack it. The insects lose their hunger, lose their capacity to populate and thus die out.
- Therefore use of Natural Horticulture Oil helps in proper sanitization, and help keeping the pests & diseases at bay.

SUNLIGHT

Maintaining wide spacing reduces the seed requirement and supports easy air and sunlight penetration in the crop canopy, leading to better and healthier cane growth. It also allows for easier intercultural operations.

INTERCROPPING / PEST CONTROL / WEED MANAGEMENT.

Practicing intercropping (which is possible due to wider spacing) thereby increasing effective utilization of land, giving additional income and reducing weed growth by 60%. & reduce water requirements to a very large extent.

Crop friendly intercropping details are well know to farmers. Intercropping increased nutrient elements N, P, K and O.M, while decreased pH and EC in the soil than control and that improve soil fertility properties through the decompose of intercropping crops roots and secrete acids into the soil and put P. Intercropping has the ability to symbiotically associate with certain soil microbial such as rhizobia, which fix atmospheric nitrogen.

- Nitrogen & Carbon fixing 1) ಹುರುಳಿ- Horse gram 2) ಅಲಸಂದೆ - black eyed pea 3) ಹೆಸರು ಕಾಳು - Mung Bean 4) ಉದ್ದು -Black gram 5) ನುಗ್ಗೆಕಾಯಿ - drumstick 6) ಮೂಲಂಗಿ – Radish & many more as locally available.
- For pest control 1) Marigolds 2) Garlic 3) Tulsi 4) Onion 5) Lemongrass 6) Chilli 7) Castor oil plant 8) Gliricidia 9) Mustard and many more as locally available.
- **Various plants used for green pest management in sugarcane cultivation : Neem - *Azadirachta indica*, Calotropis – *Calotropis gigantia*, Common leucas - *Leucas aspera*, Nochi - *Vitex negunda*, Aloe vera, Karanji - *Pungamia pinnata*, Datura, Tobacco, Ginger, Garlic, Green chilly.**
- Boundry cropping recommended: Castor (audal kannada)
- Solar Pest trap available from www.krishibandhu.in Cell No: 9900003891. Recommended 1 unit per acre.

Intercropping is an alternative to chemical pesticides. It is based on the ecological relationship between living organisms, shaped over millions of years. The roots of the plants release exudates forming a thin, nutritionally rich layer around them. This layer is called rhizosphere. This rich environment attracts several microorganisms, through chemotaxis, and they compete for this niche. Some of these fungi and bacteria live in symbiosis with the plant, promoting mutual benefits. The exudation of polysaccharides and chemical signals by the roots favors the establishment of these beneficial microorganisms, which in return may prevent the growth of plant microbial pathogens. The refined molecular communication between plants and microorganisms induces transcriptional responses in each other, resulting in a set of physiological responses and morphological changes in plants.

The health of plants is strongly influenced by their microbiota and microorganisms from the soil. In ecologically balanced environments, such as forests, the soil microorganism's bank has enormous diversity.

Thus biological control occurs naturally through ecological interactions. In agricultural systems, microorganisms that suppress plant enemies are called MBCAs—microbial biological control agents (Köhl, Kolnaar, & Ravensberg, 2019).

However, the success of biocontrol depends on a series of biotic and abiotic environmental factors that are directly influenced by agricultural practices, such as soil management and the application of agrochemicals. The restitution of soil microorganisms in agricultural systems is a practice that has been showing good results in the vigor of plants. The effects generated by these microorganisms increase the growth and productivity of plants of agronomic interest (Singh, Pandey, & Singh, 2011). Microorganisms can promote protection against phytopathogens by inducing systemic resistance (ISR) in plants or by antagonistic interactions between MBCAs and opposing organisms.

These mechanisms occur through interactions between plant–microorganism and microorganism–microorganism. The sum of these interactions reflects on the success of the biocontrol and, consequently, on the health of plants. This set of interactions involves refined interspecific communication, through molecular signals that trigger cascades of metabolic responses, both in plants and in microorganisms. (Venturi and Keel, 2016). Studying these phenomena simultaneously, in vitro, is still a challenge due to the large number of molecular signals involved in these communications and the complexity of the responses induced in the ecological system. However, different studies reinforce the influence of

interspecific interactions and the importance of the variability of species in the soil community and plant microbiota (Koch et al., 2018).

WATER & SOIL EROSION MANAGEMENT.

- Bunds at the boundary.
- Check the water flow in the land, and to avert water taking away the rich top soil, create trenches of 3 X 3 X 6 feet where ever required.
- You can also fill it with waste crop to create excellent manure.

Note: DO NOT BURN ANY CROP WASTE in the field.

GROUND PREPARATION NEW PLANTATION : Use NAVA DHANYA (MINUS 50 DAYS)

- MONOCOT SEEDS 1.Corn 2.Wheat 3.Maize 4.Paddy 5.Barley 6.Finger millet 7.Pearl millet 8.Barnyard 9.Amaranth 10.Buckwheat 11.Finger millet 12.Foxtail millet 13.Kodu 14.Little millet 15.Proso millet 16. Sorghum.
- DICOT SEED 1.green gram 2.black eyed beans 3.lentils 4.Indian Brown lentils 5.pigeon peas 6.kidney beans 7.green peas 8.White peas 9.split black gram 10.black gram beans
- SICOT / OIL SEEDS 1.groundnut 2.rapeseed 3.mustard 4.soybean 5.sunflower 6.sesame 7.kusbi

Make mixture of Monocot + Dicot + Sicot any seeds in equal proportion to create nava dhanya. The Nava dhanya start to flower between 45 ~ 50 days, then the entire crop is to be mulched and thus creating a healthy field for cane growing.

PROOF OF ORGANIC GROWTH / SELF CERTIFICATION.

- To provide information of the crops grown organically, kindly download the app from krishibandhu apitra mitra on google playstore. Site: <https://play.google.com/store/apps/details?id=com.i9930.android.app.krishibandhu>
- For any assistance call : 9900003891.

KINDLY REFER

- SOIL HEALTH IMPORTANCE : <https://khuba.in/soil-health-importance>
- COVER CROPS: <https://khuba.in/soil-health-cover-crops>
- SOIL & HUMAN HEALTH: <https://khuba.in/soil-%26-human-health-1>

SUGAR CANE ESTIMATION PER ACRE		HO	GP
DAY -60	Fresh land ground preparation: Sow Nava Dhanya (list provided) between 45 to 50 days the crops start to flower, then mulch the same.		
DAY 0	Fresh seeding / plantation. <ul style="list-style-type: none"> Growth promoter 500 grams + Natural Horticulture Oil 1 liter mix in 200 liter of water, drench the seeds and plant. Mix Khuba Soil conditioner with the soil around seed. 	1 ltr	0.5 Kg
DAY 0	After cutting. <ul style="list-style-type: none"> Growth promoter 500 grams + Natural Horticulture Oil 1 liter mix in 200 liter of water, drench plant. Mix Khuba Soil conditioner with the soil around plant. 		
DAY 0	Inter cropping preferred crops: Onion, Garlic, Horse gram, Radish etc.		
NATURAL HORTICULTURE OIL			
DRIP	180 days use 15 ml Oil per day / acre. Calculate accordingly depending on watering days	3 ltr	
FLOOD	1 st flooding - 60 th Day - 120 th Day - 1 liter every time.		
GROWTH PROMOTER			
DRIP	240 days Use 10 grams per day / acre Calculate accordingly depending on watering days		2.5 Kg
FLOOD	45 th - 90 th - 135 th - 180 th - 225 th DAY Use 500 grams per acre.		
Total		4 ltr	3 Kg

KHUBA SOIL CONDITIONER AVERAGE

BAGS	10	12	14	16	22	26 ~ 28
YIELD	45 ~ 50	50 ~ 60	60 ~ 70	70 ~ 80	90 ~ 100	100 +
DOSAGE	Provide dosage of all material at earliest within 2 or 3 times.					

Pest Management with Chilly & Marigold / Border of Castor plants .

Weed management: With Horsegram (Uruli) or Blackeyed Pea.(Alsande) or Green Gram (Hesaru) by broadcasting.

Intercrop : Any 60 day growing Vegetable crop as per your local choice.

PEST MANAGEMENT

Sugarcane crop is affected by more than 60 insects of which about 10 insects are rather more important as far as the yield loss is concerned. Among the major insects damaging sugarcane, borers, sucking pests, soil dwelling insects are more prevalent in Tamil Nadu and adjoining states which account 20% loss in cane yield 15% loss in sugar yield.

	Common Name	Scientific Name	Family	Order
1	Early shoot borer	<i>Chilo infuscatellus</i>	Crambidae	Lepidoptera
2	Internode borer	<i>Chilo sacchariphagus indicus</i>	Crambidae	Lepidoptera
3	Top borer	<i>Scirphophaga excerptalis</i>	Pyalidae	Lepidoptera
4	Termites	<i>Odontotermes obesus</i>	Termitidae	Isoptera
5	White grubs	<i>Holotrichia Consanguinea</i>	Melolonthidae	COleoptera
6	Woolly aphid	<i>Ceratovacuna lanigera</i>	Phempigidae	Hemiptera
7	White fly	<i>Aleurolobus barodensis</i> <i>Neomaskellia bergii</i> <i>N . andropogonis</i>	Aleyrodidae	Hemiptera
8	Mealy bug	<i>Saccharicoccus sacchari</i>	Pseudococcidae	Hemiptera
9	Scale insects	<i>Melanaspis glomerata</i>	Diaspididae	Hemiptera
10	Nematode	Reniform nematode - <i>Rotylenchulus reniformis</i> . Root knot nematode – <i>Meloidogyne</i> spp Lance nematode – <i>Hoplolaimus indicus</i> Lesion nematode - <i>Pratylenchus coffeae</i>	Trichostrongylidae	Monhysterida
11	Grasshopper			

EARLY SHOOT BORER, CHILO INFUSCATELLUS SNELLEN

Symptom of damage:

Dead heart in 1-3 month old crop, which can be easily pulled out, rotten portion of the straw coloured dead – heart emits an offensive odour. A number of bore holes at the base of the shoot just above the ground level.



Life cycle:

Egg: Flat – scale like eggs are laid in 3-5 rows on the lower surface of leaves in masses of 4-100. The masses are slightly overlapping like tiles. It hatches 4-6days.

Larva: Larva is dirty white with five dark violet longitudinal stripes and dark brown head.

Duration 16-30days.

Pupa: Pupation takes within the tunnel. Caterpillar before pupating makes a large exit hole in the stem and blocks the opening with silken discs.

Adult: Pale greyish brown moth with black dots near the coastal margin of the forewings and with white hind wings.



Management:

Cultural method:

Early planting during December – January escapes the shoot borer incidence.

Daincha intercropped sugarcane record the lowest early shoot borer incidence.

Trash mulching along the ridges to a thickness of 10-15 cm 3 days after planting.

Ensure adequate moisture to bring down the soil temperature and increase humidity (unfavourable condition for the multiplication of early shoots borer).



Physical method:

Remove and destroy dead hearts.



Biological method:

Release 125 gravid females of sturmiopsis inferens a tachinid parasite per ac.



INTERNODE BORER, CHILO SACCHARIPHAGUS INDICUS (KAPUR)

Symptom of damage: Internodes constricted and shortened, with a number of boreholes and fresh excreta in the nodal region. Affected tissues reddened.

Nature of damage: Caterpillars attack sugarcane plants after 3 months of planting. They bore into the canes near the nodes; entry holes are plugged with excreta. Entry is generally confined to the first five internodes.



Life cycle:

Egg: Scale – like oval, flat, shiny and waxy white eggs are laid by female moths in batches of 9-11, near the midribs, on leaf sheaths or on stem.

Larva: White larva with four violet longitudinal stripes and light brown head.

Pupa: Pupation takes place in semi – dried sheath. Pupal period 7 - 10 days

Adult: straw coloured with a dark spot on each of the forewings



Management:

Cultural method:

Use resistant varieties like CO 975, COJ 46 and CO 7304

Select internode borer damage free setts for planting

Detrashing & burying the trash during the 5th, 7th and 9th month



Physical method:

Collect and destroy the eggs periodically.

Detrashing the crop on 150th and 210th day of planting. Detrashing dislodge the pupae that remain in the leaf sheath.



Biological method:

Release egg parasite, *Trichogramma chilonis* at the rate of 2.5 cc / release / ha. Six release at fortnightly intervals starting from 4th month onwards.

Setting pheromone traps at spindle level on 5th month of the crop at the rate of 6 traps per acre in a 15 metre grid. The pheromone septa need to be changed twice at 75 days interval.

Chemical method: Avoid the use of excessive nitrogenous fertilizers.

TOP BORER, *SCIRPOPHAA EXCERPTALIS* (FB.)

Symptom of damage:

Dead heart arise on after sixth month grown up canes, which cannot be easily pulled.

Parallel row of shot holes in the emerging leaves.

Bore holes at the top of the shoot and shows bunched top appearance.



Nature of damage:

Caterpillars are mainly found in the apical portion of the canes, boring through the growing point and down the upper joints until it reaches the sappy portion of the stem, there it feeds on the tissues and destroys the cane. They also bore into the unfolded leaves preferably into the midrib, mining its way to the base.



Life cycle:

Egg: Eggs are laid on the lower surface of top leaves in clusters particularly near midribs. The clusters are covered with buff coloured hairs. : 10-80 eggs per egg mass
Larva: Smooth, white or cream coloured with a red coloured mid – dorsal line and yellow head.
Pupa: Pupation takes place within the larval tunnel in a chamber with an exit hole Constructed by the caterpillar. Pupal period 6 - 21 days
Adult: White Coloured moth (with a buff Coloured anal tuft in the abdominal tip of female)



Management:

Cultural method:
Use resistant variety CO 419, CO 745 and CO 6516 and tolerant varieties Co 859, Co 1158 and Co 7224.
Physical method:
Collect and destroy the egg masses.



TERMITES, ODONTOTERMES OBESUS RHAMB

Symptom of damage:

Poor germination of setts (after planting), characteristic semi – circular feeding marks on the margin of the leaves in the standing crop. Causes yellowing and drying of outer leaves first followed by the inner leaves Entire shoot dries up and can be pulled out. Setts hollow inside and may be filled with soil. Cane collapses if disturbed; rind filled with mud.



Life cycle: Eggs: Dull, kidney shaped and hatches in 30-90 days
Nymphs: Moults 8-9 times and are full grown in 6-12 months
Adult: Creamy coloured tiny insects resembling ants with dark coloured head



Management:

Cultural method: Flood irrigation at the time of planting.

Physical method: Locate and destroy the termite colony.

Collect and destroy the termite affected setts from the field

WHITE GRUB, HOLOTRICHIA CONSANGUINEA (BLANCH)

Symptom of damage:

Yellowing and wilting of leaves.

Drying of entire crown.

Affected canes come off easily when pulled.

Cause extensive damage to roots and base of shoot.

Life cycle:

Egg: A female lays on an average of 27 eggs in the soil, which are pear like white enclosed in earthen cells.

Grub: Fleshy 'C' shaped, whitish yellow in colour found close to the base of the clump.

Pupa: Pupae are tan to brown, and occur deeper in the soil in earthen chambers.

Adult: Adult beetles are a rusty-red color just after emerging from the pupal stage, but turn nearly black.



Management:

Avoid use of ANIMAL RAW MANURE (Manure which has not been properly prepared)

Cultural method: Provide adequate irrigation.

Deep ploughing immediately after harvesting.

Physical method: Set up light trap.

Collect and destroy the adult beetles.



SUGARCANE WOOLY APHID, CERATOVACUNA LANIGERA

Symptoms:

Adults and nymphs desap leaves by piercing styles through stomata. Whitish patches – coalesce to turn yellowish and drying from the tip along margins. Leaves become brittle and dries completely. Heavy secretion of honey dew – development of sooty mould. Deposition of wooly matter on ground / soil distinctly visible.



Life cycle:

Adult emerged after fourth moult and viviparous reproduction. Apterous (Wingless) female reproduce parthenogenetically. Each female produced about 15 – 35 young ones within 24 hr after mating. Each female reproduces maximum of 217 nymphs during the period of 20 days. The female are more in the population, which leads to fast multiplication. Nymph takes 6 to 22 days to complete four instars and become adult.

The life cycle of female complete within one – month period. The longevity of adult is from 32 to 57 days. The life cycle may vary according to the climatic conditions and variety. In most of the affected fields at various locations all the nymphal instars and adults are noticed. In extreme cases, the winter is passed as eggs which are laid during the previous autumn by sexual females. In spring they hatch and give rise to apterous parthenogenetic viviparous females. The winged females appear in such swarms as to darken the sky and cover the vegetation. The non-migratory species, the whole life – cycle is spent on the same plant.



Management

Cultural Method: Paired row system of planting.

Avoid excessive use of nitrogenous fertilizers.

Use of organic fertilizers.

Rapping of canes all along the rows.

Infested tops should not be transported.

Infested canes should not be used as seed for planting.

Biological Method: Encourage local predators like *Diapha aphidivora* Meyrick – Pyralidae
Ishchiodon scutellaris Episyphus baleatus – Syrphidae
Chrysopa spp. – Chrysoptidae
Schymnus sp. *Cheilomenes sexmaculata*, *Coccinella septempunctata*, *Synonychia grandis*
Brumus sp. And *Dideopsis aegrota* – Coccinellidae
Pathogens like *Cladosporium oxysporum*, *Metarhizium anisopliae*, *Verticillium lecanii* and *Beauveria bassiana*



WHITEFLIES, ALEUROLOBUS BARODENSIS

Symptom of damage:

Yellowing of leaves

Leaf turns pinkish or purple and later gradually dry.

Infested leaves look white and black dots.



Life cycle: Egg: Females lay eggs in a line near the midrib or any where on the lower surface of the leaves. Eggs are yellowish with a small curved stalk. Colour changes to black about two hours after the eggs are laid. Nymph & Pupa: Neonate nymphs are pale yellow in colour, flat and oval in shape, later turn shiny black. Its body is surrounded by fringes of wax. The fourth instar being the pupal stage, is flat, oval, grayish in colour and slightly bigger than the nymph. There is a 'T' shaped white marking on the thorax, which splits at the time of adult emergence. Adult: Pale yellow body with hyaline wings dusted with waxy bloom, exhibit brisk fluttering movements.



Management: Cultural Method:

Avoid indiscriminate use of insecticides for control of other pests such as pyrilla, black bug, woolly aphids

Mechanical Method:

Detrashing the puparia bearing leaves and immediately disposing by burning or burying to prevent emergence of adult white flies



MEALYBUG, SACCHARICOCCUS SACCHARI

Symptom of damage:

Pinkish oval insects beneath leaf sheath on the nodes, with whitish mealy coating, main cane stunned also attack roots. Sooty mould develops on the honey dew giving blackish appearance on canes.



Life cycle:

Eggs: Eggs are retained in the female reproductive organs until almost fully mature. Incubation period is short. The females may bring forth hundreds of young ones parthenogenetically. Egg is yellowish, smooth, cylindrical and rounded at both ends.

Nymph: Newly emerged nymphs are quite active with a pinkish transparent body.

Adult: White with mealy coating, sessile.



Management:

Cultural method:

Use resistant varieties like CO 439, CO 443, CO 720, CO 730 and CO 7704

Drain excess water from the field.

Physical method:

Detrash the crop on 150 and 210 DAP



SCALE INSECTS, MELANASPIS GLOMERATA (GREEN)

Symptom of damage:

The leaves of infested canes show signs of tip drying and unhealthy pale green colour and with continued infestation these turn yellow. Desapping leads to non-opening of leaves also, which also turn yellow and finally dry up. Nodal region is more infested than internodal region. Infested crop loses its vigour, canes shrivel, growth is stunted and the internodal length is reduced drastically. Ultimately cane dries up. Such canes when slit open appear brownish red.



Life cycle:

Nymph: Females multiply ovo-viviparously. The nymphs that hatch out from the eggs within the female's body come out through the genital aperture. They are called 'crawlers'. They settle after selecting suitable site for feeding.

Adult: Greyish black or brown circular scales, they cover the nodal region forming a thick encrustation.



Management:

Cultural method:

- Use resistant varieties like CO 439, CO 443, CO 453, CO 671, CO 691 and CO 692
- Select and plant the scale insect free setts.
- Keep the fields and bunds free from weeds.
- Avoid water stagnation in the field for the longer period.
- Avoid repeated ratoons.

Physical method: Detrash the crop at 150th and 210th day of planting.

Biological method: Release *Chilocoris nigritus* (or) *Pharascymnus horni*.



NEMATODES

Symptom:

Usually paling of leaves, first in the form of streaks, later complete yellowing-chlorosis, occurring in patches spread out all over the field. Chlorosis in severe cases, accompanied by drying up of margins and leaf tips is more common in ratoon and young crop.

Stunting of crop, reduction in number and size of internodes.

Roots are stubby and spares.

Affected field shows pale green to whitish look.



Nematode types:

There are several nematodes present in the soil of which, four nematodes are mainly damaging the sugarcane crop. They are:

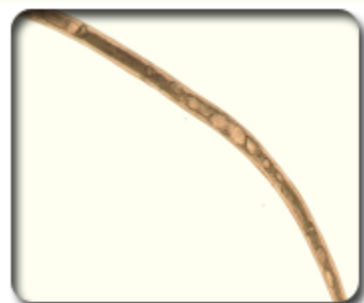
Lesion nematode - *Pratylenchus coffeae*

Root-lesion nematodes are migratory endoparasites. Females of *P. penetrans* lay about 1 or 2 eggs/day for about 35 days, with a maximum of 68 eggs being laid by one female. Eggs are laid singly or in clusters in both soil and roots. Second stage juveniles hatch after eggs have incubated for 9 (30 C) to 25 (15 C) days. Males are required for reproduction by *P. penetrans* but not by *P. neglectus*.



Lance nematode - *Hoplolaimus indicus*

Lance nematodes, *Hoplolaimus* spp., are ecto-parasites, sometimes semi-endo-parasites. Nematodes which are large and highly resistant to effects of temperature extremes and dry soil conditions. Larvae look similar to adults except that they are smaller. This group of nematodes is easily detected with soil sampling.



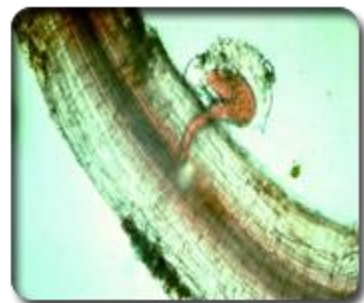
Root knot nematode - *Meloidogyne* spp.

Root knot nematodes are microscopic roundworms, obligate endo-parasites that complete most of their life cycle within their host roots. The nematodes survive in soil as eggs and also second stage larvae.



Reniform nematode - *Rotylenchulus reniformis*.

The term 'reniform' refers to the kidney-shaped body of the mature female. They are semi-endoparasitic (partially inside roots) species in which the females penetrate the root cortex, establish a permanent-feeding site in the stele region of the root and become sedentary or immobile.



SOIL CONDITIONER

Management:

Cultural method:

Deep ploughing, solarisation, flooding, crop rotation and apply organic manure. Under wetland conditions, intercropping with sunnhemp or marigold or daincha

Apply Khuba Soil conditioner & supplement field with Navadhanya as directed & spray the land with Natural Horticulture Oil.



GRASSHOPPERS, HIEROGLYPHUS BANYAN

Symptom of damage:

Adult and nymph grasshoppers feed on leaves from the margins of the leaf blades creating cutout areas during the solitary stage. finally it leaves only the leaf midrib.



Identification of pest:

Egg: Eggs in the form of egg pods, usually more than ten, either in the sand or among leaf litters. Each egg pod consists of about 10-300 eggs that are rice shaped.

Nymph:

Nymphs are miniature versions of adult grasshoppers, except that they are light in colour and do not possess wings. The nymphal stage may last for a period of 5-10 days.

Adult:

After about a month, a nymph becomes an adult. An adult grasshopper lives for 1-2 months.



Management:

Cultural method:

Tillage - Tillage controls grasshoppers primarily by eliminating the green plants on which grasshoppers feed.

Organic Method:

Use Nava dhanya to pre grow to flowering stage and mulch.

Use Khuba Soil Conditioner.

Use Natural Horticulture Oil & Spray as required.



SUGARCANE DISEASES - RED ROT

Symptoms

Canes exhibit leaf colour change, from green to orange and then to yellow in the third or fourth leaf. Then the leaves start drying from bottom to top. The cane loses its normal colour and longitudinal discoloration spots / ribs are seen. The internode region shrinks with rupture of tissue in the root eye region and the spores are ejected from these spots. If the fungal spores enter the leaf sheath through the leaf midrib, then reddish spots can be seen on the backside of the leaf midrib also. The external symptoms appear only after 16 - 21 days after infection and drying of entire cane takes another 10 days time. When the affected cane is split opened, the inner region is reddish in colour with intermittent white tinges across the cane length. If the variety is highly susceptible or disease incidence is severe, ash colour fungal growth is seen inside the cane. Sometimes, the pith inside the cane is filled with blackish brown liquid and exhibited alcohol odour.



Identification of pathogen

Red rot disease is caused by the fungus *Glomerella tucumanensis*. An older name, *Colletotrichum falcatum*, is still preferred by some pathologists.

Pathogen present on leaf sheaths and blades, solitary or aggregated, often forming short lines between vascular bundles, globose, immersed, dark brown to black 65-250 μm diam.; wall up to 8 cells thick, sclerotia on outside, pseudoparenchymatous within, ostiole slightly papillate, circular.



Management

Cultural method:

The red rot affected field must be rotated with rice for one season and other crops for two seasons.

Growing of recommended resistant and moderately resistant varieties viz., Co 86249, CoSi 95071, CoG 93076, CoC 22, CoSi 6 and CoG 5

Physical method: Removal of the affected clumps at an early stage and soil drenching with Natural Horticulture Oil.



SETT ROT

When diseased setts are planted they may rot before germination, or the shoots may die after reaching a height of about 6-12 inches. As the setts get dried up, the reddish colour becomes black with lots of black coloured fungal spores adhering to it.

If infected shoots survive, they are very much stunted and chlorotic. Eventually the leaves may wither and the shoots wilt. If the affected shoots and setts are examined the central portion of the shoots will be seen discoloured red and the contents of the sett rotting. When split opened, the affected setts exhibit pineapple odour.



Identification of pathogen:

Ceratocytyis paradoxa were initially whitish, measuring about 5 mm in diameter. The colonies were turned black due to the production of chlamydospores, which are heavily pigmented, when mature.



Management

Cultural method: Proper drainage and planting of setts in 1-2 cm depth.

Pre treatment has been found to stimulate germination of buds and hasten growth so as to help the young plants to overcome the competition with the pathogen.

Organic Method: Use Natural Horticulture Oil as directed for both direct soil application & seed treatment.



SMUT

Symptoms

Production of whip like structure of 25 – 150 cm. from the growing point of the canes. Whip covered by translucent silvery membrane enclosing mass of black powdery spores.

Initial thin canes with elongated internodes later become reduced in length.

Profuse sprouting of lateral buds with narrow, erect leaves especially in ratoon crop.

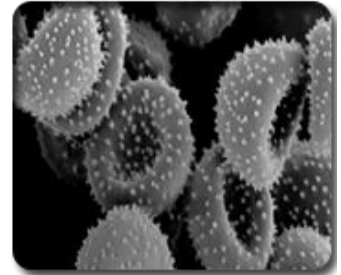


Identification of pathogen

Ustilago scitaminea

The fungal mycelium spores are echinulate, light brown and spherical, measuring 6.5 – 8.5 μ in diameter.

They germinate readily in water, producing 2-3 celled promycelia. sporidia arise terminally or laterally and they are hyaline, thin walled, single celled and elliptical to linear.



Management

Cultural method:

Growing of resistant and moderately resistant varieties viz., Co 86249, CoG 93076, CoC 22, CoSi 6 and CoG 5

Discourage ratooning of the diseased crops having more than 10 per cent infection
Cajanus cajan is grown as a companion crop between rows of sugarcane, the secondary spread of the disease is substantially reduced.

Physical method:

Treating the seed setts with Areated Steam Therapy (AST) at 50 °C for 1 hour or in hot water at 50 °C for 30 minutes or at 52 °C for 18 minutes
Roguing of smut whips with gunny bags/polythene bag and dipped in boiling water for 1 hour, and diseased clums must be uprooted and burnt.



WILT

Symptoms:

External: Gradual yellowing and drying of foliage, shrinkage/withering of canes.

Internal: Light to dark purplish or brown discolouration of ground tissue, pithiness and boat shaped cavities in the middle of the internodes.



Identification of Pathogen

Conidiospores usually erect and branched. Macroconidia abundant, falcate to rather straight, 3-5-septate, with a distinct foot-cell, 27-73 \times 3.4-5.2 μ m. Blastoconidia straight or slightly curved, 2-3-septate, fusiform to lanceolate, with a somewhat pointed, often slightly asymmetrical apical cell and a truncate basal cell, 16-43 \times 3.0-4.5 μ m.



Management

Cultural method:

Healthy seed, sett treatment with fungicides, resistant varieties, crop rotation, managing root borer, avoiding prolonged drought and water logging and hygienic practices.



RUST

Sugarcane rust is mainly a disease of the leaf. The earliest symptoms are small, elongated yellowish spots that are visible on both leaf surfaces. The spots increase in length, turn brown to orange brown or red brown in color. Pustules, which produce spores, usually develop on the lower leaf surface.



Identification of pathogen

Puccinia erianthi : Uredinia were elongate, reddish-brown, with capitate, hyaline to light brown paraphyses.
Urediniospores were thick-walled, orange-brown, obovoid, measuring 26-34 x 16-20 μm .
The urediniospore surface was echinulate with 4-5 equatorial pores.
Teliospores were dark brown and measured 30-43 x 17-23 μm , clavate, two-celled and slightly constricted at the septum.



Management

Cultural method: Use resistant varieties like Co 91010 (Dhanush), Co 87025 (Kalyani)

GRASSY SHOOT DISEASE

Symptoms

Initial symptom appears in the young crop of 3 – 4 months age as thin papery white young leaves at the top of the cane. Later, white or yellow tillers appear in large number below these leaves (profuse tillering). The cane becomes stunted with reduced internodal length. There is no millable cane formation. At times, one or two canes grow well in the affected tillers with greenish leaves. When these seemingly good canes are used for setts, the following crop produces only whitish leaves; these leaves dry early and gaps in the field.



Mode of spread

The disease is spread by the use of affected setts for planting.
Also, the black hopper (*Browtista moesta*) acts as a carrying agent of this disease.

Management

Cultural method: Growing resistant varieties viz., Co 86249, CoG 93076 and CoC 22
Avoid ratooning if GSD incidence is more than 15 % in the plant crop
Physical method: Rogue out infected plants in the secondary and commercial seed nursery. Treat setts with aerated steam at 50°C for 1 hour to control primary infection. Treating them with hot air at 540C for 8 hours and spraying twice a month with aphidicides.



YELLOW LEAF DISEASE

Symptom of Damage:

Yellowing of midrib and adjacent laminar region and subsequent leaf drying along the mid rib in 3 to 5 leaves from top. In some cases reddish discolouration is also seen and in severe cases drying of spindle along with leaves.



Pathogen:

The virus is transmitted by aphids, *Melanaphis sacchari* and *Rhopalosiphum maidis*, in a semi-persistent manner.
SCYLV is a member of the Luteoviridae family. The virus is localized within the phloem cells of the plant.



Management

Cultural method:
Use healthy seed cane
Field should be maintain with proper hygiene
Application proper nutritional management and use resistant varieties.



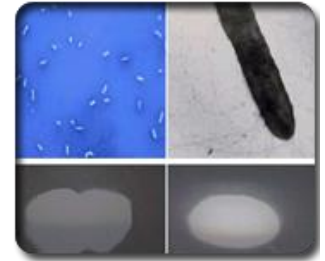
RATOON STUNTING

The affected plants are stunted, the stunting being most severe in stubble and ratoon crops. Infected stocks is the presence of pin head like orange coloured dots of bacteria on the internal soft tissue in the nodal region. The setts taken from diseased plants germinate poorly and the few shoots that emerge grow very slowly. It is sap-transmissible and no insect vector has been found.



Pathogen

The organism that causes RSD is, *Leifsonia xyli* subsp. *xyli*, a small aerobic bacterium. The genus of the pathogen was previously called *Clavibacter*.



Management

Cultural method: Select healthy setts for planting.

Mechanical method: Treat setts with hot water at 50°C for about 2 hours give 100 per cent control.

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