

Tech. DOC. No.96

TECHNICAL PROGRAMME

(2009-2010)

(Citrus, Banana, Papaya, Sapota and Jackfruit)



for
Discussion and Finalisation
at

Kerala Agricultural University

Thrissur - 680 656

(16th to 19th November 2009)



ALL INDIA CO ORDINATED RESEARCH PROJECT ON TROPICAL FRUITS
DIR. HESSARAGhatta, BANGALORE 560 089

PREFACE

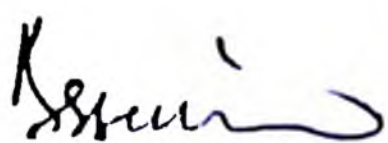
Citrus, banana, papaya, sapota and jackfruit covered under the project on tropical fruits are grown in diverse agro-climatic conditions across the country and contribute significantly to the socio-economics. Through the formulation and implementation of effective need based technical programme and its implementation at different coordinating centres has helped in improving the production and productivity of these tropical fruits. Implementation of improved technologies by the farmers has helped in plugging the gaps in productivity. Therefore, it is essential that technical programme is formulated, discussed and implemented for speedier testing and adoption of new technology.

The tentative technical programme for 2009-2010 prepared based on the review of the earlier programmes and regional needs. The scientists from different centres are requested to go through the technical programme critically and discuss if any programmes are repetitive or already concluded or any changes in treatments. In addition, new experiments proposed by respective centres are presented separately for discussion and finalisation besides inclusion of new centres as approved in 11th plan. However, the details of the ongoing trials have not been included. Chairman and Rapporteurs of different sessions are also requested to critically examine the programme based on the in-depth review of the work presented. I am sure all the concerned will share their experiences for formulating the effective technical programme.

I am thankful to the centres for their help in developing the technical programme. Co-operation extended by the experts in the field is thankfully acknowledged. I am also thankful to all those who are involved directly or indirectly for the compilation of this technical programme.

10th November 2009




(Amrik Singh Sidhu)

Director & Project Coordinator (Fruits)

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SESSION-IA MANAGEMENT OF GENETIC RESOURCES

ON GOING EXPERIMENTS

Sl. No.	Trials	Code No.	Centre allotted	Number of centres
CITRUS				
1	(a) Collection, Characterisation, Conservation, Evaluation and utilization of germplasm	1.1.1	Ludhiana, Rauri, Tinsukia Tirupati, NRCC, Nagpur* and Bikaner**	6
BANANA				
2	a) Collection, Characterisation, Conservation, Evaluation and utilization of germplasm	1.2.1	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat, Kannara, Kovvur, Mohanpur, Pusa NRCB, Trichy* and Bhubaneswar**	11
3	(a) Evaluation of FHIA hybrids	1.2.2	Arabhavi, Coimbatore, Kannara, Kovvur Mohanpur and Pusa	6
PAPAYA				
4	a) Collection, characterisation, evaluation and utilization of germplasm	1.3.1	Coimbatore and Bangalore*	2
SAPOTA				
5	Collection, characterisation, evaluation utilization of germplasm	1.4.1	Arabhavi, Gandevi, Kovvur, Periyakulam and Dapoli**	5
JACKFRUIT				
6	Collection, Characterisation and evaluation of germplasm	1.5.1	Jorhat, Kannara, Kovvur, Mohanpur, Periyakulam and Dapoli**	6
* Co-operating centre. ** = New centre				

NEW EXPERIMENT

Nil

SESSION-IB VARIETAL IMPROVEMENT ON GOING EXPERIMENTS

Sl. No.	Trials		Code No	Centre allotted	Number of centres
CITRUS					
1	Evaluation of cultivar under different agro climatic conditions	(a) Mandarin	1.1.2	Akola, Ludhiana, Tinsukia, NRCC, Nagpur* and Bikaner**	5
		(b) Sweet orange	1.1.2	Rahuri and Tirupati	2
		(c) Acid lime	1.1.2	Periyakulam, Rahuri and Tirupati	4
2	(a) Clonal selection of acid lime		1.1.3	Akola, Periyakulam, Rahuri, Tirupati, NRCC Nagpur, and Bikaner**	6
3	(b) Clonal selection of sweet orange		1.1.3	Rahuri, Tirupati & NRCC Nagpur	3
4	(c) Clonal selection of mandarin		1.1.3	Akola, Chethalli, Ludhiana, Tinsukia, NRCC, Nagpur* and Bikaner**	6
5	Evaluation of promising clones of citrus	a) Nagpur mandarin	1.1.4	Akola, NRCC Nagpur* and Bikaner**	3
		b) Sweet orange	1.1.4	Rahuri and Tirupati	2
		c) Acid lime	1.1.4	Akola, Periyakulam and Rahuri, Tirupati	4
		d) Pummelo	1.1.4	Lucknow*, NRCC Nagpur* and Tirupati	3
BANANA					
6	(b) Clonal selection		1.2.2	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat, Kannara, Kovvur, Mohanpur, Pusa and Bubaneswar**	10
7	(c) Varietal trial in banana		1.2.2	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat Kannara, Kovvur, Mohanpur, Pusa and Bubaneswar**	10
8	(d) Evaluation of promising clones of banana		1.2.2	Arabhavi, Coimbatore, Kannara, Kovvur, Mohanpur and NRCB, Trichy*	6
9	(a) Improvement through hybridization		1.2.3	Coimbatore and Kannara	2
10	(b) Improvement through mutation breeding		1.2.3	Coimbatore and Kannara, NRCB Trichy*	3
11	Development of pre-breeding lines through hybridization a) Development of mapping population b) Development of molecular markers		1.2.4	Coimbatore (a), Kannara (a & b), IHR, Bangalore* (a & b) and NRC for Banana, Trichy* (a & b)	4
PAPAYA					
12	(b) Breeding for high yield, fruit quality and papain		1.3.1	Coimbatore and Bangalore*	2

13	(b) Varietal performance studies in papaya	1.3.2	Coimbatore, Pusa, Ranchi** and Bangalore*	3
14	Evaluation of promising clones of papaya	1.3.3	Coimbatore, Kowvur, Jalgaon, Pusa, Ranchi** and Lucknow	6
SAPOTA				
15	Varietal trial in sapota	1.4.2	Arabhavi, Gandevi, Kowvur and Periyakulam and Dapoli**	5
16	Varietal improvement	1.4.3	Periyakulam	1
JACKFRUIT				
17	Varietal trial in jackfruit	1.5.2	Jorhat, Kannara, Kowvur, Mohanpur, Periyakulam and Dapoli**	6
RAMBUTAN				
18	Performance of promising rambutan clones	1.6.1	Kannara, Kowvur and Mohanpur	3
* Co-operating centre: **= New centre				

REVISED EXPERIMENTS

CITRUS

1.1.4 Evaluation of promising clones of citrus

a) Nagpur mandarin

Centres: Akola, Tinsukia, Ludhiana

Co-operating centre: NRCC, Nagpur and Chethalli

Clones: N-4, N- 28, N -34 identified at NRC for citrus, Nagpur and Mandarin 182 identified at Akola, CRS – 4 clone of Khasi mandarin identified at Tinsukia and high yielding clone (Clone –11) of Coorg mandarin identified at chethalli

Source of availability: Akola, Tinsukia, Chethalli and NRCC Nagpur

Rough lemon rootstock to be used

Design: RBD

Number of plants/replication: 4

Treatments: 6

Observations: Observations on growth (height, girth and canopy volume) should be recorded yearly. Yield and quality of fruits including market acceptability should be recorded after fruiting. Incidence of pest and disease also should be recorded.

b) Sweet orange

Centres: Rahuri, Ludhiana, Tinsukia and Tirupati

Clones: Phule mosambi identified at Rahuri, M-3, M 8 and M 4 identified at NRCC, Kodur Sathgudi, Blood red Malta and Shamouti orange

Source of availability: Rahuri, Tirupati and NRCC Nagpur

Rangpur lime rootstock to be used

Design: RBD

Number of plants/replication: 4

Treatments: 7

Observations: Observations on growth (height, girth and canopy volume) should be recorded yearly. Yield and quality of fruits including market acceptability should be recorded after fruiting. Incidence of pest and disease also should be recorded.

c) Acid lime

Centres: Akola, Periyaculam, Rahuri, NRCC Nagpur and Tirupati

Clones: TAL 94/14 and TAL 94/13 identified at Tirupati, Phule Sharbati identified at Rahuri, Akola lime identified at Akola and 4 clones of acid lime identified at NRCC (NRCC Niboo -2, NRCC Niboo -3, NRCC Niboo -4 and KL -12 identified at NRCC)

Source of availability: Akola, Rahuri, Tirupati and NRCC, Nagpur

Seedlings to be used

Design: RBD

Number of plants/replication: 2

Treatments: 8

Observations: Observations on growth (height, girth and canopy volume) should be recorded yearly. Yield and quality of fruits including market acceptability should be recorded after fruiting. Incidence of pest and disease also should be recorded.

d) Pummelo

Centres: Tirupati and Tinsukia

Co-operating centres: CISH, Lucknow and NRCC, Nagpur

Clones: PTF-1, PTF-2, PTF-3, PTF-4, NRCC Pummelo-1, NRCC Pummelo 2, NRCC Pummelo-3, NRCC Pummelo-4, NRCC Pummelo-5, check (local)

Source of availability: IIHR, Bangalore and NRCC Nagpur

Design: RBD

Number of plants/replication: 2

Treatments: 10

Observations: Observations on growth (height, girth and canopy volume) should be recorded yearly. Yield and quality of fruits including market acceptability should be recorded after fruiting. Incidence of pest and disease also should be recorded.

NB: In all the cases, local check has to be included for the respective group.

BANANA

1.2.2(d) Evaluation of promising clones of banana

- Under the new experiment NRCB selections 02, 03 and 04 may be included in the multi-location evaluation trials.

1.2.4 Development of pre-breeding lines through hybridization

- The title of "Development of molecular markers" may be changed as "Diversity analysis in banana using molecular markers". IRAP marker system (Inter Retrotransposon Amplifier Polymorphism) may be uniformly applied in all centres (as it is more robust i.e. informative).

In developing mapping population the following changes are made:

- Kannara: Sigatoka leaf spot (Plantain (AAB) *Musa accuminata* ssp. *Burmanicoides*)
NRCB, Trichy: Water use efficiency (BBXBB)

NEW EXPERIMENTS

BANANA

1. Collection and evaluation of somaclonal variants in banana (cv. Grand Naine) from tissue culture plantation

Proposed centre: Jalgaon.

Objectives:

- To collect somaclonal variants from tissue culture plantation
- To evaluate the somaclonal variants for growth, yield and bunch parameters.

Background Information: Banana is most important cash fruit crop extensively grown in Maharashtra by suckers, but area under tissue culture is also increasing. Somaclonal variation is a serious problem in tissue culture banana cv. Grand Naine. This occurs more commonly and frequently in Cavendish sub group of banana. At the same time the variant became prove good carrying additional traits. A scientific work on somaclonal variants in banana is meager and the detailed study needs to be undertaken to observe the good and additional traits carried out by somaclonal variants.

Year of start: June 2009

Experiments details. During the first year the somaclonal variants will be selected from farmers field and *per se* performance will be studied. The promising variants identified will be planted at BRS, Jalgaon for further evaluation.

Observations to be recorded

- I) Growth: 1. Pseudostem height (cm), 2. Pseudostem girth (cm), 3.No. of functional leaves at harvesting, 4 Total No. of leaves
- II) Phenotypic characters: 1. Leaf shape abnormalities, 2.Leaf pigmentation abnormalities, 3. Pigmentation on pseudostem, 4. Fruit deformities
- III) Duration: 1. No. of days to flowering, 2.No. of days to harvesting,
- IV) Yield: 1 No. of fingers/bunch, 2. Finger length (cm), 3. Finger girth (cm), 4. No. of hands/bunch, 5 Av. weight of bunch (kg), 6. Yield (t/ha)
- V) Reaction to Sigatoka leaf spot disease and viruses.

Practical /utility: If promising is found possessing desirable traits such as resistant to sigatoka leaf disease, virus diseases with high yield potential may be a boon to banana growers.

PAPAYA

1.3.3 Evaluation of promising clones of papaya

Centres: Coimbatore, Jalgaon, Kovvur, Pune, Pusa, Ranchi and CISH, Lucknow

Treatments: 4 Varieties (TECP 1, TECP 2, TECP 3 and local check)

Replications: 5

Number of plants / replication: 60

Design: RCBD

Methodology

- 1) Sowing: December / January
- 2) Transplanting onto the main field after retaining it in the Nursery for 45 days: (January 15th or February 15th).
- 3) Planting distance: 2.1 x 2.1m (Trench planting is advisable)
- 4) First flowering to start after 145 to 150 days after sowing
- 5) First harvest to commence after 270 days of sowing (September or October 2010)
- 6) Fruit evaluation to be done during October 2010.

2. Varietal trial In Papaya

Proposed centre: Kovvur (Inclusion under the existing programme)

Objective: To select and popularize a high yielding Papaya variety suitable to the tract

Methodology:

Design: RBD

Replications: 3

Varieties: 11

They are CO 2, CO 3, CO 5, CO 6, CO 7, Coorg honey dew, Surya, Pusa Dwarf, Pusa Nanha, Sunrise solo, Local Check

SESSION-II
PLANTING DENSITY, PROPAGATION AND ROOTSTOCKS

ON GOING EXPERIMENTS

Sl. No.	Trials	Code No.	Centre allotted	Number of centres
CITRUS				
1.	b) Rootstock trial in acid lime	2.1.2	Periyakulam	1
2.	Evaluation of Rough lemon and Rangpur lime	2.1.3	Akola	1
3.	Pilot cum demonstration trial (Rootstock)	2.1.4	Akola, Rahuri, Tinsukia and NRCC, Nagpur*	4
4.	Evaluation of promising rootstock in citrus	2.1.5	Ludhiana, Rahuri, Tinsukia , Tirupati & NRCC, Nagpur*	5
5.	Rejuvenation of mandarin spaced at normal spacing	2.1.6	Akola, Ludhiana, Tinsukia and NRCC, Nagpur* and Bikaner**	5
BANANA				
5.	(a) High density planting and sucker arrangement in banana	2.2.1	Jalgaon, Jorhat, Kannara, Pusa and Bhubaneswar **	5
7.	(c) Height (Size) of sucker and time of planting (Demonstration trial)	2.2.2	Mohanpur	1
8.	Performance studies of tissue culture plants	2.2.3	Gandevi, Jorhat and Mohanpur	3
SAPOTA				
9.	(a) Spacing trial in sapota	2.4.2	Arabhavi, Kovvur and Periyakulam and Dapoli**	4
10.	(b) Pruning trial in sapota	2.4.2	Gandevi and Periyakulam	2
11.	Canopy management under high density planting in sapota	2.4.3	Arabhavi, Gandevi, Kovvur and Periyakulam	4
12.	Rejuvenation of sapota at normal spacing	2.4.4	Arabhavi, Gandevi, Kovvur, Periyakulam and Dapoli**	5
JACKFRUIT				
13.	Standardization of propagation methods	2.5.1	Jorhat, Kannara, Kovvur, Mohanpur, Periyakulam and Dapoli**	6
14.	Effect of rootstocks on the performance jackfruit	2.5.2	Jorhat, Kannara, Kovvur, Mohanpur and Periyakulam	5

* Co operating centre ** - New centre

REVISED EXPERIMENTS

CITRUS

2.1.5 Evaluation of promising rootstocks in citrus

Centers: Ludhiana, Rahuri, Tinsukia, Chethalli, Tirupati & NRCC, Nagpur.

Experiment-1: Evaluation of different rootstocks for optimum growth and productivity of citrus (mandarin and sweet orange)

To evaluate the citrus rootstocks for various citrus spp. budded plants will be spaced at 6 x 6 m distance, the recommended doses of fertilizer will be applied uniformly to all the experimental plants. The details of the treatments and observations to be recorded are as follows

T1:NRCC rootstocks 1 Rough Lemon X Troyer Citrange	T9 x-639
T2:NRCC rootstocks 2 Rough Lemon X Troyer Citrange	T10 Alemow (<i>C. macrophylla</i>)
T3:NRCC rootstocks 3 Rough Lemon X Troyer Citrange	T11 Volkameriana
T4:NRCC rootstocks 4 Rough Lemon X Trifoliolate Orange	T12 Rangpur Lime (Brazilii)
T5:NRCC rootstocks 5 Rough Lemon X Troyer Citrange	T13 Kata Jamir
T6:NRCC rootstocks 6 Rough Lemon X Trifoliolate Orange	T14 Rangpur lime (Aboher)
T7:CRH-12	T15 Pummelo (white flesh)
T8:CRH-47	T16 Probable hybrid (203)

*Note: Check for mandarin-Rough lemon rootstock, Kinnow mandarin-Jatti-Khatti rootstock, Sweet orange-Rangpur lime rootstocks.

No. of plants/unit: 4, Spacing: 6 X 6 m, Replications 3, Design: R.B.D

Observation

- | | | |
|--|---|--|
| 1) Nursery observation | : | a) Bud intake b) Plant Height c) No. of Leaves d) Stock and scion girth |
| 2) Pre-bearing performance | : | a) Stock and scion girth and canopy volume
b) Nutrient uptake (Macro and micro nutrient) |
| 3) Bearing Performance-Vegetative growth | : | a) Plant height b) Stock and scion girth
c) Tree spread (E x W – N x S) d) Tree volume |
| 4) Quality parameters | : | Wt. of fruit, size of fruit (length and breadth) fruit firmness, peel thickness, Juice %, no. of seeds, T.S.S. and acidity |
| 5) Diseases, Insect-pest and nematode | : | Will be recorded |
| 6) Nutrient uptake | : | Macro and micro nutrient |
| 7) Yield (kg/plant) | : | kg and No. of fruits/plant |

2.1.6 Rejuvenation of mandarin spaced at normal spacing

Centres: Akola, Ludhiana and Tinsukia
Co-opting centre: NRCC, Nagpur

a) Khasi mandarin (Centre: Tinsukia)

Methodology

Pruning strategies

- i. Pruning has to be done as per the level of occurrence of die back.
- ii. Spray of fungicide (Bavistin 1 g/litre) and pasting of cut ends with COC.

Insect pest management: Conventional practices to be followed for control of trunk borer, if observed contributing to decline.

Disease management: Conventional practices to be followed for control of powdery mildew, if observed contributing to decline.

Nutrient management

- T₁ - Soil application of 25 kg FYM + 5 kg neem cake + 100% RDF (comprising 200 g ZnSO₄ + 100 g borax /plant) + 1 kg Dolomite /plant/year (to be applied in two equal splits as pre- and post- monsoon application)
- T₂ - Soil application of 25 kg FYM + 5 kg neem cake + multiple microbial culture (*T. harzanium*, *Pseudomonas fluorescense* and *Azotobacter/Azospirillum*) + 1 kg Dolomite/plant/year + 50% RDF (comprising 100 g ZnSO₄ + 50 g borax /plant) as soil application + 50% RDF (comprising 100 g ZnSO₄ + 50 g borax /plant) as foliar application (to be applied in two equal splits as pre- and post- monsoon application)
- T₃ - Control (Farmers practice)

b) Nagpur mandarin (Centre: Akola and Nagpur)

c) Kinnow mandarin (Centre: Ludhiana)

Methodology

Pruning strategies

- i. Pruning has to be done as per the level of occurrence of die back.
- ii. Spray of fungicide (Bavistin 1 g/litre) and pasting of cut ends with COC.

Insect pest management: Conventional practices to be followed for control of psylla, bark eating caterpillar and aphid, if observed contributing to decline.

Disease management: Conventional practices to be followed for control of foot and root rot diseases, if observed contributing to decline.

Nutrient management

- T₁ - Soil application of 25 kg FYM + 5 kg neem cake with 100% RDF (comprising FeSO₄, MnSO₄, and ZnSO₄ 200 g/plant) to be applied at the time of flower emergence in three equal splits
- T₂ - Soil application of 25 kg FYM + 5 kg neem cake + multiple microbial culture (*T. harzanium*, *Pseudomonas fluorescense* and *Azotobacter/Azospirillum*) + 50% RDF (comprising FeSO₄, MnSO₄, and ZnSO₄ 100 g/plant each) as soil application + 50% RDF (comprising FeSO₄, MnSO₄, and ZnSO₄ 100 g/plant each) as foliar application
- T₃ - Control (Farmers practice)

NEW EXPERIMENT

Nil

SESSION-III A
NUTRITION

ON GOING EXPERIMENTS

Sl. No.	Trials	Code No.	Centre allotted	Number of centres
CITRUS				
1	C) a) Effect of bio fertilizers and bio control agents on growth, yield and quality of Mandarin	3.1.1	Akola, Ludhiana and Tinsukia	3
2	C) b) Effect of bio fertilizers and bio-control agents on growth, yield and quality of Sweet orange	3.1.1	Rahuri and Tirupati	2
3	C) c) Effect of bio fertilizers and bio-control agents on growth, yield and quality of Acid lime	3.1.1	Periyakulam	1
4	D) a) Nutrient management under high density planting in mandarin	3.1.1	Akola, Chethalli, Ludhiana, Tinsukia, NRCC, Nagpur* and Bikaner**	6
5	D) b) Nutrient management under high density planting in sweet orange	3.1.1	Rahuri and Tirupati	2
6	D) c) Nutrient management under high density planting in acid lime	3.1.1	Periyakulam, Rahuri and Tirupati	3
7	E) a) Studying on residual and cumulative effect of nutrients in mandarin	3.1.1	Akola, Chethalli, Ludhiana, Tinsukia & NRCC, Nagpur*	5
8	E) b) Studying on residual and cumulative effect of nutrients in sweet orange	3.1.1	Rahuri and Tirupati	2
9	E) c) Studying on residual and cumulative effect of nutrients in acid lime	3.1.1	Periyakulam, Rahuri and Tirupati	3
10	(F) a) Standardisation of stage wise requirement of nutrients in mandarin	3.1.1	Akola, Chethalli, Ludhiana, Tinsukia & NRCC, Nagpur*	5
11	(F) b) Standardisation of stage wise requirement of nutrients in sweet orange	3.1.1	Rahuri and Tirupati	2
12	(F) c) Standardisation of stage wise requirement of nutrients in acid lime	3.1.1	Periyakulam and Rahuri	2
13	a) Orchard efficiency analysis in mandarin	3.1.2	Akola, Ludhiana, Tinsukia and Bikaner**	4
14	b) Orchard efficiency analysis in sweet orange	3.1.2	Rahuri and Tirupati	2
15	c) Orchard efficiency analysis in acid lime	3.1.2	Akola, Periyakulam and Rahuri	3
BANANA				
16	b) Effect of bio-fertilizers and bio-control agents on growth, yield and quality of banana	3.2.1	Coimbatore, Gandevi, Jalgaon, Jorhat, Kovvur, Mohanpur and Pusa	7
17	c) Effect of different sources of Nitrogen on yield and quality of banana	3.2.1	Jalgaon	1
18	d) Effect of micro-nutrients on growth and yield of banana	3.2.1	Kannara and Mohanpur	2

19	e) Nutrient requirement under high density planting in banana	3.2.1	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat, Kannara, Kowvur, Mohanpur, Pusa and Bubaneswar**	10
20	f) Standardisation of stage wise requirement of nutrients in banana	3.2.1	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat, Kannara, Kowvur, Mohanpur, Pusa and Bubaneswar**	10
21	Validation of Fertiliser adjustment equations in banana	3.2.2	Coimbatore, Kannara, and Kowvur	3
PAPAYA				
22	Effect of bio-fertilizers and bio-control agents on growth, yield and quality of papaya	3.3.1	Coimbatore, Pusa and Ranchi**	3
23	Standardisation of stage wise requirement of nutrients in papaya	3.3.2	Coimbatore, Pusa and Ranchi**	3
SAPOTA				
24	Effect of organic and inorganic fertilizers on growth and yield of sapota	3.4.1	Arabhavi, Kowvur, Periyakulam and Dapoli**	4
25	Orchard efficiency analysis in sapota	3.4.2	Arabhavi, Gandevi, Kowvur, Periyakulam and Dapoli**	5
26	Studies on residual and cumulative effect of nutrients in sapota	3.4.3	Arabhavi, Gandevi, Kowvur and Periyakulam	4
27	Standardisation of stage wise requirement of nutrients in sapota	3.4.4	Arabhavi, Gandevi, Kowvur and Periyakulam	4
* Co-operating centre: ** = New centre				

REVISED EXPERIMENTS

CITRUS

3.1.1 (C) INM in Citrus (Suggested Title)

Centres

- Mandarin: Akola, Ludhiana and Tinsukia
- Sweet orange: Rahuri and Tirupati
- Acid lime: Periyakulam

- Objective: 1. Standardization of bio-fertilizers in citrus
2. Effect of bio-fertilizers on the growth, yield and quality of citrus

Treatment details:

- Recommended dose of NPK 100%RDF (Control)
 - 100% RDF + AM (500g/plant) + PSB (100g/plant) + *Azospirillum* (50 g/plant)
 - 100% RDF + AM (500 g/plant) + PSB (100 g/plant) + *Azospirillum* (100 g/plant) + *T. harzianum* (100 g/plant)
 - 75% RDF + AM (500 g/plant) + PSB (100 g/plant) + *Azospirillum* (100 g/plant) + *T. harzianum* (100 g/plant)
 - 50% RDF + AM (500 g/plant) + PSB – (100 g/plant) + *Azospirillum* (100 g/plant) + *T. harzianum* (100 g/plant)
- [AM: Arbuscular Mycorrhizae, PSB: Phosphate Solubilizing Bacteria]

NOTE: The native microbes need to be isolated from rhizosphere of experimental site and application rate must be defined in terms of colony forming units (cfu)

Design: RBD (A × B), Replications: 4, Treatments: 5

810097



Method of Application: Biofertilizers are to be mixed with 10 kg FYM/plant at the time of fertilizer application

Observations to be recorded

- a. Vegetative growth parameters (Girth, Tree spread and Height)
- b. Yield and quality parameters
- c. Soil microbial population
- d. Soil fertility changes (N, P, K, Ca, Mg, Fe, Mn, Cu and Zn)
- e. Leaf nutrient changes (N, P, K, Ca, Mg, Fe, Mn, Cu and Zn)
- f. Post-harvest studies (Shelf life)

BANANA

3.2.1 (b) Effect of bio-fertilizers and bio-control agents on growth, yield and quality of banana

- Bio-control agents in the title of the project may be deleted.
- The quantity of *Glomus mosseae* @25g/plant may be given as against @250g/plant.

3.2.1 (f) Standardization of stage wise requirement of nutrients in banana

The treatment details have been revised and furnished as follows.

Treatment Details

(A) Nutrient levels: Three

- (i) 100% RDF (L1)
- (ii) 80% RDF (L2)
- (iii) 60% RDF (L3)

(B) Stage wise levels: Six treatment levels each for four stages of crop growth.

Treatments	Percent nutrient levels/Stages of growth*							
	I 3 MAP* (Vegetative stage)		II 5 MAP* (Flower bud Initiation stage)		III 7 MAP* (Pre flowering/ Flowering stage)		IV 9 MAP* (Flowering/Bunch development stage)	
	N	K ₂ O	N	K ₂ O	N	K ₂ O	N	K ₂ O
T1	10	10	40	20	30	30	20	40
T2	20	15	30	25	30	30	20	30
T3	30	20	20	30	20	30	30	20
T4	40	25	30	35	30	25	0	15
T5	50	30	20	40	20	30	10	0
T6	50	20	30	40	20	40	0	0

* Based on the variety, the duration may be calculated or considered

NEW EXPERIMENTS

BANANA

1. Recycling of biomass in banana plantation for sustainable production.

Proposed centre: Mohanpur

Background: Only 10-15% of total biomass of a 'Martaman' banana (Musa AAB, Silk) plant gets immediate utilization as marketable fruits and rest biomass is a neglected waste. Recycling of this biomass (adding 5 kg raw cowdung) produced 15-20 kg Vermicompost (NPK @ 1.5, 0.5, 1.5%). It is, therefore, possible to apply atleast 15 kg Vermicompost per banana plant using the waste biomass of its own plantation. It also indicate the possibility of reduction in fertilizer input by 50-70% of N and K₂O of the RDF (NPK @ 200, 40, 200g/plant) for 'Martaman' banana in West Bengal.

Objectives:

- To estimate the quantity of reduction in fertilizer input (N & K₂O) by recycling of biomass in banana plantation.
- To observe possible impact on economics and environment of banana production system in West Bengal.

Treatments* : (to be imposed in 3 splits)

T0	: N & K ₂ O = 0%
T1	: N & K ₂ O = 100% of RDF (200 g N & 200 g K ₂ O /crop)
T2	: RCB @ 15 kg/plant**
T3	: RCB @ 15 kg/plant +25% N & 13% K ₂ O of RDF
T4	: RCB @ 15 kg/plant +50% N & 25% K ₂ O of RDF
T5	: RCB @ 15 kg/plant +75% N & 50% K ₂ O of RDF

*40 g P₂O₅/crop in all treatments

**RCB = Recycled Compost of Banana Biomass

Design: Randomised Block Design, Replications: 3, Plant/replication: 4 (total plant=60).

Observation: 1. Plant growth (at shooting) and production of total biomass & marketable fruits (at harvest), 2. Soil nutrition status (Organic C, pH, N, P & K; initial & after harvest) and 3. Production cost of per kg fruit and biomass.

Results: Observations on recycling of banana biomass through vermicomposting were recorded during 2008-09. Based on these records, 5 treatments were formulated with specified objectives. Planting was done as per layout in May, 2009. The first split dose of treatments (T0 to T5) have been imposed in July, 2009 as per programme.

2. Studies on the effect of application of fertilizers in solution on Growth, yield and quality of banana

Proposed centre: Kowur

Objective: To study the increase in fertilizer use efficiency in Banana by application of nutrients in solution form

Methodology

Cultivar: Grand Naine (AAA)

Plot size: 7.2 x 7.2 m

Design: RBD

Replications: 4

Treatment details:

1. 100% RDF through Soil by pocketing (Check)
2. 100% RDF through Solution
3. 75% RDF through Solution
4. 50% RDF through Solution
5. 75% RDF through Solution + Spraying K_2SO_4 (0.5%) twice at 5th & 20th day after last hand opening
6. 50% RDF through Solution + Spraying K_2SO_4 (0.5%) twice at 5th & 20th day after last hand opening

Method & time of application: Dissolve the Nitrogen (urea) and Potassium (Muriate of Potash) fertilizers in water (1.0 l/plant) and apply on moist soil i.e. on the second or third day after irrigation (30 cm away from the base) in eight equal splits at 20 days interval starting from 40 DAP. Spaying of K_2SO_4 (0.5%) twice at 7 MAP and 8 MAP will be taken up uniformly for all the treatments except T₁ (Control).

3. Influence of age of micro-propagated banana plants on growth and yield

Proposed centre: Kovvur

Objective: To standardize the optimum age of the tissue culture plants for planting in the main field

Methodology:

Design: RBD

Replications: 7

Cultivar: Grand Naine (AAA)

Treatments (Duration of second stage hardening): 30 days, 60 days, 90 days, 120 days, 150 days

Note: During the process of hardening the plants will not be allowed to come out of poly bag and strike roots in to the soil. Hence the plants should be shifted from place to place during hardening.

SESSION-IIIB
WATER MANAGEMENT, WEED CONTROL AND
ORCHARD MANAGEMENT
ON GOING EXPERIMENTS

Sl. No.	Trials	Code No.	Centre allotted	Number of centres
CITRUS				
1	(A) Fertigation studies in citrus	3.1.3	Rahuri, Tinsukia and Tirupati	3
2	(B) a) Identification of critical stage of water requirement in mandarin	3.1.3	Akola, Ludhiana, Tinsukia & NRCC, Nagpur*	4
3	(B) b) Identification of critical stage of water requirement in sweet orange	3.1.3	Rahuri and Tirupati	2
4	(B) c) Identification of critical stage of water requirement in acid lime	3.1.3	Periyakulam, Rahuri and Tirupati	3
5	(C) a) Standardisation of stage wise water requirement in mandarin	3.1.3	Akola, Ludhiana, Tinsukia and NRCC, Nagpur*	4
6	(C) b) Standardisation of stage wise water requirement in sweet orange	3.1.3	Rahuri and Tirupati	2
7	(C) c) Standardisation of stage wise water requirement in acid lime	3.1.3	Periyakulam, Rahuri and Tirupati	3
8	(D) a) Studies on irrigation and nutrient interactions in mandarin	3.1.3	Akola, Ludhiana, Tinsukia, NRCC, Nagpur* and Bikaner**	5
9	(D) b) Studies on irrigation and nutrient interactions in sweet orange	3.1.3	Rahuri and Tirupati	2
10	(D) c) Studies on irrigation and nutrient interactions in acid lime	3.1.3	Periyakulam, Rahuri and Tirupati	3
11	Intercropping trial in citrus	3.1.4	Ludhiana, Rahuri and Tinsukia	3
BANANA				
12	A) Fertigation studies in banana	3.2.3	Coimbatore, Gandevi and Jalgaon	3
13	B) Standardisation of stage wise water requirement in banana	3.2.3	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat, Kovvur, Mohanpur and Pusa	8
14	C) Studies on irrigation and nutrient interactions in banana	3.2.3	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat, Kannara, Kovvur, Mohanpur, Pusa and Bhubaneswar**	10
15	Chemical control of weeds	3.2.4	Arabhavi and Mohanpur	2
16	Intercropping trial in banana	3.2.5	Gandevi, Jalgaon, Kannara and Mohanpur	4
PAPAYA				
17	A) Fertigation studies in papaya	3.3.3	Coimbatore and Ranchi**	2
18	B) Standardisation of stage wise water requirement in papaya	3.3.3	Coimbatore, Ranchi** and Pusa	3
19	C) Studies on irrigation and nutrient interactions in papaya	3.3.3	Coimbatore, Ranchi** and Pusa	3
SAPOTA				
20	Fertigation studies in sapota	3.4.5	Arabhavi, Gandevi, Kovvur, Periyakulam and Dapoli**	5

* Co operating centre ** = New centre

REVISED EXPERIMENTS

CITRUS

3.1.3. (D) Studies on Irrigation and nutrient Interactions In citrus Centers

- Mandarin: Akola Mandarin: Akola, Ludhiana, Tinsukia and Bikaner**
Co- opting center: NRCC, Nagpur
- Sweet orange: Rahuri and Tirupati
- Acid lime: Periyakulam, Rahuri and Tirupati

Treatments Details:

Irrigation and Fertigation levels	
Treatments	
I ₁ F ₁	Drip irrigation with 0.7 ER and fertigation of 60 % RDF
I ₁ F ₂	Drip irrigation with 0.7 ER and fertigation of 70 % RDF
I ₁ F ₃	Drip irrigation with 0.7 ER and fertigation of 80 % RDF
I ₂ F ₁	Drip irrigation with 0.8 ER and fertigation of 60 % RDF
I ₂ F ₂	Drip irrigation with 0.8 ER and fertigation of 70 % RDF
I ₂ F ₃	Drip irrigation with 0.8 ER and fertigation of 80 % RDF
I ₃ F ₁	Drip irrigation with 0.9 ER and fertigation of 60 % RDF
I ₃ F ₂	Drip irrigation with 0.9 ER and fertigation of 70 % RDF
I ₃ F ₃	Drip irrigation with 0.9 ER and fertigation of 80 % RDF

(ER= Evaporation Replenishment) RDF: Recommended dose of fertilizer.

Design: RBD,

Replications: 3

No. of plants/treatment: 4

Application of fertigation interval: Monthly (from October to June)

Fertilizer will be Urea, Urea Phosphate, Murate / sulphate of potash and Mono potassium Phosphate along with Chelated Micronutrients.

Observations: Height, spread and canopy volume of the tree, stem girth, leaf area, leaf nutrients status and yield and fruit quality. Fruit growth pattern also need to be recorded.

BANANA

3.2.3 (A) Fertigation studies in banana

The modified fertigation schedule are as follows:

- Growth phase differs in short duration/long duration cultivars.
- Observations: Nutrient uptake studies at different stages may be carried out.

3.2.3 (B) Standardisation of stage wise water requirement in banana

- Regulated deficit irrigation may be included in the title

Observations:

- Physiological parameters may also be studied and correlated with yield.
- Biochemical parameters due to stress related to low water supply may be studied.

3.2.3 (C) Studies on irrigation and nutrient Interaction in banana

- Cultivar may be mentioned.
- Method of irrigation (drip or flood) may be spelt out.
- Interval of irrigation should be clear.

Observations:

- Additional observations on available soil moisture, leaf water potential and physiological parameters (carbon assimilation, transpiration and respiration) may be recorded. Water use efficiency data is a must.

3.2.4 Chemical control of weeds

- Why mulching (organic/plastic) is not included as a weed control treatment.
- Residue analysis of weedicides in fruit and soil should be done.
- Yield of banana may be recorded and presented.

3.2.5 Intercropping trial in banana

- Studies on nutrient dynamics in inter-cropped field may also be taken up.

NEW EXPERIMENT

PAPAYA

1. Studies on nutrient requirement on papaya under drip system of Irrigation (Fertigation)

Proposed centre: Kozhuvur

Objective: To standardize the requirement of N&K nutrients for Papaya under drip system of irrigation.

Methodology:

Design: RBD.

Replications: 4.

Treatments: 5

Treatment details:

T₁: 100 % RDF

T₂: 80% RDF

T₃: 60% RDF

T₄: 40% RDF

T₅: 100 % RDF with Flood irrigation

SESSION-IV

GROWTH, DEVELOPMENT AND VALUE ADDITION

ON GOING EXPERIMENTS

Sl. No.	Trials	Code No	Centre allotted	Number of centres
CITRUS				
1	a) Regulation of flowering in Mandarin	4.1.1	Tinsukia	1
2	c) Regulation of flowering in Acid lime	4.1.1	Periyakulam	1
3	Regulation of flowering in acid lime (<i>C.aurantifolia</i> , Swingle) (Observational trial)	4.1.2	Akola, Periyakulam, Rahuri and Tirupati	4
BANANA				
4	b) Chemical manipulation for higher yield and quality in banana	4.2.1	Coimbatore, Gandevi, Jalgaon, Jorhat and Pusa	5
5	c) Identification of optimum LAI in banana	4.2.1	Arabhavi, Coimbatore, Kannara and Mohanpur	4
6	Evaluation of different varieties of banana for fibre extraction	4.2.2	Coimbatore, Kovvur, Kannara, Mohanpur, Pusa and NRCB, Trichy*	6
* Co-operating centre: ** = New centre				

REVISED EXPERIMENT

BANANA

4.2.1 (b) Chemical manipulation for higher yield and quality in banana

Treatment details:

Main Plot:	Sub Plot:	
M ₁ : 150:50:150g NPK plant ⁻¹	S ₁ : Brasinolides 25 ppm	S ₅ : 0.5% KNO ₃ spray
M ₂ : 200:50:200g NPK plant ⁻¹	S ₂ : CPPU 4 ppm	S ₆ : 0.5% K ₂ SO ₄ spray
M ₃ : 250:50:250g NPK plant ⁻¹	S ₃ : 2,4-D 10 ppm	S ₇ : Dehanding (retaining 6 hands)
M ₄ : 300:50:300g NPK plant ⁻¹	S ₄ : 0.5% KH ₂ PO ₄ spray	S ₈ : No sprays (control)

- In treatments, S₁ – Brasinolides at 25 ppm instead of 2ppm, S₆ – 1.5% K₂SO₄ Instead of 0.5% K₂SO₄
- Possibility of de-navelling and fertilizer use through cut ends may also be explored for improving bunch weight. (Kotur & Murthy Ref. ICAR NEWS, April-June 2007)

NEW EXPERIMENT

Nil

**SESSION-V
PEST MANAGEMENT
(INSECT PESTS AND NEMATODES)**

ON GOING EXPERIMENTS

Sl. No	Trials	Code No.	Centre allotted	No. of centres
CITRUS				
1.	Survey and surveillance of pests and their natural enemies a) Roving survey b) Fixed plot survey	5.1.1	Akola, Chethalli, Ludhiana, Periyakulam, Rahuri, Tinsukia, Tirupati and Bikaner**	8
2.	Biology and population dynamics of Leaf miner (L), Blackfly (B) Fruitfly (F) and Psylla (P) a) Monitoring of adult population d) Life table studies	5.1.2	Chethalli (F,L & P), Ludhiana (P), Periyakulam (L), Rahuri (B), Tinsukia (L & P) and Tirupati (L)	6
3.	II) Evaluation of synthetic chemicals and natural products against leaf miner in citrus	5.1.3	Periyakulam, Rahuri, Tinsukia and Tirupati	4
4.	III a) Integrated management of citrus blackfly, psylla, aphid, rust mite and leaf folder	5.1.3	Akola, Chethalli, Rahuri and Tirupati	4
5.	IV) Chemical control of mealy bugs and scales	5.1.3	Ludhiana and Rahuri	2
6.	V) Non pesticidal management of lemon butterfly	5.1.3	Akola and Periyakulam	2
7.	VI) Integrated pest management of fruit sucking moth	5.1.3	Akola, Rahuri and Tirupati	4
8.	VII) Seasonal incidence, Biology and Management of Citrus butterfly with Bio-agents in citrus nursery	5.1.3	Ludhiana, Periyakulam and Tinsukia	3
9.	VIII) Evaluation of Bio rational insecticides against citrus psylla (<i>Diaphorina citri</i> Kuwayama)	5.1.3	Akola, Ludhiana, Rahuri, Tirupati, Tinsukia and NRCC, Nagpur*	6
10.	IX) Field release of <i>Malloda boninensis</i> for management of citrus psylla, <i>Diaphorina citri</i> Kuwayama	5.1.3	Akola, Ludhiana, Rahuri, Tirupati, Tinsukia and NRCC, Nagpur*	6
11.	X) Evaluation of Bio rational insecticides/acaricides against citrus mites	5.1.3	Akola, Ludhiana, Rahuri, Tirupati, Tinsukia and NRCC, Nagpur*	6
12.	a) Survey and identification of citrus nematode	5.1.4	Ludhiana, Periyakulam, Tinsukia and Tirupati	4
13.	b) Control of citrus nematode <i>T. semipenetrans</i> with organic soil amendments	5.1.4	Ludhiana, Periyakulam and Rahuri	3
14.	c) Bio control of citrus nematode	5.1.4	Ludhiana, Periyakulam, Pusa and Tinsukia	4
15.	Screening of germplasm against nematode	5.1.5	Akola, Rahuri and Tirupati	3

BANANA				
16.	Survey of insect pests	5.2.1	Coimbatore, Gandevi, Jalgaon, Jorhat, Kannara, Mohanpur, Pusa and Bhubaneswar**	8
17.	Biology and population dynamics of Aphids - A Pseudostem borer - P Root mealy bug - R	5.2.2	Coimbatore (A), Gandevi (A), Kannara (P and R) and Mohanpur (A)	4
18.	a) Integrated management of banana pseudostem weevil (<i>Odoiporus longicollis</i>)	5.2.3	Jorhat and Kannara	2
19.	b) Evaluation of various management strategies against scarring beetle of banana	5.2.3	Jorhat, Mohanpur and Pusa	3
20.	d) Evaluation of botanicals and neem based insecticides against pseudostem weevil of banana	5.2.3	Jorhat and Kannara	2
21.	g) Management of banana rust thrips, <i>Chaetanophothrips signipennis</i> using biopesticides	5.2.3	Gandevi, Jalgaon and NRCB, Trichy*	3
22.	a) Survey and identification of banana nematode	5.2.4	Arabhavi, Coimbatore, Jalgaon, Jorhat, Kannara and Mohanpur	6
23.	b) Biological control of banana nematodes	5.2.4	Arabhavi and Kannara	2
24.	c) Screening of banana germplasm for nematodes	5.2.4	Arabhavi, Coimbatore, Jalgaon, Kannara, Mohanpur and NRCB, Trichy*	6
25.	f) Use of bio pesticides for the management of nematodes of banana	5.2.4	Arabhavi, Coimbatore and Jorhat	3
26.	g) Management of nematodes in ratoon and high-density planting systems	5.2.4	Coimbatore	1
27.	a) Screening of of germplasm against banana stem weevil, <i>Odoiporus longicollis</i>	5.2.5	Jorhat and Kannara	2
28.	b) Biological control of banana stem weevil, <i>Odoiporus longicollis</i>	5.2.5	Jorhat, Kannara and Mohanpur	3
29.	Screening of banana germplasm against scarring beetle	5.2.6	Mohanpur and Pusa	2
SAPOTA				
30.	Survey and surveillance of insect pests of sapota and their natural enemies a) Roving survey b) Fixed plot survey	5.4.1	Gandevi, Periyakulam and Dapoli**	3
31.	Biology and population dynamics	5.4.2	Gandevi and Periyakulam	2
32.	Management of bud boring insects of sapota	5.4.3	Periyakulam and Dapoli**	2
33.	IPDM module for sapota pest and disease complex	5.4.5	Periyakulam	1
JACKFRUIT				
34.	Survey and incidence of insect pests	5.5.1	Jorhat, Kannara, Kowur, Mohanpur, Periyakulam and Dapoli**	6
* Co-operating centre: ** = New centre				

REVISED EXPERIMENTS

BANANA

5.2.4 (b) Biological control of banana nematodes

The major nematodes which are existing in those areas and causing economic damage may be included. Accordingly, the following nematodes have been included for controlling the same by using biocontrol agents.

Centres: Arabhavi – *Radopholus similis* and *Meloidogyne incognita*
Kannara - *Radopholus similis* and *Heterodera oryzicola*

The revised treatment details are as follows:

- T₁-*Trichoderma viride*@25g/m²
- T₂-*Pseudomonas fluorescens*@25g/m²
- T₃-*Paecilomyces lilacinus*@25g/m²
- T₄-*Bacillus subtilis*@25g/m²
- T₅-EPN *Heterorhabditis indica* @6¹⁰
- T₆-Caldan @10g/m²
- T₇-Untreated control

5.2.4 (f) Use of biopesticides for management of nematodes of banana

The title may be changed as "Management of banana nematodes by using biopesticides"

Centres: Arabhavi – *Radopholus similis* and *Meloidogyne incognita*
Coimbatore - *Radopholus similis*, *Pratylenchus coffeae* and *Helicotylenchus multicinctus*
Jorhat – *Pratylenchus thornei* and *Meloidogyne incognita*

The revised treatments are as follows

- T₁ - Sucker dip – Nimbicidin @1.5% (15ml / l water) for 30 minutes
- T₂ - Neem cake @500g/plant
- T₃ - *Solanum nigrum* dried leaves @1 kg/plant
- T₄ - *Calotropis gigantea* dried leaves @1 kg/plant
- T₅ - Growing *Tagetes* around the basin at three months after planting
- T₆ - Growing sunnhemp around the basin at three months after planting
- T₇ - VAM (*Glomus mosseae*) @20g/plant
- T₈ - Caldán @10g/plant
- T₉ - Untreated control

Method of application: Apply of the same dose at planting, 3 and 6 months after planting around the soil.

5.2.4 (g) Management of nematodes in ratoon and high density planting systems

- Treatment 3 (T₁ - Caldán @ 40 g/clump soil application followed by half dose after 3rd month) may be deleted, since the dose of Caldán@40g/ clump is very high.
- As the higher dose, causes phyto toxicity to the plants.
- The dosage of *Pseudomonas fluorescens* is fixed as @25g/clump Instead of 80g/clump under T-5.

5.2.6 (a) Screening of banana germplasm against banana stem weevil, *Odolporus longicollis*

- Screening the germplasm for banana stem weevil under field conditions. The field escapes may be screened under laboratory conditions by leaf sheath technique.

NEW EXPERIMENT

SAPOTA

1. Chemical control of sapota seed borer *Trymalitis margarlas* Meyrick

Proposed centre: Gandevi

Objective: Field evaluation of some insecticides against *T. margarlas*

Background/Importance of the problem: Sapota (*Manilkara achras* (Mill)) commonly known as chiku is one of the most important fruit crop of Gujarat. Among the various factors affecting the yield and economic value of fruit, damage done by insect pests is very important. Recently, a new pest have been recorded for the first time on this crop i.e., a seed borer, *Trymalitis margarlas* Meyrick (Tortricidae: Lepidoptera) has been found damaging to sapota fruit for the first time in South Gujarat. The pest has been collected, reared and got identified from CABI Biosciences, London and reported for the first time as a most dangerous pest of sapota (Patel, 2001). The larvae are an internal borer feeding exclusively on seed and come out for pupation by preparing a tunnel through the pulp. Thus, the infested fruits later on attacked by micro-organisms as well as ants and other insects too. Therefore, make the fruits unfit for consumption. The extent of damage recorded was as high as 10-15 per cent (Anonymous, 2004). This pest found spreading very quickly in coastal sapota orchards of Valsad and Navsari districts. There is no work done so far on control of this pest. Considering the extent of damage and spread of this pest, it is felt need to develop control schedule against this pest. Therefore, the present project on Chemical control of sapota seed borer, *T. margarlas* will be proposed.

Probable date of start: August-September 2010

Experimental details:

Number of treatments	:	7
Design	:	RBD
Replication	:	3 (one tree considered as one replication)
Spacing	:	10 x 10 m
Variety	:	Kalipatti
Number of sprays	:	Three at 20 days interval First:- 20 Sept 2010 Second:- 10 October 2010 Third:- 30 October 2010

Treatment details:

- T₁ : Profenophos (0.075%)
- T₂ : Novaluron 10 EC (0.005%)
- T₃ : Fenobucarb (0.1%)
- T₄ : Indoxcarb (0.25g/l)
- T₅ : Chlorpyrifos (0.05%)
- T₆ : Endosulfan (0.07%)
- T₇ : Control (Water spray)

Each treatment will be allotted to all the trees in a single line and the observation will be taken from randomly selected three trees considering one tree as one replication. The quantity of spray fluid 10 liter per tree will be applied.

Area required: 210 sq. m.

Observations to be recorded/plan of work: From each tree five branches of about one meter in length will be selected and total number of fruits as well as infested fruits will be counted before spraying as well as 10 and 20 days after each spray and percentage infestation will be worked out.

Duration of the project: Three years

Practical/ scientific utility: A proper chemical control method of this newly introduced pest will be developed for the betterment of the sapota growers of the region.

References:

- Anonymous, 2004. Annual report, AICRP ON Tropical fruit (Banana and Sapota), FRS, NAU, Gandevi.
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- Sandhu, G.S. and Saran. 1982. Chemical control of chiku moth on sapota. *Pesticides*, 16 (1):23-26.
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SESSION-VI
DISEASE MANAGEMENT
ON GOING EXPERIMENTS

Si. No.	Trials	Code No.	Centre allotted	No of centres
CITRUS				
1.	Survey and incidence of disease a) Roving survey b) Fixed Plot survey	6.1.1	Akola, Chethalli, Ludhiana, Periyakulam, Pusa, Rahuri, Tinsukia, Tirupati and Bikaner**	9
2.	a) Integrated management of <i>Phytophthora</i> root rot in mandarin	6.1.2	Akola, Chethalli, Ludhiana, and Tinsukia	4
3.	b) Integrated management of Dry root rot (<i>Fusarium, Rizoctonia</i>)	6.1.2	Tirupati	1
4.	(c) Screening of germplasm against root rot	6.1.2	Akola, Ludhiana, Rahuri and Tirupati	4
5.	Management of Citrus canker bacteria (Pilot cum demonstration trial)	6.1.3	Akola, Periyakulam, Pusa, Rahuri, Tirupati and NRCC, Nagpur*	6
6.	Identification and Characterization of CTV isolates of citrus	6.1.4	Akola, Chethalli, Periyakulam, Rahuri, Tinsukia, Tirupati and NRCC, Nagpur*	7
7.	Identification and Characterization of citrus yellow mosaic virus	6.1.5	Periyakulam, Rahuri and Tirupati	3
8.	Studies on greening disease	6.1.6	Akola, Chethalli, Ludhiana, Periyakulam, Rahuri, Tinsukia, Tirupati and NRCC, Nagpur*	8
9.	Supply of disease free plants	6.1.7	Akola, Chethalli, Ludhiana, Tinsukia and Tirupati	5
BANANA				
10	Survey of fungal, bacterial and viral diseases a) Roving survey, c) Isolation of causal organism and identification for new disease only	6.2.1	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat, Kannara, Kovvur, Mohanpur, Pusa, NRCB, Trichy* and Bhubaneswar**	11
11	Characterization of <i>Fusarium</i> isolates causing Panama wilt of banana	6.2.2	Arabhavi, Coimbatore, Jalgaon, Jorhat, Kannara, Mohanpur and Pusa	7
11	Integrated management of <i>Fusarium</i> wilt diseases of banana	6.2.3	Coimbatore, Jorhat, Kannara, Kovvur, Mohanpur and Pusa	6
12	Studies on Sigatoka or prevalent leaf spot disease a) Epidemiology	6.2.5	Arabhavi, Coimbatore, Jorhat, Kannara, Kovvur, Mohanpur and NRCB-Trichy*	7
13	b) Management of Sigatoka or prevalent leaf spot disease with oil based formulations	6.2.5	Arabhavi, Coimbatore, Jalgaon, Jorhat, Kannara, Kovvur, Mohanpur and NRCB-Trichy*	8
14	Diagnosis of banana viruses in germplasm and planting material used in experiments	6.2.6	Arabhavi, Coimbatore, Gandevi, Jalgaon, Jorhat, Kannara, Kovvur, Mohanpur, Pusa and NRCB Trichy*.	10
15	a) Etiology and management of tip over or rhizome rot disease of banana	6.2.7	Arabhavi, Coimbatore, Gandevi, Jalgaon, Mohanpur and NRCB Trichy*	6
16	b) Integrated management of tip over or rhizome rot disease of banana (Demonstrational trial)	6.2.7	Kovvur	1

17.	Screening of banana germplasm for Leaf spot disease - L <i>Fusarium</i> wilt - W Banana bunchy top - B Rhizome rot - R	6.2.8	Arabhavi (L and R), Coimbatore (L, P, W and B), Gandevi (R), Jalgaon (L and R), Jorhat (R), Kannara (L, W and B), Kovvur (W), Mohanpur (L, R, and W), Pusa (R) and NRCB, Trichy*(R)	10
PAPAYA				
18.	Survey of fungal and viral diseases	6.3.1	Coimbatore, Pune and Pusa	3
19.	Epidemiology and Integrated management of papaya ring spot virus	6.3.2	Coimbatore, Pune and Pusa	3
20.	Molecular diagnosis and differentiation of papaya ring spot virus isolates	6.3.3	Coimbatore#, Pune#, Pusa# and IIHR, Bangalore*	4
21.	Molecular diagnosis and differentiation of papaya leaf curl virus isolates	6.3.4	Coimbatore#, Pune#, Pusa# and IIHR, Bangalore*	4
SAPOTA				
22.	Survey and incidence of disease in sapota a) Roving survey & b) Fixed plot survey	6.4.1	Arabhavi, Gandevi, Kovvur, Periyakulam and Dapoli**	5
23.	Chemical control of leaf spot disease in sapota	6.4.2	Arabhavi, Periyakulam and Dapoli**	3
JACKFRUIT				
24.	Survey and incidence of diseases	6.5.1	Jorhat, Kannara, Kovvur, Mohanpur and Periyakulam	5
*Co-operating centre, **= New Centre #Will provide papaya virus samples to IIHR, Bangalore for molecular characterization and diagnosis				

REVISED EXPERIMENTS

BANANA

6.2.2 (iii) Isolation of *Fusarium* sp., from disease suckers and rhizospheric soil on the following medium.

- The title may be changed as "Isolation of *Fusarium* sp. from diseased suckers".
- Instead of Modified Komoda's medium, use ¼ strength PDA for Isolation of Foc from infected corm pieces and also from the pseudostem strands. The rest of the treatment may be deleted.
- NB: The collected wilt infected samples (as per the procedures given and sent separately) are to be sent to Director NRC for Banana, Trichy for molecular characterisation with an intimation to the PC (TF) unit.

6.2.7 b) Integrated management of rhizome rot of banana (Observation trial)

Centre: Kovvur

T ₁	Healthy suckers
T ₂	Healthy suckers + dipping in streptomycin for 30 min. @500 ppm
T ₃	Healthy suckers + dipping in <i>Pseudomonas fluorescens</i> for 30 min. @50g/lit.of water
T ₄	Healthy suckers + dipping in <i>Trichoderma viride</i> for 30 min. @50g/lit.of water
T ₅	Healthy suckers + soil application with 4g of bleaching powder at 0 th + 1 st + 2 nd + 3 rd + 4 MAP
T ₆	Healthy suckers + soil application with Emission @1g/lit. 1-2 lits./plant at 0 th + 1 st + 2 nd + 3 rd + 4 th MAP
T ₇	Healthy suckers + soil application with 4 g of bleaching powder at 0 th + 1 st + 2 nd + 3 rd + 4 th MAP + growing sunnhemp in the interspaces for 3 times till 5 MAP.
T ₈	Healthy suckers + dipping in streptomycin 1-2 lit.per plant@500 ppm at 15 days + 2 nd + 4 th + MAP + growing sunnhemp in the interspaces for 3 times till 5 MAP.
T ₉	Healthy suckers + drenching with <i>Pseudomonas fluorescens</i> 1-2 litr./plant @50g/lit.of water at 0 th + 1 st + 2 nd + 3 rd + 4 MAP + growing sunnhemp in the interspaces for 3 times till 5 MAP.
T ₁₀	Healthy suckers + drenching with <i>Trichoderma viride</i> 1-2 litr./plant @50g/lit.of water at 0 th + 1 st + 2 nd + 3 rd + 4 MAP + growing sunnhemp in the interspaces for 3 times till 5 MAP.
T ₁₁	Healthy suckers + drenching with <i>Pseudomonas fluorescens</i> + <i>Trichoderma viride</i> 1-2 litr./plant @50g/lit of water at 0 th + 1 st + 2 nd + 3 rd + 4 MAP + growing sunnhemp in the interspaces for 3 times till 5 MAP
T ₁₂	Healthy suckers + soil application with 4g of bleaching powder/ plant at the time of planting + drenching with streptomycin @ 500 ppm 1-2 lit./plant on 1 st Map + <i>Pseudomonas fluorescens</i> @50g/plant at 2 nd + 4 MAP MAP + growing sunnhemp in the interspaces for 3 times till 5 MAP.
T ₁₃	Healthy suckers + growing sunnhemp in the interspaces for 2-3 times till 5 months after planting.
T ₁₄	Healthy suckers + drenching with emission @1g/litre of water(One litre per plant) at the time of planting + drenching with streptomycin 500ppm (1-2 lit per plant) on 1 st MAP+ <i>P. fluorescens</i> @25gm/plant at 2 nd and 4 th MAP + growing sunnhemp in the interspaces for 2-3 times till 5 MAP.



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