THERMOTHERAPY FOR SUGARCANE DISEASE MANAGEMENT

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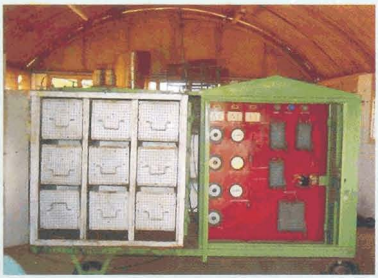
Diseases are one of the major constraints in the profitable cultivation of sugarcane. Since the crop is cultivated widely in the country the seed cane is moved very frequently from one location to another. Vegetative propagation favours accumulation of pathogens of most of the diseases in sugarcane probably except foliar diseases. Hence, along with seed canes disease causing pathogens are also introduced into new areas, albeit unwillingly. In addition to new pathogens there are chances for carry over of more virulent pathotypes or strains of different pathogens to new areas.

Slow accumulation of different pathogens over a period of time makes minor disease into a major one. Several epidemics due to red rot, smut, wilt, grassy shoot, ratoon stunting, yellow leaf and leaf scald occurred in the past indicated that disease infected seed cane played significantly in their creation and further spread. Sugarcane production in the country has to be sustained to meet the demand from farmers and industry for various purposes like sugar, fibre, alcohol etc. In order to achieve the demand for sugar in 2020 sugarcane production and productivity have to the increased. Here supply of disease free seed material form the basis for higher production. The concepts of multi-ratooning and precision farming would not be successful unless healthy seed nursery programme is followed in letter and spirit.

Sugarcane, being a long duration crop, available throughout the year in the field facing different seasons is also favourable for the infection by different kinds of pathogens. Infected seed cane results in disease development immediately after planting or later depending on the pathogen titre or season and cause enormous loss to sugarcane production. Thermotherapy is the proven approach to eliminate/inactivate the pathogens resides in the seed canes.

The scientific principle involved in heat therapy is that the pathogens present in seed materials are inactivated or eliminated at set temperatures not deleterious for the host tissues. Earlier, hot water treatment was used to control sett borne diseases in Australia. Subsequently, hot air treatment was used to control ratoon stunting in case of immature canes in USA. In various parts of the world, four types of heat treatment plants have been designed and



Front view of aerated steam unit

fabricated for administering heat to seed canes of sugarcane. These are hot water, hot air, moist hot air and aerated steam. The latter types are being used in India (Table).

Hot water treatment

This has water tank with provisions for heating, stirring, temperature control and arrangements for handling cane baskets into and from water tanks. The capacity of the plant varies according to the requirement. Before planting the setts, treating with fungicides is recommended because of buds becomes soft and are easily attacked by pathogenic fungi present in soil. Alternatively the fungicides can be mixed in the treatment chamber to control systemic infections of smut pathogen.

Hot air treatment

Hot air at specified temperature is let inside the treatment chamber and treated. This type of treatment is used in USA.

Moist hot air treatment

In this method, the canes are treated in hot air at 54°C for 4 hours under high humidity conditions.

Table: Comparative information on the features of four heat treatment systems used to manage sugarcane diseases is presented in the table.

Particulars	Type of heat therapy			
	Hot water	Hot air	Moist hot air	Aerated steam
Countries using	All sugar-cane growing countries	Louisiana, USA	India	India & USA
Medium of heat Nature of heat	Water Wet	Air Dry	Moist hot air Moist	Steam Moist
Specific heat of medium Nature of seed to be used Full canes or setts	1.0 Mature setts	0.2 Immature/mature Full cane	0.5 Immature/mature Full cane	0.5 Immature/mature Setts
Detrashing of cane	Not necessary	Necessary	Necessary	Not necessary
Recommended temperature	50°C	54°C	54°C	50°C
Recommended duration	2-3 hours	8 hours	3-4 hours	1-3 hours
Environmental set up	Open	Closed, air tight	Closed, air tight	Closed but continuously open vents
Side effects of treatment	Softening of buds, damage to buds when handled	Desiccation of canes, poor germination	No adverse effects	No adverse effects
Diseases controlled	Grassy shoot, ratoon stunting, smut	Grassy shoot, ratoon stunting	Grassy shoot, ratoon stunting	Grassy shoot, ratoon stunting, smut (partial), red rot not effective.

Aerated steam treatment (AST)

This method is followed commonly in many States. The AST unit consists of a steam generating chamber, air-blower, mixture chamber and a treatment chamber. The treatment chamber can hold 18 trays (60x30x30 cm) made of punched GI sheets which slide on wheels. Each tray can accommodate 150 setts. The temperature of air-steam mixture is controlled by automatic temperature controls. The aerated steam inlet tubes in the treating chamber are arranged in such a fashion that the aerated steam is uniformly distributed. The unit has timer control and thermostats which regulates supply of aerated steam to the chamber and maintenance of temperature.

Three tier seed nursery programme for disease-free seed

The seed programme is being implemented to produce and supply disease free seeds to farmers through breeder seeds, foundation seed, and certified seed . The commercial seed is distributed to the farmers for general planting. This programme is a continuous process and from third year onwards, farmers get disease free seed. Even the crop from certified seed after few years attract diseases hence, the fresh seed should be supplied to farmers to sustain the crop yield at higher levels.

In general, thermotherapy results in softening of buds, hence, care should be taken while handling to reduce the bud damage. Also fungicide treatment before planting is necessary to prevent easy entry of soil pathogens into the setts. In place of the thermotherapy, meristem-culture derived seedlings can be used in three tier seed nursery programme to get disease-free seedlings.

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