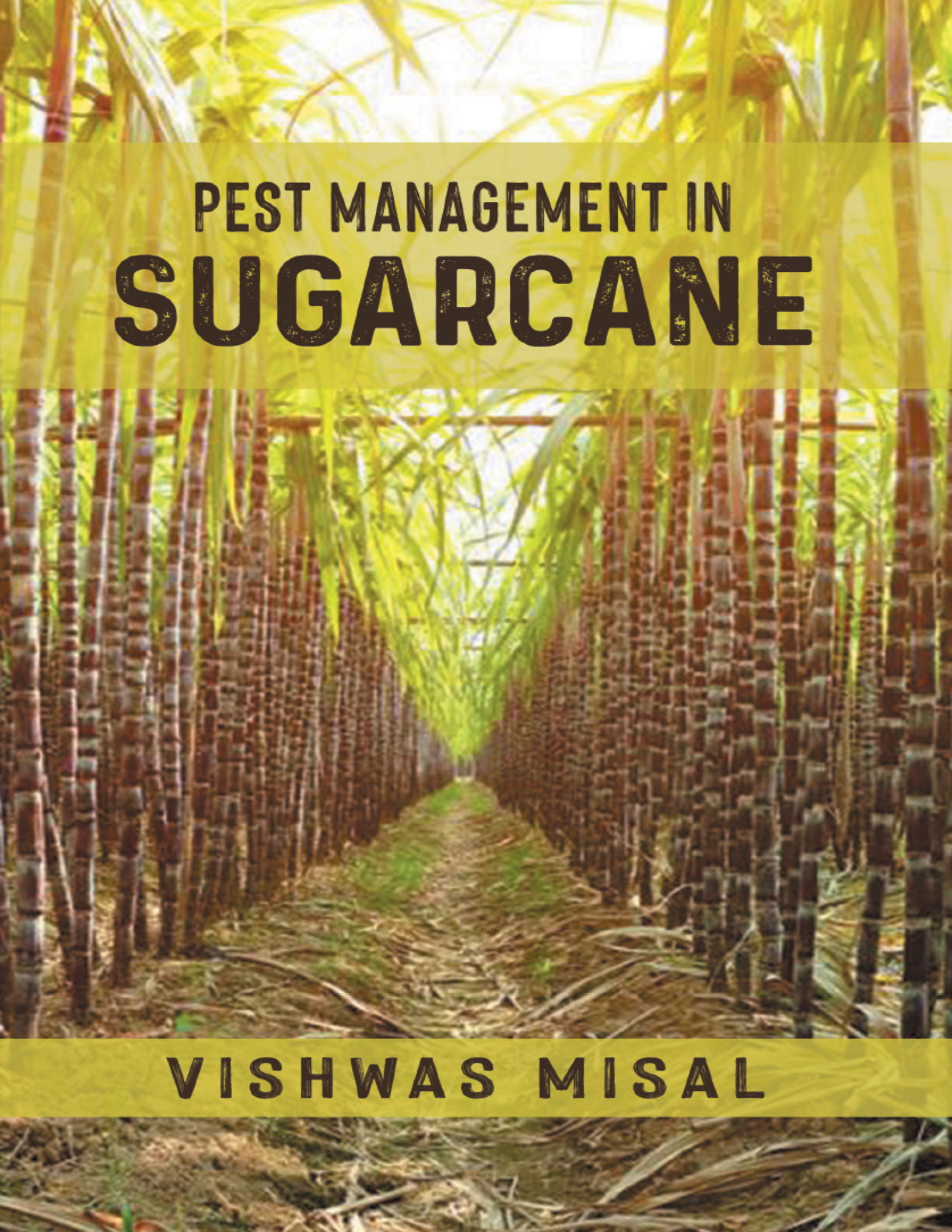

PEST MANAGEMENT IN SUGARCANE

VISHWAS MISAL

Published in India by Prowess Publishing,
YRK Towers, Thadikara Swamy Koil St, Alandur,
Chennai, Tamil Nadu 600016

Print: 978-1-5457-5296-8
eISBN: 978-1-5457-5297-5

Library of Congress Cataloging in Publication

CONTENTS

FIVE F: Biofertilizers in sugarcane IPM

FIVE G: Biocontrol agents in Sugarcane, Definition, Significance, Types of agents, Formulations, Pest management strategy

List of Tables

References and Illustrations cited

Appendices

Annexures

Index

INTRODUCTION

Sugarcane is an important industrial crop of India. Perhaps this could be the largest agroprocessing industry in India. This industry is mainly situated in rural India and has changed the face of rural India to a great extent in a real sense.

The sugarcane is grown in India wherever irrigation facility is available. The sugarcane was previously used for Gur making which was the major form of consumption in day to day use for tea, sweets etc. Since the inception of sugar mills in 1930, sugar could be made popular in place of gur since it has a better shelflife and easiness in handling while making use.

This crop was grown on area of 1176000 hac in 1930 which has gone up to 5114000 hac in 2018. There are about 525 sugar mills as on 2017–18 as against 29 in 1930–31 with average crushing capacity 644 t/day in 1940–41 to 4439 t/day in 2017–18 with sugar production 0.934 million tons in1940–41 to 32.328 million tons in 2017–18 and recovery 8.96 in 1930–31 to 10.73 in 2017–18 and molasses production 3336000 tons in 1935–36 to 13980000 tons in 2017–18.

Sugarcane is being used for production of Sugar, gur, khandsari and as an animal feed and some portion used as seed material. The changes in utilization pattern of sugarcane for production was 140.604 million tons in 1975–76 and 306070 million tons in 2016–17, out of which production of white sugar % was 29.80% in 1975–76 & 63.20% in 2016–17, used for seed and feed 11.90% in 1975–76 and 11.70% in 2016, Gur and khandsari, 1975–76, 58.30% and 25.07% in 2016–17.

The consumption pattern of sugarcane products has also witnessed on higher side; in 1986–87 total consumption of sugar was 87.75 lac tons and per capita consumption was 11.5 kg/year, total consumption of gur, khandsari was 79.25 kg/year and per capita was 10.4 kg/yr and it was 254.50 lac tons total consumption of sugar and 19.3 kg/yr/capita, 53.99 Gur, khandsari and 4.1 kg/yr capita in 2016–17.

This crop is grown in Tropical and Subtropical regions of India. Tropical states like Andhra Pradesh, Gujarat, Karnataka, Orissa, Madhya Pradesh, Maharashtra and Subtropical states like Bihar, Haryana, Punjab, Uttar Pradesh and Uttarakhand. The average yield in tropical states Tamil Nadu-104.2, Maharashtra-78.5, Karnataka-76, Andhra Pradesh-71, Gujarat-70, Orissa-62.7, Madhya Pradesh-53.8 mt/ha and subtropical states, Bihar-55.3, Haryana-74.0, Punjab-79.3, Uttar Pradesh-61.9, Uttarakhand-59.2 mt/ha.

The above statistics underlines the magnitude of this crop in India as a whole and also gives an insight of need to improve the productivity of this crop on all India basis.

The Cooperative Sugar Industries Federations in every state are actively emphasizing on this aspect. They are making every efforts to increase the productivity of the cane in their area of operation to ensure uninterrupted supply of cane to run the unit with full installed capacity. But still there is a scope to further augment cane development activities.

The lot of efforts are being done by state govts and sugar industries as a whole, private and cooperatives, to increase the yield and recovery of sugarcane crop. This is a cyclic nature crop and after every three years there is a reduction in acreages. There is no consistency in cane development activities by sugar mills as a whole barring some exceptions. The scenario is changing by introduction of newer technologies in efficient water use, to improve fertilizer use efficiency by introduction of use of water soluble fertilizers wherever drip irrigation system is installed, improved plant protection like use of new generation insecticides and use of biocontrol agents, use of biofertilizers, use of light traps, sex pheromones and so on.

There is a lot of information available on the damage potential of insects, diseases and weeds as a group called Pests. There are about 288 insect pests recorded in different categories, borers & sucking insect pests, about more than 70 disease in the categories of bacterial, fungal, miscellaneous disease or disorders, nematodes, parasites and also mycoplasma like organisms (MLO)s, more than 30 types of weeds in the category of broad leaf, grasses and sedges. The degree of damages and economic losses are in the category of 20% and above and in some cases total loss of the crop.

The effort is being made herewith to bring the available information on these aspects under one umbrella as an integrated approach as an Integrated Pest Management concept. This has been compiled from best available sources like Govt., University bulletins, research papers, also electronic media like websites, Wikipedia etc. This is intended and will be of use for Sugar Mills for their crop development staffs, enterprising growers, extension workers, agri college students in India and sugarcane growing countries in South East Asia and South Africa.

CHAPTER ONE

Meaning of Pest, Economic importance, Regional Significance wise list, Nomenclature

Meaning of Pest

A destructive insect or other animal that attack crops, food, livestock etc.

Definition of Pest: Something resembling a pest in destructiveness especially, a plant or animal detrimental to human or human concern, such as agriculture or livestock production and forestry. In layman terms, pest is the organism that distracts the human life.

Scientific definition of pest is that those organisms which damage our cultivated plants, our forest, storage, domestic products including other aesthetic qualities are called pest. The pests are those organisms which harbor in cultivated quality crops.

Pest is derived from French word 'Peste' and Latin term "Pestis".

-Pests means plague or contagious disease. Pest is any animal which is noxious, destructive or troublesome to man or his interests.

-Pest is an any organism which occurs in large numbers & conflict with man's welfare, convenience & profit.

Insect pests can be classified broadly in following groups based on their way of damage, host association, biological characters, metamorphosis.

A. **Defoliaters:** *Scletonisers, Sapsuckers, Bark borers*

B. **Monophagus:** *Oligophagous, Polyphagous*

C. **r-pests:** *r-pests, k-pests, r-k pests*

D. **Ametabola:** *Paurometabola, Hemimetabola, Holometabola*

E. **Over-ground pests:** Root stock borer (*Emmalocera depresallis*), Pink borer (*Sesamia inference*), Stem borer (*Diatrea saccharalis*), Mexican rice borer (*Eoreuma loftini*), Sugarcane borer (*Chilo terenellus*), Sugarcane thrips (*Fulmekiola serrata*), Cane aphid (*Melanaphis sacchari*), Grasshopper (*Oxya chinensis*)

F. **Under-ground pests:** Sugarcane grub *(Tomarus subtropicus),* Giant termite *(Mastotermes darwiniensis),* Ants *(All species),* Sugarcane whitefly *(Aleurolobus barodensis),* Burrowing bug *(Scaptocoris tapla),* Field cricket *(Gryllus pennsylvanicus)*

Economic Importance

The sugarcane crop is having a long growth duration and hence it is vulnerable to insect pests and diseases. Some estimate suggests that 20% & 19% actual decline in production can be there by pests and diseases respectively.

Table 1: Losses in sugarcane production due to different insects and pests in India

Name of Pest	Reduction in cane yield	% reduction in sugar recovery
Early shoot borer	22 to 33	2CCS
Internode borer	34.88	1.7–3.07
Top shoot borer	21–37	0.2–4.1
Stalk borer	up to 33	1.7–3.07
Gurdaspur borer	5–15	0.1–0.8
Root borer	35	0.3–2.90
Scale insect	32.6	1.5–2.5
Mealy bugs	poor germination up to 35%	brix loss 16.20
Black bug	31.6	0.1–2.8
Pyrilla	14.7	2.0–3.0
Arboridia sp.	86	1.0–1.5
Whitefly	80	1.4–1.8
White grub (H)	100	5.0–6.0
White grub (L)	33	complete drying
Rodents	7 to 39	–

It is evident from the above table that the losses in terms of sugar recovery, CCS, brix in some cases there is a complete drying of the crop.

Borers are damaging in the range of 22–35%, Sucking pests 32 to 86%, Soil insects like white grubs 33 to 100%.

There is a possibility of becoming some minor pests as a major one due to climatical diversity such as Wooly aphids has created a havoc in Maharashtra some years back.

There is also a lack of awareness about the damage done by pests and diseases. It is only noticed when the damage has already been done. This is because the farmer's perception that this crop does not require any other inputs than water and fertilizers. Due to closer spacing it would have also been difficult to identify the pests in initial stages and hence it could be noticed only when they have already done substantial damage to the crop.

Region wise Significance of Insect pests

The sugarcane crop is being infested by about 288 no of different types of insect pests. Out of these pests already recorded about 24 are of major importance since they are causing heavy losses in quantity as well as quality. The incidence of diseases and pests on sugarcane varies with geographical areas of the country as a whole. Borers and stalk borers are predominant in subtropical areas whereas pests like internode borers and shoot borers and diseases like rust and eyespot are making their presence in tropical areas.

A Pests of National Significance

I Pests

Borers

1. Early shoot borer : *Chilo infuscatellus* Snellen (Lepidoptera: Crambidae)
2. Pink borer : *Sesamia inferens* Walker (Lepidoptera: Noctudae)
3. Top shoot : *Scirpophaga excerptalis* Walker (Lepidoptera: Crambidae)

borer

4. Root borer	:	*Emmalocera depressella* Swinehoe (Lepidoptera: Crambidae)
5. Internode borer	:	*Chilo sacchariphagus indicus* Kapur (Lepidoptera: Crambidae)
6. Stalk borer	:	*Chilo auricillus* Dudgeon (Lepidoptera: Crambidae)

Sucking pests

1. White wooly aphid	:	*Ceratovacuna lanigera* Zehntner (Hemiptera: Aphididae)
2. Black bug	:	*Cavelerius sweeti* Dist. (Hemiptera: Lygaedae)
3. Whitefly	:	*Aleurolobus barodensis* Maskell (Hemiptera: Aleyrodidae)
4. Pyrilla	:	*Pyrilla perpusilla* Walker (Hemiptera: Lophopidae)
5. Mealy bug	:	*Saccharicoccus sacchari* Cockerell, (Hemiptera: Psudococcoidae)
6. Mite	:	*Oligonychus sacchari* Mc Gregor (Trombidiformes: Tetranychidae)

Subterranean pest

1. Termites	:	*Odontotermes spp*. (Isoptera: Termitidae)

II Diseases

1. Red rot	:	*Colletotrichum falcatum* Went
2. Wilt	:	*Acremonium implicatum*, (Gilman & Abbott) Gams, *Fusarium moniliforme* subsp. Glotinas J. Sheld
3. Grassy shoot	:	*Mycoplasma like organism* (MLO)
4. Smut	:	*Ustilago scitaminea* (Syd.) M. Piepenbr, M. Stoll & Oberw
5. Scald	:	*Xanthomonas albilineans* Dowson
6. Red stripped disease	:	Xanthomonas *rubrilineans* Dowson

III Weeds

Broad leaf

1. Pigweed	:	*Amaranthas viridis* Hook. F. (Amarathaceae)
2. Swine cress	:	*Coronopus didymus* (L.) Sm. (Brassiceae)
3. Black nightshade	:	*Solanum nigrum* L. (Solanaceae)
4. Common purselane	:	*Portulaca oleracea* L. (Portulacaceae)
5. False amaranthus	:	*Digera avensis* Forssk (Amarantaceae)
6. Lambs quarter	:	*Chenopodium album* L. (Chenopodiaceae)
7. Scarlet pimpernel	:	*Anagallis arvensis* L. (Primulaceae)
8. Sweet clover	:	*Melilotus indica* (L.) All. (Fabaceae)
9. Field bindweed	:	*Convolvulus arvensis* L. (Convolvulaceae)
10. Fine leaf fumitory	:	*Fumaria parviliflora* Lam. (Fumariceae)
11. Corn spurry	:	*Spergula arvensis* L. (Caryophyllaceae)
12. Carrot grass	:	*Parthenium hysterophorus* L. (Asteraceae)
13. Horse purslane	:	*Trianthema portulacastrum* L. (Aizoaceae)
14. Goat weed	:	*Ageratum conyzoides* L. (Asteraceae)
15. Tropical spider wort	:	*Commelina bengalensis* L. (Commelinaceae)
16. False daisy	:	*Eclipta alba* L. (Asteraceae)
17. Spurge	:	*Euphorbia hirta* L. (Euphorbiaceae)

Grasses

1. Crabgrass	:	*Digitaria sanguinalis* (L.) Scop. (Poaceae)

2. Barnyardgrass	:	*Echinochloa crusgalli* (L.) Beauv. (Poaceae)
3. Bermuda grass	:	*Cynadon dactylon* (L.) (Poaceae)
4. Wild sugarcane	:	*Saccharum spontaneum* L. (Poaceae)
5. Johnson grass	:	*Sorghum halapense* (L.) Pers. (Poaceae)
6. Torpedo grass	:	*Panicum repens* L. (Poaceae)
7. Blue grass	:	*Poa annua* L. (Poaceae)
8. Chinese lovegrass	:	*Eragrostis unioloides* (Retz) Nees. Ex Steud. (Poaceae)
9. Goosegrass	:	*Eleusine indica* (L.) Gaertner (Poaceae)

Sedge

1. Purple nutsedge	:	*Cyperus rotundus* L. (Cyperaceae)
2. Flat sedge	:	*Cyperus iria* L. (Cyperaceae)

IV Rodents & Mammals

1. Lesser bandicoot	:	*Bandicota bengalensis* Gray (Rodentia: Muridae)
2. Soft furred field rat	:	*Millardia meltada* Gray (Rodentia: Muridae)
3. Jackal	:	*Canis aureus* l. (Carnivora: Canidae)

V Nematodes

1. Lesion nematode	:	*Pratylenchus coffeae* Gooday
2. Lance nematode	:	*Hoplolaimus indicus*, Sher

3. Reniform nematodes	:	*Rotylenchulus reniformis* Linford and Oliveira
4. Root knot nematode	:	*Meloidogyne* spp.

B Pest of Regional Significance

I Insect Pests

1. Plassy borer	:	*Chilo tumidicostalis* Hampson (Lepidopter: Crambidae)
2. Scale insects	:	*Melanaspis glomerata* Green (Hemiptera: Diaspididae)
3. White grubs	:	*Holotrichia consanguinea* Blanch. (Coleoptera: Scarabeidae)
4. Gurdaspur borer	:	*Acigona steniellus* Hampson (Lepidoptera: Crambidae)
5. Green borer	:	*Raphimetopus ablutellus* (Lepidoptera: Crambidae)

II Diseases

1. Pokkahboeng	:	*Fusarium moniliforme* Sheldon
2. Rust	:	*Puccinia melanocephala*
3. Mosaic	:	*Sugarcane mosaic* virus
4. Yellow leaf disease	:	*Sugarcane yellow leaf* virus (SCYLV)

Out of these insect pests, some pests are damaging above the ground portion of the plant and others damaging portion in the soil. Following are some examples.

Overground insect pests

Root knot borer, Pink borer, Stem borer, Mexican rice borer, Sugarcane borer, Sugarcane thrips, Cane aphids, Grasshoppers.

Underground insect pests

Sugarcane grub, Giant termite, Ants, Sugarcane whitefly, Burrowing bug, Field cricket.

You've Just Finished your Free Sample

Enjoyed the preview?

Buy: https://store.prowesspub.com