PLANT PATHOLOGY

Technical Programme – 2017-2018

PP 14 & : Identification of pathotypes of red rot pathogen

PP 14 (a) : Maintenance of isolates of red rot pathogen

Objective : To gather information on the major pathotypes of red rot from the different areas/zones.

Year of start : 1983-84 (Continuing project)

Location :

North West Zone	:	Lucknow, Shahjahanpur, Kapurthala, Uchani and Karnal (SBI)
North Central Zone	:	Pusa and Seorahi
East Coast Zone	:	Anakapalle, Cuddalore and Nayagarh
Peninsular Zone	:	Navsari, Coimbatore and Thiruvalla

Working isolates showing pathogenic variability from the previously reported pathotypes at different centers will be confirmed at the following centers : Lucknow and Uchani (North-West zone) and S.B.I., Coimbatore (Peninsular and East Coast zones). The participating centers will deposit such working isolates at the above mentioned centers latest by June 15 of each year. The zonal centers will also maintain the type cultures.

Sugarcane Differentials (19 Nos.) : 1. *Baragua* (*S. officinarum*); 2. *Khakai* (*S. sinense*); 3. SES 594 (*S. spontaneum*); 4. CoS 767; 5. BO 91; 6. CoC 671; 7. Co 7717; 8. Co 997; 9. CoJ 64; 10. Co 1148; 11. Co 419; 12. Co 62399; 13. Co 975; 14. CoS 8436, 15. Co 7805, 16. Co 86002, 17. Co 86032, 18. CoV 92102 and 19. CoSe 95422

No. of isolates : Virulent isolates collected from red rot affected canes of commercially cultivated varieties in the zone.

Method of inoculation : Plug method of inoculation is to be used (Details vide PP.17). Inoculations with each isolate to be done on all the differentials with freshly prepared spore suspension. All inoculations to be completed in 2 days by last week of August.

Observation : One observation at 60th day of inoculation.

Evaluation : The canes are to be split open longitudinally. Inoculated canes free from borer infestation and other damages are taken for evaluation. Based on parameters viz., nodal transgression, lesion width, white spots, top yellowing/drying, rind infection and sporulation over the rind, the host reaction is categorized into three groups viz., Resistant (R), Susceptible (S) and Intermediate (X) as follows –

R **:** Lesion width laterally restricted; nodal transgression up to 2 nodes; white spots, rind infection, sporulation over the rind and yellowing/drying of tops absent.

S **:** Lesion width laterally spreading, nodal transgression more than 2 nodes; white spots progressive or restricted; in case of progressive white spots, rind infection, sporulation over the rind and yellowing/drying of tops absent or present.

X **:** Lesion width laterally restricted or spreading; nodal transgression more than 2 nodes; white spots absent or present (restricted type), rind infection, sporulation over the rind and yellowing/drying of tops absent.

PP 17 : Evaluation of zonal varieties for resistance to red rot, smut, wilt & YLD

Objective : To gather information on the relative resistance to red rot, smut and wilt of the entries in zonal varietal trial of the respective zones.

PP 17 A RED ROT

Locations :

North West Zone	**:**	Lucknow, Kapurthala, Uchani, Shahjahanpur, Pantnagar and Karnal (SBI)
North Central Zone	**:**	Pusa, Motipur and Seorahi
North East Zone	**:**	Buralikson
East Coast Zone	**:**	Anakapalle, Cuddalore and Nayagarh
Peninsular Zone	**:**	Thiruvalla, Navsari, Coimbatore and Powarkheda

Year of Start : 1986-87 (Continuing project)

Varieties : All the centres will test all the entries of early and midlate groups under IVT and AVT of the respective zones. The seed material for this programme is to be obtained from the respective breeders of the centres. One six-metre row of at least 20 clumps may be kept for inoculation with each pathotype by plug/nodal cotton swab method. Any red rot susceptible variety of the same maturity group may be used as standard (check).

Inoculum (Pathotypes to be used) :

North West Zone	:	CF08 & CF09 (To be inoculated separately)
North Central & North Eastern Zones	:	CF07 & CF08 (To be inoculated separately)
East Coast Zone	:	CF06
Peninsular Zone	:	CF06 & CF12

(Note: If pathotypes are not available, CF07, CF08 and CF09 may be obtained from IISR, Lucknow; and CF06 & CF12 from SBI, Coimbatore).

Freshly sporulating, 7-day-old, culture, in Petri-dishes will be taken. The spore mass will be washed with 100 ml of sterile water and collected in a flask. Conidial suspension at a spore concentration of one million spores per ml will be prepared for inoculation. Fresh inoculum should always be used for inoculation. To maintain the virulence of pathotype, it should be inoculated in susceptible variety and re-isolated and purified.

Method of inoculation

1. Plug Method : Two canes in each of the 20 clumps to be inoculated. Inoculation is to be done in the middle of the 3rd exposed internode from bottom and two drops of the spore suspension is to be injected with a large syringe in each cane and sealed with plastic clay (plasticine) or modeling clay.

2. Nodal Cotton Swab Method : Two canes in each of 20 clumps will be inoculated by removing leaf sheath (lower most green leaf sheath) and immediately placing cotton swab (dipped in freshly prepared inoculum suspension) around the cane covering nodal region. The cotton swab should be held in place by wrapping parafilm® around the cane stalk.

Evaluation

1. Plug Method: The canes to be split open longitudinally sixty days after inoculation along the point of inoculation. Inoculated canes free from borer infestation and other damages are taken for evaluation. This is graded on the international scale of 0-9 as follows:

Variety (genotype): ---------- Method of inoculation: ----------

No. of canes evaluated	Condition of tops*	Lesion width ** (LW)	White spot ‹ (WS)	Nodal transgression ※ (NT)	Total Score	Remarks
1.						
2. to						
15.						

* 1.Condition of top: Green (G)-0; Yellow (Y)/Dry (D)-1.

**2. Lesion width above to inoculated internode is assigned the score 1, 2 or 3

‹ 3. White spot is assigned score of 1 or 2 according to whether it is restricted or progressive.

※4. N.T. No. of nodes crossed above the inoculated internode and given the score as:

1- if one node crossed; 2-if two nodes crossed; 3. if three nodes are crossed (maximum)

Average Score = Total Score/No. of canes evaluated

Disease reaction: 0-9 scale

0.0 to 2 - R
2.1 to 4 – MR
4.1 to 6 – MS
6.1 to 8 – S
Above 8 – HS

Note : Average score is taken into account for assigning the disease reaction.

2. Nodal Cotton Swab Method : Remove cotton swab and scrap the node with a knife. Record presence/absence of lesions. In case lesions are progressing into stalk, the reaction is to be recorded as S (susceptible) and if no lesion development, then R (resistant).

PP 17 B. SMUT

Locations :

North West Zone	**:**	Lucknow, Kapurthala, Uchani, Shahjahanpur and Pantnagar
North Central Zone	**:**	Pusa, Motipur and Seorahi
East Coast Zone	**:**	Anakapalle, Cuddalore and Nayagarh
Peninsular Zone	**:**	Coimbatore, Powarkheda, Thiruvalla, Padegaon, Navsari, Kolhapur, Sankeshwar and Pune

Year of Start : 1994-1995

Varieties : All the entries of early and midlate group under IVT and AVT of the respective zones. The seed material is to be obtained from the respective breeders of the centre.

Inoculum : *Sporisorium scitamineum* (Syn. *Ustilago scitaminea)* teliospores freshly collected from smut susceptible sugarcane varieties will serve as source of inoculum.

Storage : Freshly collected whips are air dried by keeping under shade and teliospores are collected in butter paper bags and are stored in desiccator under anhydrous calcium chloride. Spore viability is to be ensured before inoculation.

Inoculation : The method of inoculation consists of steeping of setts (three bud) for 30 minutes in a spore suspension of over 90% viability and with a spore load of one million spores per milliliter.

Plot size & Planting : The plot size is one, 3-metre row planted with 10, three-bud setts with a minimum of two replications.

Standards : Any smut susceptible and resistant variety of same maturity group may be used as standard (check).

Observations : Number of smut affected clumps per row are to be recorded. Smut incidence at fortnightly intervals has to be recorded up to harvest of the crop.

Evaluation : Evaluation is based on percentage of total clumps infected (No. of affected clumps/total clumps x100). It is required to maintain at least 15 to 20 clumps in each genotype before arriving at the percentage of infection. The following grading is to be followed for disease reaction:

0 %	**:**	Resistant
>0 to 10 %	**:**	Moderately resistant
>10 to 20 %	**:**	Moderately susceptible
>20 to 30 %	**:**	Susceptible
Above 30 %	**:**	Highly susceptible

PP 17 C. WILT

Location : Kapurthala, Lucknow, Pusa, Navsari, Sankeshwar, Anakapalle and Nayagarh

Year of Start : 2000-2001

Varieties : Entries of AVT of the respective zones.

Preparation of inoculum for application in soil: Mix 250 g sorghum seed (ground powder) and 750 g sand in 1:3 ratio and add 50-100 ml of distilled water (depending upon the soil moisture) in the container. Put 100 g of sorghum-sand mixture in 250 ml conical flasks and sterilize at 15 lb psi for 2 hr. After 2 days, inoculate each flask with 4-5 mycelia discs of *Fusarium sacchari* grown on oat meal agar medium in a Petri dish and incubate at 22±1^{o}C for 15 days. On 16th day, collect whole inoculum in one tray and mix thoroughly. Apply the inoculum mixture (@100 g/meter row) over the setts uniformly in the furrows at the time of planting.

Plot size & Planting : Two rows of 5 m length.

Standards (check) : Any wilt susceptible and resistant variety of the zone.

Observations :
1. Germination count at 45 days after planting
2. Appearance of wilt symptoms on the standing canes (on clumps)
3. At the end of 10 months, 10 clumps are to be uprooted with roots. All the canes from the clumps will be split open longitudinally and the wilt severity index scored on a 0-4 scale.

Evaluation : 0-4 Scale of wilt severity index

Grade Symptoms

0 Healthy canes and roots with no external or internal symptoms of wilt.

1. No wilting or drying of leaves, no stunting or shrinking of the stalk or rind, slight pith formation with yellow discolouration of the internal tissues in one or two lower internodes only. No cavity formation or fungal growth seen. Apparently normal and healthy roots.

2. Mild yellowing of top leaves and drying of lower leaves, mild stunting and shrinking of the stalk and rind. Yellowish discolouration of the internal tissues extending to three or four bottom internodes. Slight cavity formation of the pith, no fungal growth seen, slightly discoloured roots.

3. Mild yellowing of top leaves and drying of lower leaves, mild stunting and shrinking of the stalk and rind. Light brown discolouration of the internal tissues throughout the entire length of the cane except the top. Severe pith and cavity formation. Sparse fungal growth observed in the pith cavities.
4. Complete yellowing and death of the leaves, marked stunting, shrinking and drying of the stalk and rind, dark brown discolouration of the internal tissues extending throughout the entire length of the cane. Large pith cavities with profuse overgrowth of the associated fungi. Most of the roots necrotic with dark discolouration dislodge easily from the stalks. Roots mildly discoloured and slightly necrotic.

The mean wilt severity index is worked out based on the number of canes samples.

$$\text{Mean wilt severity index} : \frac{\text{Sum of wilt indices of individual stalks}}{\text{Number of stalks samples}}$$

PP 17 D: YELLOW LEAF DISEASE (YLD)

YLD symptoms of mid rib yellowing are expressed during 6-8 months crop stage. If disease severity increases, the yellowing spreads to laminar region and later there will be drying of affected mid rib and adjoining laminar tissue from leaf tip downwards along the mid rib. Another important symptom would be bunching of leaves in the crown. Highly susceptible variety will exhibit severe foliage drying during maturity stage. In place of yellow disclouration, purple or pinkish purple discolouration may also be seen on the mid rib and lamina. Canes of the affected plant do not dry.

To assess YLD severity, the following disease severity grades are to be given during maturity stages of the crop (3 observations by 8^{th}, 10^{th} and 12^{th}months). Each time, minimum of 25 canes (free from other biotic stresses) are to be scored.

YLD severity grades:

(The colour photographs of YLD symptoms displaying severity grades are available in the soft copy of the technical programme).

Disease grade	Description
0	No symptom of the disease
1	Mild yellowing of midrib in one or two leaves, no sign of typical bunching of leaves caused by YLD
2	Prominent yellowing of midrib on all the leaves in the crown. No bunching of leaves
3	Progress of midrib yellowing to laminar region in the whorl, yellowing on the upper leaf surface, and bunching of leaves
4	Drying of laminar region from leaf tip downwards along the midrib, typical bunching of leaves as a tuft
5	Stunted growth of the cane combined with drying of symptomatic leaves

Mean of the severity grades to be computed and the following YLD severity scale is to be used to assign disease reaction of the variety.

YLD severity scale :

Score	Disease reaction
0.0 - 1.0	Resistant
>1.0 – 2.0	Moderately resistant
>2.0 – 3.0	Moderately susceptible
>3.0 – 4.0	Susceptible
>4.0 – 5.0	Highly susceptible

Symptoms of Yellow Leaf Disease displaying different severity grades

PP 22 : Survey of sugarcane diseases naturally occurring in the area on important sugarcane varieties

Objective : To gather information on the diseases naturally occurring in the area on varieties for compiling an all India disease status report yearly

Locations : Lucknow, Kapurthala, Uchani, Shahjahanpur, Pantnagar, Karnal (SBI), Pusa, Seorahi, Buralikson, Anakapalle, Cuddalore, Nayagarh, Coimbatore, Mandya, Sankeshwar, Powarkheda, Thiruvalla, Padegaon, Kolhapur, Navsari and Pune.

Year of Start : 1989-1990

Observations : Periodic observations in June, September and December in all locations to gather information on the per cent incidence of diseases on all varieties of the area (General survey)

PP 23 : Assessment of elite and ISH genotypes for resistance to red rot

Objective : To gather information on *Saccharum* sp. and elite genotypes for resistance to red rot, so that the resistant genotypes could be used in breeding programme as possible donor for resistance

Locations : Kapurthala, Uchani, Karnal, Shahjahanpur, Lucknow, Pusa, Seorahi, Anakapalle, Cuddalore and Navsari.

No. of genotypes : Director, SBI, Coimbatore may be requested in advance for supply of seed material of the genotypes.

Plot size : One, six metre row of at least 10 clumps

No. of isolates: As indicated in PP 17 experiment.

Method of inoculation : Plug method only.

Inoculum : As per details given under PP 17 (Pathotypes to be inoculated individually only)

Method of evaluation : As per details in PP 17

PP 28 (b): Methodology for screening sugarcane genotypes for resistance to brown rust (*Puccinia melanocephala*)

Objective : To standardize methodology for inoculation of urediniospores of brown rust and rating of resistance.

Year of start : 2013-14

Locations : Pune, Padegaon, Kolhapur, Sankeshwar and Anakapalle

Leaf whorl method of inoculation was found superior over clip inoculation in leaf whorl at all the centres. To screen genotypes for resistance to rust the following parameters are to be standardized,

I. Inoculum dose (10^4, 10^5, 10^6 uredospores per ml)

II. Time of inoculation Weekly inoculation during July - August

III. Number of inoculations Minimum of six depending on the prevailing climate conditions

IV. Observations to be recorded.

After 4 weeks, record symptoms on leaves by counting- (i) average number of rust pustules per square inch, and (ii) number of leaves bearing rust pustules

Padegaon, Pune and Anakapalle centres will take up the standardization work.

Rating of resistance: To be taken up after standardization of the whorl inoculation method.

PP 31: Screening, epidemiology and management of pokkah boeng in sugarcane

Objectives : To study the development of pokkah boeng disease in relation to weather parameters and its management in sugarcane crop.

Location : Kapurthala**,** Uchani, Shahjahanpur, Seorahi, Pusa, Kolhapur, Pune, Akola, Sankeshwar, Anakapalle and Nayagarh

Year of start: 2011-2012

Observations to be recorded: Screening the desirable varieties for the incidence of pokkah boeng, correlation of climatic factors in relation to disease development and management of pokkah boeng under field conditions if the disease reaches acute phase.

(i) Screening:

Symptoms to be observed

Mild - Green plants with pokkah boeng (curling/ twisting of spindle leaves, tearing of leaves, whitish/chlorotic streaks on the leaves) at varying intensities.

Moderate - Yellowing of 3rd/ 4th leaf followed by complete yellowing of foliage and expression of top rot symptom.

Severe - Yellowing of leaves + Discolouration (Light coloured) of stalks + Wilting symptom in opened stalks.

Observe for the presence of above symptoms and grade it as given below:

Varieties*	Per cent infected plants				Disease reaction
	Mild	Moderate	Severe	Total incidence	
V1					
V2					
V3					

*: No restriction on number of varieties to be studied

Disease Reaction:

0-5% - Resistant; >5-10% - Mod. Susceptible; >10-20% - Susceptible; > 20% - Highly Susceptible

(ii) Epidemiology

Record temperature, relative humidity and rainfall from May to September and establish correlation with disease incidence

(iii) Management

Varieties : Two susceptible varieties

Treatments:

T-1. Sett treatment – Carbendazim treatment with Sett treatment device (0.1%)

T-2. Foliar spray - Carbendazim – 0.05% a.i. (3 sprays at 15 days interval from May15th)

T-3. Sett treatment (T1) + Foliar spray with carbendazim (T2)

T-4. Control

Replications: 4

Observations: Record disease incidence of pokkah boeng displaying symptons of top rot or wilt or both and present, the data in tabular form

Since overnight soaking of setts with fungicides is impractical it was suggested to go for fungicide treatment with sett treatment device for effective management of primary sources of fungal pathogens in sugarcane.

PP 32 : Management of brown spot disease of sugarcane

Objective : To find out effective method of brown spot management through chemicals.

Locations : Pune, Padegaon, Kolhapur and Sankeshwar

Year of Start : 2015-16

Treatment :

I. Variety : Brown spot susceptible variety CoM 0265 (or local susceptible variety)

II. Fungicides

T.1	- Propiconazole	-	0.1 %
T.2	- Hexaconazole	-	0.1 %
T.3	- Triadimefon	-	0.1 %
T.4	- Mancozeb	-	0.3 %
T.5	- Carbendazim	-	0.1 %
T.6	- Control (Untreated)	-	-

III. Time of application of fungicides: To be applied just after appearance of brown spot lesions followed by two sprays at 15 days interval.

Plot size : 6 x 7 sq. m

Design : RBD

Replications : Three

Observations:

1. Germination %
2. Disease incidence% (No. of clumps showing disease / total no. of clumps x 100)
3. Disease severity (% leaf area covered with brown spot lesions based on observations of 10 leaves per clump; total no. of clumps to be observed at least 10)
4. Cane yield per plot and per hectare
5. Brix, Pol %, Purity and CCS %
6. Cost-benefit ratio

PP 33 : Management of yellow leaf disease through meristem culture

Objective : To produce sugarcane seed cane free from yellow leaf disease through meristem culture.

Locations :

North West Zone	:	Lucknow, Uchani & Pantnagar
Peninsular Zone	:	Coimbatore, Pune & Sankeshwar
East Coast Zone	:	Anakapalle & Cuddalore

Year of Start : 2016-17

Methodology :

(i) Establishment of aseptic culture: Select the sugarcane variety for YLD-free seed production. Young cane tops are collected from 4-6 month old crop by removing the leaf sheath from field grown plants. The excised shoot tip of about 10 cm long is washed with water and then rinsed with a common disinfectant such as Savlon or Dettol solution followed by washing with sterilized water and dipping in 10% sodium hypochlorite solution for 10 minutes for disinfecting the plant material.

(ii) Inoculation of meristem tip: A wide-mouth flask containing the surface sterilized material is taken inside the laminar flow chamber. The material is washed thoroughly 3-4 times with sterilized distilled water till the odour of chlorine fades away. The minimum possible size (about 2-5 mm) of apical dome is excised with help of a sterile sharp blade and placed in glass bottle containing modified MS medium supplemented with kinetin (0.015 mg/l) and benzyl adenine (1.0 mg/l) as well as sucrose (30 g/l). The apical domes (apical meristem) are incubated at 25° ± 1°C under 16 hr / 8 hr light-dark cycle. The meristem is transferred to fresh medium once in 7-10 days for survival and growth. Initially, the growth would be slow and may take about 30 to 45 days for new shoots to come out.

(iii) Shoot multiplication: The developing shoots are transferred to fresh containers with MS shoot multiplication medium for sub-culturing. A number of shoots emerge soon after and sub-culturing is repeated every 15 to 20 days depending upon the rate of shoot multiplication which may vary with the variety. After 45 to 60 days, the regenerated shoots are transferred to modified MS liquid medium along with kinetin (1.07 mg/ l) and benzyl adenine (0.25 mg/l) as well as sucrose (20 g/l). After 25-30 days, new shoots will arise from the axils of the developing shoots. The multiple shoots developed are separated in small groups and transferred to fresh multiplication medium once in 15-20 days.This process of subculture is repeated for 7-8 cycles until the desired number of shoots is attained.

(iv) **Transfer of shoots to rooting medium:** Only well-grown shoots with three to four leaves should be transferred to rooting medium. Dry leaves are removed and green leaves trimmed at the tips. While separating, care is taken not to damage the basal portion of the shoots from where the roots would emerge. Groups of five to six shoots are placed in culture tubes containing half-strength MS medium supplemented with 5 mg/l naphthalene acetic acid and 30 g/l sucrose. Roots are formed within 15-25 days and once good root development has taken place the plantlets become ready for transfer to polybags/planting trays.

(v) **Hardening of plantlets:** Plantlets with well developed shoots and roots are taken out of the glass culture bottles and thoroughly washed with water to remove all traces of the medium. The plantlets with slightly trimmed roots and leaves are sown in polybags/planting trays containing a mixture of separately sieved river sand, silt and vermicompost or farm yard manure in a 1:1:1 ratio. The plantlets are maintained under intermittent mist or are covered with clean transparent plastic sheet until the first new leaves emerge. After 10 to 15 days under high humidity, the plantlets are transferred to shade net-house and maintained for another 4 to 5 weeks. NPK (1.0%) spray is given once in a week after establishment of the plantlets to improve initial growth. The plants become ready for transplanting in field after 45-50 days.

The canes produced in field from tissue culture-raised plants are designated as Breeder Seed which may be further multiplied for production of Foundation Seed and subsequently seed for commercial planting.

Indexing of plantlets for sugarcane yellow leaf virus (SCYLV)

Indexing of shoots before rooting may be carried out for SCYLV where facilities are available. The protocol is given below:

RT-PCR assays may be performed (Viswanathan *et al.* 2008, 2009). Total RNA is extracted from the first unfurled leaf along with midrib using TRI Reagent. The quality of RNA is checked in 1% agarose gel. The forward primer SCYLV-615F (ATGAATACGGGCGCTAACCGYYCAC) and the reverse primer SCYLV-615R (GTGTTGGGGRAGCGTCGCYTACC) may be used to specifically amplify ~613bp of the SCYLV genome. The total RNA to be reverse transcribed using RevertAid H Minus first strand cDNA synthesis kit (MBI Fermentas, USA), primed with 50 pmol of SCYLV-615R in a thermocycler. The PCR reaction to be performed in a total volume of 25 µl containing 2 µl cDNA, 2.5 µl of 10x PCR buffer containing 15mM $MgCl_2$, 0.5 µl of 10mM dNTP mix, 10 pmol each of forward and reverse primers (SCYLV-615F and SCYLV-615R, 1.25 units of *Taq*, and sterile milliQ water to the final volume.

PCR programme

Initial denaturation at 94°C for 4 min
Denaturation at 94°C for 1 min
Annealing at 65°C for 1 min
Primer extension 72°C for 45 sec
} 30 cycles
Final extension72°C for 10 min.

A 10 µl aliquot of each amplified product to be analyzed by electrophoresis on 1.5% agarose gel stained with ethidium bromide.

Observations to be recorded :

S.No.	Name of variety	No. of plantlets during hardening process	No. of plantlets transplanted in field	YLD incidence (%)	
				Breeder Seed crop	Foundation Seed
1					
2					
3					

For North West Zone

PP 14: Pathogenic behaviour of isolates of *C. falcatum* on a set of differentials

Sl. No	Pathotype /Isolate	Source	Reaction of host differentials													
			Co 419	**Co 975**	**Co 997**	**Co 1148**	**Co 7717**	**Co 62399**	**CoC 671**	**CoJ 64**	**CoS 767**	**CoS 8436**	**BO 91**	***Bara-gua***	***Kakhai***	**SES 594**
1.	CF01	Co 1148														
2.	CF02	Co 7717														
3.	CF03	CoJ 64														
4.	CF07	CoJ 64														
5.	CF08	CoJ 64														
6.	CF09	CoS 767														
7.	CF11	CoJ 64														
8.	New isolate/s															

The order of the differentials to be maintained and if additional differentials are added they may be given at the end.

For North Central Zone

PP 14: Pathogenic behaviour of isolates of *C. falcatum* on a set of differentials

Sl. No	Pathotype /Isolate	Source	Reaction of host differentials													
			Co 419	**Co 975**	**Co 997**	**Co 1148**	**Co 7717**	**Co 62399**	**CoC 671**	**CoJ 64**	**CoS 767**	**CoS 8436**	**BO 91**	***Bara-gua***	***Kakhai***	**SES 594**
1.	CF07	Co J 64														
2.	CF08	CoJ 64														
3.	New isolate/s															

The order of the differentials to be maintained and if additional differentials are added they may be given at the end.

For East Coast Zone

PP 14: Pathogenic behaviour of isolates of *C. falcatum* on a set of differentials

Sl. No	Pathotype /Isolate	Source	Reaction of host differentials													
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Kakhai	SES 594
1.	CF06	CoC 671														
2.	New isolate/s															

The order of the differentials to be maintained and if additional differentials are added they may be given at the end.

For Peninsular Zone

PP 14: Pathogenic behaviour of isolates of *C. falcatum* on a set of differentials

Sl. No	Pathotype /Isolate	Source	Reaction of host differentials													
			Co 419	Co 975	Co 997	Co 1148	Co 7717	Co 62399	CoC 671	CoJ 64	CoS 767	CoS 8436	BO 91	Baragua	Kakhai	SES 594
1.	CF06	CoC 671														
2.	CF12	Co 94012														
3.	New isolate/s															

The order of the differentials to be maintained and if additional differentials are added they may be given at the end.

PP 22: Survey of naturally occurring sugarcane diseases

Sl.No.	Disease	Name of area* surveyed	% Disease incidence (clump basis)	Varieties affected	Crop stage when observed	Any other information
1	Red rot					
2	Smut					
3	Wilt					
4	RSD					
5	YLD					
6	GSD					
7	Pokkah boeng					
8	Foliar Diseases (Specify)					
9	Other disease problems specific to the location					

* Mention name of district also; RSD= Ratoon stunting disease; YLD= Yellow leaf disease; GSD= Grassy shoot disease.

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

Characters on which data to be recorded in Initial Varietal Trial (IVT) and Advance Varietal Trial (AVT)

Crop : Sugarcane (Early – Plant)

1. Germination % at 30 days for tropics and 45 days for sub-tropics
2. No. of tillers (thousand/ha) at 120 days
3. No. of shoots (thousand/ha) at 240 days
4. Cane yield (t/ha) after 10 months at harvest
5. Number of millable canes (thousand/ha) after10 months at harvest
6. Stalk length (cm) after 10 months at harvest
7. Stalk diameter (cm) after 10 months at harvest
8. Single cane weight (kg) after 10 months at harvest
9. Brix % at 8 and 10 months
10. Sucrose % in juice at 8 and 10 months
11. Purity % at 8 and 10 months
12. CCS % at 8 and 10 months
13. CCS t/ha after 10 months at harvest
14. Extraction % after 10 months at harvest
15. Fibre % after 10 months at harvest
16. Pol % cane after 10 months at harvest
17. Jaggery quality after 10 months at harvest (if facility available)
18. Jaggery yield (t/ha) after 10 months at harvest (if facility available)

Morphological characters

1. Lodging: Erect, lodging, snapping, heavy lodging
2. Leaf sheath spines: Absent (A), present (P), medium (M), heavy (H)
3. Flowering: Absent (A), present (P)
4. Canopy structure and colour: Green, light green, yellowish green, dark green
5. Bud size: Big (B), small (S), medium (M)
6. Pithiness: Absent (A), present (P), less (L), heavy (H)
7. Internode splits: Absent (A), present (P), low (L), moderate (M), heavy (H)
8. Natural incidence of diseases and pests

Annexure-II

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

Characters on which data to be recorded in ratoon crop

Crop: Sugarcane (Early – Ratoon)

Note: 1. No gap filling should be done.

2. Ratooning operation should be completed within 15 days after harvesting plant crop.

1. Number of tillers (thousand/ha) before giving full earthing up (90 days)
2. Number of cane formed tillers (thousand/ha) after 180 days
3. Number of millable canes (thousand/ha) after 270 days at harvest
4. Cane yield (t/ha) after 270 days at harvest
5. Stalk length (cm) after 270 days at harvest
6. Stalk diameter (cm) after 270 days at harvest
7. Single cane weight (kg) after 270 days at harvest
8. Brix % after 270 days at harvest
9. Sucrose % in juice after 270 days at harvest
10. Purity % after 270 days at harvest
11. CCS % after 270 days at harvest
12. CCS t/ha after 270 days at harvest
13. Extraction % after 270 days at harvest
14. Fibre % after 270 days at harvest
15. Pol % cane after 270 days at harvest
16. Jaggery quality after 270 days at harvest (if facility available)
17. Jaggery yield (t/ha) after 270 days at harvest (if facility available)

Annexure-III

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

Characters on which data to be recorded in Initial Varietal Trial (IVT) and Advance Varietal Trial (AVT)

Crop: Sugarcane (Midlate – Plant)

1. Germination % at 30 days for tropics and 45 days for sub-tropics
2. No. of tillers (thousand/ha) at 120 days
3. No. of shoots (thousand/ha) at 240 days
4. Cane yield (t/ha) after 12 months at harvest
5. Number of millable canes (thousand/ha) after 12 months at harvest
6. Stalk length (cm) after 12 months at harvest
7. Stalk diameter (cm) after 12 months at harvest
8. Single cane weight (kg) after 12 months at harvest
9. Brix % at 10 and 12 months
10. Sucrose % in juice at 10 and 12 months
11. Purity % at 10 and 12 months
12. CCS % at 10 and 12 months
13. CCS t/ha after 12 months at harvest
14. Extraction % after 12 months at harvest
15. Fibre % after 12 months at harvest
16. Pol % cane after 12 months at harvest
17. Jaggery quality after 12 months at harvest (if facility available)
18. Jaggery yield (t/ha) after 12 months at harvest (if facility available)

Morphological characters

1. Lodging: Erect, lodging, snapping, heavy lodging
2. Leaf sheath spines: Absent (A), present (P), medium (M), heavy (H)
3. Flowering: Absent (A), present (P)
4. Canopy structure and colour: Green, light green, yellowish green, dark green
5. Bud size: Big (B), small (S), medium (M)
6. Pithiness: Absent (A), present (P), less (L), heavy (H)
7. Internode splits: Absent (A), present (P), low (L), moderate (M), heavy (H)
8. Natural incidence of diseases and pests

Annexure-IV

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

Characters on which data to be recorded in ratoon crop

Crop: Sugarcane (Midlate – Ratoon)

Note: 1. No gap filling should be done.
2. Ratooning operation should be completed within 15 days after harvesting plant crop.

1. Number of tillers (thousand/ha) before giving full earthing up (90 days)
2. Number of cane formed tillers (thousand/ha) after 180 days
3. Number of millable canes (thousand/ha) after 330 days at harvest
4. Cane yield (t/ha) after 330 days at harvest
5. Stalk length (cm) after 330 days at harvest
6. Stalk diameter (cm) after 330 days at harvest
7. Single cane weight (kg) after 330 days at harvest
8. Brix % after 330 days at harvest
9. Sucrose % in juice after 330 days at harvest
10. Purity % after 330 days at harvest
11. CCS % after 330 days at harvest
12. CCS (t/ha) after 330 days at harvest
13. Extraction % after 330 days at harvest
14. Fibre % after 330 days at harvest
15. Pol % cane after 330 days at harvest
16. Jaggery quality after 330 days at harvest (if facility available)
17. Jaggery yield (t/ha) after 330 days at harvest (if facility available)

Centre-wise slot numbers allotted to sugarcane entries proposed for evaluation in AICRP(S)

S.No	Centre	Slot number	Centre Code
Peninsular Zone			
1	Coimbatore (including Karnal)	001 - 060	Co
2	Mandya	061 – 070	CoVC
3	Navsari	071 - 080	CoN
4	Padegaon	081 - 090	CoM
5	Powarkheda	091- 100	CoJN
6	Sankeshwar	101 - 110	CoSnk
7	Thiruvalla	111 - 120	CoTl
8	VSI, Pune	121 - 130	CoVSI
9	EID Parry, Pugalur	131 - 140	PI
10	Sirugamani	141 - 145	CoSi
North West Zone			
11	Faridkot	181 - 190	CoPb
12	Kota	191 - 200	CoPK
13	Lucknow	201 - 210	CoLk
14	Kapurthala	211 - 220	CoPb
15	Pantnagar	221 - 230	CoPant
16	Shahjahanpur	231 - 250	CoS
17	Sriganganagar	251 - 260	CoSg
18	Uchani	261 - 270	CoH
East Coast Zone			
19	Anakapalle	321 - 335	CoA
20	Cuddalore	336 –345	CoC
21	Nayagarh	346 - 355	CoOr
22	Vuyyuru	356 –365	CoV
23	Perumallapalle	366- 375	CoT
24	EID Parry, Nellikuppam	376 –385	PI
North Central Zone			
25	Bethuadahari	426 - 435	CoB
26	Pusa	436 - 450	CoP
27	Seorahi	451 - 465	CoSe
28	Motipur (IISR)	466 - 475	CoLk
North East Zone			
29	Buralikson	501 - 510	CoBln

Note: In each agro-climatic zone sufficient slot numbers are kept reserved for accommodating entries of centers identified in future under AICRP (S). The 3-digit slot numbers are to be prefixed by 2-digit number of the year in which entries are accepted for evaluation at AICRP (S) workshop/group meeting. Finally, a 5-digit number of a variety is to be preceded by the centre's code.