

**TAMIL NADU AGRICULTURAL UNIVERSITY**

**PROCEEDINGS**

**37<sup>th</sup> HORTICULTURAL CROP SCIENTISTS MEET 2021**  
**(April 28-30, 2021)**

**Lead Center**

Horticultural College and Research Institute  
Coimbatore

**Directorate of Research**

Tamil Nadu Agricultural University  
Coimbatore 641 003

**2021**

## PROCEEDINGS

### 37<sup>th</sup> HORTICULTURAL SCIENTISTS' MEET 2021 (April 28 -30 2021)

The 37<sup>th</sup> Horticulture Scientists Meet was held during April 28-30, 2021 at the Tamil Nadu Agricultural University, Coimbatore, through on-line connecting all scientists across the University College Campuses, Research Stations and KVKs besides main campus. **Dr. K.S. Subramanian**, Director of Research welcomed the horticulture scientists and provided current statistics on horticulture production and way forward to meet the challenges ahead. **Dr. N. Kumar**, Vice Chancellor offered opening remarks indicating a need for strenuous efforts to sustain the productivity while ensuring quality standards set for export market. He highlighted that the horticulture production has surpassed food grain production since 2010 and continued to grow taller thereafter. Currently, the horticulture production is registered as 326 million tonnes during 2020-21 which is 6 million tonnes higher than the previous year 2019-20 despite pandemic and frequent lockdowns faced by the country due to COVID 19. The Vice Chancellor narrated key areas of interest encompassing introduction of arid fruits, off-season mango production, high density planting systems, grafting in vegetables, hybrid seed production, regular jasmine flower production and micropropagation of coconut.

The Director of Research flagged off a few researchable issues such as precise area and production statistics on horticulture using remote sensing and GIS, ensure spread of newly released fruits and vegetable varieties and their notification, evolve criteria for the release of fruit varieties, cataloguing of genetic resources with QR coding, scion-stock interactions and their benefits on biotic and abiotic stress management, introduction of innovative farming (vertical farming, farm automation, robotics in agriculture, drone technology), artificial intelligence in pests and diseases monitoring, establish multi-institutional collaborations to develop micropropagation of coconut, oxygenating indoor gardening to combat COVID 19 and nano-horticulture. The action taken reports on the 36<sup>th</sup> Horticulture Scientists Meet were presented by **Dr. L. Pugalendi**, Dean, HC & RI, Coimbatore and **Dr. P. Muthulakshmi**, assoc. Prof. (Plant Pathology). During the pre-review, the Deans of three Horticultural Colleges and technical directors had reviewed the on-going university research projects (132), action plan projects (49), core projects (11), AICRPs (5) besides externally funded projects (89).

The outcome of the review process was presented by **Dr. M.S. Aneesarani**, Prof. & Head (i/c), Fruits, **Dr. S. Swarnapriya**, Prof. & Head, Vegetables, **Dr. K. Venkatesan**, Prof. & Head, Spices & Plantation Crops, **Dr. K. Rajamani**, Prof. & Head, Floriculture & Medicinal Crops, and plant protection by **Dr. K. Prabakar**, Director (CPPS). The Action Plan for the year 2021-22 was presented by **Dr. T. Arumugam**, Dean, HC & RI, Periyakulam. In the closing remarks, the Vice Chancellor said that the horticulture scientists should work with biotechnologists to overcome bottlenecks in horticulture breeding programs, compatibility chart has to be prepared in consultation with all technical directors, papaya grafting technology, promotion of cluster bean dwarf mutant, resistance to vein clearing in bhendi, brinjal possessing resistance to fruit and shoot borer, recognition of farmers developed horticulture varieties, vertical farming technology and multi-institutional collaborations to promote micropropagation in coconut.

The Director of Research concluded with a set of suggested points encompassing documentation on germplasm, develop guidelines for the variety release of fruit trees, organic production of horticultural crops, collaborative research programs to manage viral diseases and nematodes and GI tagging of selected horticultural crops. **Dr. P. Paramaguru**, Dean (i/c), HC & RI (W), Trichy, proposed a formal vote of thanks.

The proceedings of the meet are furnished under the following headings:

#### **I. Fruit Science**

- A. Cultures under MLT/ART/OFT
- B. Action plan: 2021 - 2022
- C. Remarks on the Research Projects
- D. General recommendations

#### **II. Vegetable Science**

- E. Cultures under MLT/ART/OFT
- F. Action plan: 2021 - 2022
- G. Remarks on the Research Projects
- H. General recommendations

#### **III. Spices and Plantation Crops**

- A. Cultures under MLT/ART/OFT
- B. Action plan: 2021 - 2022
- C. Remarks on the Research Projects
- D. General recommendations

#### **IV. Floriculture and Landscape Architecture**

- A. Cultures under MLT/ART/OFT
- B. Action plan: 2021 - 2022
- C. Remarks on the Research Projects
- D. General Recommendations

#### **V. Medicinal and Aromatic Crops**

- A. Cultures under MLT/ART/OFT
- B. Action plan: 2021 - 2022
- C. Remarks on the Research Projects
- D. General recommendations

#### **VI. Crop Production**

- A. Technologies for Adoption/OFT/Information
- B. Action plan: 2021 - 2022
- C. Remarks on the Research Projects

#### **VII. General Remarks**

#### **VIII. List of Participants**

## I. Fruit Science

### A. Cultures for Release and under MLT/ART/OFT

#### 1. MANGO: Selection – Natham Local

At HC & RI, Periyakulam, a clonal selection was made on mango and the salient features are given as below

- Selection from Natham local
- Semi spreading and regular bearing
- High yielding- 540 kg/tree (15 years)
- Fruit weight -240 gm /fruit with high TSS-19.4° Brix
- Brown colour tinch from stalk end to distal end
- Suitable for off season mango: Sep - Oct (400kg/tree)

#### 2. BANANA: Pre-release culture- H96/7

High yielding banana culture H96/7(ABB) is a cross between Karpooravalli and H201. The fruits are similar to Karpooravalli with good quality parameters and TSS of 23 - 25°brix. The hybrid is tolerant to lesion nematodes with lesion index of 15.33% whereas Karpooravalli is highly susceptible (lesion index 42.28%). It has recorded an average bunch weight of 22 kg /plant.

#### 3. JACK FRUIT: Clonal Selection (AH-15)

- Selected from field gene bank at HC & RI, Periyakulam  
The variety has a crispy flake, high TSS and high pulp peel ratio

<b>Special Characters-Jackfruit (AH-15)</b>	
Fruit length (cm)	58.50
Fruit diameter (cm)	89.20
Fruit weight (kg)	17.00
No. of flakes per fruit	290.00
Weight of flakes per fruit (kg)	8.41
No. of fruits per tree	75.00
Yield per tree (kg)	885.00

## **CULTURES PROPOSED FOR MLT / ART**

### **1. PAPAYA: Pre-release culture C1-33 for MLT**

A gynodioecious selection (Sel C1-33) was made from progenies of C1 cross combination (CP.96 x CO.8). During the evaluation of F6 generation, based on low disease severity, better fruit set and red pulp colour, four single plant selections were made. The yield of these selections ranged from 40-45 kg per plant with a PRSV score of 5.00

### **2. JAMUN: CLONAL SECTION SC-04**

At HC & RI, Periyakulam, a clonal selection was made on Jamun and the salient features are given as below

- Regular bearer
- Semi branching habit
- Big sized, oblong fruits (22.45g) with high pulp content (92.17%) and TSS (16.50o Brix)
- High yielding (80 to 90 kg /tree & 12.48 to 14.04 t/ha)
- Harvest starts from 4-5th year and economic yield can be obtained from 8th year onwards
- Suitable for cultivation in dry lands, alkaline and sodic soils
- Suitable for preparation of RTS, fruit bar, dry fruit, vinegar, fruit candy and seed powder

**B. ACTION PLAN (2021-22)****A. CROP IMPROVEMENT**

Crop: MANGO		
Name of the theme	Theme No 1: Identification of traditional mango genotypes of Tamil Nadu for future breeding programme	
Theme Activity	Survey, identification, documentation and conservation of elite seedling progenies of mango genotypes for economic parameters	
Region I		
Name of the Centre	Action Plan (2021-2022)	Deliverables
RRS, Paiyur	<ul style="list-style-type: none"><li>❖ Distinctiveness of identified seedling populations to be confirmed through morphological characterization using NBPGR descriptor</li><li>❖ Scions of identified eight seedling progenies of mango to be grafted and planted for further evaluation.</li></ul>	<ul style="list-style-type: none"><li>❖ Identification of high yielding traditional genotypes with superior trait</li></ul>
Region II		
(Southern districts of TN) Department of Fruit Science, HC & RI, Periyakulam	<ul style="list-style-type: none"><li>❖ Evaluation of pickling mango genotypes for yield and quality attributes</li></ul>	<ul style="list-style-type: none"><li>❖ Identification of superior genotypes for pickling</li><li>❖ Mango selection Natham palpushpam may be proposed for variety release</li></ul>
HC & RI, Coimbatore	Evaluation of mango varieties for off season bearing	Annur -05 may be evaluated for off season bearing

<b>Crop: BANANA</b>		
<b>Name of the theme</b>	<b>Theme No 1: Improvement of banana through hybridization</b>	
<b>Theme Activity</b>	<b>To evaluate the pre-release banana hybrids for yield and quality with resistance to nematodes and <i>Fusarium</i> wilt</b>	
<b>Region I</b>		
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>❖ The pre-release culture, H 96 / 7 may be proposed for variety release</li> <li>❖ As per MoA with Hi-Fi Biotech, Salem, H 96/7 to be multiplied</li> </ul>	<ul style="list-style-type: none"> <li>❖ <i>Fusarium</i> and nematode resistant banana hybrid(s) with better yield and quality attributes will be released for commercial cultivation</li> <li>❖ Multiplication of TC plants on MoA with Hi-Fi Biotech</li> </ul>
<b>Region II</b>		
<b>Theme Activity</b>	<b>Breeding banana to develop Hybrids/varieties similar to commercial varieties (Rasthali) for resistance / tolerance to nematode wilt complex.</b>	
Name of the Centre	Action Plan (2021-2022)	<b>Deliverables</b>
Department of Fruit Science, HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>❖ Breeding programme to be continued to develop resistance to nematode wilt complex in Rasthali (AAB) using synthetic diploid, triploid and tetraploid hybrids</li> <li>❖ Use of nutrient solutions/growth regulators for effecting fertilization</li> </ul>	<ul style="list-style-type: none"> <li>❖ <i>Fusarium</i> wilt resistant hybrid resembling Rasthali (AAB) will be developed for commercial cultivation</li> </ul>
<b>Theme activity</b>	<b>Collection and evaluation of banana genotypes for wind prone areas</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science, HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>❖ Dwarf genotypes/mutants / clonal variants of banana akin to commercial varieties may be identified</li> </ul>	<ul style="list-style-type: none"> <li>❖ Genotypes suitable for wind prone areas will be evaluated.</li> </ul>

<b>Crop: BANANA</b>		
<b>Name of the theme</b>	<b>Theme No 2: Evaluation of varieties/cultivars</b>	
<b>Theme Activity</b>	<b>Performance of banana varieties/hybrids/cultivars in Trichy region under gardenland and wetland condition</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HC & RI (W), Trichy	<ul style="list-style-type: none"> <li>❖ Collection and planting of banana varieties/hybrids</li> <li>➤ Observing growth and yield parameters in plant crop</li> </ul>	<ul style="list-style-type: none"> <li>➤ Best performing varieties/hybrids/cultivars will be identified for commercial cultivation of Trichy region</li> </ul>
<b>Crop: PAPAYA</b>		
<b>Name of the theme</b>	<b>Theme No 1: Improvement of papaya through breeding approaches</b>	
<b>Theme Activity</b>	<b>Development of inter-generic hybrids with Papaya Ring Spot Virus tolerance</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science, HC&RI, Coimbatore	Selection of a promising inter-generic hybrid with PRSV resistance, yield and quality in F <sub>8</sub> population	<ul style="list-style-type: none"> <li>➤ PRSV resistant hybrids/varieties with better yield and quality attributes</li> </ul>
<b>Theme Activity</b>	<b>Development of improved gynodioecious varieties for high yield, better quality attributes and PRSV tolerance</b>	
Department of Fruit Science HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>➤ Evaluation and purification of identified gynodioecious selection (CI-33) in F<sub>7</sub> generation and forwarding to MLT.</li> <li>➤ Development of new F1 hybrids of gynodioecious types for tropical conditions</li> <li>➤ The protocol for somatic embryogenesis may be validated</li> </ul>	<ul style="list-style-type: none"> <li>➤ High yielding gynodioecious varieties/hybrids ideal for tropical conditions with firm flesh, PRSV tolerance will be developed</li> <li>➤ Mass multiplication protocol will be developed</li> </ul>



<b>Crop: ACID LIME</b>		
<b>Name of the theme</b>	<b>Theme No 1: Improvement of acid lime</b>	
<b>Theme Activity</b>	<b>Evaluation and identification of superior acid lime types</b>	
Region I		
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
CRS, Sankarankovil	➤ Collection and evaluation of accessions bearing bigger sized fruits, thornless, seedless and superior qualities	❖ Identification of superior genotypes with high yield and desirable qualities
Region II		
(Southern districts of TN) Department of Fruit Science, HC & RI, Periyakulam	❖ Evaluation of pickling mango genotypes for yield and quality attributes	❖ Identification of superior genotypes for pickling
<b>Crop: MANDARIN ORANGE</b>		
<b>Name of the theme</b>	<b>Theme No 1: Collection and enrichment of mandarin orange germplasm</b>	
<b>Theme Activity</b>	<b>Evaluation of mandarin orange varieties suitable for Shevaroy hills</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HRS, Yercaud	❖ Evaluation of the existing germplasm and identification of suitable varieties for Shevaroy hills.	❖ Identification of high yielding mandarin orange variety suitable for Shevaroy hills

<b>Crop: GRAPES</b>		
<b>Name of the theme</b>	<b>Theme No1 : Improvement of grapes through breeding approaches</b>	
<b>Theme Activity</b>	❖ <b>Evaluation of grapes varieties (<i>Vitis vinifera</i> L. &amp; <i>Vitis labrusca</i> L.), elite bud sports Muscat Hamburg against biotic and abiotic tolerance</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
GRS, Theni	❖ Screening best performing varieties / clones for biotic and abiotic tolerance. Collection and pooling of data for variety release of the culture Sonaikodi	❖ Identification of best varieties for popularization ❖ The promising genotype Sonaikodi will be popularised

<b>Crop: GUAVA</b>		
<b>Name of the theme</b>	<b>Theme No 1: Improvement of guava through breeding approaches</b>	
<b>Theme Activity</b>	<b>Screening of open pollinated (OP) progenies and hybrid derivatives for red pulp, less / soft seeded and high yield.</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science, HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>❖ Identification of promising types from existing OP population.</li> <li>❖ Multiplication of already identified OP seedling progenies</li> <li>❖ Identification of distinctiveness in the selected OP seedlings.</li> </ul>	Identification of a red flesh guava variety with soft seeds
<b>Name of the theme</b>	<b>Theme No 2: Evaluation of genotypes for biotic and abiotic stress tolerance for rootstock purpose</b>	
<b>Theme Activity</b>	<b>Screening and evaluation of guava genotypes and species for biotic and abiotic stress tolerance for rootstock purpose</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HC & RI (W), TRICHY	<ul style="list-style-type: none"> <li>➤ Screening of wild species of guava for biotic and abiotic stress through pot culture experiment</li> </ul>	<ul style="list-style-type: none"> <li>➤ Identification of tolerant rootstocks for commercial method of propagation of guava by grafting.</li> </ul>

<b>Crop: JACK FRUIT</b>		
<b>Name of the theme</b>	<b>Theme No 1: Collection, evaluation and identification of high yielding and quality jackfruit</b>	
<b>Theme Activity</b>	<b>Evaluation of elite jackfruit genotypes</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
VRS, Palur AC & RI, Kudumiyamalai	<ul style="list-style-type: none"> <li>❖ Promising cultures of jack fruit may be evaluated</li> </ul>	<ul style="list-style-type: none"> <li>❖ Identification of high yielding jack genotype with good quality attributes</li> <li>❖ Variety release proposal to be submitted for AH-15 during 2021-22</li> </ul>
Department of Fruit Science HC & RI, Periyakulam	<ul style="list-style-type: none"> <li>❖ Evaluation of already identified jackfruit genotypes for off season production (AH-6 &amp; AH-15)</li> </ul>	
HRS, Pechiparai	<ul style="list-style-type: none"> <li>❖ Collection of evaluation of Jack genotypes</li> </ul>	

<b>Crop: JAMUN</b>		
<b>Name of the theme</b>	<b>Theme No 2 :Collection and evaluation of Jamun genotypes</b>	
<b>Theme Activity</b>	<b>Identification of early and regular bearing jamun genotypes for commercial exploitation</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science, HC & RI, Periyakulam	❖ Survey and collection of early and regular bearing genotypes of jamun	❖ Identification of a regular bearing jamun genotype with good quality

<b>Crop: Arid zone fruits</b>		
<b>Name of the theme</b>	<b>Theme 1: Collection and evaluation of Arid zone fruits</b>	
<b>Theme Activity</b>	<b>Varietal evaluation of Arid zone fruits</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science HC&RI, Coimbatore	❖ Evaluation of Fig and Apple ber varieties for commercial exploitation	❖ Identification of promising arid zone fruit crops for commercial exploitation ❖ Fig, Apple ber and dragon fruit varieties will be evaluated
RRS, Aruppukottai	❖ Evaluation of Arid Zone Fruit crops for suitability under semi arid and vertisol conditions ❖ Evaluation of elite custard apple ( <i>Annona squamosa</i> ) types from Pochampalli region, Dharmapuri Dt. under semi arid vertisol conditions.	
HC & RI (W), Trichy	❖ Assembling planting material of underutilized fruits and evaluating existing arid zone fruits	

<b>Crop: Sub tropical fruit crops</b>		
<b>Name of the theme</b>	<b>Theme 1: Collection and enrichment of sub tropical fruits</b>	
<b>Theme Activity</b>	<b>Avocado-Collection and evaluation of avocado genotypes suitable for lower Pulney hills</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>

HRS, Thadiyankudisai	❖ Elite avocado genotypes may be multiplied and distributed to HRS, Pechiparai, Yercaud and farmers of lower Pulney hills for simultaneous evaluation.	❖ Identification of promising genotypes/varieties for commercial exploitation
<b>Name of the theme</b>	<b>Theme 2: Collection and evaluation of litchi genotypes / varieties for lower Pulney hills</b>	
<b>Theme Activity</b>	<b>Collection and evaluation of litchi genotypes / varieties for lower Pulney hills</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HRS Thadiyankudisai	❖ Evaluation of litchi genotypes / varieties	❖ Identification of superior genotypes for commercial exploitation
<b>Crop: Temperate fruit crops</b>		
<b>Name of the theme</b>	<b>Theme No 1: Collection and enrichment of temperate fruit crop varieties</b>	
<b>Theme Activity</b>	<b>Evaluation of low chill temperate fruit crops</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HRS, Ooty HRS, Kodaikanal	❖ Evaluation of low chilling temperate fruit crop varieties viz., pear, peach and plum	❖ Identification of low chilling varieties for commercial exploitation
<b>Crop: STRAWBERRY</b>		
<b>Name of the theme</b>	<b>Theme No 1: Collection and enrichment of strawberry varieties</b>	
<b>Theme Activity</b>	<b>Evaluation of genotypes suitable for upper pulney hills</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HRS, Kodaikanal	❖ Popularization of identified strawberry varieties at The Nilgris	❖ Promising varieties will be popularized

## CROP MANAGEMENT

<b>Crop: MANGO</b>		
<b>Name of the theme</b>	<b>Theme No 1: Optimizing the factors responsible for increasing the production</b>	
<b>Theme Activity</b>	<b>1. Evaluation of mango varieties under UHDP</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HC & RI, Coimbatore HC & RI, Periyakulam	❖ Performance of different varieties under UHDP may be assessed	❖ Identification of mango variety suitable for UHDP

<b>Crop: MANGO</b>		
<b>Name of the theme</b>	<b>Theme No 2: Optimizing the factors responsible for increasing the production</b>	
<b>Theme Activity</b>	<b>Identification of suitable rootstocks for dwarfness/abiotic stresses</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
RRS, Paiyur & HC & RI, Periyakulam	❖ Evaluation of rootstocks viz., Nakkare and 13-1 for salinity tolerance	❖ Evolving management strategies for abiotic stress

<b>Crop: BANANA</b>		
<b>Name of the theme</b>	<b>Theme No 1: Standardization of protocol for mass multiplication of banana</b>	
<b>Theme Activity</b>	<b>Standardization of protocol for multiplication of banana</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HC & RI, Coimbatore	❖ Protocol for mass multiplication of TNAU pre-release cultures	❖ Evolving protocol for CO2 (AB), H-531 (AAB), NPH-02-01 (AAB), H.96/7 (ABB) for rapid multiplication

<b>Crop: BANANA</b>		
<b>Name of the theme</b>	<b>Theme No 2: Standardization of organic nutrient schedule for export banana</b>	
<b>Theme Activity</b>	<b>Organic nutrient management schedule for banana</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HC & RI, Coimbatore	❖ Standardization of organic nutrient package	❖ Nutrients schedule for organic cultivation will be developed

<b>Crop: PAPAYA</b>		
<b>Name of the theme</b>	<b>Theme No 1:Validation of grafting technology in papaya</b>	
<b>Theme Activity</b>	<b>Dioecious rootstocks for grafting in papaya</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>❖ Grafts of papaya varieties Co. 8 (dioecious) and Co.7 (gynodioecious) may be produced and evaluated.</li> <li>❖ Different rootstocks with vigour and dwarfness may be tried</li> </ul>	<ul style="list-style-type: none"> <li>❖ Promotion of dioecious varieties for commercial cultivation</li> <li>❖ Validation of grafting technology</li> </ul>

<b>Crop: PAPAYA</b>		
<b>Name of the theme</b>	<b>Theme No 2:PRSV management through cultural practices</b>	
<b>Theme Activity</b>	<b>Standardization of package of practices for PRSV management</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science HC&RI, Coimbatore	❖ Testing of nutrient formulation for PRSV management	❖ Evolving nutrient management technology for PRSV management

<b>Crop: GUAVA</b>		
<b>Name of the theme</b>	<b>New propagation techniques</b>	
<b>Theme Activity</b>	<b>Standardization of vegetative propagation technique in guava</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Department of Fruit Science HC&RI, Coimbatore, HC & RI (W), Trichy	❖ Standardization of techniques for propagation through leaf and stem cuttings	❖ Evolving a cost effective new propagation method
<b>Crop: GUAVA</b>		
<b>Name of the theme</b>	<b>Canopy management</b>	
<b>Theme Activity</b>	<b>Standardization of pruning intensity and season in guava</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HC & RI (W), Trichy	❖ Standardization of canopy management technique and foliar application of nutrients to improve yield and quality	❖ Optimum pruning intensity and season of pruning with foliar application of nutrients for yield improvement
<b>Crop: GRAPES</b>		
<b>Name of the theme</b>	<b>Theme No 1: Quality improvement practices by using water soluble fertilizers and biostimulants through pre-harvest application</b>	
<b>Theme Activity</b>	<b>Enhancement of quality characters in grapes var. Muscat Hamburg</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
GRS, Theni	❖ Suitable pre-harvest spray of water soluble fertilizers and biostimulants through foliar application will be standardized for enhancing the bunch and quality characters	❖ Evolving nutrient package for yield and quality improvement
<b>Crop: GRAPES</b>		
<b>Name of the theme</b>	<b>Theme No 2: Enhancement of yield and quality</b>	
<b>Theme Activity</b>	<b>Evaluation of commercial grapes varieties under 'Y' trellis training system</b>	

<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
GRS, Theni	❖ Assessing the yield and quality potential of grape varieties under Y trellis system of training	❖ Alternative training system for commercial adoption

### **Sub tropical fruit crops**

#### **Crop: ACID LIME / MANDARIN ORANGE**

<b>Name of the theme</b>	<b>Strategies to improve productivity in citrus</b>	
<b>Theme Activity</b>	<b>Management of citrus greening</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HC & RI, Periyakulam HRS, Thadiyankudisai	❖ The package for management of citrus greening may be validated and popularized	❖ Evolving management package for citrus greening

#### **Crop: Temperate fruit crops**

<b>Name of the theme</b>	<b>Optimizing the factors responsible for increasing the production</b>	
<b>Theme Activity</b>	<b>Standardization of package of practices</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
HRS, Kodaikanal & HRS, Ooty	❖ Development of package of practices for low chill temperate fruit crops in Nilgris and upper Pulney hills	Evolving package of practices for low chilling temperate fruit crops

#### **Crop: Arid Zone fruit crops**

<b>Name of the theme</b>	<b>Package of practices for Arid zone fruits</b>	
<b>Theme Activity</b>	<b>Standardization of package of practices for fig</b>	
<b>Name of the Centre</b>	<b>Action Plan (2021-2022)</b>	<b>Deliverables</b>
Dept. of Fruit Science HC&RI, Coimbatore	❖ Standardization of nutrient and irrigation schedule for yield enhancement in Fig	❖ Evolving nutrient management practices for yield enhancement of introduced fig varieties



**C. REMARKS ON THE RESEARCH PROJECTS****CROP IMPROVEMENT**

<b>S.No.</b>	<b>Name of the Projects</b>	<b>Name of the Scientist</b>	<b>Period</b>	<b>Remarks</b>
<b>A. MANGO</b>				
Regional Research Station, Paiyur				
1.	<b>HCRI/ PAI/ HOR/ FRU/ 2019/ 004</b> Survey, identification and evaluation of superior seedling progenies in mango	Dr. L. JeevaJothi	October, 2019 - September, 2022	Select genotypes may be characterized using NBPGR descriptor. Scions may be collected and grafted for evaluation
<b>Department of Fruit Science, HC&amp;RI, Coimbatore</b>				
2.	<b>HCRI/ CBE/HOR/FRU/2020/002</b> Evaluation of mango varieties suitable for UHDP in mango	Dr. M.S. Aneesa Rani	May, 2020 - April, 2023	Uniform planting material to be evaluated. Physiological parameters may be studied including a Crop physiologist. Comparative performance of UHDP at PKM may be studied.
<b>B. PAPAYA</b>				
<b>Department of Fruit Science, HC&amp;RI, Coimbatore</b>				
3.	<b>HCRI/CBE/HOR/FRU/2020/001</b> Development of a dwarf gynodioecious papaya variety through induced mutagenesis and selection from segregating OP progenies	Dr. M.S. Aneesa Rani	October, 2019 - September, 2022	Selection must be focused on size of the fruits, firmness of flesh with PRSV resistance.
4.	<b>HCRI/CBE/HOR/FRU/2021/002</b> Development of F <sub>1</sub> hybrids in	Dr. J. Auxilia	January, 2021- December, 2023	A gynodioecious hybrid papaya may be developed as a

	gynodioecious papaya with tolerance to PRSV and thermo-stability suitable for tropical conditions			replacement for Red Lady with desirable qualities like free of papain odour and firm flesh
<b>C. GUAVA</b>				
<b>Department of Fruit Science, HC&amp;RI, Coimbatore</b>				
5.	<b>HCRI/CBE/HOR/FRU/2013/003</b> Improvement of guava ( <i>Psidium guajava</i> ) through selection and inter-varietal hybridization	Dr. M. Kavino	July, 2017 - July, 2021	Molecular profiling of the select genotype to be done. TSS may be assessed at 3/4 <sup>th</sup> maturity Identified progeny to be multiplied and supplied to Periyakulam and Trichy along with Check Thai guava and ArkaKiran
<b>Department of Fruit Science, HC&amp;RI (W), Trichy</b>				
6.	<b>HCRI/TRY/HOR/FRU/2020/001</b> Screening and evaluation of guava genotypes and species for biotic and abiotic stress tolerant root stocks	Dr. V.P. Santhi	January, 2020 - December, 2022	Comparative performance of wild species with other rootstocks has to be carried out. Multiplication of wild species and simultaneous grafting may be done. Pot culture studies may be attempted for wilt and nematode resistance by simulating the conditions of open field.
<b>D. ACID LIME</b>				
<b>Citrus Research Station, Sankarankovil</b>				
7.	<b>HCRI/SAN/HOR/FRU/2017/001</b> Survey and identification of suitable acid lime genotypes for year round production	Dr. T. Rangaraj	April, 2017 - March, 2020	Importance to be given for selection and collection of acid lime with year round production
8.	<b>HCRI/SAN/HOR/FRU/2018/001</b> Evaluation and identification of root	Dr. T. Rangaraj	October, 2018 - September, 2022	Grafting to be attempted instead of budding. Alemow can be used

	stocks for improvement of yield and quality of acid lime ( <i>Citrus aurantifolia</i> Swingle.)			as a rootstock and the performance may be assessed.
<b>E. MANDARIN ORANGE</b>				
<b>Horticultural Research Station, Yercaud</b>				
9.	<b>HCRI/YCD/HOR/FRU/2016/001</b> Survey, collection and evaluation of Mandarin orange varieties under Shervaroy condition	Dr. V.A. Sathiyamurthy	January, 2017 - June, 2021	The project may be continued. Check variety has to be planted for evaluation
<b>F. GRAPES</b>				
<b>Grapes Research Station, Theni</b>				
10.	<b>HCRI/TNI/HOR/FRU/2020/002</b> Collection and evaluation of elite clones of grapes ( <i>Vitis vinifera</i> L.) var. Muscat Hamburg	Dr. A. Subbiah	October, 2020 - September, 2023	The new bud sport pulavarkodi has to be proposed for release. Molecular profiling has to be completed before release of the culture
<b>G. JACKFRUIT</b>				
<b>AC&amp;RI, Kudimiyamalai</b>				
11.	<b>HCRI/KDM/HOR/FRU/2020/001</b> Multiplication and evaluation of identified elite jackfruit genotypes in farmers' holding of Pudukottai district	Dr. R. Jayavalli	January, 2020 - December, 2022	Project to be continued
<b>H. JAMUN</b>				
<b>Regional Research Station, Aruppukottai</b>				
12.	<b>HCRI/APK/HOR/FRU/2019/001</b> Evaluation of jamun genotypes and crop regulation practices suitable for dry vertisol condition	Dr. K.R. Rajadurai	October 2019 - September 2024	Regular flowering and bearing genotypes may be identified.
<b>I. STRAWBERRY</b>				
<b>Horticultural Research Station, Ooty</b>				

13.	<b>HCRI/OTY/HOR/FRU/2018/001</b> Collection and evaluation of Strawberry varieties suitable for Nilgiris	Dr. S. Karthikeyan	October, 2018 - September, 2020	The project can be concluded
<b>J. AVOCADO</b>				
<b>Horticultural Research Station, Thadiyankudisai</b>				
14.	<b>HCRI /TKD/HOR/FRU/2019/002</b> Evaluation of avocado ( <i>Persea americana</i> Mill.) genotypes for yield and quality under the lower Pulney hills	Dr. T. Thangaselvbai	January, 2019 - December, 2021	Selected genotypes may be evaluated at HRS, Pechiparai, and farmer's field at Thadiyankudisai
<b>K. LITCHI</b>				
<b>Horticultural Research Station, Thadiyankudisai</b>				
15.	<b>HCRI/TKD/HOR/FRU/2019/001</b> Evaluation of Litchi ( <i>Litchi chinensis</i> Sonn) genotypes/varieties for growth, yield and quality.	Dr. S.Easwaran	August, 2019 - July, 2024	The project to be continued
<b>L. SUBTROPICAL FRUITS</b>				
<b>Horticultural Research Station, Yercaud</b>				
16.	<b>HCRI/YCD/HOR/FRU/2019/002</b> Performance evaluation and identification of avocado ( <i>Persea americana</i> Miller), litchi ( <i>Litchi chinensis</i> Sonn.) and Jamun ( <i>Syzygium cuminii</i> Skeela) genotypes/varieties for high yield and quality suitable for Shevaroy hills.	Dr. P. R. Kamalkumaran	December, 2019 – November, 2022	The project to be continued

## CROP MANAGEMENT

S.No	Name of the Projects	Name of the Scientist	Period	Remarks
<b>A.MANGO</b>				
<b>Regional Research Station, Paiyur</b>				
1.	<b>HCRI/PAI/HOR/FRU/2018/001</b> Studies on the yield and quality attributes in the Paclobutrazol treated fields of main and off season mango ( <i>Mangifera indica</i> L.) cv. Bangalora	Dr. S. Sri Vidhya	August 2018 - December 2021	The project may be concluded
2.	<b>HCRI/PAI/HOR/FRU/2019/003</b> Studies on the effect of micronutrient application on the yield and quality of Mango	Dr. S. Sri Vidhya	August 2019 - December 2021	The project may be concluded Compatibility of micronutrients and growth regulators to be assessed
3.	<b>HCRI/ PYR/ HOR/ FRU/ 2020/ 001</b> Studies on the performance of approach and softwood grafts of selected mango varieties on the establishment of tree canopy and root architecture under UHDP system	Dr. L. JeevaJothi	January, 2020 - December, 2022	Root and canopy architecture to be studied for approach and softwood grafting
<b>B. BANANA</b>				
<b>Department of Fruit Science, HC&amp;RI, Coimbatore</b>				
4.	<b>HCRI/CBE/HOR/FRU/2020/003</b> Standardization of organic nutrient practices for banana cv. Neypoovan and CO2	Dr. K.B. Sujatha	July 2020 – June 2022	The project to be continued
5.	<b>HCRI/CBE/HOR/FRU/2020/004</b> Standardization of <i>in vitro</i> propagation protocol for mass multiplication in TNAU banana hybrids	Dr. K. Hemaprabha	Dec 2020 to November 2023	The project to be continued

<b>AC &amp; RI, Thanjavur</b>				
6.	<b>HCRI/ECK/HOR/FRU/2021/001</b> Optimizing the spacing of banana CV. Poovan (Musa spp.) for high density planting under coconut eco system in Cauvery Delta Zone of Tamil Nadu for leaf yield	Dr.K.S.VijaiSelvaraj	March, 2021 – February,,2024	The project to be continued
<b>Dept. of Soil Science and Agricultural Chemistry, AC &amp; RI, Killikulam</b>				
7.	<b>NRM/KKM/AGM/FRU/2016/001</b> Standardization of application method and field evaluation of potash releasing bacterial isolates for Banana crop	Dr. B. JeberlinPrabina	January, 2016 – December, 2021	Cost economics to be worked out. Project to be concluded
<b>C. PAPAYA</b>				
<b>Department of Fruit Science, HC&amp;RI, Coimbatore</b>				
8.	<b>HCRI/CBE/HOR/FRU/2021/002</b> Studies on inter-varietal and inter-generic grafting in papaya to combat sex forms and Papaya Ring Spot Virus (PRSV)	Dr.J.Auxcilia	January, 2021 – December, 2024	The project to be continued
9.	<b>HCRI/CBE/HOR/FRU/2021/001</b> Standardization of <i>in vitro</i> propagation protocol for dioecious papaya.	Dr. K. Hemaprabha	March, 2021 – February,,2023	The project to be continued
<b>D. GUAVA</b>				
<b>Department of Fruit Science, HC&amp;RI (W), Trichy</b>				
10.	<b>HCRI/TRY/HOR/FRU/2019/001</b> Micro nutrient mixtures to augment yield and quality of Guava ( <i>Psidium guajava</i> L.) under sodic soil condition	Dr. S. Kumar	September,2019- August,2022	Project to be concluded
<b>Department of Fruit Science, HC&amp;RI, Periyakulam.</b>				
11.	<b>HCRI/PKM/HOR/FRU/2020/001</b> Shelflife and quality enhancement in Guava ( <i>Psidium guajava</i> ) cv. Lucknow 49 through post-harvest treatments	Dr. V. Premalakshmi	October 2020 - September 2022	The project to be continued

<b>E. CITRUS</b>				
<b>Citrus Research Station, Sankarankoil</b>				
12.	<b>HCRI/SAN/HOR/FRU/2017/002</b> Studies on effect of micronutrients on yield and quality of acid lime ( <i>Citrus aurantifolia</i> Swingle).	Dr.T. Rangaraj	August,2017 -- May,2021	Pooled mean data for four years to be worked out Project to be concluded
<b>F. GRAPES</b>				
<b>Grapes Research Station, Theni</b>				
13.	<b>HCRI/TNI/HOR/FRU/2020/003</b> Studies on the effect of pre-harvest application of water soluble fertilizers on yield and quality in grapes var. Muscat Hamburg	Dr. S. Saraswathy	October, 2020 – September, 2022	Project to be concluded
14.	<b>HCRI/TNI/HOR/FRU/2020/001</b> Evaluation of commercial varieties on dogridge rootstock under 'Y' trellis system in grapes	Dr. S. Saraswathy,	October, 2020 – September, 2023	Project to be continued
<b>G.PEAR</b>				
<b>HRS, Kodaikanal</b>				
15.	<b>HCRI/KDL/HOR/FRU/2017/001</b> Standardizing HDP for higher productivity and quality in Pear	Dr. M.I. Manivannan	December, 2017 – November, 2021	Project to be continued
<b>H. TIMLA FIG</b>				
<b>Horticultural Research Station, Yercaud</b>				
16.	<b>HCRI/YCD/HOR/FRU/2019/001</b> Improvement of multiplication of timla fig ( <i>Ficus auriculata</i> ) through air layering using growth regulators	Dr.P.R.Kamalkumaran	October, 2019 – October, 2022	Alternate method of propagation may also be tried

## D. GENERAL RECOMMENDATIONS

- Variety release proposal for Jack fruit AH 15 and Mango "Naththam Palpushpam" should be submitted for variety release during "Golden Jubilee Year" celebration (Action: HC & RI, Periyakulam)
- Mango culture "Naththam Palpushpam" and Jack fruit culture AH.15 scions should be collected and multiplied at HC & RI, Periyakulam for large scale distribution (Action: HC & RI, Periyakulam)
- Mango varieties identified for off season bearing may be planted during June 2021 at RRS, Paiyur (Action: RRS, Paiyur)
- Off season mango varieties identified by Dr. Richard Kennedy may be planted at RRS, Paiyur & KVK, Tirur (Action: AC & RI, Killikulam & RRS, Paiyur, KVK, Tirur)
- Off season bearing mango variety "Royal Special" may be collected from Andhra Pradesh (Action: RRS, Paiyur)
- Banana breeding to be continued at Coimbatore to evolve varieties similar to Rasthali with resistance attributes. Tetraploid breeding to be attended (Action: HC & RI, Coimbatore)
- Papaya grafting technology to be perfected and multiplication of grafts to be done for large scale evaluation (Action: HC & RI, Coimbatore)
- Guava selection PG 12-1 may be multiplied and evaluated at different centres (Action: HC & RI, Coimbatore)
- Different centres at TNAU may be identified for conservation of germplasm to act as repository for fruit crops (Action: HC & RI, Coimbatore)
- Performance of arid zone fruit crops planted in various centres to be evaluated for growth and yield performance (Action: HC & RI, Coimbatore, RRS, Arupukkottai, HC & RI, Periyakulam, KVK, Tiruppur)
- Performance of fig and ber may be planted and evaluated as Arid Zone Fruit Orchard at DARS, Chettinad and RRS, Arupukkottai and studied (Action: HC & RI, Coimbatore)
- Humid zone tropical fruit crops may be introduced through NBPGR, New Delhi (Action: HC & RI, Coimbatore)
- Arid zone fruit crops to be collected and planted at new colleges of TNAU (Action: HC & RI (W), Trichy, AC & RI, ECK, Thanjavur, AC & RI, Vazhavachanur, Thiruvannamalai & AC & RI, Kudumiyannmalai)
- Dwarfing mango rootstocks viz., Cyber and 4-9 may be introduced from Karnataka (Action: HC & RI, Periyakulam, RRS, Paiyur)



- Studies on rootstock in citrus may be intensified (Action: CRS, Sankarankoil, HRS, Thadiyankudisai)
- In all the grafting studies, stock scion interaction may be studied in detail (Action: All centres)
- Management strategies for cultivation of fruit crops in problem soils may be evolved (Action: All centres)
- Organic mulching and vertical mulching in horticultural crops may be studied (Action: Directorate of NRM, TNAU, Coimbatore)
- Multitier cropping system in fruit crops may be emphasized (Action: HRS, Thadiyankudisai, HRS, Ooty, HRS, Kodaikanal)
- Value addition technologies for arid zone fruit crops (fig) may be attempted (Action: HC & RI, Coimbatore)
- Demonstration unit for strawberry cultivation has to be established (Action: HRS, Kodaikanal)
- Seed production of " TNAU Papaya CO 8" has to be taken up at ARS, Bhavani Sagar (Action: HC & RI, Coimbatore)
- Proven technologies under AICRP (Fruits) can be given for testing under OFT in KVK's. (Action: All centres)
- Cataloging with QR code may be initiated for fruit trees

## II. Vegetable Science

### A. CULTURES UNDER MLT/ART/OFT

#### A. Cultures approved for variety release submission

##### 1. Brinjal hybrid derivative HD 10-6-5-3

Brinjal hybrid derivative (HD 10-6-5-3) was selected from a cross ACM SM 9 x Annamalai. Medium size, oblong light purple with white striped fruits. Plants are semi tall (85 – 95 cm), spreading and medium branched. Early bearing variety and fruits are borne in clusters of 3 to 5 per cluster. Fruit weight is 50 – 60 g with fruit yield of 2.50 kg/plant. Estimated yield is 31.24 t/ha with 23.71% yield increase over check (CO 2). It has high total polyphenol (652 mg/100 g) and flavanoids (42.26 mg/100 g) with field tolerance to shoot and fruit borer.

##### 2. Pole Type Lablab DbP 4 (2014-1-4)

It is a hybrid derivative of CBE LP(p) 17 x CBE LP(p) 06. The pole type Lablab DbP 4 is cluster bearing and photo insensitive yielding 37.5 t/ha. The pods are 18.2 cm long, flat, fleshy with high market preference. Suitable for year round cultivation. It has 2.65% protein, 2.45% crude fibre, 8.11mg/100g Vitamin C, 97.96 mg/100g calcium, 3.43 mg/100g iron and 0.96mg/100g zinc.

##### 3. Elephant Foot Yam CBE AC 03

It is a clonal selection from the germplasm collected from Appakudal village in Erode District. It is an early maturing variety (244 days) with high corm yield of 53.47 t/ha. It has low acidity with the oxalic acid content of 93.00 mg/100 g. The per cent yield increase over the check variety Gajendra is 15.13

#### B. Cultures approved for ART

##### 1. Ridge gourd ACM LA 19-003

Ridge gourd culture ACM LA 19-003 is a hybrid derivative of the cross between LA M 3 x LA M 1. The average fruit weight is 309 g/fruit with 16.93 fruits per plant. The yield per plant is 5.26 kg/plant with 28.13% increase over check CO 1.

#### C. Cultures approved for MLT

##### 1. Bush Type Lablab Db (B) -12

It is a hybrid derivative of CBE LP (b) 03 x CBE LP(b)36. It is a cluster bearing, photo insensitive type which is very early (60-65 days for first harvest) and yields 15-18 t/ha. The pods are flat, 12-15cm long, straight and fleshy with high market preference. It has 25% total soluble protein, 4% total soluble sugars with 1.5% crude fibre content. Suitable for round the year cultivation.

## 2. Cluster bean dwarf mutant ACMC-021-10

Cluster bean ACMC-021-10 is a dwarf statured, determinate non lodging mutant of MDU1 cluster bean. Plants are short statured (70cm to 75cm) with long pods (15cm-16cm) of vegetable type. Pods are borne in clusters of 10-12 per cluster with short internodal length. Number of pods per plant is 115 to 125. Estimated pod yield is 10-12 tons /ha with protein content (2.60g), fibre (2.58g) and moisture content (87%). This mutant shows field tolerance to Fusarium wilt and Powdery mildew.

## 3. Brinjal culture CBE –SM- 03-17-21

It is a hybrid derivative of the cross between CBE- SM - 13 x HD2 (*Solanum viarum* hybrid derivative) derived cross combination. Fruits are long, light purple with white stripes and cluster bearing with 2-3 fruits per cluster. Each plant bears 44.9 fruits with a single fruit weight of 55 g and potential yield of 2.20 kg per plant in crop duration of 150 days. The yield increase over the check variety CO 2 is 26.2 per cent. It showed 12.54 % shoot and fruit borer infestation.

## 4. Okra AE-CBE-02

It is a F<sub>1</sub> hybrid between AE-CBE-92 and ABE-CBE-921. The fruit pubescence is downy. The fruits are dark green and each weighs 27.96 gm. The fruit yield per plant is 1.1kg/ plant. It is resistant to both Yellow Vein mosaic virus and Enation Leaf Curl Virus.

## B. ACTION PLAN: 2021 - 2022

### A. CROP IMPROVEMENT

<b>Crop: TOMATO</b>				
<b>Name of the theme: Development of varieties with multiple resistance in Tomato</b>				
<b>Sub theme 1: Development of F<sub>1</sub> hybrids in tomato with resistance to TLCV, PBNV and Nematodes</b>				
<b>No</b>	<b>Theme Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Evolving hybrids with resistance to TLCV and nematode in tomato	HC&RI, Coimbatore HC&RI, Periyakulam	<b>HC&amp;RI, Coimbatore</b> Crossing programme has to be effected with the collected accessions <b>HC&amp;RI, Periyakulam</b> Confirmation of resistance for TLCV in the identified hybrids through challenge inoculation	Development of multiple resistant hybrids for commercial cultivation
2	Evolving hybrids/derivatives with resistance to PBNV in tomato	AC&RI, Madurai	<ul style="list-style-type: none"> <li>Confirmation of introgression of wild genes in the pre-breeding lines through molecular profiling.</li> <li>Confirmation of resistance</li> </ul>	Pre breeding lines resistant to PBNV will be utilized for further breeding programme

			for PBNV and TLCV in the identified pre-breeding lines.	
3	Developing virus resistant tomato through marker assisted selection	CPMB & CPPS TNAU, Coimbatore	<ul style="list-style-type: none"> <li>Collection and evaluation of resistant sources of Ty 1 and Ty 3 genes conferring resistance against TLCV in tomato</li> <li>Developing markers for breeding applications in the genetic background of local cultivars</li> </ul>	Development of TLCV resistant tomato varieties/Hybrids

**Sub theme 2: Development of varieties in tomato resistant to abiotic stress**

No	Activity	Centre	Action plan for 2021-2022	Deliverables
1	Characterization of tomato genotypes for drought resistance	HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>Confirmatory trial on drought resistance has to be taken up</li> </ul>	Identification of drought tolerant lines
2.	Exploiting wild genetic diversity for enhancing salinity tolerance in tomato	CPMB, TNAU, Coimbatore	<ul style="list-style-type: none"> <li>Collection and evaluation of wild genetic diversity in tomato against salinity</li> <li>Physiological and molecular characterization of tolerant lines for genetic manipulation of salinity tolerance in tomato</li> </ul>	Identification of saline tolerant tomato genotypes

**Sub theme 3: Molecular breeding in tomato**

1.	Genetic enhancement of shelf life in tomato through targeted genome editing	CPMB, TNAU, Coimbatore	<ul style="list-style-type: none"> <li>Developing genome edited plants of tomato (PKM1 ) harboring mutations in Pectate lyase</li> <li>Molecular and biochemical characterization of gene edited plants of tomato</li> </ul>	Development of genome edited tomato plants with enhanced shelf life
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**Crop: BRINJAL**

**Development of location specific varieties in Brinjal**

**Sub theme 1: Development of location specific brinjal varieties**

No	Activity	Centre	Action plan for 2021-2022	Deliverables
1	Development of Location specific brinjal genotypes	HC &RI (W) Trichy HC &RI, Coimbatore HC&RI, Periyakulam VRS, Palur AC & RI, Thiruvannamalai	Development of location specific varieties	Development of location specific varieties

<b>Crop: CHILLI</b>				
<b>Development of varieties in Chilli</b>				
<b>Sub theme 1: Development of variety akin to Mundu type</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Characterization of chilli germplasm for yield, quality and drought tolerance (Mundu type)	Dept. of Vegetable Science, HC&RI, Periyakulam	Confirmatory evaluation of the identified mundu types through large scale demonstration in Ramnad district	Identification of drought tolerant mundu chilli types
<b>Sub theme 1: Development of varieties with high capsaicin content for industrial purpose</b>				
2	Characterization of chilli germplasm for yield, quality and high capsaicin content	Dept. of Vegetable Science, HC&RI, Coimbatore	Development of <i>Capsicum chinense</i> genotype with high yield and capsaicin for industrial purpose	Identification of accession with high capsaicin
<b>Crop: OKRA</b>				
<b>Development of hybrids with combined resistance</b>				
<b>Sub theme 1: Development of F<sub>1</sub> hybrids in Okra with resistance to YVMV and ELCV</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Characterization and field screening of Bhendi germplasm for yield, special morphological traits (slender, medium size, dark green pods and less pubescence), quality (less sliminess), YVMV and ELCV resistance	HC&RI, Coimbatore	Confirmatory trial will be taken up with the identified hybrids	Development of resistant hybrids for commercial cultivation
<b>Crop: CUCURBITS</b>				
<b>Development of hybrids/varieties with high yield and quality</b>				
<b>Sub theme 1: Screening of germplasm and development of F<sub>1</sub> hybrids in Bitter gourd</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Characterization and field screening of bittergourd germplasm (Long and dark green fruits with prominent tubercles) and development of	HC&RI, Periyakulam and HC &RI (W), Trichy	Confirmatory yield trial with commercial check hybrid may be taken up	Development of F <sub>1</sub> hybrids for commercial cultivation

	hybrids			
2.	Development of pre breeding lines in bitter gourd through inter specific hybridization	HC&RI, Coimbatore	Hybridization with wild spp. <i>M.charantia</i> var. <i>muricata</i> and <i>M.symbalaria</i>	Development of predominantly gynocious pre-breeding lines/hybrids in bitter gourd
<b>Sub theme 2: Development of small fruited varieties/ hybrids in Ash gourd</b>				
1	Development of small fruited varieties/hybrids in ash gourd	VRS, Palur, AC&RI, Madurai	Storage and market preference studies may be taken up for the identified hybrids	Development of small fruited ash gourd varieties
<b>Sub theme 3: Development of salad varieties in cucumber</b>				
1	Development of salad varieties in cucumber	HC&RI, Coimbatore	Evaluation of salad varieties/hybrids in cucumber	Development of hybrids / Varieties in salad cucumber
<b>Crop: CLUSTER BEAN</b>				
<b>Theme 1: Development of hybrids/varieties with high yield and quality in cluster bean</b>				
<b>Sub theme 1: Development of dwarf mutant in cluster bean</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Characterization of dwarf type cluster bean through mutation breeding	HC&RI, Coimbatore	Large scale demonstration and Multi Location Trial in cluster bean	Development of dwarf genotypes (Non lodging )
<b>Crop: ONION</b>				
<b>1.Evaluation of onion (Common and aggregatum) varieties / hybrids for yield and quality suitable for Trichy and Perambalur regions.</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Evaluation of onion (Common and aggregatum) varieties / hybrids for yield and quality suitable for Trichy and Perambalur regions.	HC&RI (W), Trichy	Collection, evaluation and identification of onion (big and aggregatum) varieties / hybrids for yield and quality	Identification of Suitable onion variety / hybrid (big and aggregatum) for commercial cultivation in Trichy and Perambalur regions.

<b>Crop : TAPIOCA</b>				
<b>1. Introduction of new tapioca varieties for yield, quality and disease incidence under Pachamalai hills of Trichy district.</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Evaluation of tapioca varieties for yield, quality and disease incidence under pachamalai hills of Trichy district.	HC&RI (W), Trichy	Introduction and evaluation of new tapioca varieties for yield, quality and screening for disease incidence in Pachamalai hills of Trichy district.	Identification of suitable variety of tapioca for pachamalai hills by the replacement of existing traditional low yielding cultivar.
<b>Crop :MORINGA</b>				
<b>1. Evaluation of perennial genotypes in moringa</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Evaluation of perennial genotype karumbu moringa	HC&RI, Periyalulam	Evaluation of identified perennial karumbu moringa genotype for yield and bioactive compounds	Identification of suitable perennial karumbu moringa genotype for cultivation
<b>Crop: UNDERUTILIZED VEGETABLE CROPS</b>				
<b>Theme 1: Development of varieties with high yield and quality in underutilized Vegetable Crops</b>				
<b>Sub theme 1: Evaluation of medicinally important underutilized vegetables for high yield and quality</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Collection and evaluation of underexploited medicinally important vegetable crops	AC&RI, Madurai	Crop improvement and management technologies will be standardized for <i>M.cymbalaria</i>	Identification of elite genotypes and standardization of crop management technologies in <i>M.cymbalaria</i>

## **B. CROP MANAGEMENT**

<b>Crop: ORGANIC PACKAGE FOR VEGETABLES</b>				
<b>Theme 1: Development of Organic package for high value Vegetables</b>				
<b>Sub theme : 1 Organic packages for hill vegetables</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Development of organic packages for high value hill vegetables viz., Chinese cabbage, Broccoli and Lettuce	HRS, Ooty	Development of Organic packages for high value temperate vegetable crops viz., Carrot, Garlic, Cabbage, Beetroot, Radish, Bush beans, Lettuce and Broccoli at HRS, Ooty	Development of organic packages for high value temperate crops

<b>Crop: MICRONUTRIENT MIXTURES FOR VEGETABLE CROPS</b>				
<b>Theme 1: Standardization of growth promoting formulations to enhance yield and quality in vegetables</b>				
<b>Sub theme : 1 Customized Fertilizer for Bitter gourd</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Customized Fertilizer will be tested in 5 different agro-climatic zones of TN except high rainfall zone and Hilly zone (Test crop: Bitter gourd)	Dept. of SS&AC, Coimbatore and HC&RI, Coimbatore	Confirmatory trial and OFT will be taken up	Standardization of growth promoting formulations to enhance yield and quality in Bitter gourd and bhendi
<b>Crop: WEED MANAGEMENT IN VEGETABLES</b>				
<b>Theme 1: Integrated weed management of Vegetables</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Development of Integrated weed management for vegetables	Dept. of Vegetable Science, HC&RI, TNAU, Coimbatore Dept. of Agronomy, TNAU, Coimbatore	Performance evaluation of sweet potato under coconut will be taken up.	Standardization of Integrated weed management technologies in vegetables
<b>Crop: HYDROPONICS IN VEGETABLE CULTIVATION</b>				
<b>Theme 1: Standardization of technologies for hydroponics cultivation</b>				
<b>No</b>	<b>Activity</b>	<b>Centre</b>	<b>Action plan for 2021-2022</b>	<b>Deliverables</b>
1	Standardization of technologies for hydroponics cultivation	Dept. of Vegetable Science, HC&RI, Coimbatore HRS, Ooty HRS, Kodaikanal	Standardization of technologies for hydroponic cultivation in vegetables Confirmatory evaluation will be taken up for Amaranthus, Fenugreek and Mint	Standardization of technologies for hydroponic cultivation



## C. REMARKS ON THE RESEARCH PROJECTS

### I. CROP IMPROVEMENT

S. No.	Project Number, Title and Period	Project Investigator and Centre	Remarks
<b>I. CROP IMPROVEMENT</b>			
<b>TOMATO</b>			
1.	<b>HCRI/CBE/HOR/VEG/2020/002</b> Developing breeding line with ty-5 gene for ToLCV resistance by back cross breeding in tomato Period: <b>June 2020 to Sep 2023</b>	Dr.T.Saraswathi Professor (Hort.)	To be continued
2.	<b>HCRI/CBE/HOR/VEG/2020/003</b> Characterisation and documentation of Tomato ( <i>Solanum lycopersicum</i> L.) prebreeding lines for drought tolerance Period: <b>Jan 2020 to Mar 2022</b>	Dr.A.Sankari Associate Professor (Hort.)	Precise data on drought tolerance at different moisture levels has to be derived and inbreds can be identified. Project to be continued
3.	<b>HCRI/MDU/HOR/VEG/2019/002</b> Confirming PBNV resistance in the interspecific tomato inbred lines and transferring resistance to the commercial varieties. Period: <b>July 2019 to June 2022</b>	Dr.A.Beulah Assoc. Professor(Hort.) Dr.S.Harish Asst. Professor	Molecular confirmation has to be done for the presence of resistant gene and the Project to be continued
<b>BRINJAL</b>			
4.	<b>HCRI/CBE/HOR/VEG/ 2019/004</b> Evaluation and selection of locally preferred brinjal genotypes for western zone of TamilNadu Period: <b>December 2019 to November 2021</b>	Dr.B.K.Savitha Asst. Professor (Hort.)	Cataloguing of germplasm has to be done to avoid the duplication and the project to be continued
5.	<b>HCRI/TRY/HOR/VEG/2020/001</b> Development of region specific brinjal variety/hybrid for yield and quality traits	Dr. A. Nithya Devi Assistant Professor (Horticulture)	Cataloguing of germplasm

	Period: <b>January 2020 to December 2022</b>	Dr. V.R.Saminathan Assoc.Prof.(Agrl.Entomology)	has to be done to avoid the duplication and the project to be continued
6.	<b>HCRI/PLR/HOR/VEG/2020/001</b> Cluster bearing brinjal types for yield and quality specific to North-Eastern zone Period: <b>March 2020 to February 2023</b>	Dr.K.Shoba Thingalmaniyan Asst. Prof and Head i/c Vegetable Research Station, Palur Dr.S.Ganapathy Asst. Prof (PBG)	Cataloguing of germplasm has to be done to avoid the duplication and the project to be continued
7.	<b>HC&amp;RI/VVNR/HOR/VEG/2019/001</b> Improvement of locally preferred brinjal types for North Eastern Zone of Tamil Nadu Period: <b>October 2019 to September 2022</b>	Dr.K.A.Shanmugasundaram Asst. Professor (Hort.)	Cataloguing of germplasm has to be done to avoid the duplication and the project to be continued
<b>CHILLI</b>			
8.	<b>HCRI/PKM/HOR/VEG/2019/001</b> Purification of Mundu chilli ( <i>Capsicum annuum L.</i> ) genotypes and evaluation for high yield and suitable for rainfed conditions Period: <b>October 2019 to September 2022</b>	Dr K Nageswari, Professor (Hort.)	Per cent of purification has to be ascertained and the project to be continued
9.	<b>HCRI/CBE/HOR/VEG/2021/001</b> Development of chilli ( <i>Capsicum chinense</i> Jacq.) genotype with high yield and capsaicin for industrial purpose. Period: <b>November 2020 to December 2023</b>	Dr.H.Usha Nandhini Devi Asst. Prof.(Hort.),	To be continued
10.	<b>HCRI/PAL/SST/GNT/2021/001</b> Enhancement of seed yield and quality in chilli PLR 1 Period: <b>December 2020 –December 2022</b>	Dr. V. Vijaya Geetha Assistant Professor (Seed Science and Technology) Dr. K. Senthamizh Asst. Professor (Agrl. Nematology)	The project may be revised and resubmitted
<b>OKRA</b>			
11.	<b>HCRI/CBE/HOR/VEG/2019/001</b> Development of high yield F <sub>1</sub> hybrids with yellow	Dr.R.Swarnapriya Professor and Head	To be continued

	vein mosaic virus (YVMV) and enation leaf curl virus resistance (ELCV) in bhendi Period: <b>January 2019 – August 2024</b>		
	<b>ASH GOURD</b>		
12.	<b>HCRI/MDU/HOR/VEG/2019/003</b> Evaluation and selection of small fruited ash gourd genotypes for yield and quality suitable for pandal and open field condition. Period: <b>July 2019 to June 2022</b>	Dr.A.Beulah Associate Professor Dept. of Horticulture, AC&RI, Madurai Dr.K.Thangaraj Assistant Professor (PBG) AC & RI, Madurai	To be continued
	<b>BITTER GOURD</b>		
13.	<b>HCRI/PKM/HOR/VEG/2017/001</b> Development of F <sub>1</sub> hybrids in bitter gourd for better yield and quality. Period: <b>October. 2017 to September 2021</b>	Dr. R. Balakumbahan, Asst. Prof. (Horti) Dr. J. Sheela, Prof. (Plant Pathology)	The reaction to mosaic disease has to be compared with the commercial hybrids and the project to be continued.
14.	<b>HCRI/TRY/HOR/VEG/2019/001</b> Development of F <sub>1</sub> hybrid / variety in bitter gourd ( <i>Momordica charantia</i> L. Moench) for high yield and quality Period: <b>October 2019 to September 2022</b>	Dr. K.Kumanan Asst.Prof (Hort.) Dr. S. Sheeba Assc.Prof(SS&AC)	Project to be continued and due care has to be given for the selection of fruit size, shape, colour and mosaic incidence.
	<b>PUMPKIN</b>		
15.	<b>HC&amp;RI/CBE/HOR/VEG/2019/002</b> Development of F <sub>1</sub> hybrids in Pumpkin ( <i>Cucurbita moschata</i> Duch. ex Poir.) for small size and high carotene content Period: <b>March 2019-March 2021</b>	Dr.V.Rajasree Assc Prof (Hort.)	Completion report has to be submitted
	<b>CUCUMBER</b>		
16.	<b>HC&amp;RI/CBE/HOR/VEG/2020/001</b> Development of salad varieties in <i>Cucumis sps</i> (Cucumber and Snap melon) Period: <b>January 2020 to September 2023</b>	Dr.R.Swarnapriya Professor and Head	Cucumber and Snapmelon germplasm has to be categorised and the project to be

			continued.
	<b>GARDEN BEAN</b>		
17.	<b>HCRI / VGD/HOR / VEG / 2019 /001</b> Development of high yielding, short duration, bush type vegetable garden bean ( <i>Lablab purpureus</i> var. <i>typicus</i> ) Period: <b>April 2019 – November 2022</b>	Dr.T.L.Preethi Assistant Prof.( Hort)	Project may be transferred to HC & RI, Periyakulam and selection for photo-insensitive types has to be done.
	<b>POLE BEAN</b>		
18.	<b>HCRI/TKD/HOR/VEG/2019/002</b> "Development of pole bean ( <i>Phaseolus vulgaris</i> L) variety suitable to lower Pulney hills". Period: <b>October 2019 – September 2022</b>	Dr. K. Sundharaiya Assistant Professor (Hort.)	Completed report has to be submitted with the available data.
	<b>CHOW-CHOW</b>		
19.	<b>CPMB/CBE/BIT/VEG/2021/001</b> Meristem tip culture for the production of disease-free quality planting materials in Chow-Chow ( <i>Sechium edule</i> ) Period: <b>December 2020 to November 2022</b>	Dr. N. Manikanda Boopathi Assoc. Prof (Biotechnology), DPB	To be continued
	<b>CASSAVA</b>		
20.	<b>HCRI/YTP/HOR/TAP/2017/001</b> Evaluation of suitable cassava variety for rainfed ecosystem in hilly areas of Tamil Nadu. Period: <b>August 2017 to August 2020</b>	Dr.P.S. Kavitha Asst. Prof. (Hort.)	Completion report has to be submitted
	<b>MORINGA</b>		
21.	<b>HCRI/CBE/HOR/VEG/2019/003</b> Screening of rootstocks for drought tolerance and uniformity in Moringa ( <i>Moringa oleifera</i> ) Period: <b>July 2019 – March 2022</b>	Dr.T. Sumathi Assistant Professor (Horticulture)	To be continued
22.	<b>New</b> Enhancing yield and quality of moringa by interspecific hybridization of cultivated moringa species ( <i>Moringa oleifera</i> Lam.) with wild species ( <i>Moringa concanensis</i> Nimmo) Period: <b>September 2020 to August 2023</b>	Dr. S. Santha Assistant Professor (PB&G.)	To be continued
<b>UNDER EXPLOITED VEGETABLES</b>			
23.	<b>HCRI/MDU/HOR/VEG/2019/001</b> Collection, evaluation and characterization of underutilized vegetables like spine gourd ( <i>Momordica dioica</i> ) and athalakkai ( <i>Momordica cymbalaria</i> ) Period: <b>June 2019 – May 2022</b>	Dr. C. Rajamanickam Assistant Professor (Horticulture)	Project to be continued and confirmatory trials has to be taken up.

<b>VEGETABLE CROPS</b>			
24.	<b>CPMB/CBE/BIF/2018/CP084</b> A study on DNA fingerprinting of varieties and hybrids in major crops of Tamil Nadu Period: <b>April 2020 to September 2022</b>	Dr. R. Gnanam Dr. N. Senthil Dr. N. Manikanda Boopathi Dr. P. Jayakanthan	To be continued

## II. CROP MANAGEMENT

S. No.	Project Number, Title and Period	Project Investigator and Centre	Remarks
<b>TOMATO</b>			
1	<b>NRM/PKM/SAC/VEG/2020/001</b> Development and evaluation of fulvic acid based multi nutrient formulation for tomato Period: <b>January 2020 to December 2022</b>	Dr. P. Malathi Assistant Professor (SS&AC)	To be continued
2	<b>DNRM/CBE/AGM/2021/001</b> Effect of <i>Paenibacillus</i> inoculation for salt stress alleviation and improved growth and yield of Tomato grown under saline conditions Period: <b>January 2021 to December 2022</b>	Dr.N.O.Gopal, Professor (Agrl.Micro.) Dr.L.Srimathipriya, Asst. Prof (Agrl.Micro.) HC&RI (W),Trichy.	To be continued
<b>BRINJAL</b>			
3	<b>DCM/TRY/CRP/VEG/2021/001</b> Physiological evaluation of brinjal for Sodicy tolerance and irrigation through growth promoter and nutrients. Period: <b>January 2021 to December 2023</b>	Dr.R.Amutha, Professor (Crop Physiology) Dr.A.Nithya Devi Assistant Professor (Horticulture)	The project may be closed
<b>BHENDI</b>			
4	<b>SEC/TRY/SST/VEG/2020/001</b> Development of seed priming technique for better field emergence and productivity in bhendi under saline / sodic soil condition Period: <b>August 2020 to July 2023</b>	Dr.A.Sabir Ahamed Professor (SST)	Soil sampling has to done and the initial salinity level has to be assessed. Project to be continued.
5	<b>NRM/CBE/SAC/VEG/2019/004</b> Foliar Nutrition of Water Soluble Fertilizers for Enhancing Yield and Quality of Bhendi ( <i>Abelmoschus esculentus</i> L.Moench) Period: <b>January 2021 to December 2022</b>	Dr.D.Selvi, Professor (SS&AC) Dept.SS&AC, TNAU, Coimbatore-3	To be continued
<b>ONION</b>			
6	<b>NRM/MDU/AGC/2020/001</b> Development of non –edible oil based gibberellic acid formulation and its evaluation in onion Period: <b>February 2020 to January 2023</b>	Dr. K. Senthil Asst.Prof (Agrl. Chemicals) Dr. V. Swaminathan Professor and Head (Horticulture)	To be continued

<b>CUCURBITS</b>			
7	<b>HCRI/TKM/HOR/VEG/2020/001</b> Sequential cropping of cucurbits under rice based cropping system Period: <b>July 2020 to June 2022</b>	Dr. A. Punitha., Asst. Professor (Horticulture), KVK, Tiruvallur. Dr.C.Muralidharan. Professor Agronomy), RRS,Tirur.	To be continued
<b>BITTER GOURD</b>			
8	<b>HCRI/CBE/HOR/VEG/2019/003</b> Customised fertilizers for bitter gourd Period: <b>Sep 2019 – Aug 2022</b>	Dr. K.M.Sellamuthu, Assoc. Prof. (SS&AC) NRM, HC & RI,Periyakulam	To be continued
9	<b>NRM/CBE/SAC/VEG/2019/002</b> Customized fertilizer for Bitter gourd Period: <b>Sep 2019 – Aug 2022</b>	Dr. L.Chithra Professor (SS&AC) Dr. R.K.Kaleeswari Professor (SS&AC)	To be continued
<b>GREEN LEAFY VEGETABLES</b>			
10	<b>NRM/CBE/SAC/VEG/2019/003</b> Bio fortification of Iodine in Green Leafy Vegetables Period: Dec2019- Nov 2021	Dr.M.R.Latha Associate Professor( SS&AC) Dept.SS&AC, TNAU, Coimbatore-3	The iodine content of the leaf has to be assessed before and after imposing the treatment and the project to be continued.
<b>CHOW CHOW</b>			
11	<b>HCRI/TKD/HOR/VEG/2019/001</b> Effect of micronutrients and bio stimulants on growth, yield and incidence of mosaic disease in chow chow. Period: <b>August 2019-August 2022</b>	Dr.Easwaran, Ph.D Associate Professor (Hort)	The project may be completed
<b>CLUSTER BEAN</b>			
12	<b>HCRI/MTP/HOR/VEG/2019/001</b> Evaluation of Vegetable Cluster bean genotypes under <i>Melia dubia</i> based ecosystems Period: <b>October 2019 to September 2022</b>	Dr. P. Hemalatha Assistant Professor (Hort.)	Project to be continued and pooled data has to be presented.
<b>MORINGA</b>			
13	<b>HCRI/ DCM / PKM /AGR/2021/001</b> Optimising crop geometry and harvesting heights in Moringa ( <i>Moringa oleifera</i> ) for leaf production Period: <b>January 2021 to December 2022</b>	Dr. M.P. Kavitha Assistant Professor (Agronomy) NRM, HC &RI, Periyakulam	To be continued
<b>CASSAVA</b>			
14	<b>DCM/YTP/CRP/TAP/2019/001</b> Mitigation of Salt Stress in Cassava by Exogenous Melatonin Period: <b>Nov 2019 –Dec 2021</b>	Dr. M. K. Kalarani Professor (Crop Physiology) Dr. P.S.Kavitha Assistant Professor (Horticulture)	To be continued

<b>ELEPHANT FOOT YAM</b>			
15	<b>HCRI/CBE/HOR/VEG/2020/004</b> Evaluation of smaller mini corms in elephant foot yam ( <i>Amorphophallus paeoniifolius</i> ) under closer spacing systems Period: October 2020 to September 2022	Dr. C. Thangamani Assistant Professor (Hort.)	The optimum size of corm for maximum yield has to be standardized and the project to be continued
<b>TEMPERATE VEGETABLE CROPS</b>			
16	<b>HCRI/OTY/HOR/VEG/2021/001</b> Standardization of crop specific organic farming package of practices for selected temperate vegetable crops Period: <b>January 2021 to December 2022</b>	Dr. P. Raja, Asst. Prof. (Ag. Micro). Dr.S. Karthikeyan, Asst. Prof(Hort.) Dr.D.Keisar Lourdusamy Assoc. Prof (Horti.)	To be continued

#### **EXTERNALLY FUNDED PROJECT**

<b>S. No.</b>	<b>Project Number, Title and Period</b>	<b>Project Investigator and Centre</b>	<b>Remarks</b>
1	<b>DST/HCRI/CBE/VEG/2018/R003</b> Exploitation of hybrid vigour for quality and yield improvement through marker assisted selection in cucumber ( <i>Cucumis sativus</i> L.) Period: <b>01.04.2018 to 31.09.2021</b>	Dr. S. Praneetha Professor (Hort.)	Evaluation to be done for two seasons for stability and the project to be continued
2	<b>DST – NIF/HCRI/PKM/VEG/2019/R006</b> Testing of two Moringa varieties for growth and yield performance Period: <b>April 2019 to March 2021</b>	Dr. K Nageswari, Professor (Hort) Dr G. J. Janavi, Prof. And Head	Completion report has to be submitted
3	<b>BRNS/HCRI/MDU/HOR/2017/R001</b> Isolation of short statured early maturity mutants in cluster bean (MDU1) through gamma irradiation Period: <b>2017-2021</b>	Dr.P Balasubramanian(PI) Asst Prof (Horti.), ICAR KVK, Ramnad Dr C.Vanniarajan (Co- PI) Prof and Head (PBG) Dr A. Beulah Assoc. Prof &Head (Horti.)	Completion report has to be submitted
4	<b>IPI/NRM/MDU/SSAC/2018/R003</b> Fertilisation of K and secondary nutrients for quality vegetable production in low base status soils of intensively vegetable growing areas of southern agro climatic zone of Tamil Nadu ( <b>F37 AHS</b> ) Period: <b>June 2018 to May 2021</b>	Dr.P.P.Mahendran Professor (Soil Science) and Head	Completion report has to be submitted

## D. GENERAL RECOMMENDATIONS

- Development of multiple resistant varieties in Tomato through gene pyramiding (**Action:** Department of Vegetable Science, Coimbatore/Periyakulam)
- Trait specific breeding in cucurbits has to be initiated through interspecific hybridisation (**Action:** Department of Vegetable Science, Coimbatore)
- Grafting studies to be initiated for tomato (**Action:** Department of Vegetable Science, Coimbatore)
- Studies on bellary onion to be initiated at HC&RI, Trichy. Accessions from NHRDF may be obtained and evaluated for introduction (**Action:** HC&RI, Trichy)
- Development of holistic package of practices for organic cultivation of major vegetables (**Action:** Department of Vegetable Science, Coimbatore and Department of Sustainable Organic Agriculture, Coimbatore)
- Brainstorming session may be conducted with molecular biologists for evolving research programmes in vegetables for trait specific breeding (**Action:** Department of Vegetable Science, Coimbatore and Centre for Plant Molecular Biology, Coimbatore)
- Post harvest technology in vegetables may be strengthened (**Action:** Department of Vegetable Science, Periyakulam)
- Development of customized formulations for the management of problematic soils and to boost up the yield in Vegetable Crops (**Action:** Department of Vegetable Science, Coimbatore and Department of Soil Science and Agricultural Chemistry, Coimbatore)
- Technology capsules for viral diseases and nematode management may be developed (**Action:** Centre for Plant Protection Studies, Coimbatore)
- Protocol for quick multiplication in Elephant Foot Yam has to be taken up (**Action:** Department of Vegetable Science, Coimbatore)
- Cataloguing of existing germplasm without duplication has to be carried out (**Action:** All Centres)



### III. Spices and Plantation Crops

#### A. CULTURES UNDER MLT/ART/OFT

##### ART – Turmeric

###### Special features of BS 9

- Fresh rhizome Yield : 52 t/ha
- Curcumin content : 4.38 percent
- MLT for the high yielding turmeric culture BS9 was conducted at HC&RI, Coimbatore and TCRS, Yethapur during 2017-18 and 2018-19.
- Seed multiplication of the pre release culture BS9 was taken up during 2019-2020 and 500 kg of seed rhizome of BS 9 is available for taking up ART in the ensuing season.
- ART was conducted at 42 locations covering 6 districts in Tamil Nadu during 2020-21.

##### ART - Coriander

###### Special features of CS 38

- Selection from germplasm collection maintained at HC&RI, Coimbatore
- High leaf yield (4238 kg/ha)
- Duration – 38 to 45days
- 23 % yield increase over the check variety CO (CR)4
- MLT was conducted for high leaf yielding coriander culture CS 38 during 2014-15 and 2015-16.
- ART was also conducted during 2017-18, 2018-19 and 2019-2020
- The results of the ART revealed that the highest leaf yield was recorded by CS38 followed by East West and CO (CR)4 varieties.
- On farm Large scale Demonstration of the leafy coriander type CS 38 was taken up at HC&RI, Coimbatore during Rabi season 2020-21 which recorded a leaf yield of 5250 kg/ha
- Large scale demonstration of the leafy coriander (summer) type CS 38 will be taken up during May 2021.

##### OFT: On farm testing evaluation of micronutrient mixtures for cocoa

- Four grades of micronutrient mixtures containing graded doses of Fe, Mn, Zn, Cu and B, was evaluated for cocoa under coconut ecosystem during 2019-20 and 2020-21 in three locations *viz.*, Farmer's fields of Aliyar Nagar (10.234<sup>0</sup> N and 77.763<sup>0</sup> E) Sethumadai (10.4852<sup>0</sup> N and 76.8898<sup>0</sup> E) and Kaliyapuram (10.5536<sup>0</sup> N and 76.9249<sup>0</sup> E)
- Number of plants per treatment : 30 ; Number of replications : 3
- Formulated micronutrient mixtures were applied @ 100 g per plant, one month after the application of macronutrients. Blanket dose of macronutrients were applied.
- Initial soil characteristics were assessed, pod yield and dry bean yield were recorded periodically during each harvest across the locations and pooled at the completion of the flowering season.
- Application of micronutrient mixture Grade 3 @ 100 g per plant per year is beneficial in terms of pod and dry bean yield of cocoa. The effect was almost on par with micronutrient mixture Grade 4 across three locations (Tables 1, 2 and 3) during 2019 - 20 and 2020-21.

**B. ACTION PLAN: 2021-22**

<b>CROP IMPROVEMENT</b>			
<b>Crop : Turmeric</b>			
<b>Theme No 1 :</b> Evaluation of varieties in spices for high yield and quality			
<b>Sub Theme I :</b> Evaluation of varieties of turmeric for high yield and high curcumin content through selection			
<b>Activity</b>	<b>Name of the centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Evaluation of clonal selection	HC&RI, Coimbatore	Evaluation of the identified genotypes with high curcumin content may be continued at Coimbatore and Bhavanisagar along with check varieties BSR 2 and CO 2	Identification of a high yielding variety with high curcumin content
	ARS, Bhavanisagar	Large scale demonstration of the promising genotype BS 9 may be conducted and the culture may be proposed for variety release	
<b>Crop : Ginger</b>			
<b>Theme No 1 :</b> Evaluation of varieties in spices for high yield and quality			
<b>Sub Theme II:</b> Evaluation of ginger varieties for high yield, quality and tolerance to soft rot through selection			
<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Evaluation of high yielding ginger genotype	HRS, Ooty	Large scale trials may be continued in more number of farmers holdings to evaluate the performance of ginger genotypes, ACC 578 and Mahima	Identification of high yielding ginger variety suitable for open cultivation in Nilgiris
<b>Crop : Coriander</b>			
<b>Theme No 1 :</b> Development of varieties in spices for high yield and quality			
<b>Sub Theme III :</b> Development of coriander varieties for high yield and quality			
<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Evaluation of promising coriander	HC&RI, Coimbatore	Large scale demonstration of the leafy coriander type CS 38 may be taken up and the culture may be	Identification of coriander variety for high leaf yield

genotypes for seed and leaf purpose		proposed for variety release	
	HC&RI, Periyakulam	Confirmation study on developing technologies for growing leafy coriander under vertical garden may be continued	Suitable technology for growing spices for leaf purpose under vertical garden will be standardized
<b>Crop : Curry leaf</b>			
<b>Theme No 1 :</b> Development of varieties in spices for high yield and quality			
<b>Sub Theme IV :</b> Development of curry leaf varieties for high yield, quality and tolerance to drought			
<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Development of curry leaf varieties	HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>▪ Evaluation may be continued for one more year for confirmation of the results</li> <li>▪ All the genotypes of curry leaf may be maintained at HC&amp;RI, Coimbatore</li> </ul>	High yielding with high essential oil content of Curry leaf genotype will be identified
	HC&RI, Coimbatore	The performance of the graft may be studied in the field condition to assess the suitability of water deficit conditions	Suitable rootstock for water deficit conditions will be identified
<b>Crop : Nutmeg</b>			
<b>Theme No 1 :</b> Development of varieties in spices for high yield and quality			
<b>Sub Theme V :</b> Development of varieties for high yield and quality in tree spices			
<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Development of varieties for high yield and quality in nutmeg	HRS, Pechiparai, HRS, Thadiyankudisai CRS, Aliyarnagar	MLT may be conducted for Nutmeg culture MF 4 along with local check	Identification of high yielding Nutmeg variety
<b>Crop : Coconut</b>			
<b>Theme No 2 :</b> Development of varieties in plantation crops for high yield and quality			
<b>Sub Theme I :</b> Evaluation of existing germplasm and selection of superior genotypes for varieties with high yield and quality			
<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>

Development of DXT, TXD and DXD hybrids in coconut for high quality tender nut	CRS, Veppankulam and CRS, Aliyarnagar	Evaluation of existing hybrids of DXT, TXD and DXD for high quality tender nut may be continued until yield consistency is obtained	Development of hybrids in coconut for high quality tender nut
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## **CROP MANAGEMENT**

### **Crop : Bush pepper**

#### **Theme No 1: High Density Planting of bush pepper under shade net**

##### **Sub Theme 1: Enhancement of population density and improving the productivity under shade net**

<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Standardization of HDP in Bush Pepper under shade net condition	HRS, Pechiparai	Establishment of shade net and planting bush pepper under HDP inside shade net	Optimization of spacing for HDP in Bush Pepper under shade net for yield intensification in bush pepper and also solve the drudgery in pepper harvesting

### **Crop : Turmeric**

#### **Theme No 2 : Standardization of improved agro techniques for increasing the productivity of spices**

##### **Sub Theme I : Developing a package for mechanization in turmeric**

<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Mechanization in turmeric from planting to harvest	HC&RI, Coimbatore & AEC&RI, Coimbatore	University research project may be proposed on mechanization in turmeric and the trial may be initiated	Development of package for mechanization in turmeric

### **Crop : Curry leaf**

#### **Theme No 3 : Standardization of improved agro techniques for increasing the productivity of spices**

##### **Sub Theme II : Developing package of practices for organic production of curry leaf**

<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Developing package of practices for	HC&RI, Coimbatore	<ul style="list-style-type: none"> <li>▪ Confirmation studies may be conducted for standardization of cost effective agro</li> </ul>	<ul style="list-style-type: none"> <li>▪ Suitable agro technique for organic cultivation of curry</li> </ul>

organic production of curry leaf	HC&RI, Periyakulam DSOA, Coimbatore CPPS, CBE	<p>techniques for organic cultivation practices in curry leaf for yield and quality</p> <ul style="list-style-type: none"> <li>Same type of organic package for curry leaf may be followed in all the centres</li> </ul>	leaf variety Senkambu will be identified
<b>Crop : Coconut</b>			
<b>Theme No. 4</b> : Standardization of fertigation technology for Coconut			
<b>Sub Theme I</b> : Standardization of fertigation scheduling for Coconut			
<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Standardization of fertigation technique for tall, dwarf and hybrids of Coconut	HC&RI, Coimbatore & CRS, Aliyarnagar	<ul style="list-style-type: none"> <li>Fertigation scheduling for tall varieties may be studied at HC&amp;RI, Coimbatore</li> <li>Fertigation scheduling for dwarf and hybrids may be studied at CRS, Aliyarnagar</li> </ul>	<ul style="list-style-type: none"> <li>Fertigation scheduling for tall, dwarf and hybrids of coconut will be standardized</li> </ul>
<b>Crop : Cocoa</b>			
<b>Theme No 5</b> : Standardization of micro nutrients for cocoa			
<b>Sub Theme II</b> : Standardization of micro nutrients for cocoa grown under coconut eco system			
<b>Activity</b>	<b>Name of the Centre</b>	<b>Action Plan (2021-22)</b>	<b>Deliverables</b>
Standardization of micro nutrients for cocoa	CRS, Aliyarnagar	Large scale field trials across the state may be conducted to evaluate the impact of micronutrients for cocoa	<ul style="list-style-type: none"> <li>Micronutrient formulation for cocoa will be standardized</li> </ul>

### C. REMARKS ON THE RESEARCH PROJECTS

S. No.	Project No. & title and period	Name of the scientist	Remarks
<b>CROP IMPROVEMENT</b>			
1.	<b>HCRI / TKD / HOR / SPC / 2019 / 001</b> Collection and evaluation of black pepper ( <i>Piper nigrum</i> L.) genotypes for yield and quality under the lower Pulney conditions. (January 2019 to December 2021)	Dr. T. Thangaselvabai Professor and Head	<ul style="list-style-type: none"> <li>▪ Evaluation of all genotypes may be done</li> <li>▪ This programme of research may be combined with Horticultural Research Station, Yercaud</li> </ul>
2.	<b>HCRI/ALR/HOR/SPC/2019/002</b> Performance evaluation of turmeric genotypes under coconut ecosystem (October 2019 to September 2022)	Dr. V. Sivakumar, Assistant Professor (Hort.) Dr. E. Rajeswari, Associate Professor	<ul style="list-style-type: none"> <li>▪ Since turmeric and coconut are heavy nutrient uptake crops, suitable fertilizer combination may be standardized for the intercropping system</li> </ul>
3	<b>HCRI/TRY/HOR/SPC/2015/003</b> Collection and Evaluation of Curry leaf ( <i>Murraya koenigii</i> Spreng.) genotypes for Sodic Soil (April 2018 to March 2021)	Dr. K. Indhumathi Assistant Professor (Hort.)	<ul style="list-style-type: none"> <li>▪ The project may be concluded and completion report may be submitted.</li> <li>▪ Based on the result of the project it was observed that curry leaf variety Senkambu is not suitable for sodic soils</li> <li>▪ Suitable crop for sodic soil may be explored</li> </ul>
<b>CROP MANAGEMENT</b>			
4	<b>HCRI/CBE/HOR/SPC/2020/001</b> Effect of microbial consortia on crop growth, rhizome yield and curcumin content of Turmeric ( <i>Curcuma longa</i> L.) (October 2020 to September 2023)	Dr. A. Ramar Professor (Hort.) Dr. U. Sivakumar Professor (Agrl. Microbiology)	<ul style="list-style-type: none"> <li>▪ Compatibility of microbial consortia may be assessed.</li> <li>▪ Effect of microbial consortia on curcumin content of turmeric may be assessed</li> <li>▪ Population dynamics of microbes</li> </ul>

			present in the soil may be worked out.
5	<b>NRM/BSR/SAC/SPC/2019/001 (921)</b> Optimising sources, levels and frequency of sulphur application for enhancing rhizome yield and curcumin content of Turmeric grown under Western zone of Tamil Nadu (June 2019 to July 2022)	Dr. D. Muthumanickam, Professor (SS&AC)	<ul style="list-style-type: none"> <li>The trial may be carried out for one more year</li> </ul>
6	<b>HCRI/CBE/HOR/SPC/2019/003</b> Standardization of packaging for curry leaf for export (January 2020 to December 2022)	Dr. K. Venkatesan Professor and Head	<ul style="list-style-type: none"> <li>The existing farmers' practices of packing fresh curry leaf in loose gunny bags dipped in water may be included as one of the treatments to meet the requirement of local farmers</li> </ul>
7	<b>HCRI/CBE/HOR/SPC/2019/004</b> Evaluation of combined effect of micronutrients and fungicides to control leaf spot in curry leaf ( <i>Murraya koenigii</i> Spreng.) (December 2019 to November 2021)	Dr. S. Velmurugan, Assistant Professor (Hort.) Dr. S. Sundravadana, Assistant Professor (Pl. Path.)	<ul style="list-style-type: none"> <li>Compatibility of micro nutrients and fungicides may be assessed</li> <li>The toxicity on the final product may also be studied</li> <li>Physical, chemical and biological compatibility may be studied</li> <li>Chelated form of micronutrient may be added with fungicide</li> </ul>
8	<b>HCRI/PKM/HOR/SPC/2021/001</b> Effect of organic inputs on herbage yield and quality in Mint ( <i>Mentha arvensis</i> ) and Fenugreek ( <i>Trigonella foenum graecum</i> ) (July 2020 – June 2022)	Dr. R. Chitra Assistant Professor (Horticulture) Dr. P. Jansirani Professor and Head	<ul style="list-style-type: none"> <li>The trial may be conducted for one more year for confirmation of result. BCRI may be worked out for the nutrient package</li> </ul>
9	<b>HCRI/PPI/HOR/SPC/2020/001</b> Assessment of yield in high density planting of clove (February 2020 to January 2022)	Dr. A. Jaya Jasmine Professor and Head	<ul style="list-style-type: none"> <li>The project may be continued</li> </ul>
10	<b>HCRI/CBE/HOR/SPC/2019/002</b> Effect of fertigation on growth, yield and productivity of tall varieties of coconut (October 2019 to September 2022)	Dr. K. Venkatesan Professor and Head	<ul style="list-style-type: none"> <li>Response of tall variety of coconut to fertigation may be observed for another three more years for confirmation of results</li> </ul>

11	<b>HCRI/ALR/HOR/SPC/2019/002</b> Nutrient (N-P-K) Optimization for Dwarf Varieties of Coconut (June 2019 to May 2022)	Dr. C. Sudhalakshmi Assistant Professor (SS&AC)	<ul style="list-style-type: none"> <li>▪ The project may be continued.</li> <li>▪ Yield data may be recorded from second year onwards and pooled data may be compiled for analyzing the yield consistency</li> <li>▪ Follow standard practice of existing micronutrient mixture for nutrient optimization</li> </ul>
12	<b>DCM/VPM/AGR/SPC/2018/001</b> Studies on nutrient (N&K) requirement and method of application to ECT coconut nursery (December 2018 to November 2020)	Dr. R. Babu Professor and Head	<ul style="list-style-type: none"> <li>▪ The project may be completed and the completion report may be submitted</li> </ul>
13	<b>HC&amp;RI/VPM/AGR/SPC/2019/001</b> Studies on performance of popular varieties of banana as intercrop in coconut eco-system (July 2019 to March 2021)	Dr. R. Babu Professor and Head	<ul style="list-style-type: none"> <li>▪ Research may be conducted for one more year with Poovan and Monthan varieties of banana as intercrop in coconut eco-system</li> <li>▪ Extension proposal may be sent</li> </ul>
14	<b>HCRI/CBE/HOR/SPC/2019/001</b> Standardization of protocol for on farm decomposition of cocoa leaf litter and pod husk waste (October 2019 to September 2022)	Dr. B. Senthamizh Selvi Asst. Professor (Hort.) Dr. V. Jegadeeswari Asst. Professor (Hort.)	<ul style="list-style-type: none"> <li>▪ The project may be concluded and completion report may be submitted</li> </ul>
15	<b>SEC/TRY/SST/SPC/2020/001</b> Studies on germination behavior and viability of Palmyrah ( <i>Borassus flabellifer</i> L.) seeds (April 2020 to March 2022)	Dr. P. Masilamani, Dean, Dr. C. Indu Rani, Associate Professor (Hort)	<ul style="list-style-type: none"> <li>▪ To assess the establishment of Palmyrah seedlings, comparative studies may be done between <i>insitu</i> sowing and polythene bag sowing</li> </ul>
16	<b>HCRI/CBE/HOR/SPC/2018/001</b> Evaluation of remunerative intercrops through farmer participatory approach for sustainable income to oilpalm growers (July 2018 to March 2021)	Dr. T. Sumathi Assistant Professor (Hort.)	<ul style="list-style-type: none"> <li>▪ The project may be concluded and completion report may be submitted</li> </ul>



**EXTERNALLY FUNDED SCHEMES**

<b>S. No</b>	<b>Project No. &amp; title and period</b>	<b>Name of the scientist</b>	<b>Remarks</b>
1	NMPB/HCRI/PKM/SPC/2019/R005, Standardization of organic production technique and processing of black turmeric ( <i>Curcuma caesia</i> Roxb.) (April 2019 to September 2020)	<b>PI</b> :Dr.R.Chitra Asst. Prof. (Hort.) <b>Co-PIs:</b> Dr.P.Jansirani Prof. & Head Dr. D. Janaki Asst. Prof. (SS&AC)	<ul style="list-style-type: none"><li>▪ Dry samples of black turmeric may be sent to the Professor and Head, Dept. of Medicinal &amp; Aromatic Crops, HC&amp;RI, Coimbatore for fractionalizing the alkaloids.</li><li>▪ Analysis part may be carried out by the Professor and Head, Dept. of Medicinal &amp; Aromatic Crops</li><li>▪ Crop may be raised in the elite centers having subtropical climate. Hence 3 to 4 kgs of planting material may be sent to the elite centers</li></ul>

## D. GENERAL RECOMMENDATIONS

- DUS characterization of Palmyrah may be done with CPCRI, Kasaragod  
**(Action: AC&RI, Killikulam)**
- Introduction may be done in Black pepper and Cashew since much variability is not present in the Indian varieties  
**(Action: HRS, Thadiyankudisai & RRS, Vridhachalam)**
- Exploitation of rootstock in Black pepper resistant to wilt and nematode may be concentrated **(Action: HRS, Pechiparai)**
- Multitier cropping and intercropping system under coconut plantation may be studied **(Action: HC&RI, Coimbatore, CRS, Aliyarnagar and CRS, Veppankulam)**
- Research on Organic farming in Coconut and Cashew may be strengthened  
**(Action: HC&RI, Coimbatore, CRS, Aliyarnagar, CRS, Veppankulam and RRS, Vridhachalam)**
- Research on Vertical mulching technology in Coconut may be continued for another three years for getting consolidated data **(Action: HC&RI, Coimbatore)**
- On farm trial may be conducted for the management of Basal stem rot disease in Coconut **(Action: CRS, Veppankulam)**
- On farm trial may be conducted for the management of root wilt disease in Coconut **(Action: CRS, Aliyarnagar)**

## **IV. Floriculture and Landscape Architecture**

### **A. CULTURES UNDER MLT/ART/OFT**

#### **(1) Pre-release culture of Winter Jasmine (*Jasminum multiflorum*)**

As per the recommendations of the Crop Scientist Meet (Hort.) 2018, MLT and ART of the clonal selection Acc.Jm-1(KMD) of *J. multiflorum* were laid as detailed below.

#### **MLT**

MLT is in progress in the following six centres.

1. HC&RI(W), Trichy
2. HC&RI, Periyakulam
3. AC & RI, Madurai
4. ARS, Bhavanisagar
5. FRS, Thovalai
6. RRS, Paiyur

#### **ART**

ART is in progress in 17 farmers' fields at Coimbatore, Erode, Karur, Trichy, Salem, Namakkal and Theni Districts.

## B. ACTION PLAN : 2021 - 2022

### I. CROP IMPROVEMENT

#### Theme 1: Breeding for development of improved varieties in Jasmine

S. No.	Activity	Centre & Scientists	Action Plan for 2021-2022	Deliverables
<b>Sub-theme 1: Development of improved varieties through clonal selection</b>				
i.	Collection, characterization and evaluation of <i>Jasminum sambac</i> genotypes	<u>Coimbatore</u> Horticulturist Biotechnologist Entomologist	<ul style="list-style-type: none"> <li>Evaluation of the identified promising clone of <i>J. sambac</i> Acc.Js-36 for yield, quality and marketability</li> <li>Evaluation of the clones under MLT and ART</li> </ul>	Identification and selection of superior clone in <i>J. sambac</i> for commercial cultivation
ii.	Collection, characterization and evaluation of <i>J. auriculatum</i> genotypes	<u>Coimbatore</u> Horticulturist Biotechnologist Entomologist	<ul style="list-style-type: none"> <li>Collection and assembling of diverse genotypes of <i>J. auriculatum</i></li> <li>Morphological and molecular characterization to establish distinctiveness of the genotypes</li> </ul>	Identification and selection of superior clones in <i>J. auriculatum</i> with improved yield, quality and resistance to gall mite
<b>Sub-theme 2: Development of improved varieties through mutation breeding</b>				
i.	Mutation breeding in <i>Jasminum</i> spp. for yield, quality, pest and disease resistance	<u>Coimbatore</u> Horticulturist Plant Breeder Biotechnologist	<ul style="list-style-type: none"> <li>Imposing mutation treatments in <i>Jasminum</i> species (<i>J. sambac</i>, <i>J. grandiflorum</i>, <i>J. auriculatum</i>) to induce variability</li> <li>Evaluation of mutant generations of <i>Jasminum</i> species (<i>J. sambac</i>, <i>J. grandiflorum</i>, <i>J. auriculatum</i>) for desirable traits</li> </ul>	Creation of variability through mutation breeding Identification of promising mutants for yield, quality and pest (bud worm in <i>J. sambac</i> and gall mite in <i>J. auriculatum</i> ) and disease resistance (blight in <i>J. grandiflorum</i> )

## II. CROP MANAGEMENT & POST-HARVEST MANAGEMENT

### Theme 2: Standardization of improved agro-techniques for flower and ornamental crops

S. No.	Activity	Centre&Scientists	Action Plan 2021-2022	Deliverables
<b>Sub-theme 1: Standardization of mass propagation protocol for tuberose</b>				
i.	Standardization of mass propagation protocol for tuberose through pro-tray technology	<u>Coimbatore</u> Horticulturist Crop Physiologist	<ul style="list-style-type: none"> <li>• Validation of technique for mass propagation of tuberose through pro-tray raised bulblets.</li> </ul>	Availability of technology for mass propagation of tuberose
<b>Sub-theme 2: Development of technique to delay flower bud opening in nerium</b>				
i.	Standardization of techniques to delay flower bud opening in Nerium	<u>Coimbatore</u> Horticulturist Crop Physiologist	<ul style="list-style-type: none"> <li>• Validation of different lighting and fogging system on flower yield and delayed bud opening</li> <li>• Working out the cost economics</li> </ul>	Availability of technique to overcome bottleneck faced by nerium farmers due to harvesting during midnight
<b>Sub-theme 3: Development of improved package of practices for <i>J. sambac</i> cultivars</b>				
i.	Development of improved package of practices (plant population, spacing, pruning techniques) for <i>J. sambac</i> cultivars to enhance yield and induce year-round flowering	<u>Coimbatore</u> Horticulturist Crop Physiologist	<ul style="list-style-type: none"> <li>• Evaluation of planting method with 2 plants/pit and 3 plants/pit</li> <li>• Standardization of spacing to align with higher number of plants/pit</li> <li>• Validation of pruning techniques (pruning frequency, pruning height, canopy table, possibility of mechanization, etc.) to induce flowering during Nov-Feb.</li> </ul>	Availability of improved package of practices for <i>J. sambac</i> to enhance yield and induce flowering during Nov-Feb.

<b>Sub-theme 4: Optimization of spacing and nutrient levels on the growth and flower yield of Ixora</b>				
i.	Optimization of spacing and nutrient levels on the growth and flower yield of Ixora ( <i>Ixora coccinea</i> L.)	<u>Trichy</u> Horticulturist Crop Physiologist	Standardization of optimum spacing for maximum growth and yield of Ixora	Suitable spacing and nutrient level will be standardized for commercial cultivation of Ixora in Trichy district

### **Theme 3: Value addition in flower crops**

<b>S. No.</b>	<b>Activity</b>	<b>Centre&amp;Scientists</b>	<b>Action Plan for 2021-2022</b>	<b>Deliverables</b>
<b>Sub-theme 1: Development of value added functional products of hibiscus</b>				
i.	Validation of value added functional products of hibiscus and releasing as technology	<u>Coimbatore</u> Horticulturist Post-harvest expert	<ul style="list-style-type: none"> <li>• Product testing for consumer preference</li> <li>• Release of technology</li> </ul>	Technology for preparation of value added hibiscus products

## C. REMARKS ON THE RESEARCH PROJECTS

### (i) Crop Improvement

S. No.	Project No. & title and project period	Project leader	Remarks
1.	<b>HCRI/THO/HOR/FLO/2020/001</b> Survey, collection and evaluation of Pitchi ( <i>Jasminum grandiflorum</i> L.) accessions for yield, quality and off season production. (Period: Dec 2019 - Dec 2022)	Dr. G. Ashokkumar FRS, Thoivalai	<ul style="list-style-type: none"> <li>• The scope of expansion of area under <i>J. grandiflorum</i> may be assessed.</li> </ul>
2.	<b>HCRI/CBE/HOR/FLO/2019/001</b> Evaluation and clonal selection in <i>Jasminum multiflorum</i> to identify viable types for commercial cultivation (Period: Oct 2019 - Sep 2022)	Dr. M. Ganga HC & RI, Coimbatore	<ul style="list-style-type: none"> <li>• MLT and ART trials may be continued. However, priority may be given at present to development of new variety of <i>J. sambac</i>.</li> </ul>
3.	<b>HCRI/CBE/HOR/FLO/2017/002</b> Evaluation and clonal selection in underutilized jasmine species ( <i>Jasminum</i> spp.) (Period: Sep 2017 - Aug 2020)	Dr. M. Ganga HC & RI, Coimbatore	<ul style="list-style-type: none"> <li>• The project may be closed and completion report submitted.</li> </ul>
4.	<b>HCRI/THO/HOR/FLO/2020/002</b> Evaluation of Red rose types with sturdy petals and shelf life for garland making (Period: Mar 2020 to Feb 2022)	Dr. G. Ashokkumar, FRS, Thoivalai	<ul style="list-style-type: none"> <li>• Agrotechniques may be standardized for the ideal rose type identified instead of evaluation of rose types.</li> <li>• New subprojects may be formulated in crops such as Nerium based on farmers' needs.</li> </ul>
5.	<b>HCRI/YCD/HOR/FLO/2019/001</b> Collection and evaluation of cut foliage under Shevaroy's condition (Period: Oct 2019 - Oct 2022)	Dr. M. Anand HRS, Yercaud	<ul style="list-style-type: none"> <li>• Comparison may be made among the cut foliage species only for cost economics and post harvest life and (for short and long distance transportation) and not for growth parameters, since they are different species.</li> <li>• <i>Podocarpus</i> sp., and Eucalyptus Silver Dollar may be included in the evaluation.</li> </ul>

6.	<b>HCRI / PKM / HOR / FLO / 2019 / 001</b> Evaluation and identification of suitable <i>Crossandra</i> genotypes / varieties for Periyakulam condition (Period: Oct 2019 - Sep 2022)	HC & RI, Periyakulam	<ul style="list-style-type: none"> <li>• The project may be continued.</li> <li>• Ploidy status of the accessions evaluated may be analyzed.</li> <li>• Accession numbers may be assigned for local collections.</li> </ul>
7.	<b>HCRI/CBE/HOR/FLO/2021/001</b> Strengthening germplasm, conservation, documentation and characterization of <i>Ixora</i> (Period: Jan 2021 - Jan 2024)	HC & RI, Coimbatore	<ul style="list-style-type: none"> <li>• The project may be revamped to suit the requirements of the flower growers of the region.</li> </ul>

## (ii) Crop Management

S. No.	Project No. & title and project period	Project leader	Remarks
1.	<b>HCRI/MDU/HOR/FLO/2019/001</b> Induction of off season flowers in Jasmine ( <i>Jasminum sambac</i> Ait.) cv. Gundu Malli (Period: Jul 2019 - Jun 2022)	Dr. M. Palanikumar, AC & RI & KVK, Madurai	<ul style="list-style-type: none"> <li>• The project may be completed and salient findings reported.</li> <li>• Experience gained by the Project Leader may be utilized in formulation of project proposal for reorientation of package of practices for <i>J. sambac</i>.</li> </ul>
2.	<b>HCRI/BSR/HOR/FLO/2020/002</b> Inducing off-season flower production in jasmine ( <i>Jasminum sambac</i> ) with special reference to Erode belt (Period: Aug 2020 - Apr 2021)	Dr. P. Hemalatha, ARS, Bhavanisagar	<ul style="list-style-type: none"> <li>• Proposal for deletion of the project may be submitted and the Project Leader may submit a new proposal on some other topic.</li> </ul>
3.	<b>HCRI/PKM/HOR/FLO/2019/002</b> Effect of Foliar application of bio-stimulants on yield and quality of Tuberose ( <i>Polianthes tuberosa</i> ) (Period: Nov 2019 - Oct 2021)	Dr. P. Arul Arasu, HC & RI, Periyakulam	<ul style="list-style-type: none"> <li>• The technical programme may be improved with respect to the mode of application of biofertilizers and the revised project proposal may be resubmitted.</li> </ul>
4.	<b>HCRI/BSR/HOR/FLO/2020/001</b> Assessing hexanal application techniques for extending the shelf life of tuberose ( <i>Polianthes tuberosa</i> L.) by pre and post harvest treatment.	Dr. P. Hemalatha, ARS, Bhavanisagar	<ul style="list-style-type: none"> <li>• The project may be improved in respect of following aspects: <ul style="list-style-type: none"> <li>- Frequency of hexanal application</li> <li>- No. of applications</li> <li>- Control treatment</li> </ul> </li> </ul>



	(Period: Aug 2020 - Apr 2021)		- Inclusion of Boric acid treatment
5.	<b>HCRI/CBE/HOR/FLO/2019/002</b> Standardization of techniques for delayed bud opening in Nerium ( <i>Nerium oleander</i> L.) (Period: Nov 2019 - Oct 2021)	Dr. M. Velmurugan HC & RI, Coimbatore	<ul style="list-style-type: none"> <li>• The project may be continued with further refinement based on results obtained.</li> <li>• Duration of fogging may be optimized</li> <li>• Assessment of the effect of fogging on bud opening may be analyzed.</li> </ul>
6.	<b>HCRI/TRY/HOR/FLO/2019/001</b> Optimization of spacing and nutrient levels on growth and flower yield of Ixora ( <i>Ixora coccinea</i> L.) (Period: Jan 2019 - Dec 2021)	Dr. C. Indu Rani HC & RI (W), Trichy	<ul style="list-style-type: none"> <li>• The project may be continued.</li> <li>• Application of micronutrients which is essential for Ixora may be included in the package of practices.</li> </ul>

#### D. GENERAL RECOMMENDATIONS

- Research on breeding of Jasmine may be strengthened. The promising culture of *Jasminum sambac* Acc.Js-36 may be multiplied and forwarded to the next level so as to release it as a new variety. **(Action: HC&RI, CBE)**
- Scientists may visit jasmine fields in Krishnagiri district and the pruning technique being adopted there may be assessed and validated. **(Action: HC&RI, CBE)**
- The package of practices of *Jasminum sambac* may be reoriented with respect to planting method (number of plants per pit) and pruning techniques. **(Action: HC&RI, CBE)**
- A safer pruning knife for pruning of jasmine plants may be fabricated. **(Action: HC&RI, CBE and AEC&RI, CBE)**

## V. MEDICINAL & AROMATIC CROPS

### A. CULTURES UNDER MLT/ART/OFT

In gymnema, high yielding genotype TNG<sub>sy</sub> 14 is proposed for conducting MLT. It is a selection from Yercaud (IC number IC-0630517). The culture recorded 0.75 kg dry leaf weight/plant with a gymnemagenin content of 0.72 %.

### B. ACTION PLAN : 2021 - 2022

#### A.CROP IMPROVEMENT

##### Theme 1. Breeding for development of improved varieties in medicinal plants

S.No.	Activity	Scientist & Centre	Action plan for 2021-2022	Action taken
<b>Sub theme 1: Development of variety in <i>Gymnema (Gymnema sylvestre L.)</i> for high yield and gymnemagenin content through clonal selection</b>				
1.	Evaluation and clonal selection	Horticulturist Dept. of Medicinal & Aromatic Crops, Coimbatore	Identification of high yielding genotype and conducting MLT	Developing variety with high yield and gymnemagenin content
<b>Development of variety in <i>Tinospora cordifolia</i> for yield and quality through clonal selection</b>				
2.	Evaluation and clonal selection	Horticulturist Dept. of Medicinal & Aromatic Crops, Coimbatore	<ul style="list-style-type: none"> <li>• Collection of germplasm</li> <li>• Characterization for morphological, yield and quality traits</li> </ul>	Identification of high yielding genotype for yield and quality traits
<b>Sub theme 2: Development of variety in Kantankathiri (<i>Solanum surattense L.</i>) for high yield and quality</b>				
1.	Evaluation and selection	Horticulturist Dept. of Medicinal & Aromatic Crops, Coimbatore	Collection of germplasm Characterization for morphological, yield and quality traits	Identification of high yielding genotype for yield and quality traits

<b>Sub theme 3: Development of variety in Senna (<i>Cassia angustifolia</i> L.) through mutation breeding</b>				
1.	Evaluation of M <sub>2</sub> and M <sub>3</sub> progenies	i.Horticulturist Dept. of Horticulture, AC & RI, Killikulam ii.Horticulturist Dept. of Medicinal & Aromatic Crops, Coimbatore	Raising M <sub>2</sub> and M <sub>3</sub> progenies and evaluation for morphological, yield and quality traits.	Development of variety with high yield and quality in senna
<b>Theme 2. Understanding biosynthetic pathway of colchicine biosynthetic genes</b>				
<b>Sub theme 1. Transcriptomic profiling of <i>Gloriosa superba</i> for identification of key genes involved in colchicine biosynthetic pathway</b>				
1.	Transcriptome sequencing	Department of Plant Molecular Biology and Bioinformatics, CPMB&B	<ul style="list-style-type: none"> <li>• Identification of different developmental stages of tubers</li> <li>• Isolation of RNA</li> <li>• Transcriptome sequencing using Illumina High Seq platform</li> </ul>	<ul style="list-style-type: none"> <li>• Identification of different developmental stages of tubers</li> <li>• Isolation of RNA</li> <li>• Transcriptome sequencing using Illumina High Seq platform</li> </ul>
<b>CROP MANAGEMENT</b>				
<b>Theme 1. Research focus on screening of medicinal plants for nutritional value, anti oxidant, antiviral property and development of functional formulation as immune boosters</b>				
1.	Screening of medicinal plants for nutritive values and pharmaceutical properties	Horticulturist Dept. of Medicinal & Aromatic Crops, Coimbatore	Screening of medicinal plants Identification of nutritive value and pharmaceutical property	Development of functional formulation for enhancing the immunity level Commercialization of the herbal product

### C. REMARKS ON THE RESEARCH PROJECTS

S.No.	Project	Remarks
<b>UNIVERSITY RESEARCH SUB PROJECTS (CROP IMPROVEMENT)</b>		
1.	HCRI/CBE/HOR/MED/2019/001 Identification of high yielding genotype in gymnema for high leaf yield and quality <b>September,2019- August ,2022</b>	Multiplication of high yielding genotype and conduct of MLT
2.	<b>New</b> - Evaluation of M <sub>2</sub> and M <sub>3</sub> generation of senna ( <i>Cassia angustifolia</i> ) for yield and quality traits <b>January,2021 – February 2024</b>	URP number has to be obtained by the Scientist, AC & RI, Killikulam
<b>UNIVERSITY RESEARCH SUB PROJECTS (CROP MANAGEMENT)</b>		
1.	HC&RI / CBE / HOR / MED/2019/003. Standardisation of propagation technique for java tea ( <i>Orthosiphon stamineus</i> Benth.). <b>Dec 2019 to October,2021</b>	The project may be continued and closure report to be submitted after the completion period
2.	CPBG/MDU/PBG/FRU/2019/001: Standardization of protocol for micropropagation of <i>Hemidesmus indicus</i> L. (Nannari) <b>August 2019 – July 2021</b>	The project may be continued and closure report to be submitted after the completion period
3.	HCRI/PKM/HOR/FLO/2021/001 Foliar spray of plant growth regulators and nutrients to enhance the yield and yield character of Davana ( <i>Artemisia pallens</i> Wall.,) <b>September 2020 – August 2023</b>	The project may be continued
4.	NRM/TRY/AGM/2020/001 Influence of AM fungal association on growth and root biomass production of Ashwagandha ( <i>Withania somnifera</i> L.) in sodic soil <b>September 2020 - August , 2023</b>	The project may be continued

### D. GENERAL RECOMMENDATIONS

1. Seed production of CO.1 Manathakkaali can be taken up at ARS, Bhavanisagar
2. Research on *Cissus* can be taken up in medicinal Crops department

#### List of URP/AICRP/ERP

Crop	Agri. Ent. (No.)	Pl. Path. (No.)	Nematology (No.)
University Research Projects	17	27	12
AICRP Projects	2	6	1
Externally Funded Projects	3	6	1
OFT	2	8	-
Action Plans	9	13	10

## V. Crop Protection

### A. TECHNOLOGIES FOR ADOPTION / OFT / INFORMATION

1. For Adoption	
1.	<p><b>Pollination of watermelon with <i>Apis cerana indica</i> for improved crop productivity</b> (TNAU, Coimbatore, AC&amp;RI, Madurai HC&amp;RI, Periyakulam, RRS, Vriddhachalam, HRS, Yercaud)</p> <ul style="list-style-type: none"><li>Placing two <i>Apis cerana indica</i> bee colonies/acre recorded 23.7% increased fruit set, 22.36% yield increase and the highest BC ratio of 1:3.15 compared to open pollination.</li></ul>
2.	<p><b>Biopesticides against TMB on guava</b> (TNAU, Coimbatore, AC&amp;RI, Madurai HC&amp;RI, Periyakulam, HC&amp;RI(W), Trichy, HRS, Yercaud, RRS, Vriddhachalam)</p> <ul style="list-style-type: none"><li>Spray application of three rounds of malathion 50 EC 2ml/lit (or) azadirachtin 1% 2ml/lit (or) <i>Beauvaria bassiana</i> (<math>1 \times 10^8</math> cfu/ml) 4g/lit at 21 days interval commencing from flowering recorded the highest healthy fruits yield (14.0, 12.48 and 11.37 t / ha, respectively) with BC ratio of 1:2.89, 1:2.78 and 1:2.62.</li></ul>
3.	<p><b>Biopesticides against TMB on moringa</b> (TNAU, Coimbatore, AC&amp;RI, Madurai HC&amp;RI, Periyakulam, HC&amp;RI(W), Trichy, HRS, Yercaud, RRS, Vriddhachalam)</p> <ul style="list-style-type: none"><li>Spray application of three rounds of malathion 50 EC 2ml/lit (or) azadirachtin 1% @ 2ml/lit (or) <i>Beauvaria bassiana</i> (<math>1 \times 10^8</math> cfu/ml) 4g/lit at fortnightly interval each at flush formation, flowering and pod forming stage recorded the highest marketable pod yield (21.97, 18.73 and 18.72t/ha, respectively) and BC ratio of 1:2.94, 1:2.52 and 1:2.43.</li></ul>
4.	<p><b>Integrated disease management strategy for viral and phytoplasma disease complex of brinjal</b> (ARS, Virinjipuram; AC &amp; RI, Vazhavachanur; TNAU, Coimbatore; AC&amp;RI, Kudumiyamalai; AC&amp;RI, Madurai)</p> <ul style="list-style-type: none"><li>Adoption of bio-intensive management package viz., seed treatment with <i>Bacillus subtilis</i> (Bbv 57) @ 10 g/kg; nursery application of neem cake @ 1.0 kg/sq.m.; growing of maize as border crop; roguing out of early infected plants up to 30 DAT; installation of yellow sticky traps @ 12 Nos./ha; foliar spraying of neem oil formulation @ 3 ml/lit and need based application of acaricide, spiromesifen 240 SC @ 1.0 ml/lit. was found significantly effective in managing the mosaic and little leaf diseases and whitefly population with increased fruit yield and higher C:B ratio.</li></ul>

5.	<p><b>IPM strategy for the virus diseases in snake gourd</b> (TNAU, Coimbatore; AC&amp;RI, Madurai; HC&amp;RI, Periyakulam; KVK, Tindivanam)</p> <ul style="list-style-type: none"> <li>A combination of treatments viz., seed treatment @ 10 g/kg of seeds + soil application @ 2.5 kg/ha with <i>Bacillus subtilis</i> (Bbv 57) + basal soil application of micronutrient mixture @ 2.5 kg each of ferrous sulphate, zinc sulphate, copper sulphate, manganese sulphate and boric acid per hectare + foliar spraying of micronutrient mixture (0.2% concentration of each ferrous sulphate, zinc sulphate, copper sulphate, manganese sulphate and 0.1% boric acid) at 25 days after sowing + need based application of thiamethoxam 25 WG @ 0.5g/l was found to be highly effective in reducing the incidence of virus diseases in snake gourd with higher fruit yield and C:B ratio.</li> </ul>
6.	<p><b>Management of leaf blight disease in coconut</b> (CRS, Aliyar Nagar; CRS Veppankulam; HC&amp;RI, Coimbatore; AC&amp;RI, Echangkottai)</p> <ul style="list-style-type: none"> <li>Root feeding with tebuconazole @ 5ml in 100 ml water of during January, April, July and October + soil application of 200 g <i>Bacillus subtilis</i> (Bbv 57) with 50 kg FYM and application of additional dose of potash @ 1kg/palm over recommended dose was effective against leaf blight severity with the highest nut yield and CB ratio. There was also no fungicide residue in kernel, water and leaf of coconut.</li> </ul>
7.	<p><b>Management of leaf blight (<i>Alternaria alternata</i>) in <i>Gloriosa superba</i></b> (TNAU, Coimbatore; MRS, Vagarai; CRS, Aliyar Nagar; TCRS, Yethapur)</p> <ul style="list-style-type: none"> <li>Foliar spraying of tebuconazole + trifloxystrobin @ 0.05% on the onset of the disease followed by two sprays at 15 days interval was found to be effective in reducing the leaf blight severity (<i>Alternaria alternata</i>) with the highest seed yield and CB ratio.</li> </ul>

## 2. For On Farm Trial

### OFT 1. IPDM capsule for the management of major pest and diseases including virus diseases in vegetable crops (Tomato and Chillies)

#### Treatments:

#### T<sub>1</sub> - IPDM package

- Seed treatment with *Bacillus subtilis* (Bbv57) 10g/kg of seed; Barrier crop with three rows of maize (closely sown), yellow sticky traps 12 nos./ha.
- Soil application of micronutrient mixture @ 2.5 kg/ha each of ferrous sulphate, zinc sulphate, copper sulphate, manganese sulphate and boric acid; foliar application of micronutrient mixture each of ferrous sulphate, zinc sulphate, copper sulphate, manganese sulphate @ 0.2% and 0.1% boric acid at 30 and 45DAS.
- Roguing out of virus infected plants upto 45 days of transplanting.
- Need based application of imidacloprid 17.8%SL @ 3.0ml/10 lit and followed by spiromesifen 22.90%SC 1.25ml/lit at 10 days interval for tomato.
- Need based application of imidacloprid 17.8%SL @ 3.0ml/10 lit and followed by pyriproxyfen 10%EC @ 1.0ml/lit at 10 days interval for chillies.
- Need based application of hexaconazole 5% SC @ 1ml/l followed by propiconazole 25% EC @ 1 ml/l on 15 days interval for early blight management (tomato).
- Need based spraying of azoxystrobin 18.2% w/w + difenoconazole 11.4%

w/w SC @ 0.1% thrice at 15 days interval starting from noticing the powdery mildew or die-back (chillies).	
<b>T<sub>2</sub> - Farmer's practice</b> <b>T<sub>3</sub> - Untreated control</b> <b>Design:</b> Exploded design and observations to be taken in seven replications  <b>Observations to be recorded:</b> <ul style="list-style-type: none"> <li>• Pests and diseases incidence at weekly intervals; PDI; Natural enemy population (predators &amp; parasitoids); Yield; Marketable yield; B: C ratio</li> </ul>	
<b>Centres to be involved:</b>	
<b>AC &amp; RI, Madurai (MS)</b> <b>Coordinating Centres</b> (Madurai (or) Dindigul Dt.)	: <b>Dr. J. Jayaraj, Professor ( Entomology)</b> <b>Dr. K. Kalpana, Asst. Professor (Plant Pathology)</b>
AC & RI, Coimbatore (Coimbatore (or) Tiruppur Dt.)	: Dr. T. Elayabharathi, Asst. Professor (Entomology) Dr. M. Karthikeyan, Asst. Professor (Plant Pathology)
HC & RI, Periyakulam (Theni Dt.)	: Dr. P.Indiragandhi, Asst. Professor (Entomology) Dr. R.Vimala, Professor (Plant Pathology)
HRS, Yercaud & TCRS, Yethapur (Salem Dt.)	: Dr. M. Senthil Kumar, Asst. Professor (Entomology) Dr. N. Indra, Asst. Professor (Plant Pathology)
RRS, Paiyur & AC&RI, VVNR (Dharmapuri (or) Krishnagiri Dt.)	: Dr. K. Govindan, Asst. Professor (Entomology) Dr.M. Devanathan, Prof. (Plant Pathology)

\* MS-Monitoring Scientists

Note:

- For fruit borer & pinworm management the package of practices as in CPG has to be followed.
- The OFT has to be laid out jointly by the identified Centres and Scientists and observations have to be recorded on the same day for both pests and diseases.

<b>OFT 2.</b>	<b>Evaluation of management modules of rugose spiralling whitefly in coconut</b>
	<b>Treatments:</b> <u>Module 1:</u> Setting up of yellow sticky traps/ sheets (5x1.5 ft) @ 10/acre for trees >6years age or painting coconut trunk (2ft.) with yellow paint @ 14 trees/acre for trees <6years age to monitor and mass trap the RSW population; Stapling leaflets containing nymphs of RSW parasitised by <i>E. guadeloupae</i> on the under surface of the infested leaflets@100/ac; release of <i>Mallada</i> sp eggs @ 400/ac; neem oil 0.5% spray.

	<p><b>Module 2:</b>  Setting up of yellow sticky traps/ sheets (5x1.5 ft) @ 10/acre for trees &gt;6years age or painting coconut trunk (2ft.) with yellow paint @ 14 trees/acre for trees &lt;6years age to monitor and mass trap the RSW population; Stapling leaflets containing nymphs of RSW parasitised by <i>E. guadeloupae</i> on the under surface of the infested leaflets@100/ac; release of <i>Mallada</i> spp. eggs @ 400/ac; spraying of <i>Isaria fumosorosea</i> (<math>2 \times 10^8</math> CFU/ml) 5 gram/litre of water) two sprays at 14 days interval.</p>
	<p><b>Module 3:</b>  TNAU capsule (Release of <i>Encarsia guadeloupae</i> @ 100 parasitoids /ac (10 leafbits/ac); installation of yellow sticky traps (5 ft. x 1.5 ft.) smeared with castor oil @ 8/ ac; release of <i>Mallada</i> spp. eggs @ 400/ac; neem oil 0.5%.</p>
	Untreated control (Conservation biological control)
	<p><b>Nutrient management for all the treatments including control</b>  Urea 1.3 kg; Super phosphate 2.0 kg; Muriate of potash 3.5 kg; Neem cake application @ 5 kg; organic manure (well rotten FYM) @ 50 kg; TNAU micronutrient mixture @1.0kg/tree/year; root feeding with TNAU coconut tonic @200ml/palm once in six months.</p>
	Design : RBD Replication : 7 (14 palms per module; each replication with 2 plants) Season : Yearround
<b>Centres to be involved:</b>	
<b>TNAU, CBE [MS]* Coordinating Centre Coimbatore Dt.</b>	: <b>Dr. S. Jeyarajan Nelson, Professor (Entomology)</b>
Erode & Namakkal Dts.	: Dr. T. Elaiyabharathi, Asst. Professor (Entomology)
AC&RI, KKM Tirunelveli & Tenkasi Dts.	: Dr. Abdul Razak, Professor (Entomology)
AC&RI, KKM Kanyakumari Dt.	: Dr. G. Preetha, Asst. Professor (Entomology)
CRS, ALR Tiruppur and Dindigul Dts.	: Dr. M. Alagar, Asst. Professor (Entomology)
CRS, VPM Tiruvarur, Mayiladuthurai & Thanjavur Dts.	: Dr. V. G. Mathirajan, Asst. Professor (Entomology)
RRS, VRI Cuddalore Dt	: Dr. S. Jayaprabhavathi, Asst. Professor (Entomology)
HRS, YCD Salem Dt.	: Dr. M. Senthilkumar, Asst. Professor (Entomology)



KVK, RMD Ramanathapuram Dt.	:	Dr. S. Elanchezhyan, Asst. Professor (Entomology)
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\* MS-Monitoring Scientist

Note: The inputs will be supplied under the CDB Scheme in operation at four centres. The PI & CoPIs of the Scheme will facilitate the input supply.

<b>Observations:</b>	
	<ol style="list-style-type: none"> <li>1. Per cent infestation by RSW and other whitefly species (coinhabitants)</li> <li>2. Infestation index;</li> <li>3. No. of RSW trapped in yellow sticky trap;</li> <li>4. % Parasitization by <i>Encarsia</i>;</li> <li>5. Colonization by predator, <i>Mallada</i> spp.</li> <li>6. Other pests and natural enemies;</li> <li>7. Percent infection by <i>Isaria</i> &amp; laboratory confirmation;</li> <li>8. Yield in terms of nuts/tree after one year</li> </ol>
	10. BC Ratio
	Note: Pretreatment count (PTC) should be taken and percent changes should be worked out based on the PTC.

<b>OFT 3.</b>	<b>Indigenous sex pheromone dispenser for brinjal shoot and fruit borer</b>
	<b>Treatments:</b> T1 - Indigenous PVC dispenser T2 - Indigenous Silicone dispenser T3 - Indigenous Rubber dispenser T4 - Indigenous Neoprene dispenser T5 - Check (commercial blend)
	Season : <i>Kharif</i> and <i>Rabi</i> No. of treatments : Five Replication : Four traps / treatment Design : RBD Time of Installation : After 50 DAP
	<b>Note:</b> <ol style="list-style-type: none"> <li>1. Between the traps a minimal distance of 10 meter is to be maintained</li> <li>2. Dispensers are to be replaced for three times at 21 days interval. The used dispensers are to be collected and stored in refrigerator in individual packing for residue analysis</li> <li>3.</li> </ol>
	<b>Observation to be recorded</b> Per cent shoot damage and fruit damage at weekly intervals from 50 DAP Mean moth catches/trap/week Yield and BC ratio
<b>Centres to be involved:</b>	

<b>AC&amp;RI, KKM [MS]* Coordinating Centre</b>	:	<b>Dr. G. Ravi, Professor (Entomology)</b>
TNAU, CBE	:	Dr. S. Jeyarani, Professor (Entomology)
HC&RI, PKM	:	Dr. P. Indiragandhi, Asst. Professor (Entomology)
HC & RI (W), TRY	:	Dr. M. Chandrasekaran, Asst. Professor (Entomology)

\* MS-Monitoring Scientist

Note:

The lures and traps required for the experiments will be supplied and residue analysis of lures will be carried out by the Monitoring Scientist.

<b>OFT 4.</b>	<b>Integrated disease management strategy for ring spot disease in Papaya</b>	
	<p><b>Treatments:</b>  <b>T1:</b> Border crop with maize (3 rows closely sown) + raising the seedlings in insect proof net house and foliar spraying of neem oil (3%) three days before planting + soil drenching with humic acid @ 2ml/lit./plant at bimonthly intervals (2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> month) + soil drenching of <i>Jeevamruth</i> (200 lit) mixed with cake (groundnut, gingelly @ 5 kg each in 25 lit water) extracts @ 1 lit./plant thrice at bimonthly intervals up to 8<sup>th</sup> month (3<sup>rd</sup>, 5<sup>th</sup> and 8<sup>th</sup> month) + foliar spraying of zinc sulphate (5g/lit.) + boron (1g/lit.) + urea (10g/lit.) at 4<sup>th</sup> and 7<sup>th</sup> MAP + Early application of flonicamid 50WG @ 75 g a.i./ha when aphid population is observed.  <b>T2:</b> Farmers Practice  <b>T3:</b> Untreated Check</p>	
	Design: RBD; Replications: 7	
	<p><b>Observations to be recorded:</b></p> <ul style="list-style-type: none"> <li>• PRSV incidence (PI) and Disease severity (Grade)</li> <li>• Vector population</li> <li>• Fruit Yield (t/ha) and CB ratio</li> </ul>	
Note: The trial has to be laid out jointly and observations have to be taken together on the same day		
<b>Centres to be involved:</b>		
<b>TNAU, CBE [MS]* Coordinating Centre (Coimbatore Dt.)</b>	:	<b>Dr. S. K. Manoranjitham, Assoc. Prof (Pl. Pathology) Dr. T. Elaiyabharathi, Asst. Professor (Entomology)</b>
AC&RI, VVNR KVK, VRM (Vellore Dt.)	:	Dr. M. Devanathan, Professor (Pl. Pathology) Dr K. Sasikumar, Asst. Professor (Entomology)
AC&RI, MDU (Madurai Dt.)	:	Dr. K. Manonmani, Asst. Professor (Pl. Pathology) Dr. K. Suresh, Asst. Professor (Entomology)
HC & RI (W), TRY	:	Dr. R. Thilagavathi, Asst. Professor (Pl. Pathology)

(Trichy Dt.)	Dr. M. Chandrasekaran, Asst. Professor (Entomology)
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\* Monitoring Scientists

<b>OFT 5.</b>	<b>Integrated disease management strategy for anthracnose disease of mango</b>		
	<b>Treatments:</b> T1 –Annual spray schedule comprising systemic, contact fungicides and biocontrol agents		
	<b>Spray schedule:</b>		
<b>Spray</b>	<b>Month</b>	<b>Crop stage</b>	<b>Treatments schedule</b>
Spray 1	June	Pruning	Copper oxy chloride 50 % WP (0.25%)
Spray 2	August	Vegetative stage	Carbendazim + mancozeb (0.1%)
Spray 3	October	Vegetative stage	Copper oxy chloride 50 % WP (0.25%)
Spray 4	December	Flower bud initiation	Chlorothalonil (0.2%)
Spray 5	January 1 <sup>st</sup> week	Flowering	Carbendazim + mancozeb (0.1%)
Spray 6	January 3 <sup>rd</sup> week	Flowering	<i>Bacillus subtilis</i> (Bbv 57) (0.5%)
Spray 7	February 2 <sup>nd</sup> week	Fruit setting	Tebuconazole (50%)+ trifloxystrobin (25%) – 0.075%
Spray 8	March, 1 <sup>st</sup> week	Fruit development	<i>Bacillus subtilis</i> (Bbv 57) (0.5%)
Spray 9	March 4 <sup>th</sup> week	Fruit development	Tebuconazole(50%)+trifloxystrobin (25%)– 0.075%
Spray 10	April 3 <sup>rd</sup> week	Fruit maturity & Pre harvest spray	Chlorothalonil (0.2%)
	T2 – Farmers' Practice (Alternate spray with carbendazim / copper oxychloride)		
	T3 – Control		
	Design: RBD; Replications: 7		
	<b>Observations to be recorded:</b> • Per cent disease index (PDI), Fruit Yield (t/ha) and BC ratio		
<b>Centres to be involved:</b>			
<b>HC&amp;RI, PKM [MS]*</b>	:	<b>Dr. R. Vimala, Professor (Pl. Pathology)</b>	
<b>Coordinating Centre</b>	:		
TNAU, CBE**	:	Dr. S. K. Manoranjitham, Assoc. Professor (Pl. Pathology)	
AC&RI, MDU	:	Dr.K. Manonmani, Asst. Professor (Pl. Pathology)	
* MS-Monitoring Scientist	:		
** to be conducted at Regional Research Station, Paiyur			

<b>OFT 6.</b>	<b>Validation of endospore based formulation of <i>Bacillus subtilis</i> (BST 18) for the management of major soil borne diseases of tomato</b>	
	<p><b>Treatments:</b>  T1 - Seed treatment (10ml/kg) + seedling dip (10ml/lit) + soil application (400ml/acre) at 30 DAT + foliar spray (0.2 %) on 60 DAT of <i>Bacillus subtilis</i> (BST 18)  T2 – Seed treatment (10ml/kg) + seedling dip (10ml/lit) + soil application (400ml/acre) at 30 DAT + foliar spray (0.2 %) on 60 DAT of <i>Bacillus subtilis</i> (Bbv57)  T3 – Farmers’ Practice  T4 - Untreated control  Design: RBD; Replications: 5</p> <p><b>Observations to be recorded:</b></p> <ul style="list-style-type: none"> <li>• Per cent disease incidence (Damping-off, wilt and collar rot)</li> <li>• Severity of other diseases</li> <li>• Fruit yield (t/ha) and BC ratio</li> </ul>	
	<b>Centres to be involved:</b>	
	<b>TNAU, CBE [MS]* Coordinating Centre</b>	<b>: Dr. S. Harish, Asst. Prof (Plant Pathology)</b>
	TNAU, CBE	: Dr. M. Karthikeyan, Asst. Professor (Plant Pathology)
	AC & RI, MDU	: Dr. K. Kalpana, Asst. Professor (Plant Pathology)
	H&RI, PKM	: Dr. R. Vimala, Professor (Plant Pathology)
	HC&RI(W), TRY	: Dr. K. Rajappan, Professor (Plant Pathology)

\* MS-Monitoring Scientist

<b>OFT 7.</b>	<b>IPDM for the management of major pests and diseases of onion</b>	
	<p><b>Treatments#:</b>  T1 – IPDM Practice</p> <ul style="list-style-type: none"> <li>• Removal of volunteer onion plants and culls to destroy onion thrips reservoir</li> <li>• Seed treatment with thiophanate methyl @ 2.5 g/kg of seed.</li> <li>• Soil application of <i>B. subtilis</i> (Bbv 57) @ 1.25 kg/ha + <i>T. asperellum</i> (Tv1) @ 1.25 kg/ha + VAM fungi @ 12.5 kg/ha + azophos @ 4kg/ha + neem cake @ 250 kg/ha</li> <li>• Need based application of tebuconazole @ 1.5 ml/l for purple blotch disease management</li> <li>• Need based application of 3.3% mefenoxam + 33.1% chlorothalonil SC @ 0.1% followed by 23.4% mandipropamid SC @ 0.1 % for downy mildew management.</li> <li>• Fipronil 80%WG @ 1.5g/10 lit. for thrips on need basis;</li> <li>• Chlorpyrifos 20%EC @ 2.0 ml/10 lit. for root feeders on need basis</li> </ul> <p>T2 – Farmers’ Practice  T3 - Untreated check  Design: RBD; Replications: 5</p> <p><b>Observations to be recorded:</b></p> <ul style="list-style-type: none"> <li>• Per cent disease index – Purple blotch, twister blight and downy mildew</li> </ul>	

	<ul style="list-style-type: none"> <li>• Per cent disease incidence - Basal rot</li> <li>• Incidence and damage due to onion pests</li> <li>• Bulb yield (t/ha) and BC ratio</li> </ul>
<b>Centres to be involved:</b>	
<b>TNAU, CBE [MS]* Coordinating Centre</b>	: <b>Dr. M. Karthikeyan, Asst. Professor (Plant Pathology)</b> <b>Dr. V. Baskaran, Asst. Professor (Entomology)</b>
HC & RI (W), TRY	: Dr. R. Thilagavathi, Asst. Profesor (Pl. Pathology) Dr. V. R. Saminathan, Assoc. Professor (Entomology)
AC&RI, MDU KVK, MDU	: Dr. K. Manonmani, Asst. Profesora (Pl. Pathology) Dr. B. Usharani, Asst. Professor (Entomology)
HC&RI, PKM	: Dr. R. Vimala, Professor (Pl. Pathology) Dr. P. Indiragandhi, Asst. Professor (Entomology)
RRS, APK KVK, APK	: Dr. P. Mareeswari, Asst. Professor (Pl. Pathology) Dr. J. Ramkumar, Asst. Professor (Entomology)
# The OFT has to be laid out jointly by the identified Scientists and combined observations have to be made	
* MS-Monitoring Scientist	

<b>OFT 8.</b>	<b>Evaluation of short duration, temperature tolerant high yielding oyster mushroom</b>	
	<b>Treatments:</b> <b>Treatments</b> T1 –TNAU- KKM-20-01 ( <i>Pleurotus djamor</i> ) T2 – Oyster mushroom - <i>Pleurotus florida</i> var. PF T3 – Oyster mushroom - <i>Pleurotus djamor</i> var. MDU1 Design: RBD; Replications: 7 (Three beds/replication) <b>Observations to be recorded:</b> <ul style="list-style-type: none"> <li>• Days for spawn running</li> <li>• Days for first harvest</li> <li>• Total crop duration</li> <li>• Yield (kg/bed)</li> <li>• Biological efficiency and CB ratio.</li> <li>• Organoleptic evaluation data</li> </ul>	
<b>Centres to be involved:</b>		
<b>AC&amp;RI, MDU [MS]* Coordinating Centre</b>	:	<b>Dr. V. Ramamoorthy, Asst. Professor (Plant Pathology)#</b>
AC&RI, KKM	:	Dr. Dr. E. G. Ebenezer, Professor & Head (Pl. Pathology)
TNAU, CBE	:	Dr. G. Thiribhuvanamala, Assoc. Professor (Pl. Pathology)
HC & RI (W), TRY	:	Dr. R. Thilagavathi, Asst. Profesor (Pl. Pathology)
RRS, VRI	:	Dr. A. Sangeetha, Asst. Professor (Pl. Pathology)
# The Coordinating Centre Scientist will supply the spawn of all varieties / cultures.		

<b>OFT 9.</b>	<b>Outdoor cultivation of paddy straw mushroom (<i>Volvariella volvacea</i>) in banana cropping system<sup>#</sup></b>
	<p><b>Bed preparation:</b> Soaking paddy straw in 2% lime or steaming for 1h; bundle method (3bundles´ 4 layers+1 bundle opened at the top with plastic sheet covering for whole cropping period (tight during spawn run and loose during cropping) with intermittent water spray on mushroom beds. Bed size: 1.5 x 1.5 x 1.5 cubic ft. (4 kg substrate)</p> <p><b>No of beds:</b> 10 beds to be prepared and laid in the interspaces of banana crop (preferably 7<sup>th</sup> to 9<sup>th</sup> month).</p> <p><b>Observation to be recorded:</b> Days for spawn run, Days for pinhead formation, Days for first harvest, total yield (kg/bed), CB ratio</p> <p><sup>#</sup>The co-ordinating centre has to conduct a demonstration online for methodologies to be followed.</p>
<b>Centres to be involved:</b>	
<b>TNAU, CBE [MS]*</b>	<b>: Dr. G. Thiribhuvanamala, Assoc. Professor (Pl. Pathology)</b>
<b>Coordinating Centre</b>	
AC&RI, MDU	: Dr. P. Manonmani, Asst. Professor (Pl. Pathology)
HC & RI (W), TRY	: Dr. R. Thilagavathi, Asst. Profesor (Pl. Pathology)
AC&RI, KKM	: Dr. M. Paramasivam, Asst. Professor (Pl. Pathology)
AC&RI, VVNR	: Dr. P. Deivamani, Asst. Professor (Pl. Pathology)
* MS-Monitoring Scientist	

## For Information

### I. Fruit Crops - a). Entomology

#### 1. Population dynamics of pests

##### i. Sapota budborers

The incidence of the budborer and seedborer of sapota was positively correlated with relative humidity, whereas all the other weather parameters showed a negative non-significant influence against incidence the two pests.

##### ii. Mango fruitflies

The fruit fly, *Bactrocera* spp. was active in mango ecosystem with a maximum population (17.8 fruit flies/trap) during the 52<sup>nd</sup> SMW (24<sup>th</sup> – 31<sup>st</sup> December) and the population was minimum (9.5/trap) during the 42<sup>nd</sup> SMW (15th October -21st October).

#### 2. Management of banana pseudostem borer

Pseudostem injection of emamectin benzoate 5%SG @ 0.4 g/l was effective against banana pseudostem borer, *Odoiporus longicollis* and gave 93.33, 100 and 93.74 per cent reduction in nendran and 100, 87.49 and 100 per cent reduction in red banana, respectively over untreated check. Farmers' practice showed maximum of 70.37 per cent reduction over untreated check.

#### 3. Pesticide residues in fruits

Pesticide residue monitoring in market samples of fruits revealed that of the 81 samples analysed, 11 samples recorded residues of insecticides. However, none of the samples showed residues above the FSSAI MRL.

## **b). Plant Pathology**

### **1. Mahaffee spore trap for the detection of air borne inocula of grapevine mildews**

A low cost solar operated impaction spore trap similar to Mahaffee spore trap was designed to monitor the air borne inocula of grape vine mildews. A rapid highly sensitive specific LAMP assay was also standardized, which is effective in detecting grapevine downy and powdery mildew pathogens.

### **2. Molecular confirmation of banana Fusarium wilt -FOC Race 4**

Molecular confirmation of Foc - TR4 was carried out from the samples collected from Salem, Erode, Dharmapuri, Theni and Coimbatore districts using six 13c primer. In all the confirmed TR 4 isolates, the nucleotide at 279 position was thiamine instead of cytosine and correspondingly the 93rd position of amino acid was tyrosine.

### **3. Banana fusarium wilt management**

Bacterial endophytes viz., *Bacillus amyloliquefaciens* and *B. paraconglomeratum* mediated induction of resistance was observed against Fusarium wilt in cultivar Karpooravalli.

### **4. Citrus greening (Huanglongbing) disease in citrus**

The citrus greening disease causative agent was confirmed as *Candidatus liberibacter asiaticus* by characterizing 16S rDNA in acid lime, mandarin orange, rough lemon, pummelo, italian lemon and sour orange. The management strategy module viz., application of FYM (5Kg) + neem cake (500 g) + VAM & Bacillus subtilis (Bbv 57) (250 g) + 600g N + 500g P + 700g K + micronutrient 250g as basal (Zn + Fe + S + Ca + Mg + Mn + B) + foliar spray @ 1gm/lit (A) Zn, Fe, Mn, B, Mg (New flush) (B) P, K, Cu, Mg (flowering) (C) Ca, Mn, Zn, Mg (Fruit setting) + tetracycline (1000ppm) recorded a PDI of 45.26 as against 81.5 in control.

## **c). Nematology**

### **1. Biomangement of *Meloidogyne incognita* in banana**

Sucker treatment with consortia (*Lysinibacillus fusiformis* + *Pseudomonas geniculata*) of liquid formulation @ 10 ml/ sucker reduced the root knot nematode population in soil by 31% and root by 47% on banana over untreated control.

### **2. Biocontrol potential of bacterial antagonist against *Meloidogyne enterolobii* and *Fusarium* wilt complex in guava**

Soil application of consortia formulation of *Lysinibacillus fusiformis* and *Bacillus subtilis* @ 60 g/tree, twice at 3 months interval recorded lowest root knot index (2.33) and least wilt incidence grade (0.8) with 42% increased fruit yield in guava compared to untreated control.

### **3. Bio-intensive management of citrus nematode, *Tylenchulus semipenetrans* in acid lime**

Delivery of liquid *Purpureocillium lilacinum* @ 4 lit/ha + neem seed kernel extract 5% @ 4 lit/ha, twice at 30 days interval through drip irrigation system reduced citrus nematode population by 77% in soil and 76% in roots and improved fruit yield by 33% in acid lime.

## II. Vegetables

### a). Entomology

#### 1. Thrips species in Tamil Nadu

Documentation and molecular characterization of plant infesting thrips species complex of vegetables in Tamil Nadu indicated that the species diversity of thrips was high in North West Zone and North Eastern Zone. Thrips intensity was found to be high in South Zone and the dominant species across Tamil Nadu is *Thrips tabaci*. Among the vegetables surveyed, chillies and tomato supported maximum species of thrips. In cucurbits *Thrips palmi* was the dominant species.

#### 2. Bemisia species in Tamil Nadu

Out of 202 locations across 7 ecological zones surveyed, sweet potato whitefly, *Bemisia tabaci* is predominant and the solanum whitefly, *Aleurothrixus trachoides* is emerging as a notable species which needs continuous monitoring.

#### 3. Biodiversity of arthropods in curry leaf

A total of 48 insect species under 47 genera, 37 families of 10 orders were recorded in fixed plot and random studies on curry leaf plantations. The functional diversity comprised 18 species of herbivores, 15 species of predators, four species of parasitoids, four species of scavengers and two species of pollinators. Among the insect pests *Diaphorina citri* and *Diaphorina* sp. was observed to be the dominant one. Among the natural enemies *Chrysoperla zastrowi sillemi* was the dominant predatory fauna.

#### 4. Mealybugs on tapioca

Extensive surveys conducted in the northern western part of the state revealed the presence of complex of mealybugs including *Paracoccus marginatus*, *Ferrisia virgata*, *Phenacoccus parvus*, *Pseudococcus jackbeardsleyi*, *Phenacoccus solenopsis* and the new invasive cassava mealybug, *Phenacoccus manihoti*.

#### 5. Pesticide residues in vegetables

A total of 360 farmgate samples of vegetables, spices samples were subjected to analysis of pesticide residues. Among them, 38 vegetable samples registered detectable residues, in which three samples exceeded the MRL fixed by CODEX and FSSAI. Thiomethaxam was found exceeding the limits in tomato and brinjal (two samples) and clothianidin was found exceeding the limits in ridge gourd. Okra, cauliflower, bitter gourd, chilli, brinjal, tomato and lab lab showed detectable level of clothianidin, thiamethoxam cypermethrin, imidacloprid, tebuconazole and acetamiprid residues.

Totally 21 Vegetables (carrot, beetroot, cabbage, potato, ginger, garlic) samples from Nilgris district screened for 14 organochlorine, 8 synthetic pyrethroids, 9 organophosphorus, 5 neonicotinoids, 2 diamide insecticides, 5 fungicides and 5 herbicides. The residues of thiamethoxam and tebuconazole were found at Below Limit of Quantification (BLQ) in carrot, garlic and beetroot. Out of 3 garlic samples analyzed, one garlic sample contained 0.38 mg/kg of  $\lambda$ -Cyhalothrin which exceeded the CODEX MRL of 0.2 mg/kg (FSSAI MRL is not available for garlic).



## 6. Dissipation of insecticides in tomato

The preharvest periods determined for Chlorantraniliprole 18.5 SC (30 g.a.i/ha), Spiromesifen 22.9 SC (150 g. a.i/ha), Imidacloprid 17.8 SL (30 g. a.i/ ha), Flubendiamide 39.35 SC(48 g. a.i/ha) and Emamectin benzoate 5 SG (48 g. a.i/ha) for tomato crop were, 4.47, 4.16, 2.11, 3.90 & 3.90 days, respectively at the recommended dose of application.

## 7. Decontamination of insecticide residues in chilli

Tap water washing of chilli fruits for 1 minute followed by dipping in lukewarm water for 1 minute resulted in 0.103 mg/kg of acetamiprid residues with a reduction of 39.05% residues over treated check sample. Tap water washing for 1 minute followed by dipping in 2% NaCl has resulted in reduction of 32.19, 56.53 per cent residues of imidacloprid and acephate over treated control. Tap water washing for 1 minute followed by dipping in 2% lemon solution for 1 minute has resulted in residues of 0.094 mg/kg of thiamethoxam residues with 30.88 percent reduction over control.

## 8. Management of mealybugs of tapioca

Management of the mealybugs in standing crops in five locations revealed that Fonicamid 50 WG 0.3 g/l was the best treatment in controlling mealybugs in which 2.29 numbers of mealybug colonies were observed followed by Thiamethoxam 25 WG 0.5 g/l (2.68/plant) and Spirotetramet 150 OD 1.25 ml/l (2.95/plant), and Buprofezin 25 SC 1.5 ml/l (3.71/plant) at 15 days after treatment while in control 6.27colonies were observed. The rosette damage was found to be minimum in Fonicamid 50 WG 0.3 g/l (32.33%) followed by Thiamethoxam 25 WG 0.5 g/l (32.56%), Spirotetramet 150 OD 1.25 ml/l (34.01%) and Buprofezin 25 SC 1.5 ml/l (39.99%). In untreated control highest rosette damage of 64.28 per cent was recorded.

## b). Plant Pathology

### 1. Endophytic *Bacillus pumilus* (TEB10) antagonistic on *Pythium aphanidermatum* and *Fusarium lycopersici*

*Bacillus pumilus* (TEB10) antagonistic bacterium on tomato exhibited antimicrobial activity against *P. aphanidermatum* (55 - 79%) and *F. lycopersici* (38 - 43%). Bacterial volatile organic compounds upregulated during the interaction of *B. pumilus* (TEB10) and *P. aphanidermatum*: 2-methyl-1-butanol, 2, methyl- butanoic acid, mesitylene, levomenthol, benzothiazole. Morphology of *P. aphanidermatum* and *F. lycopersici* was altered after the exposure to bacterial volatile compounds.

### 2. Integrated disease management (IDM) practice for bacterial wilt of tomato

Soil amendment with lime depending upon pH of the soil to make soil neutral, seedling root dipping with streptomycin @ 200ppm and soil drenching with copper oxychloride @ 2.5g per litre of water at 20 DAT and 60 DAT and copper hydroxide @ 2 g per litre at 40 DAT recorded the lowest bacterial wilt incidence in tomato.

3. ***Ampelomyces quisqualis* for the management of bhendi powdery mildew**

A total of ten isolates of *A. quisqualis* was identified based on the morphological and molecular characterization.

4. **Development of RNAi constructs for Cucumber mosaic virus (CMV) in chillies**

Developed RNAi constructs targeting coat protein, replicase and 2b genes of CMV for chilli.

5. **Mushroom biodiversity**

Twenty five wild mushroom collections belonging to *Pleurotus* spp, *Calocybe indica*, *Agaricus augustus*, *Lentinus squarrosulus*, *Coprinopsis cinerea*, *Ganoderma lucidum*, *Pisolithus tinctorius*, *Pleuteus hispidulus*, *P.cervinus*, *Lycoperdon esculatum*, *Trametes versicolor* and *Lenzites betulina* were documented. The TNAU-MDU-20-03 strain of milky mushroom recorded higher bio-efficiency ranging from 129 to 138.9 %.

6. **Natural dye from *Pycnoporus sanguineus***

Coconut saw dust and mixed saw dust + 10% wheat bran recorded 70.3 and 75.4 % bio-efficiency in 55 days for *P. sanguineus*. The cinnabarin dye was extracted for fabric dyeing from *P. sanguineus*.

7. **Outdoor cultivation method for paddy straw mushroom cultivation in coastal areas**

The outdoor cultivation of paddy straw mushroom in coastal areas recorded the bio-efficiencies ranging from 18.0 to 19.2 per cent in a cropping cycle of 14 to 17 days with CB ratio from 1:2.5 to 2.8.

**c). Nematology**

1. **Management of root knot nematode, *Meloidogyne incognita* in tomato by *Purpureocillium lilacinum***

Combined application of seed treatment with *Purpureocillium lilacinum* ( $2.4 \times 10^6$  cfu/g) @ 10g / kg seed, seedling root dip with *P. lilacinum* spore suspension @  $4 \times 10^6$  spores / ml and soil application of *P. lilacinum* @ 2.5kg/ha resulted 62% reduction of *M. incognita* population in soil and 53 % in roots.

2. **Effect of *Purpureocillium lilacinum* on non target organisms viz., Entomopathogenic nematodes and predatory nematode**

Application of *Purpureocillium lilacinum* had no adverse effect on survival of entomopathogenic nematodes viz., *Steinernema siamkayai*, *S. glaseri*, *Heterorhabditis indica*, *H. bacteriophora* and predatory nematode, *Mononchus* sp. The growth of *P. lilacinum* was not inhibited by *Xenorhabdus* sp. Culture filtrates of *P. lilacinum* had no effect on juvenile mortality of *Steinernema siamkayai*, *S. glaseri*, *H.indica*, *H. bacteriophora* *in vitro*.

3. **Efficacy of *Bacillus firmus* against root knot nematode, *Meloidogyne incognita* on cucumber**

*Bacillus firmus* exhibited highest percent inhibition of egg hatching by 96.08% and juvenile mortality by 98.0%. Soil application of *Bacillus firmus* @ 2.5 kg/ha significantly reduced the root knot nematode population in soil by 46.5% and wilt incidence by 24.0% over control

4. **Management of root knot nematode, *Meloidogyne incognita* on cucumber**

Combination of soil application with *Pochonia chlamydosporia* @ 6 kg/ac and intercrop with *Tagetes erecta* (1:3) was effectively reduced soil population by 53% and also increased yield by 66% over control on cucumber.

5. **Nematotoxic potential of *Simarouba glauca* leaf and bark extracts against root knot nematode, *Meloidogyne incognita***

A total of 17 antimicrobial compounds viz., 3-Hydroxypyridine, Hexadecanoic acid, Linoleic acid, Dimethoxy curcumin etc were identified from leaf and barks of *Simarouba glauca* to test its efficacy against root knot nematode, *Meloidogyne incognita* infesting Solanaceous vegetables

### III. Spices and Plantation Crops

#### a). Entomology

1. **Banker crops for rugose spiralling whitefly**

Among the 67 host plants studied, only six hosts supported the full growth and development of RSW viz., coconut (*Cocos nucifera*), teak (*Tectona grandis*), banana (*Musa paradisiaca*), guava (*Psidium guajava*), maize (*Zea mays*) and Spanish cherry (*Mimusops elengi*), while five other hosts viz., *Annona muricata*, *A. squamosa*, *A. reticulata*, *Theobroma cacao* and *Ficus religiosa* supported RSW up to its nymphal stage while the remaining 56 hosts were preferred only for oviposition by RSW.

2. **Eriophyid mite on coconut**

Among Tall x Tall cross combinations screened for reaction against eriophyid mite, ECT x LCT recorded lower level of mean grade index (2.1) and this was followed by LCT x ADOT (2.2) and WCT x TPT (2.3) whereas BGR x ADOT recorded higher level of mean grade index (2.9). Among five Dwarf x Dwarf cross combinations, COD x MYD recorded lower level of mean grade index (1.5) and this was followed by MYD x GCD (1.7) and CGD x MGD (2.0) whereas the standard check recorded the highest grade index of 3.5.

3. **Rhinoceros beetle invasion in Gaja cyclone affected areas**

Survey for the damage by the beetle in juvenile gardens showed damage ranging from 21 to 30% was recorded in juvenile coconut gardens planted after Gaja Cyclone in

Nagapattinam District. Ad-hoc Management Practices addressing manure pits, planting time, juvenile gardens and left over wood logs was formulated and disseminated to the farmers through extension officials.

#### **i. Manure pit management**

- Remove and burn all dead coconut trees in the garden
- Collect and destroy the various bio-stages of the beetle from the manure pits
- Application of green muscardine fungus, *Metarrhizium anisopliae* @ 5 x 10<sup>11</sup> spores m<sup>3</sup> - spray 250 ml *Metarrhizium* culture + 750 ml water in manure pits
- Physical barrier: cover the manure pit with UV stabilized white colour fishing net to trap the emerging adult beetles
- Application of chlorpyrifos 1.5% D or Malathion 5 % D @ 5 g / 10 sq. ft. to kill the grubs

#### **ii. Juvenile garden management**

- Rhino guard comprising pit guard to protect the entry of the grub and collar guard to protect the entry of the adult beetles into the plant
- Application of insecticides viz., fipronil 0.3 GR @ 25 g/tree or carbosulfan 6 G @ 15 g/palm or chlorpyrifos 10 G @ 10 g/palm mixed with 1 kg of sand inside the collar guard.

### **b). Plant Pathology**

#### **1. Management of bud rot in coconut nursery**

Soil application of *Trichoderma asperellum* (Tv1) @ 25 g/ cent at the time of sowing + crown application of *Bacillus subtilis* @ 10 g / lit. twice at third and sixth months after sowing + application of AM fungi @ 50 g/ cent at three months after sowing was effective in reducing the bud rot incidence.

### **IV. Medicinal and aromatic crops**

#### **a). Entomology**

#### **1. Mealybugs infesting tuberose**

Among the mealybugs infesting tuberose, Giant mealybug, *Icerya aegyptiaca* was found to cause 72.55 per cent infestation in cultivar Golden Rod followed by Aster (57.86%). Other mealybug species found to infest the tube rose in Kanyakumari District were, Cotton mealybug, *Phenacoccus solenopsis*, Striped mealybug, *Ferrisia virgata*, and Eggplant mealybug, *Coccidohystrix insolita*.

## 2. **Jasmine budworm**

Insecticide use pattern against Jasmine budworm, *Hendecasis duplifascialis* indicated extensive use of organophosphate groups followed by neonicotinoids, synthetic pyrethroids and premix formulations of insecticides in Trichy, Erode and Madurai Districts.

### **b). Plant Pathology**

#### 1. **Effect of Bacillus consortia against root rot diseases of *Gloriosa superba***

Dipping tubers in talc based formulation of *Bacillus* consortia with *Bacillus amyloliquifaciens* + *B. endophyticus* (1%) for 20 minutes + soil drenching with *Bacillus* consortia (1%) on 30 and 60 DAP was found to be effective and recorded the least incidence of *Sclerotium* (11%) and *Macrophomina* (10%) with the highest seed yield of 415 kg /ha.

#### 2. **Development of IPM strategy for the management of collar rot / root rot and nematode disease complex in medicinal Coleus**

Basal soil application of *Bacillus subtilis* (Bbv 57) @ 2.5 kg/ha + dipping of cuttings in 0.2 % *B. subtilis* (Bbv 57) + SA of *B. subtilis* (Bbv 57) on 30 DAP and 45 DAP @ 2.5 kg/ha + *Pochonia chlamydospora* (TNAU Pc-001) @ 2.5 kg +100 kg of FYM as basal was found to be effective in reducing the disease incidence (14%) and reduction of nematode population in soil (82%) and root (67.8%) with gall index of 2 and recorded fresh tuber yield of 18.51 t/ha.

### **c). Nematology**

#### 1. **Nematode management in medicinal coleus**

Soil application of *Pochonia chlamydospora* @ 1g/m<sup>2</sup> along with 100 g of FYM or vermicompost thrice at 30 day interval reduced soil and root nematode population to an extent of 50.6 and 63% respectively over control

## **B. ACTION PLAN : 2021 -2022**

### **Theme areas**

1. Screening of germplasm and mechanism of resistance
2. Pesticide dynamics in horticultural crops
3. Insect pests / diseases / nematodes monitoring
4. Pest, diseases and nematodes management in open/ protected cultivation

### Theme 1: Screening of germplasm and mechanism of resistance

<b>Theme Leader:</b>	<b>Dr. T. Elaiyabharathi, Asst. Professor (Entomology), TNAU, Coimbatore</b>		
<b>Action Plan- E1</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Screening for resistance to insects and mites in horticultural crops	TNAU, CBE Dr. T. Elaiyabharathi, Asst. Professor (Entomology) Team to be identified based on requirement of Breeders	Screening for resistance with standard scoring methods	Entries showing resistance traits will be elucidated
<b>Theme Leader:</b>	<b>Dr. K. Senthamizh, Asst. Professor (Nematology), VRS, Palur</b>		
<b>Action Plan-N1</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Identification of sources of resistance against root knot nematode, <i>Meloidogyne incognita</i> in vegetable crops (Cont..)	VRS, PLR Dr. K. Senthamizh, Asst. Professor (Nematology) TNAU, CBE Dr. P.Kalaiarasan, Asst. Professor (Nematology) HC &RI, PKM: Dr.S. Prabhu, Asst. Professor (Nematology) AC & RI, EachanECK: Dr. M.Shanmuga Priya, Asst. Professor (Nematology)	<ul style="list-style-type: none"> <li>Identification of sources of resistance against root knot nematode, <i>M. incognita</i> in vegetable crops</li> </ul> <b>Observations to be recorded</b> Root knot index , Final nematode population in soil and root	Nematode resistant accessions / germplasm in vegetable crops.

### Theme 2: Pesticide dynamics in horticultural crops

<b>Theme Leader:</b>	<b>Dr. S. V. Krishnamoorthy, Professor (Entomology), TNAU, Coimbatore</b>		
<b>Action Plan-E2</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Monitoring of Pesticide residues in vegetables	TNAU, CBE Dr. S. V. Krishnamoorthy, Professor (Entomology) Dr. K. Bhuvaneshwari, Professor (Entomology) Dr. A. Suganthi, Asst. Professor (Entomology) Dr. B. Vinothkumar, Asst. Professor (Entomology) Dr. M. Paramasivam, Asst. Professor (Ag.	TNAU, CBE <ul style="list-style-type: none"> <li>Collection of farm gate samples of variety of vegetables at monthly interval from Coimbatore district for residue analysis</li> <li>Vegetables: Bhendi, Brinjal, Tomato, Bitterguord,</li> </ul>	Status of pesticide residue in farm gate samples of vegetables will be made available through the NABL-PTL

	<p>Chem)</p> <p><u>AC&amp;RI, MDU</u>  Dr. D. S. Rajavel, Professor (Entomology)  Dr. Zadda Kavitha, Asst. Professor (Entomology)</p> <p><u>AC&amp;RI, KKM</u>  Dr. G. Ravi, Professor (Entomology)  Dr. N. Balakrishnan, Assoc. Professor (Entomology)</p> <p><u>ADAC&amp;RI, TRY</u>  Dr. C. Galice Leo Justin, Professor &amp; Head  Dr. P. Yasodha, Asst. Professor (Entomology)</p>	<p>Snakeguord, Green Chillies, Cauliflower, Beetroot, Curryleaf, Amaranthus, Coriander.</p> <p><u>ADAC &amp; RI, TRY</u></p> <ul style="list-style-type: none"> <li>• Collection of farm gate samples of variety of vegetables at monthly interval from Trichy district for residue analysis</li> <li>• Vegetables: Bhendi, Brinjal, Bitterguord, Snakeguord, Green Chillies, Amaranthus</li> </ul> <p><u>AC&amp;RI, MDU</u></p> <ul style="list-style-type: none"> <li>• Collection of farm gate samples of variety of vegetables at monthly interval from Madurai district for residue analysis</li> <li>• Vegetables: Bhendi, Brinjal, Tomato, Bitterguord, Snakeguord, Green Chillies.</li> </ul> <p><u>AC&amp;RI, KKM</u></p> <ul style="list-style-type: none"> <li>• Collection of farm gate samples of variety of vegetables at monthly interval from Tirunelveli district for residue analysis</li> <li>• Vegetables: Bhendi, Brinjal, Tomato, Bitterguord, Snakeguord, Green Chillies.</li> </ul> <p>No. of samples to be analyzed:  Minimum of 6 samples per vegetable/Centre/at bimonthly interval/year except CBE which will</p>	
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		<p>have 6 samples per vegetable at bimonthly intervals/year</p> <p><b>Observations to be recorded</b></p> <ul style="list-style-type: none"> <li>• Samples with detectable residues of major insecticides</li> <li>• No. of samples above FSSAI / CODEX MRL Residues mg/kg</li> </ul> <p>For Coimbatore</p> <ul style="list-style-type: none"> <li>• 11 vegetables: Bhendi, Brinjal, Tomato, Bitterguord, Snakeguord, Green Chillies, Cauliflower, Beetroot, Curryleaf, Amaranthus, Coriander</li> <li>• 6 samples per vegetable at bimonthly intervals/year (Total no. of samples – 6*11 = 66 samples per year)</li> </ul> <p>For TRY, KKM and MDU</p> <ul style="list-style-type: none"> <li>• 6 vegetables: As indicated in the table</li> <li>• 6 samples per vegetable at bimonthly intervals/year (Total no. of samples – 6*6 = 36 samples per year)</li> </ul>	
<b>Theme Leader:</b>	<b>Dr. K. Bhuvanewari, Professor (Entomology), TNAU, Coimbatore</b>		
<b>Action Plan-E3</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>



Assessing insecticide residues in Nendran banana in Kanyakumari District	<u>TNAU, CBE</u> Dr. K. Bhuvanewari, Prof (Ent) Dr. M. Paramasivam, Asst. Prof (Ag. Chem) <u>AC &amp; RI, KKM</u> Dr. G.Preetha, Asst. Prof (Ent)	Collection of samples at harvest for residue analysis (pseudostem, flowers and fruits)  <b>Observations to be recorded</b> <ul style="list-style-type: none"> <li>• Samples with detectable residues of insecticides</li> <li>• No. of samples above FSSAI / CODEX MRL / Residues mg/kg</li> </ul>	Status of pesticide residue in Nendran banana will be documented
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### Theme 3: Insect pests / diseases / nematodes monitoring

Theme Leader:	Dr. N. Sathiah, Professor and Head (Entomology) and Dr. G. Karthikeyan, Professor and Head (Plant Pathology), TNAU, Coimbatore		
Action Plan-E4	Scientist in charge and Centre	Activities	Deliverables
Monitoring Insect Pests of Horticultural Crops	Zone I: Incharge Dr. K. Bhuvanewari, Professor (Entomology) & Dr. P. Muthulakshmi, Assoc. Prof. (Pathology) TNAU, CBE Dr. T. Elaiyabharathi, Asst. Professor (Entomology) (Coimbatore Dt.) Dr. B. Vinothkumar, Asst. Professor (Entomology) (The Nilgiris Dt.) Dr. S. K. Manoranjitham, Assoc. Prof. (Pathology) (Coimbatore Dt.) Dr. M. Karthikeyan, Asst. Prof. (Pathology) (The Nilgiris Dt.) Dr. P.Vetrivel Kalai, Asst. Prof. (Nematology) (Coimbatore Dt.)	<ol style="list-style-type: none"> <li>1. Monitoring of pests and disease of fruits, vegetables, spices, flower and medicinal crops through Roving survey @ fortnight intervals in the identified district</li> <li>2. Depositing preserved samples of newer categories of insects with the TNAU Insect Biodiversity Laboratory for documentation and cataloguing</li> <li>3. Uploading the data in CPPS Pest and Diseases Monitoring Google Sheets immediately.</li> <li>4. Submission of high quality photos to the Theme Leader for preparation of Bulletin</li> <li>5. Reporting outbreak of pests to DCPPS</li> <li>6. Monthly pest monitoring report to</li> </ol>	Pest and disease status of horticultural crops Monthly pest monitoring report Bulletin by the Team of Scientists

	<p>Dr.P.Kalaiarasan, Asst. Prof (Nematology) (The Nilgiris Dt.) Dr.G.Jothi, Assoc.Prof. (Nematology) (Erode Dt.) CRS, ALR Dr. K. Alagar, Asst. Professor (Entomology) (Tiruppur Dt.) Dr. E. Rajeshwari, Assoc. Prof. (Pathology) (Tiruppur Dt.) KVK, Pongalur Dr. P.G.Kavitha, Asst. Prof. (Nematology) (Tiruppur Dt.) ARS, BSR Dr. K. Ganesan, Asst. Professor (Entomology) (Erode Dt.) Dr. Sangheetha Panickar, Prof. (Pathology) (Erode Dt.) TCRS,YPR Dr. B. Geetha, Assoc. Professor (Entomology) (Namakkal Dt.) Dr. P. Indra, Asst. Prof. (Pathology) (Salem and Namakkal Dts) KVK, SDR Dr. Suganya Kanna, Asst. Professor (Entomology) (Salem Dt. only plains) HRS, YCD Dr. M. Senthilkumar, Asst. Professor (Entomology) (Salem Dt. only hilly regions) RRS, PYR Dr. K. Govindan, Asst. Professor (Entomology)</p>	<p>the Government and other stakeholders</p>	
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	<p>(Dharmapuri and Krishnagiri Dt.) Zone II:Incharge Dr. M. Shanthi, Professor and Head, Department of Agrl. Entomology, AC&amp;RI, Madurai &amp; Dr. M. Theradimani, Professor and Head, Department of Plant Pathology, AC&amp;RI, Madurai AC&amp;RI, MDU Dr. K. Suresh, Asst. Professor (Entomology) Dindigul Dt. KVK, MDU Dr .B. Usharani, Asst. Professor (Entomology) (Madurai Dt.) Dr. K. Manonmani, Asst. Prof. (Pathology) (Dindigul Dt.) Dr. K. Kalpana, Asst. Prof. (Pathology) (Madurai Dt) HC &amp; RI, PKM Dr. P. Indiragandhi, Asst. Professor (Entomology) (Theni Dt.) Dr. R. Vimala, Professor (Pathology) (Theni Dt.) Dr. S. Prabhu, Asst.Prof.(Nematology) (Theni, Madurai and Dindigul Dts.) KVK, RMD Dr. S. Elanchezhyan, Asst. Professor (Entomology) (Ramanathapuram Dt.) NPRC, VBN Dr. S. Mohamed Jalalludin, Professor (Entomology) (Pudukottai Dt.)</p>		
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	<p>Zone III incharge:  Dr. C. Gailce Leo Justin, Professor and Head, Department of Crop Protection, ADAC&amp;RI, Trichy &amp;  Dr. K. Rajappan, Prof. and Head, Dept. of Crop Protection, HC&amp;RI(W), Trichy HC &amp; RI (W), TRY  Dr. R. P. Soundararajan, Assoc. Professor (Entomology) (Trichy Dt)  Dr. V. R. Saminathan, Assoc. Professor (Entomology) (Karur Dt.)  Dr. R. Thilagavathy, Asst. Prof. (Pathology) (Trichy, Karur and Perambalur Dts)  Dr. J. Jayakumar, Asst. Prof. (Nematology) (Trichy, Karur and Perambalur Dts.)  CRS, VPM  Dr. V.G. Mathirajan, Asst. Professor (Entomology) (Thanjavur, Mayiladuthurai and Thiruvarur Dts.)  Dr. M. Surulirajan, Asst. Prof. (Pathology) (Thanjavur, Mayiladuthurai and Thiruvarur Dts.)  Dr. M. Shanmugapriya, Asst. Prof. (Nematology) (Cauvery Delta districts)</p> <p>Zone IV incharge:  Dr. D. Dinakaran, Professor and Head, Department of Crop Protection, AC&amp;RI, Vazavachanur &amp;  Dr. S. Douressamy, Professor (Entomology), Department of Crop</p>		
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	<p>Protection, AC&amp;RI, Vazavachanur  AC&amp;RI, VVNR  Dr. S. Douressamy, Professor (Entomology)  (Thiruvannamalai Dt.)  Dr. M. Devanathan, Professor (Pathology)  (Thiruvannamalai Dt.)  Dr. M. Devivamani, Asst. Prof. (Pathology)  (Dharmapuri &amp; Krishnagiri Dts)  RRS, VRI  Dr. S. Jayaprabhavathi, Asst. Professor  (Entomology)  (Cuddalore Dt.)  Dr. C. Vijayaraghavan, Asst. Professor  (Entomology)  (Villupuram Dt.)  Dr. G. Senthilraja, Asst. Prof. (Pathology)  (Villupuram and Cuddalore Dts)  Dr.K.Senthamizh, Asst. Prof. (Nematology)  (Villupuram and Cuddalore dts.)  KVK, TKM  Dr. V.A. Vijayasanthi, Asst. Professor  (Entomology)  (Tirur and Kancheepuram Dts.)  RRS, Tirur  Dr. M. Malathi, Asst. prof (Pl. Path.)  (Tirur and Kancheepuram Dts)  Zone V incharge:  Dr. E. G. Ebenezar, Professor and Head,  Dept. of Plant Pathology, AC&amp;RI, Killikulam  &amp;  Dr. M. R. Srinivasan, Professor and Head,  Department of Agrl. Entomology, AC&amp;RI,  Killikulam  AC &amp; RI, KKM  Dr. G. Preetha, Asst. Professor</p>		
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	<p>(Entomology)  (Kanyakumari &amp; Tenkasi Dts.)  Dr. M. Ravi, Asst. Professor (Entomology)  (Thoothukudi and Tirunelveli Dts.)  Dr.S. Kannan, Professor (Pathology)  (Thoothukudi and Tirunelveli Dts.)  ARS, Aruppukkottai  Dr. P. Marreswari, Asst. Prof. (Pathology)  (Virudhunagar Dt.)  KVK, APK  Dr. J. Ramkumar, Asst. Professor  (Entomology)  (Virudhunagar Dt.)  Collection, preservation and documentation  of insects from different parts of the State*  Dr. N. Chitra, Assoc. Professor  (Entomology), TNAU, CBE  Dr. R. Arulprakash, Asst. Professor  (Entomology), TNAU, CBE  * update on methodology will be  communicated to the concerned Scientists  by the Curator of TNAU-Insect Museum</p>		
<b>Theme Leader:</b>	<b>Dr. R. Vishnupriya, Professor (Entomology), TNAU, Coimbatore</b>		
<b>Action Plan-E5</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Monitoring mite diversity in vegetable crops ecosystem in Tamil Nadu	<u>TNAU, CBE</u> Dr. R. Vishnupriya, Professor (Entomology) (Coimbatore Dt.) Dr. E. Sumathi, Assoc. Professor (Entomology) (The Nilgiris & Namakkal Dt.) Dr. V. Baskaran, Asst. Professor (Entomology) (Erode, Tiruppur Dt.) <u>HC&amp;RI(W), TRY</u> Dr. V. R. Saminathan, Assoc. Professor	Documentation of mite diversity in vegetable crops in Tamil Nadu through roving survey at fortnightly interval*. Specimens to be sent to the Professor and Head, Department of Agrl. Entomology, CPPS, TNAU, CBE for identification. * Protocol for survey, collection and transport will be communicated by the Theme Leader.	Status of mite diversity in vegetable crops of Tamil Nadu will be available Bulletin on mite diversity in vegetable ecosystem

	(Entomology) (Trichy & Karur Dts.) <u>HRS, YCD</u> Dr. M. Senthilkumar, Asst. Professor (Entomology) (Salem) <u>AC&amp;RI, VVNR</u> Dr. Y. S. Johnson Edward Thangaraj, Professor (Entomology) Thiruvannamalai Dt. <u>RRS, VRI</u> S. Jayaprabhavathi, Asst. Professor (Entomology) (Cuddalore and Villupuram Dts.) <u>KVK, MDU</u> Dr .B. Usharani, Asst. Professor (Entomology) (Madurai Dt.)		
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#### Theme 4: Pests, diseases and nematodes management in open/ protected cultivation

##### I. Fruit Crops

Theme Leader:	Dr. B. Vinothkumar, Asst. Professor (Entomology), TNAU, Coimbatore		
Action Plan-E6	Scientist in charge and Centre	Activities	Deliverables
Ecofriendly Management of Mango Stem borer	<u>TNAU, CBE</u> Dr. B.Vinothkumar, Asst. Professor (Entomology) <u>AC &amp; RI, KKM</u> Dr. G. Preetha, Asst. Professor (Entomology) <u>TCRS, YPR</u> Dr. B. Geetha, Assoc. Professor (Entomology)	T1 – Indigenous Bioformulation* T2 – Sealer cum Healer (IIHR formulation) T3 – Untreated check <b>Design: RBD</b> <b>Replications: 7</b> <b>Observations to be recorded</b> <ul style="list-style-type: none"> <li>• Pre-treatment count</li> <li>• Re-infestation of the stem borer</li> </ul> (* 10 g leaf powder of <i>Moringa olifera</i> (Moringa), <i>Sesbania grandiflora</i> (Agathi), <i>Vitex negunda</i> (Notchi), <i>Cardiospermum halicacabum</i> (Mudakathan Keerai), <i>Azadirachta indica</i> (Neem),	Bioformulation for the management of mango stem borer will be made available

		<i>Pongamia pinnata</i> (Pungam), 10 g pod powder of <i>Terminalia chebula</i> (Kadukkai) and 10 g resin powder of <i>Ferula asafoetida</i> (Asafoetida) with 20 g neem cake + 1 part water) Note: The herbal paste has to be freshly prepared and used	
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<b>Theme Leader:</b>	<b>Dr. M. Murugan, Professor (Entomology), TNAU, Coimbatore</b>		
<b>Action Plan-E7</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Biointensive Management of psyllids in citrus ecosystem	<u>TNAU, CBE</u> Dr. M. Murugan, Professor (Entomology) Dr. N. Chitra, Assoc. Professor (Entomology) <u>AC&amp;RI, MDU</u> Dr. D. J. Jayaraj, Professor (Entomology) <u>HC &amp; RI, PKM</u> Dr. C. Muthiah, Professor & Head (Entomology) <u>AC &amp; RI, KKM</u> Dr. N. Balakrishnan, Assoc. Professor (Entomology) <u>HC&amp;RI(W), TRY</u> Dr. R. P. Soundararajan, Assoc. Professor (Entomology)	<ul style="list-style-type: none"> <li>Morphological and molecular characterization of psyllids in citrus</li> <li>Identification of the vector (or) dispersal agent involved in citrus green</li> <li>Biointensive management of psyllids in citrus (protocol will be provided separately)</li> </ul>	Psyllid diversity and its management will be made available

<b>Theme Leader:</b>	<b>Dr. A. Kamalakannan, Professor (Pl. Pathology), TNAU, Coimbatore</b>		
<b>Action Plan-P1</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Monitoring the airborne inocula of mildew pathogens and standardization of spray schedule in	<u>TNAU, CBE</u> Dr. A. Kamalakannan, Professor (Pl. Pathology) <u>HC&amp;RI, PKM</u> Dr. R. Vimala, Professor (Pl. Pathology)	<ul style="list-style-type: none"> <li>Monitoring airborne inoculum of Grapevine mildews through LAMP assay and qPCR</li> <li>Standardization of spray schedule based on airborne inocula and weather parameters</li> </ul> <u>Observations to be recorded</u> <ul style="list-style-type: none"> <li>Mildew pathogens inoculum load</li> </ul>	Standardization of spray schedule based on airborne inocula and weather parameters



grapes (contd.)	(HC&RI, PKM and GRS, Theni)	<ul style="list-style-type: none"> <li>Mildew disease severity</li> </ul>	
<b>Theme Leader:</b>	<b>Dr. S. Nakkeeran, Professor (Pl. Pathology), TNAU, Coimbatore</b>		
<b>Action Plan-P2</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Banana endophyte mediated resistance against Fusarium wilt of banana (contd.)	<u>TNAU, CBE</u> Dr. S. Nakkeeran, Professor (P. Pathology) Dr. S. K. Manoranjitham, Assoc. Professor (Pl. Pathology) <u>AC&amp;RI, MDU</u> Dr. V. Ramamoorthy, Asst. Professor (Pl. Pathology) <u>HC&amp;RI, TRY</u> Dr. R. Thilagavathy, Asst. Professor (Pl. Pathology) <u>KVK, TPS</u> Dr. C. Kavitha, Asst. Professor (Pl. Pathology)	<ul style="list-style-type: none"> <li>Development of formulation</li> <li>Bio hardening by bacterial endophytes</li> </ul> <b>Method of Application:</b> Bio-hardening of seedlings @1% consortia (10 <sup>10</sup> cfu/ml) twice at fortnightly intervals. Soil drenching @ 1% consortia (10 <sup>10</sup> cfu/ml) at 2, 4, 6 and 8 months after planting. <b>Treatments</b> T1: <i>Bacillus velezensis</i> (VB7)+ <i>Brachybacterium paraconglomeratum</i> T2: <i>Bacillus velezensis</i> (VB7)+ <i>Strenatophomonas maltophila</i> T3: <i>B. velezensis</i> (VB7)+ <i>B. paraconglomeratum</i> + <i>S. maltophila</i> T4: Farmers Practice T5: Control <b>Observations to be recorded</b> <ul style="list-style-type: none"> <li>Plant height (cm)</li> <li>Stem girth (cm)</li> <li>Time taken for flower emergence,</li> <li>Bunch weight (kg)</li> <li>Number of hands per bunch</li> <li>Disease incidence (%)</li> <li>Fruit yield (kg/ha.) and C:B ratio</li> </ul>	Production of bio hardened banana plants for enhanced resistance to <i>Fusarium</i> wilt of banana.
<b>Theme Leader:</b>	<b>Dr. V. Paranidharan, Professor (Plant Pathology), TNAU, Coimbatore</b> <b>Dr. C. Muthiah, Professor and Head, Department of Crop Protection, HC&amp;RI, Periyakulam</b>		
<b>Action Plan-P3</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Citrus greening disease (Huanglongbing disease) in citrus	<u>TNAU, CBE</u> Dr. V. Paranidharan, Professor (Pl. Pathology) Dr. M. Murugan, TNAU, CBE	<ul style="list-style-type: none"> <li>Impact assessment of citrus greening disease</li> <li>Characterization of pathogen</li> <li>Development of diagnostics</li> <li>Interaction of vector</li> </ul>	Strategies for the management of citrus greening disease will be developed.

	<p>HC&amp;RI, PKM Dr. C. Muthiah, Professor &amp; Head Dr. R. Vimala, Professor (Pl. Pathology) AC&amp;RI, MDU Dr. K. Manonmani, Asst. Professor (Pl. Pathology) Dr. J. Jayaraj, Professor (Entomology)</p>	<p>Management strategies for citrus greening disease Treatments: T1: FYM (5Kg) + neem cake (500 g) + VAM &amp; <i>Bacillus</i> (250 g) + tetracycline 1000ppm T2: FYM (5Kg) + neem cake (500 g) + 600g N+ 500g P+ 700g K + micronutrient 250g as basal (Zn +Fe+ S+ Ca +Mg +Mn +B) + tetracycline 1000ppm T3: - FYM (5Kg) + neem cake (500 g) + VAM &amp; <i>Bacillus</i> (250 g) + 600g N+ 500g P+ 700g K + foliar spay 1g/l (A) Zn, Fe, Mn, B, Mg (B) P, K, Cu, Mg (C) Ca, Mn, Zn, Mg + tetracycline 1000ppm T4: FYM (5Kg) + neem cake (500 g) + VAM &amp; <i>Bacillus</i> (250 g) + 600g N + 500g P + 700g K + micronutrient 250g as basal (Zn +Fe+ S+ Ca +Mg + Mn +B) + foliar spay 1g/l (A) Zn, Fe, Mn, B, Mg (B) P, K, Cu, Mg (C) Ca, Mn, Zn, Mg + tetracycline 1000ppm T5: Control</p>	
<b>Theme Leader:</b>	<b>Dr. P. Mareeswari, Asst. Professor, RRS, Aruppukottai</b>		
<b>Action Plan-P4</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Evolving management strategies for major diseases of arid zone fruits (contd.)	<p>RRS, APK Dr. P. Mareeswari, Asst. Professor (Pl. Pathology) (Trials in 3 locations)</p>	<p>Evaluation of biocontrol agents and new fungicide molecules against fruit rot diseases under lab and field conditions. Treatments: T1 - Tebuconazole 25% + trifloxystrobin 75% WG @ 0.1% T2 - Fluopyram 17.7% + tebuconazole 17.7% SC @ 0.1% T3 - Flusilazole + carbendazim 37.5%WP @ 0.1% T4 - <i>Bacillus subtilis</i>-Bbv57 @ 0.5% T5 -Thyme oil 5 EC @ 1% T6 - Neem seed kernal extract @ 5% T7 - Thiophanate methyl 70%WP @ 0.1% T8 - Untreated control</p>	Strategies for the management of fruit rot diseases of manila tamarind and custard apple under field condition

		Observations to be recorded Disease severity (PDI) Fruit yield (t/ha)	
<b>Theme Leaders:</b>	<b>Dr. P. Vetrivelkai, Asst. Professor (Nematology), TNAU, Coimbatore</b> <b>Dr. A. Shanthi, Professor and Head (Nematology), TNAU, Coimbatore</b>		
<b>Action Plan-N2</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Root knot nematode, <i>Meloidogyne enterolobii</i> and <i>Fusarium</i> wilt disease complex in Guava (Conti..)	<u>TNAU CBE</u> Dr. P. Vetrivelkai, Asst.Professor (Nematology) Dr. N. Swarnakumari, Asst.Professor (Nematology) Dr. S.K. Manoranjitham, Assoc.Professor (Pl.t Pathology) <u>HC &amp;RI, PKM</u> Dr. S. Prabhu, Asst.Professor (Nematology) Dr. R. Vimala, Professor (Pl. Pathology) <u>VRS, PLRr:</u> Dr. K. Senthamizh, Asst.Professor (Nematology) Dr. V. Ravichandran, Asst.Prof (Pl. Pathology) <u>AC &amp; RI, VVNR</u> Dr. P. Senthilkumar, Asst.Professor (Nematology) Dr.M.Deivamani, Asst.Professor (Pl. Pathology)	<ul style="list-style-type: none"> <li>Consortia for the management of root knot nematode, <i>M. enterolobii</i> and wilt disease complex in guava</li> </ul> <b>Treatment details</b> T <sub>1</sub> - Consortia of <i>Lysinibacillus fusiformis</i> with <i>Bacillus subtilis</i> @60g / tree twice at 3 months interval T <sub>2</sub> – <i>Pochonia chlamydosporia</i> @ 100ml/tree with <i>Bacillus firmus</i> @ 100 ml/tree thrice at monthly intervals T <sub>3</sub> -Consortia of <i>L. fusiformis</i> and <i>B.subtilis</i> @60g / tree with <i>P. chlamydosporia</i> @ 100ml/tree and <i>Bacillus firmus</i> @ 100 ml/tree twice at 3 months interval T <sub>4</sub> - <i>P.lilacinum</i> @75g mixed with FYM/ pressmud 2.5kg with neem cake 250g/ tree twice at 3 months interval T <sub>5</sub> -Fluensulfone 2% G @ 60g/tree and Carbendazim (2g/lit) @ 2lit/tree twice at 3 months interval T <sub>6</sub> -Carbofuran 3G @ 60g/tree and Carbendazim (2g/lit) @ 2 lit/tree twice at 3 months interval T <sub>7</sub> - Untreated control <b>Observations to be recorded</b> Initial and final nematode population in soil, Root knot index, Wilt incidence, yield and C: B ratio.	Development of effective microbial consortia for the management of nematode wilt disease complex in guava
<b>Theme Leader:</b>	<b>Dr. N. Seenivasan, Associate Professor (Nematology), TNAU, Coimbatore</b>		
<b>Action Plan-N3</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Management of	<u>TNAU, CBE</u>	<ul style="list-style-type: none"> <li>Citrus nematode management in Acid lime</li> </ul>	Development of effective

citrus nematode on Acid lime (New)	Dr. N. Seenivasan, Assoc.Professor (Nematology) <u>HC &amp; RI, PKM</u> Dr. S. Prabhu, Asst.Professor (Nematology) <u>ADAC&amp;RI,TRY</u> Dr. J. Jayakumar, Asst.Professor (Nematology)	<p><b>Treatment details</b></p> <p>T<sub>1</sub>–Neem seed kernel extract 5% @ 4 lit/ha twice at 30 days interval</p> <p>T<sub>2</sub>- Liquid formulation of <i>Purpureocillium lilacinum</i>@ 4 lit/ ha</p> <p>T<sub>3</sub> – T<sub>1</sub> +T<sub>2</sub></p> <p>T<sub>4</sub>– Fluensulfone 2% G@ 60g/ tree</p> <p>T<sub>5</sub>– Carbofuran 3G@ 100g/ tree</p> <p>T<sub>6</sub>– Untreated control</p> <p><b>Observations to be recorded</b></p> <p>Initial and final nematode population in soil and root, yield and C:B ratio.</p> <p>Spore load (cfu),Soil colonization (cfu) , Water quality parameters (pH, EC and carbonates )</p>	management method for citrus nematode in Acid lime
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## II. Vegetables

Theme Leader	<b>Dr. M. Muthuswami, Professor (Ento.), TNAU, CBE (TL)</b> <b>Dr. N. Swarnakumari, Asst. Prof (Nem), TNAU, CBE (TL)</b>		
Action Plan-E8	Name of the Scientist & Centre	Activities	Deliverables
Management of insects, mites and nematode pests of cucumber under protected cultivation	<p><b><u>TNAU, CBE</u></b>  <u>(Coimbatore or Tiruppur &amp; Nilgiris Dts.)</u></p> <p>Dr. M. Muthuswami, Professor (Entomology)</p> <p>Dr. E. Sumathi, Assoc Professor (Entomology)</p> <p>Dr. A. Suganthi, Asst. Professor (Entomology)</p> <p>Dr. N. Swarnakumari, Asst. Professor (Nematology)</p> <p><b><u>AC &amp; RI, MDU &amp; HC&amp;RI, PKM</u></b>  <u>(Madurai or Dindigul Dt.)</u></p> <p>Dr. D. S. Rajavel, Professor (Entomology)</p>	<ul style="list-style-type: none"> <li>The action plan will be carried out jointly by the identified Scientists</li> <li><i>Purpureocillium lilacinum</i> and <i>Pochonia chlamydosporia</i> will be supplied by the Professor and Head (Nematology) to the participating centres</li> <li>Residue analysis of the produce will be carried out at each picking at TNAU, CBE and AC&amp;RI, MDU</li> </ul> <p><b>T1: IPM module for protected cultivation</b> (in a minimum area of 10 cents chosen from one polyhouse)</p> <ul style="list-style-type: none"> <li>Removal of root biomass from previous crop and weed plants for nematode management.</li> <li>Soil solarization with transparent polythene</li> </ul>	<ul style="list-style-type: none"> <li>Documentation of insects, mites and nematode pests of polyhouse-grown cucumber</li> <li>Management of insects, mites and nematode pests of polyhouse-grown cucumber</li> <li>Residues in cucumber fruits</li> </ul>

	<p>Dr. S. Prabhu, Asst. Professor (Nematology)  <b><u>HRS, YCD &amp; TNAU, CBE</u></b>  (Salem or Yercaud)  Dr. M. Senthilkumar, Asst. Professor (Entomology)  Dr. P. Kalaiyaran, Asst. Professor (Nematology)  <b><u>RRS, PYR &amp; TNAU, CBE</u></b>  (Dharmapuri or Krishnagiri Dt.)  Dr. K. Govindan, Asst. Professor (Entomology)  Dr. P. Kalaiyaran, Asst. Professor (Nematology)</p>	<p>sheet of 25 micron thickness for a period of 2 to 3 weeks during peak summer for nematode management.</p> <ul style="list-style-type: none"> <li>• Incorporation of bio enriched FYM/ vermicompost or both @ 1 ton per ac with 5 kg <i>Purpureocillium lilacinum</i> or <i>Pochonia chlamydosporia</i> for nematode management</li> <li>• Installation of light trap (4 hrs/day)-1 No.</li> <li>• Yellow sticky trap @ 4 Nos. &amp; fruit fly trap @ 1 No.</li> <li>• Azadirachtin 1% EC 2.0 ml / lit at 15<sup>th</sup> and 45<sup>th</sup> day after raising.</li> <li>• Imidacloprid 70 WG @ 35 g a.i. /ha. on 30<sup>th</sup> day.</li> <li>• Needbased application of Spiromesifen 22.90 SC 0.75ml/lit.</li> <li>• Application of liquid formulation of <i>Pochonia chlamydosporia</i> @ 0.25 ml/m<sup>2</sup> through drip at the time of planting and at 30,60 and 90 days after planting for nematode management.</li> </ul> <p><b>T2 : Farmers practice</b> (10 cents chosen from another polyhouse maintained by the same farmer in same location)  <b>T3 : Control</b> (from the same location)  Design: RBD  Replications: 7</p>	
<b>Theme Leader:</b>	<b>Dr. T. Elaiyabharathi, Asst. Professor (Entomology), TNAU, Coimbatore</b>		
<b>Action Plan-E9</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Management of <i>Zeugodacus cucurbitae</i> female fruit flies in gourds <i>vis-à-vis</i> bait lure	TNAU, CBE Dr. T. Elaiyabharathi, Asst. Professor (Entomology) <u>HC&amp;RI(W), TRY</u> Dr. M. Chandrasekaran, Asst. Professor (Entomology)	T1 – Guava + bait additives T2 – Methyl eugenol T3 – Control Design: RBD; Replications: 7 Observations to be recorded <ul style="list-style-type: none"> <li>• No. of fruit fly adults / trap</li> </ul>	Indigenous food bait lure will be available for ecofriendly management

	<p><u>HC &amp; RI, PKM</u> Dr. P. Indiragandhi, Asst. Professor (Entomology)</p>	<ul style="list-style-type: none"> <li>• Per cent fruit fly damage and per cent reduction over control</li> <li>• Yield and BC ratio</li> </ul> <p>Note: Traps, Bait additives and methyl eugenol will be supplied by CBE centre</p>	
<b>Theme Leader:</b>	<b>Dr. S. Jeyarajan Nelson, Professor (Entomology), TNAU, Coimbatore</b>		
<b>Action Plan-E10</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Management of mealybugs in tapioca	<p><u>TNAU, CBE</u> Dr. S. V. Krishnamoorthy, Professor (Entomology) (Coimbatore Dt) Dr. K. Premalatha, Asst. Professor (Entomology) (Tiruppur Dt.) Dr. S. Jeyarajan Nelson, Professor (Entomology) (Erode Dt.) Dr. R. Arulprakash, Asst. Professor (Entomology) (Namakkal Dt) <u>TCRS, YPR</u> Dr. B. Geetha, Assoc. Professor (Entomology) (Dharmapuri &amp; Krishnagiri Dt.) <u>KVK, SDR</u> Dr. Suganya Kanna, Asst. Professor (Entomology) (Salem Dt.) <u>AC&amp;RI, KKM</u> Dr. M. Ravi, Asst. Professor (Entomology) (Kanyakumari Dt.)</p> <p><u>Identification of the mealybug</u></p>	<p>T1: IPM Module 1</p> <ul style="list-style-type: none"> <li>❖ Clipping the terminal shoots</li> <li>❖ Collection and destruction of mealybug infested plants</li> <li>❖ Application of biorationals when infestation is moderate on need basis <ul style="list-style-type: none"> <li>❖ Azadirachtin 0.15% EC 5ml/l</li> <li>❖ FORS 2 ml/l</li> </ul> </li> <li>❖ Need based insecticide application in rotation <ul style="list-style-type: none"> <li>❖ Flonicamid 50 WG 0.3g/l</li> <li>❖ Thiamethoxam 25 WG 0.5g/l</li> <li>❖ Spirotetramet 150 OD 1.25ml/l</li> </ul> </li> </ul> <p>T2. IPM Module 2</p> <ul style="list-style-type: none"> <li>❖ Application of biorational when infestation is moderate <ul style="list-style-type: none"> <li>❖ Azadirachtin 0.15% EC 5ml/l</li> </ul> </li> <li>❖ Need based insecticide application in rotation <ul style="list-style-type: none"> <li>❖ Flonicamid 50 WG 0.3g/l</li> <li>❖ Thiamethoxam 25 WG 0.5g/l</li> <li>❖ Spirotetramet 150 OD 1.25ml/l</li> </ul> </li> </ul> <p>T3. Insecticides alone (Farmers Practice) T4. Untreated control Design: RBD; Replication: 5 Season: As per the district specific cropping season</p>	<p>Cost-effective management methods for mealybugs on cassava</p>

	<p><u>complex</u>  Dr. N. Chitra, Assoc. Professor  (Entomology), TNAU, CBE  Dr. R. Arulprakash, Asst. Prof(Ent)  TNAU, CBE</p>	<p><b>Observation to be recorded</b></p> <ul style="list-style-type: none"> <li>• No. of mealybug colonies/plant at 15 DAT and at fortnightly interval</li> <li>• Mealybug species record (Specimens have to be sent to TNAU, Coimbatore for documentation for which separate protocol will be sent by the identified Scientists)</li> <li>• Percent rosette damage at 15 DAT</li> <li>• Number of natural enemies (Infested shoots have to be collected and NE population enumerated for parasitoids and predators as per standard procedure)</li> <li>• Tuber yield (Kg)</li> <li>• BC Ratio</li> </ul>	
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### **Pests, diseases and nematodes management in open / protected cultivation**

#### **Vegetable Crops: Integrated Management of Thrips on Chillies**

##### **Action Plan-E11 : Theme : 4**

<b>Name of the Centre</b>	<b>Activities</b>	<b>Deliverables</b>
<p><b>RRS, VRI</b>  Dr.L.Alwin, AP (Ento)  Location : 1  Annagramam area  Dr.S.Jayaprabhavathi  AP (Ento.)  Location:2  Kurinjipadi area  Dr.C.Vijayaraghavan  AP (Ento.)  Location : 3  Bhuvangiri Area</p>	<p><b>Module:1</b></p> <ul style="list-style-type: none"> <li>• Seed treatment with thiamethoxam 30% FS-7.0/kg.</li> <li>• Border crop – closely spaced three rows of maize/3 rows of sorghum</li> <li>• Intercropping of cluster bean @ 6:1 ratio</li> <li>• Yellow sticky traps @ 50/ha placed at 30cm to 60cm above ground level to trap adult thrips</li> <li>• ETL based (5 thrips/leaf) application of fibronil 5% SC @ 800/ha / dimethate 30% EC @ 500 ml/ha/ thiacioprid 21.70% SC @ 300 ml/ha/ cyantranilprole 10.25% OD @ 600 ml/ha (use high volume sprayer)</li> </ul> <p><b>Module:2</b></p> <ul style="list-style-type: none"> <li>• Seed treatment with thiamethoxam 30% FS-7.0 /kg.</li> <li>• Border crop – closely spaced three rows of maize / 3 rows of sorghum</li> </ul>	<p>Integrated management capsule will be made available</p>

	<ul style="list-style-type: none"> <li>• Intercropping of Agathi @ 10:1 ratio</li> <li>• Yellow sticky traps @ 50/ha placed at 30cm to 60 cm above ground level to trap adult thrips</li> <li>• ETL based (5 thrips/leaf) application of fipronil 5% SC @ 800ha/dimethoate 30% EC @ 500 ml/ha/thiacloprid 21.70% SC @ 300 ml/ha/cyantraniliprole 10.25<sup>^</sup> OD @ 600 ml/ha (use high volume sprayer)</li> </ul> <p><b>Module:3</b></p> <ul style="list-style-type: none"> <li>• Farmer's Practice</li> </ul> <p><b>Design : RBD</b></p> <p><b>Replication : 7</b></p> <p><b>Observations to be recorded</b></p> <ul style="list-style-type: none"> <li>• Population of thrips from 3 leaves representing top, middle and bottom and expressed as number of thrips per leaf- observations should be recorded from 1 week after transplanting till the completion of vegetative stage.</li> <li>• Per cent reduction over control; Green pod yield and BC ratio.</li> </ul>		
<b>Theme Leader:</b>	<b>Dr. G. Karthikeyan, Professor and Head (Pl. Pathology), TNAU, Coimbatore</b> <b>Dr. U. Sivakumar, Professor (Agrl. Microbiology), TNAU, Coimbatore</b>		
<b>Action Plan-P5</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Field evaluation of endophytic <i>Bacillus pumilus</i> (TEB10) for plant growth promotion, yield enhancement and antagonistic potential against diseases of tomato	<u>TNAU, CBE</u> Dr. U. Sivakumar, Professor (Agrl. Microbiology) Dr. G. Karthikeyan, Professor and Head (Pl. Pathology) Dr. M. Karthikeyan, Asst. Professor (Pl. Pathology) <u>AC&amp;RI, MDU</u> Dr. K. Kalpana, Asst. Professor (Pl. Pathology) <u>HC&amp;RI (W), TRY</u> Dr. R. Thilagavathi, Asst. Professor (Pl. Pathology) <u>AC&amp;RI, KDM</u>	To evaluate the antagonistic effect of <i>Bacillus pumilus</i> (TEB10) for the suppression of damping off and wilt of tomato under controlled and field condition. <b>Nursery</b> T1- <i>Bacillus pumilus</i> (TEB10) - ST @ 10 g/kg of seed T2- <i>Bacillus pumilus</i> (Bbv 57) – ST @ 10 g/kg of seed T3- Metalaxyl-M 31.8% ES - ST @ 2 ml/kg of seed T4 – Untreated control  <b>Observations to be recorded</b> 1. Plant biometric (germination (%), root	<ul style="list-style-type: none"> <li>• <i>Bacillus pumilus</i> (TEB10) antagonistic potential against diseases of tomato will be evaluated under field condition.</li> <li>• Mode of action of <i>Bacillus pumilus</i> (TEB10) will be assessed</li> </ul>



	Dr. A, Vijayasamundeeswar, Asst. Professor (Pl. Pathology)	length (cm), shoot length (cm)) defence hormone (P solubilizing, siderophore, hydrolytic enzymes – cellulose and protease activity), yield (kg/ha) and suppression of damping off (%) and fusarium wilt (%) <b>Main field</b> T1 - <i>Bacillus pumilis</i> (TEB10) @ 2.5 kg /ha as soil application on 30 days after transplanting T2 - <i>Bacillus pumilis</i> (Bbv 57) @ 2.5 kg /ha as soil application on 30 days after transplanting T3 - Carbendazim @ 0.1 % soil drenching on 30 days after transplanting T4 – Untreated control <b>Observations to be recorded</b> • Damping off and fusarial wilt incidence (%) • Yield (kg/ha.) and BC ratio	
<b>Theme Leader:</b>	<b>Dr. V. Ramamoorthy, Asst. Professor (Pl. Pathology), AC&amp;RI, Madurai</b>		
<b>Action Plan-P6</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Assessment of gliotoxin producing <i>Trichoderma virens</i> for the management of damping off and fusarial wilt of tomato	<u>AC&amp;RI, MDU</u> Dr. V. Ramamoorthy, Asst. Professor (Pl. Pathology) <u>TNAU, CBE</u> Dr. M. Karthikeyan, Asst. Professor (Pl. Pathology) <u>HC&amp;RI, PKM</u> Dr. R. Vimala, Professor (Pl. Pathology) <u>HC&amp;RI, TRY</u> Dr. K. Rajappan, Professor (Pl. Pathology) <u>AC&amp;RI, KDM</u> Dr. A, Vijayasamundeeswari, Asst. Professor (Pl Pathology)	<b>Nursery</b> T1- <i>Trichoderma virens</i> Q strain - ST @ 4 g/kg of seed T2- <i>Trichoderma asperellum</i> (Tv1) – ST @ 4 g/kg of seed T3- Metalaxyl-M 31.8% ES - ST @ 2 ml/kg of seed T4 – Untreated control <b>Observations to be recorded</b> • Germination (%) • Disease incidence (%) • Plant height <b>Main field</b> T1 - <i>Trichoderma virens</i> Q strain @ 2.5 kg /ha as soil application on 30 days after transplanting T2 - <i>Trichoderma asperellum</i> (Tv1) @ 2.5 kg /ha as soil application on 30 days after transplanting T3 - Carbendazim @ 0.1 % soil drenching on 30	Development of gliotoxin producing <i>T. virens</i> for the management of damping off and fusarial wilt of tomato.

		<p>days after transplanting T4 – Untreated control</p> <p><b>Observations to be recorded</b></p> <ul style="list-style-type: none"> <li>• Damping off and fusarial wilt incidence (%)</li> <li>• Yield (kg/ha.) and BC ratio</li> </ul>	
<b>Theme Leader:</b>	<b>Dr. M. Karthikeyan, Asst. Professor (Pl. Pathology), TNAU, Coimbatore</b>		
<b>Action Plan-P7</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Integrated disease management of bacterial wilt in tomato and brinjal	<p><u>TNAU, CBE</u> Dr. M. Karthikeyan, Asst. Professor (Pl. Pathology)</p> <p><u>AC&amp;RI, KDM</u> Dr. A, Vijayasamundeeswari, Asst. Professor (Pl Pathology)</p> <p><u>AC&amp;RI, MDU</u> Dr. R. Akila, Asst. Professor (Pl. Pathology)</p> <p><u>RRS, ASD</u> Dr. R. Ramjegadesh, Asst. Professor (Pl. Pathology)</p>	<p>Seasonal occurrence of bacterial wilt in block wise in the district to be documented</p> <p><b>Field Experiment</b></p> <p>To.</p> <ul style="list-style-type: none"> <li>• Treat the seeds with talc based formulation of <i>Bacillus subtilis</i> (Bbv 57) @ 10g/1000g of seeds and soil application of antagonistic <i>Bacillus subtilis</i> (Bbv 57) @ 50g mixed with one kg of FYM and incorporated in the nursery bed.</li> <li>• Application of neem cake @ 150kg/ha</li> <li>• Growing marigold (<i>Tagetes</i> spp.) as intercrop.</li> <li>• Soil application of 15 days enriched <i>Bacillus subtilis</i> (Bbv 57) @ 2.5 kg / ha + 150 kg of well decomposed FYM before transplanting</li> </ul> <p>T1. Soil amendment with lime (1t/ha). T2. Seedling root dipping by streptomycin @ 200ppm followed by soil drenching of streptomycin @ 0.1g + copper oxychloride @ 2.5g per litre water at 10 days interval starting from 20 days after transplanting up to 70 days T3. Drenching of copper oxychloride @ 2.5g per litre at 10 days interval starting from 20 days after transplanting up to 70 days. T4. Drenching of copper hydroxide @ 2 g per litre at 10 days interval starting from 20 days after transplanting up to 70 days. T5. Drenching of liquid formulation of <i>Bacillus subtilis</i> (Bbv 57) @1% five times at 10 days</p>	<p>IDM package will be validated for the management of bacterial wilt in tomato and brinjal.</p>

		<p>interval starting from 20 days after transplanting.</p> <p>T6. IDM: Soil amendment with lime depending upon pH of the soil to make soil neutral + seedling root dipping by streptomycin @ 200ppm + soil drenching of streptomycin @ 0.1g + copper oxychloride @ 2.5g per litre water at 20 DAT and 60 DAT and application of copper hydroxide @ 2 g/l. at 40 DAT</p> <p>T7. Control</p> <p><b>Observations to be recorded</b></p> <ol style="list-style-type: none"> <li>1. Disease incidence (%)</li> <li>2. Fruit yield (t/ha)</li> </ol>	
<b>Theme Leader:</b>	<b>Dr. V.K. Parthiban, Professor (Pl. Pathology), TNAU, Coimbatore</b>		
<b>Action Plan-P8</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Management of postharvest spoilage of tomato	<p>TNAU, CBE</p> <p>Dr. V.K. Parthiban, Professor (Pl. Pathology)</p> <p>Dr. M. Karthikeyan, Asst. Professor (Pl. Pathology)</p> <p>AC &amp; RI, MDU</p> <p>Dr. V.Ramamoorthy, Asst. Professor (Pl. Pathology)</p> <p>HC&amp;RI (W), TRY</p> <p>Dr. R. Thilagavathi, Asst. Professor (Pl. Pathology)</p> <p>AC&amp;RI, KKM</p> <p>Dr. M. Paramasivam, Asst. Prof. Professor (Pl. Pathology)</p> <p>AC&amp;RI, KDM</p> <p>Dr. A, Vijayasamundeeswari, Asst. Professor (Pl. Pathology)</p>	<p><b>The cultures will be supplied by the lead scientist.</b></p> <p>The biocontrol agents will be tested against post-harvest diseases in tomato.</p> <p>Treatments:</p> <p>Fruit soaking of biocontrol agents for 5 min @ 0.1% concentration</p> <p>T1- <i>Trichoderma viride</i> (TNAUTV2)</p> <p>T2- <i>Saccharomyces cerevisiae</i> (TNAUSC5)</p> <p>T3- <i>Bacillus subtilis</i> (TNAUBC4)</p> <p>T4 – Untreated control (water)</p> <p>Design: CRD, Replication: 6</p> <p><b>Observations to be recorded</b></p> <ol style="list-style-type: none"> <li>1. Disease incidence / severity (%)</li> <li>2. Storability (Days)</li> </ol>	Development of postharvest management of tomato through biocontrol agents.
<b>Theme Leader:</b>	<b>Dr.A. Shanthi, Professor and Head (Nematology), TNAU, Coimbatore</b>		
<b>Action Plan-N4</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Integrated	TNAU, BE	<ul style="list-style-type: none"> <li>• Integrated management practice for potato cyst</li> </ul>	Development of

Nematode Management for cyst nematodes in Potato (New)	(Location: Ooty) Dr. A. Shanthy, Professor and Head (Nematology) <u>HC&amp;RI, KM</u> (Location: Kodaikanal) Dr. S. Prabhu, Asst. Professor (Nematology)	nematodes, <i>Globodera</i> spp., <b>Treatment details</b> T <sub>1</sub> -Soil drenching with <i>Pochonia chlamydosporia</i> @ 5 lit/ha with <i>Bacillus firmus</i> @ 5 lit/ha with soil application of neem cake@ 500 kg/ha and Intercrop with Mustard @3:1 ratio T <sub>2</sub> -Fluensulfone 2% G@ 25 kg/ha T <sub>3</sub> - Carbofuran 3G@ 33kg/ha T <sub>4</sub> -Untreated control. <b>Observations to be recorded</b> Initial and final cyst population in soil, female population in roots, yield and C:B ratio.	Integrated Management practice for cyst nematode, <i>Globodera</i> spp. in potato
<b>Theme Leader:</b>	<b>Dr. G. Jothi, Associate Professor (Nematology), TNAU, Coimbatore.</b>		
<b>Action Plan-N5</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Management of root knot nematode, <i>M. incognita</i> and <i>Fusarium</i> sp wilt disease complex in tomato and bittergourd using <i>Clonostachys rosea</i> (New)	TNAU, CBE Dr. G. Jothi, Assoc. Professor (Nematology) Dr. S. Vanitha, Professor (Pl. Pathology) <u>VRS, PLR</u> Dr. K. Senthamizh, Asst. Professor (Nematology) Dr. V. Ravichandran, Asst. Prof (Pl. Path.), SRS, Cuddalore <u>AC &amp; RI, VVNR</u> Dr. P. Senthilkumar, Asst. Professor (Nematology) Dr. M. Deivamani, Asst. Prof (Pl. Path.) <u>AC &amp; RI, ECK</u> Dr. M. Shanmuga Priya, Asst. Professor (Nematology) Dr. S. Madhiyalagan, Asst. Prof. (Pl. Path.)	<ul style="list-style-type: none"> <li>Management of root knot nematode, <i>M. incognita</i> and wilt disease complex in tomato and bittergourd using <i>Clonostachys rosea</i></li> </ul> <b>Treatment details</b> T <sub>1</sub> - Seed treatment with <i>Clonostachys rosea</i> @10g/kg seed T <sub>2</sub> - Soil application with <i>C. rosea</i> @ 6 kg/ha T <sub>3</sub> – Fluensulfone 2% G@ 10 kg/ha T <sub>4</sub> – Carbofuran 3G @ 33kg/ha T <sub>5</sub> - Untreated control <b>Observations to be recorded</b> Initial and final nematode population in soil, Root knot index, wilt incidence, yield and C:B ratio	Best method of application of <i>C. rosea</i> for the management of <i>M. incognita</i> and <i>Fusarium</i> sp wilt disease complex in tomato and bittergourd

<b>Theme Leader:</b>	<b>Dr.N.Swarnakumari, , Assistant Professor (Nematology), TNAU, Coimbatore.</b>		
<b>Action Plan-N6</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Assessment of spore dispersion and persistence of <i>Pochonia chlamydosporia</i> in drip irrigation system (New)	TNAU, CBE Dr.N.Swarnakumari, Asst.Professor(Nematology) ADAC & RI, TRY Dr. J. Jayakumar, Asst.Professor (Nematology) AC & RI, VVNR Dr. P.Senthilkumar, Asst.Professor (Nematology)	<ul style="list-style-type: none"> <li>Assessing the spore dispersion at every delivery point of emitters in cucumber and tomato.</li> <li>Documenting the quality parameters of drip irrigated water.</li> <li>Assessing mycelial colonization in soil at all emitters.</li> </ul> <p><b>Observations to be recorded</b></p> <ul style="list-style-type: none"> <li>Spore load (cfu),Soil colonization (cfu) Water quality parameters (pH, EC and carbonates.</li> </ul>	Confirmation of dispersion and persistence of spores of <i>P. chlamydosporia</i> through drip irrigation system.

#### IV. Spices and Plantation Crops

<b>Theme Leader:</b>	<b>Dr. G. Senthil Raja, Asst. Professor (Pl. Pathology), RRS, Vriddhachalam</b>		
<b>Action Plan-P9</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Management of die back and gummosis diseases in cashew	RRS, VRI Dr. G. Senthilraja, Asst. Professor (Pl. Pathology) Cuddalore Dt. KVK, VRI Dr. S. Maruthasalam, Asst. Professor (Pl. Pathology) Ariyalur Dt. NPRC, VBN Dr. P. Ahila Devi, Asst. Professor. (Pl. Pathology) Pudukkottai Dt.	Field testing of following fungicides (2 sprays at 15 days interval) for the management of die back and gummosis in cashew. T1: Tebuconazole 25 EC @ 0.1% T2: Propiconazole 25% EC @ 0.1% T3: Tebuconazole 50%+ trifloxystrobin 25% w/w WG (75 WG) @ 0.05% T4: Azoxystrobin 18.2% W/W + difenoconazole 11.4% W/W SC @ 0.1% T5: Zineb 68%+ hexaconazole 4% WP @ 0.2% T6: Thiophanate methyl 70 WP @ 0.1% T7: Untreated control <b>Observations to be recorded</b> <ul style="list-style-type: none"> <li>Disease incidence / severity</li> <li>Yield (kg/ha) and CB ratio</li> </ul>	Effective management package for die back and gummosis diseases in Cashew will be developed.

<b>Theme Leader:</b>	<b>Dr. G. Karthikeyan, Professor &amp; Head, Dept. of Pl. Pathology, TNAU, Coimbatore</b> <b>Dr. E. Rajeswari, Assoc. Professor (Pl. Pathology), CRS, Aliyar Nagar</b>		
<b>Action Plan-P10</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Management of root wilt in Coconut	<u>TNAU, CBE</u> Dr. G. Karthikeyan, Professor & Head (Pl. Pathology) Dr. S. Sundravadana, Asst. Prof. (Pl. Pathology) Dr. M. Murugan, Professor (Entomology) <u>CRS, ALR</u> Dr. E. Rajeswari, Assoc. Professor (Pl. Pathology) Dr. K. Alagar, Asst. Professor (Entomology) Dr. C. Sudhalakshmi, Asst. Professor (SS & AC) <u>RRS, ASD</u> Dr. R. Ramjegadesh, Asst. Professor (Pl. Pathology) <u>AC&amp;RI, KKM</u> Dr. N. Balakrishnan, Assoc. Professor (Entomology) for Sankarankoil <u>KVK, TPS</u> <u>Dr. C. Kavitha, Asst. Professor (Pl. Pathology)</u>	<b>Molecular Diagnosis:</b> Molecular diagnosis will be done at TNAU, CBE (Dr. S. Sundravadana, Asst. Prof. (Pl. Path.) in co-ordination with Dr. E. Rajeswari, Assoc. Prof. (Pl. Path.) and Dr. R. Ramjegadesh, Asst. Prof. (Pl. Path.)). All the centres should send the plant samples and vector samples to the lead scientists. <b>Phytoplasma – vector relationships:</b> Unravelling of the interaction between phytoplasma and its vectors <b>Management of root (wilt) disease:</b> T1: Recommended dose of fertilizers + SA of microbial consortia @200 g ( <i>Trichoderma asperellum</i> (Tv1) and <i>Bacillus subtilis</i> (Bbv 57) each at 100 g) + FYM @ 50kg + Phosphobacteria @ 100g + Azospirillum @ 100g + VAM @ 50/g palm/year (Two times at six months intervals) + SA of CuSO <sub>4</sub> (200g) + MgSO <sub>4</sub> @ 1000g/palm (CuSO <sub>4</sub> @ 100 g, MgSO <sub>4</sub> @ 500g should be applied alternatively at three months intervals twice in a year ) + Root feeding with tetracycline @ 1000 ppm (100 ml/palm) at three months intervals T2: Root feeding with tetracycline @ 1000 ppm (100 ml/palm) at three months intervals T3: Recommended dose of fertilizers T4: Control <b>Observations to be recorded</b> <ul style="list-style-type: none"> <li>• Root wilt incidence and severity (using the scale)</li> <li>• Leaves: Nutrients (N, P, K) concentration and</li> </ul>	<ul style="list-style-type: none"> <li>• Molecular diagnostics will be developed</li> <li>• Integrated disease management module for root (wilt) of coconut.</li> </ul>

		<p>micronutrients</p> <ul style="list-style-type: none"> <li>• Soil (Rhizosphere and Bulk)</li> <li>• pH</li> <li>• Electrical conductivity</li> <li>• Organic carbon</li> <li>• Available macronutrients</li> <li>• Coconut yield (Nuts / harvest) and C:B ratio</li> </ul>	
<b>Theme Leader:</b>	<b>Dr. S. Nakkeeran, Professor (Pl. Pathology), TNAU, Coimbatore</b>		
<b>Action Plan-P11</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Management of basal stem rot disease in coconut	<p><u>TNAU, CBE</u>  Dr. S. Nakkeeran, Professor (Pl. Pathology)  Dr. S. Sundravadana, Asst. Professor (Pl. Pathology)  <u>AC&amp;RI, MDU</u>  Dr. V. Ramamoorthy, Asst. Professor (Pl. Pathology)  <u>CRS, ALR</u>  Dr. E. Rajeswari, Assoc. Professor (Pl. Pathology)  <u>KVK, TPS</u>  Dr. S. Kavitha, Asst. Professor (Pl. Pathology)</p>	<p><b>Treatments</b>  T1: Coconut consortia @ 5% + VAM @100g + recommended dose of fertilizer  T2: Coconut consortia @ 5% + soil drenching with copper hydroxide @ 0.25% + recommended dose of fertilizer  T3: Farmers practice  T4: Control  <b>Method of Application:</b>  Soil drenching @ 5% consortia (<math>10^{10}</math>cfu/ml) in 1% butter milk + VAM 100g at bimonthly intervals.  Soil drenching @ 5% consortia (<math>10^{10}</math>cfu/ml) in 1% butter milk + 0.25% copper hydroxide at bi monthly intervals.  <b>Observations to be recorded</b></p> <ul style="list-style-type: none"> <li>• BSR disease severity using standard score chart.</li> <li>• Number of fronds</li> <li>• Number of fronds with yellowing and drooping symptom.</li> <li>• Number of fresh lesions and dried lesions/palm</li> <li>• Coconut yield (Nuts /harvest) and C:B ratio</li> </ul>	Coconut endophyte based consortia formulation for the management of basal stem rot of coconut will be developed.

#### IV. Medicinal and aromatic crops

Theme Leader: <b>Dr. P. Muthulaksmi, Assoc. Professor (Pl. Pathology), TNAU, Coimbatore</b>			
<b>Action Plan-P12</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
<i>Bacillus</i> mediated management of root rot diseases of <i>Gloriosa superba</i>	<p>TNAU, CBE Dr.P.Muthulaksmi, Assoc. Professor (Pl. Pathology) <u>MRS,VGR</u> Dr. R. Radha Jayalaksmi Asst. Professor (Pl. Pathology) <u>TCSR, YPR</u> Dr. N. Indra, Asst. Professor (Pl. Pathology)</p>	<ul style="list-style-type: none"> <li>• Consortia of effective <i>Bacillus</i> spp. will be tested against root rot/tuber rot pathogens in <i>Gloriosa</i> under field conditions.</li> <li>• Development of suitable delivery system</li> </ul> <p><b>Treatment details</b></p> <p>T1- Dipping tubers in talc based formulation of <i>Bacillus amyloliquifaciens</i> @ 1%. for 20 min.+ Soil drenching of talc based formulation of <i>Bacillus amyloliquifaciens</i> @ 1% on 30 and 60 DAP.</p> <p>T2- Dipping tubers in talc based formulation of <i>Bacillus endophyticus</i> @ 1% for 20 min.+ soil drenching of talc based formulation of <i>Bacillus endophyticus</i> @ 1% on 30 and 60 DAP</p> <p>T3- Dipping tubers in talc based formulation of <i>Bacillus</i> consortia @ 1% for 20 min.+ soil drenching of talc based formulation of <i>Bacillus</i> consortia @ 1% on 30 and 60 DAP</p> <p>T4- Dipping tubers in liquid based formulation of <i>Bacillus</i> consortia @ 1% for 20 min. + soil drenching of liquid based formulation of <i>Bacillus</i> consortia @ 1% on 30 and 60 DAP</p> <p>T5- Dipping tubers in talc based formulation of <i>Bacillus subtilis</i> (Bbv 57) @ 1% for 20 min. + soil drenching of talc based formulation of <i>Bacillus subtilis</i> (Bbv 57) @ 1% on 30 and 60 DAP</p> <p>T6- Dipping tubers in carbendazim @ 0.1 % (5 min.) + soil drenching with 0.1% carbendazim on 30 &amp; 60 DAP</p> <p>T7- Control.</p> <p><b>Observations to be recorded</b></p>	<p>Management strategy will be developed for the soil borne diseases of <i>Gloriosa superba</i>.</p>



		<ul style="list-style-type: none"> <li>• Disease incidence (%)</li> <li>• Seed yield (kg)/ha</li> </ul>	
<b>Theme Leader:</b>	<b>Dr. P. Muthulaksmi, Assoc. Professor (Pl. Pathology), TNAU, Coimbatore</b> <b>Dr. N. Swarnakumari, Asst. Professor (Nematology), TNAU, Coimbatore</b>		
<b>Action Plan-P13</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Development of IPM strategy for the management of collar rot /root rot and nematode disease complex in medicinal <i>Coleus</i>	<u>TNAU, CBE</u> Dr.P.Muthulaksmi, Assoc. Professor (Pl. Pathology) Dr. N. Swarnakumari, Asst. Professor (Nematology) <u>AC&amp;RI, VVNR</u> <u>Dr. P. Deivamani</u> Asst. Professor (Pl. Pathology) Dr. P. Senthil Kumar, Asst. Professor (Nematology) <u>HC&amp;RI(W), TRY</u> Dr. R. Thilagavathi, Asst. Professor (Pl. Pathology) Dr. J. Jayakumar, Asst. Professor (Nematology) <u>TCRS, YPR</u> Dr. N. Indra, Asst. Professor (Pl. Pathology)	<ul style="list-style-type: none"> <li>• Consortia of effective bio agents will be tested against collar rot /root rot pathogens and nematode complex in medicinal <i>Coleus</i> under field conditions.</li> <li>• Development of suitable delivery system</li> </ul> <b>Treatments:</b> T1-Basal soil application of <i>Bacillus subtilis</i> (Bs1) @ 2.5kg/ha + dipping cuttings in 0.2% <i>B. subtilis</i> (Bs1) + SA of <i>B. subtilis</i> (Bs1) on 30 DAP and 45 DAP+ <i>Pochonia chlamydospora</i> (TNAU Pc-001) @ 2.5 kg + 100 kg of FYM on 30 and 45DAP T2- <i>Pochonia chlamydospora</i> (TNAU Pc-001) @ 5 kg/ha + 250 kg of FYM T3-Liquid formulation of <i>Bacillus subtilis</i> (Bs1) @ 1 lit. /ha + <i>Pochonia chlamydospora</i> (TNAU Pc-001) @ 1 lit./ha (Jaggery 2 kg ) at the time of planting and 30 & 45 DAP T4- Dipping cuttings in carbendazim @ 0.1% for 10 minutes + spot drenching carbendazim @ 0.1% on 30 DAP and 45 DAP+ carbofuran 3 G @ 1 kg a.i T5- Farmers practice T6- Control. <b>Observations to be recorded</b> <ul style="list-style-type: none"> <li>• Disease incidence (%)</li> <li>• Nematode population in soil and root</li> <li>• Root-knot index</li> <li>• Tuber yield (kg/ ha)</li> </ul>	Integrated pest and disease management strategy will be developed for the fungal and nematode complex in <i>Coleus forskohlii</i> .

**Theme 5 : Collection and selection of potential mushroom strains/ species suitable for commercial utilization**

<b>Theme Leader:</b>	<b>Dr. G. Thiribhuvanamala, Assoc. Professor (P. Pathology), TNAU, Coimbatore</b>		
<b>Action Plan-P14</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Collection and selection of potential mushroom strains / species suitable for commercial utilization	<p>TNAU, CBE            Dr. G. Thiribhuvanamala, Assoc. Prof. (Pl. Pathology)  <u>AC&amp;RI, MDU</u>            Dr. M. Theradimani, Prof. and Head (Pl. Pathology)  <u>AC&amp;RI, KKM</u>            Dr. M. Paramasivam, Asst. Professor (Pl. Pathology)  <u>AC&amp;RI, KDM</u>            Dr. M. Revathy, Asst. Professor (Pl. Pathology)</p>	<p>Exploitation of mushroom biodiversity for commercial utilization  <b>Observations to be recorded</b></p> <ul style="list-style-type: none"> <li>• Collection of different mushroom species/ strains/ pure culturing and maintenance</li> <li>• Testing potential mushroom strains/ species for edibility/ industrial applications</li> </ul>	<p>Strengthening of mushroom culture collection, identifying promising strains/ species and developing mass production technology.</p>
<b>Theme Leader:</b>	<b>Dr. G. Thiribhuvanamala, Assoc. Professor (P. Pathology), TNAU, Coimbatore</b>		
<b>Action Plan-P15</b>	<b>Scientist in charge and Centre</b>	<b>Activities</b>	<b>Deliverables</b>
Medicinal mushroom and exploitation of biomolecules and dyes from mushrooms	<p>TNAU, CBE            Dr. G. Thiribhuvanamala, Assoc. Prof. (Pl. Pathology)  <u>FC&amp;RI, MTP</u>            Dr. M. Kumaran, Prof. and Head (For. Biol.&amp; Tree Improvement)            Dr. P. Radha, Asst. Professor (Nut. Biochem).</p>	<ul style="list-style-type: none"> <li>• Mass production of <i>P. sanguineus</i> and extraction of cinnabarin for testing dyeing of textiles</li> </ul> <p><b>Observations to be recorded</b></p> <ul style="list-style-type: none"> <li>• Production of <i>P. sanguineus</i> fruiting bodies</li> <li>• Extraction of cinnabarin</li> </ul> <p>Testing for industrial applications</p> <ul style="list-style-type: none"> <li>• The effect of biomolecules on crop disease management will be explored</li> </ul>	<p>Utilization of fungal based natural dye for eco-friendly industrial applications.            The effect of biomolecules from mushroom will be available for crop disease management</p>

## Special Action Plan – Agrl. Entomology

Action Plan-E16	Scientist in charge and Centre	Activities	Deliverables
<p>Large scale adoption of fruit fly management technology in guava</p>	<p><u>AC &amp; RI, MDU</u> Dr.J.Jayaraj, Professor (Agrl. Entomology)</p>	<p><b>Variety: Palamedu</b>  <b>Treatments:</b> T1: Application of neem oil 2% followed by NSKE 5% and <i>Acorus calamus</i> Rhizome extract 2% at weekly interval, 21 days prior to harvest of guava fruits            T2: Farmers' practice            T3: Untreated control  <b>Observations to be recorded</b></p> <ul style="list-style-type: none"> <li>• Per cent fruit fly infestation</li> <li>• Number of pupae/fruit</li> <li>• Yield (kg/tree) and cost benefit ratio</li> <li>• Estimate per cent reduction in fruit fly infestation over untreated control</li> <li>• <b>Locations:</b> 12 locations viz., Palamedu, Alanganallur, Alagapuri, Vadipatti of Madurai district @ three farmers field in each location.</li> <li>• <b>Plot area:</b> 25 cents for each treatment</li> </ul>	<p>Technology for the management of fruit fly in guava</p>

### C. REMARKS ON THE RESEARCH PROJECTS

S.No.	Project details	Remarks
<b>I.</b>	<b>FRUIT CROPS</b>	
a.	<b>Entomology</b>	
1.	<p><b>CPPS/PKM/ENT/FRU/2020/001</b>                      Population dynamics and management of borer pest complex of sapota using chemicals and bio agents                      Period: November 2019 to October 2022                      Dr.C.Muthiah, Professor and Head Horticultural College and Research Institute, Periyakulam</p>	<ul style="list-style-type: none"> <li>• To be continued</li> </ul>
2.	<p><b>CPPS/TPS/ENT/FRU/2018/CP 109</b>                      Baiting techniques for the management of banana pseudostem borer, <i>Odoiporus longicollis</i>                      Period: December 2018 to November 2021                      Dr. G. Preetha, Asst. Professor (Entomology), Agricultural College and Research Institute, Killikulam</p>	<ul style="list-style-type: none"> <li>• Mid-term corrections should be sent for the modification of management practices for the pseudostemborer</li> </ul>
3.	<p><b>CPPS/TRY/ENT/FRU/2020/002</b>                      Development of cost effective and eco-friendly IPM strategies for the management of fruit fly, <i>Bactrocera</i> spp. in mango ecosystem                      Period: October 2020 to September 2023                      Dr.M.Chandrasekaran, Assistant Professor (Entomology), Horticultural College and Research Institute for women, Tiruchirappalli</p>	<ul style="list-style-type: none"> <li>• To be continued</li> </ul>
4.	<p><b>CPPS/MDU/ENT/ FRU/2020/002</b>                      Studies on species complex, seasonal incidence, population dynamics and eco-friendly management of fruit fly in guava in Madurai district.                      Period: January 2019 to February 2020                      Dr. S. Manisegarane, Professor (Entomology), AC&amp;RI, Madurai</p>	<ul style="list-style-type: none"> <li>• Completion report approved</li> </ul>
	<b>CORE PROJECT</b>	
5.	<p><b>CPPS/CBE/ENT/FRU/2018/CP069</b>                      Encapsulated controlled release of methyl eugenol for the management of fruit flies in guava                      Period: November 2018 to September 2020                      Dr. S.Jeyarajan Nelson, Professor (Entomology), TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>• Completion report approved</li> </ul>

<b>b.</b>	<b>Plant Pathology</b>	
5	<p><b>CPPS / CBE/ PAT/ FRU/2017/001.</b>  Evaluation and testing of Mahaffee spore trap for the detection of air borne inocula of grapevine mildews  Period: September 2017 to August 2020  Dr. A. Kamalakannan, Professor (Pl. Pathology)  TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>Project may be continued and the extension proposal may be submitted immediately.</li> </ul>
6	<p><b>CPPS/CBE/PAT/FRU/2020/001.</b>  Banana endophyte mediated induction of <i>in planta</i> resistance against <i>Fusarium</i> wilt of banana  Period: January, 2020 - December, 2023  Dr. S. Nakkeeran, Professor (Pl. Pathology)  TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>Project may be continued</li> </ul>
7	<p><b>CPPS/MDU/PAT/FRU/2020/002</b>  Development of microbial formulations, a component of IDM package for Citrus Greening Disease (CGD) in acid lime  Period: September, 2020 - August, 2023  Dr. K.Manonmani, Asst. Professor (Pl. Patho.)  AC&amp;RI, Madurai</p>	<ul style="list-style-type: none"> <li>Project may be continued</li> </ul>
8	<p>New: Management of powdery mildew disease in Grapes (<i>Vitis vinifera</i>) using endophytic microorganisms and botanicals.  Period:  Dr. S. Vanitha, Profesor (Pl.Pathology)  HC&amp;RI, Periyakulam</p>	<ul style="list-style-type: none"> <li>Project proposal may be presented in RPAC for approval and the work may be initiated.</li> </ul>
<b>c.</b>	<b>Nematology</b>	
9.	<p>New: Evaluation of bacterial endophytes against root lesion nematodes, <i>Pratylenchus coffeae</i> and <i>Radopholus similis</i> in banana  Period: January, 2021- December, 2023  Dr. P. Vetrivelkai, Assistant Professor (Nematology) TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>Project may be continued</li> </ul>
	<b>CORE PROJECT</b>	
10	<p><b>CPPS/TRY/NEM/FRU/2018/CP094</b>  Management of citrus nematode by liquid bio-products applied through drip irrigation system.  Period: Sept, 2018- Sept, 2020  Dr. N. Seenivasan, Associate Professor (Nematology), TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>Completion report already submitted.</li> </ul>

<b>EXTERNAL FUNDED PROJECT</b>		
11	<p><b>DBT/CPPS/CBE/NEM/2018/R002</b>            Harnessing the potential of endophytes against root knot nematode, <i>Meloidogyne incognita</i> in banana            Period: April 2018- Sep.2021            Dr. P. Vetrivelkai, Assistant Professor (Nematology) TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>Project may be continued</li> </ul>
<b>AICRP PROJECT</b>		
12	<p><b>AICRP/PPS/CBE/NEM/003.</b>            Validation of liquid formulation of <i>P. chlamydosporia</i> to mitigate root-knot nematode, <i>Meloidoyne enterolobii</i> infestation in guava.            Period: Aug. 2020 - Sep. 2022            Dr. N. Swarnakumari, Asst. Professor (Nematology)            Dept. of Nematology, TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>Project may be continued</li> </ul>
II.	<b>VEGETABLE CROPS</b>	
<b>a.</b>	<b>Entomology</b>	
1.	<p><b>CPPS/CBE/ENT/VEG/2018/002</b>            Dissipation pattern of insecticides applied on tomato agroecosystem            Period: April 2018 to March 2021            Dr. B. Vinothkumar, Assistant Professor (Entomology), Department of Agricultural Entomology, TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>To be continued</li> </ul>
2.	<p><b>New</b>            Decontamination of organophosphorous and neonicotinoid insecticide residues in okra and chilli            Period: July, 2020 - July 2022            Dr. K.Bhuvaneswari, Professor (Entomology)            Department of Agricultural Entomology, TNAU, Coimbatore.</p>	<ul style="list-style-type: none"> <li>To be continued</li> </ul>
<b>b.</b>	<b>Plant Pathology</b>	
3.	<p><b>CPPS/MDU/PAT/VEG/2017/002.</b>            Development and validation of endospore based formulation of <i>Bacillus</i> sp. for the management of major soil borne diseases of tomato            Period: Oct, 2017 to Nov, 2020            Dr. S. Harish, Asst. Prof. (Pl. Path)            Dept. of Plant Pathology, TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>The project may be closed and completion report may be submitted on or before 30<sup>th</sup> June, 2021.</li> </ul>
4.	<p>New: Exploring <i>Bacillus</i> spp. for the management of <i>Peanut bud necrosis virus</i> in</p>	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>

	tomato Period: March 2021 To February 2024 Dr. S. Harish, Asst. Prof (Pl. Path) Dept. of Plant Pathology, TNAU, Coimbatore	
5.	<b>CPPS/CBE/PAT/FRU/2020/002.</b> Survey and management of bacterial wilt ( <i>Ralstonia solanacearum</i> ) in tomato Period: Jan, 2020 to Dec, 2022) Dr. M. Karthikeyan, Asst Prof (Pl. Path) Dept. of Veg. Science, TNAU, Coimbatore	<ul style="list-style-type: none"> <li>Seasonal occurrence of bacterial wilt to be documented and the project may be continued.</li> </ul>
6.	<b>CPPS/CBE/PAT/VEG/2020/001.</b> Management of Postharvest Spoilage of tomato through alternative methods. Period: September 2019 to August 2022 Dr. V.K. Parthiban, Professor (Pl. Path.), Dept. of Plant Pathology, TNAU, Coimbatore	<ul style="list-style-type: none"> <li>The results have not been presented in CSM. The project may be continued.</li> </ul>
7.	<b>CPPS/MDU/PAT/VEG/2017/001</b> Documentation of Begomoviruses infecting brinjal and their Management through Integrated Approach Period: April, 2017 to June, 2020 Dr. K. Kalpana, Asst Prof (Pl. Path) Dept. of Plant Pathology, AC& RI, Madurai	<ul style="list-style-type: none"> <li>The project may be closed and completion report may be submitted on or before 30<sup>th</sup> June, 2021. A new URP may be proposed on or before 30<sup>th</sup> June 2021.</li> </ul>
8.	<b>CPPS/ VRM/ PAT/ VEG/ 2018/ 001.</b> Development of integrated disease management module for viral and phytoplasma diseases of brinjal Period: January, 2018 to December, 2020 Dr. D. Dinakaran, Professor and Head ARS, Virinjipuram – 632 104	<ul style="list-style-type: none"> <li>The project may be closed and completion report may be submitted on or before 30<sup>th</sup> June, 2021. A new URP may be proposed on or before 30<sup>th</sup> June 2021.</li> </ul>
9.	<b>CPPS/MDU/PAT/VEG/2020/001</b> Exploration of Ashwagandha for the management of chilli anthracnose Period: May 2020- June 2023 Dr. R. Akila, Asst. Prof. (Pl. Path) Dept. of Plant Pathology, AC& RI, Madurai	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
10.	<b>CPPS / CBE / PAT / VEG / 2018 / 001.</b> Evaluation of micronutrients towards the development of an IPM strategy for the virus diseases management in cucurbitaceous vegetable, snake gourd Period: April, 2018 to March, 2021 Dr. G. Karthikeyan, Professor and Head Dept. of Plant Pathology, TNAU, Coimbatore 641 003	<ul style="list-style-type: none"> <li>The project may be closed since the technology has been approved for adoption and completion report may be submitted on or before 30<sup>th</sup> June, 2021. A new URP may be proposed in the same line on bitter gourd.</li> </ul>
11.	<b>CPPS/APK/PAT/VEG/2020/001</b> Management of twister blight disease of onion in rainfed areas of Virudhunagar district.	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>

	Period: August 2020 - March 2023 Dr. P. Mareeswari, Asst. Prof. (Plant Pathology) Regional Research Station, Aruppukottai	
12.	<b>CPPS/MDU/PAT/VEG/2020/001</b> Exploring <i>Trichoderma</i> spp. and <i>Bacillus</i> spp. for the management of basal rot ( <i>Fusarium oxysporum</i> f.sp. <i>cepae</i> ) of onion Period: July 2020 to June 2023 Dr. S. Thiruvudainambi, Professor (Plant Pathology) AC&RI, Madurai 625 104	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
13.	<b>CPPS/TRY/PAT/VEG/2020/001</b> Integrated management of onion downy mildew disease Period: October 2019 to September 2022 Dr. R. Thilagavathi, Asst. Prof. (Pl. Path.) Dept. of Plant Protection, HC & RI (W), Trichy	<ul style="list-style-type: none"> <li>The trials may be conducted in disease prone areas. The project may be continued.</li> </ul>
14.	<b>CPPS/YTP/PAT/TUB/2018/001.</b> Integrated management of cassava mosaic disease in tapioca Period: October, 2018 to September, 2021 Dr.N. Indra, Asst. Prof. (Pl. Pathology) TCRS, Yethapur,	<ul style="list-style-type: none"> <li>The project may be continued with revised treatments.</li> </ul>
<b>Mushroom</b>		
15.	<b>CPPS/CBE/PAT/MUS/2019 /001</b> Standardization of techniques for commercial cultivation of paddy straw mushroom Period: April 2019 to March 2021 Dr. G. Thiribhuvanamala, Assoc. Prof. (Pl. Path.), TNAU, Coimbatore	<ul style="list-style-type: none"> <li>The project may be closed and completion report may be submitted on or before 30<sup>th</sup> June, 2021. A new URP may be proposed on or before 30<sup>th</sup> June 2021.</li> </ul>
16.	<b>CPPS/CBE/PAT/NEW.</b> Collection and Evaluation of antibacterial Ascomycetes and Basidiomycetes wild fungi from Western Ghats Period: July-2020 to June-2023 Dr.V. Paranidharan, Professor (Pl. Path.) TNAU, Coimbatore	<ul style="list-style-type: none"> <li>Identify the mushroom species having antibacterial properties. The project may be continued.</li> </ul>
17.	<b>CPPS/KDM/PAT/MUS/2019/001</b> Collection and identification of edible mushroom species from natural habitat of Gaja cyclone affected areas of Pudukkottai district and assessing their edibility Period: June 2019 to May 2020 Dr. N. Revathy, Assoc. Prof. (Pl. Path.) AC&RI, Kudumiyamalai.	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
18.	<b>CPPS/KKM/PAT/MUS/2020/001</b> Development of short duration, Temperature tolerant and High Yielding elite <i>Pleurotus</i>	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>



	mushroom Period: July 2020 to June 2023 Dr. M. Paramasivam, Asst. Prof. (Pl. Path.), AC&RI, Killikulam	
19.	New : Assessment of high yielding strains of milky mushroom and standardization of cultivation techniques for promising strain Period: June 2020- May 2022 Dr. K. Manonmani, Asst. Prof. (Pl. Path.) AC&RI, Madurai	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
<b>c.</b>	<b>Nematology</b>	
20.	<b>CPPS/CBE/NEM/VEG/2017/001.</b> Biocontrol potential of egg parasitic fungus, <i>Purpureocillium lilacinum</i> against root knot nematode, <i>Meloidogyne incognita</i> on tomato. Period: Sep 2017 to Aug 2020 Dr.A.Shanthi, Professor (Nematology) Department of Nematology, TNAU, Coimbatore	<ul style="list-style-type: none"> <li>Completion report may be submitted.</li> </ul>
21.	<b>CPPS/ CBE/ NEM/ 2019/001.</b> Harnessing the biocontrol potential of the nematophagous fungus <i>Lecanicillium lecanii</i> against root knot nematode in tomato Period: April 2019 to March 2021 Dr. G.Jothi, Assoc. Prof. (Nematology) Department of Nematology, TNAU, Coimbatore	<ul style="list-style-type: none"> <li>Completion report may be submitted.</li> </ul>
22.	<b>CPPS/VNR/NEM/VEG/2019/001.</b> Isolation of native nematode parasitic fungus: as a tool for the management of root knot nematode, <i>Meloidogyne incognita</i> on tomato at north eastern zone Period: March 2019 - Feb 2022 Dr. P. Senthilkumar, Asst. Prof. (Nematology) AC&RI, Vazhavachanur	<ul style="list-style-type: none"> <li>The project may be continued. The</li> <li>new isolates should be identified and get the accession number.</li> </ul>
23.	<b>CPPS/PLR/NEM/VEG/2018/001.</b> Management of root knot nematode, <i>Meloidogyne incognita</i> in brinjal Period: Nov 2018 to Oct 2021 Dr. K. Senthamizh, Asst. Prof. (Nematology) VRS, Palur	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
24.	<b>CPPS/CBE/NEM/VEG/2020/001.</b> Metabolomic analysis on nematotoxic potential of <i>Simarouba glauca</i> (the paradise tree) leaf and bark extracts against root knot nematode, <i>Meloidogyne incognita</i> in solanaceous vegetables Period: April 2019-March 2022 Dr. P.G. Kavitha, Asst. Prof. (Nematology) Department of Nematology, TNAU,	<ul style="list-style-type: none"> <li>The project may be continued. The technical programme should be carried out as per the objectives.</li> </ul>

	Coimbatore- 641 003	
25.	<b>CPPS/PPI/NEM/VEG/2019/001.</b> Study the efficacy of bioagents on nematode management in bhendi. Period: August 2019 – July 2021 Dr. T. Senthilkumar Asst. Prof. (Nematology) HRS, Pechiparai	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
26.	<b>CPPS/CBE/ NEM/ VEG/ 2018 /001.</b> Biocontrol of root - knot nematode, ( <i>Meloidogyne incognita</i> ) in cucumber. Period: April 19 to March 2021 Dr. G. Jothi Assoc.Prof. (Nematology) Department of Nematology, TNAU, Coimbatore-641003.	<ul style="list-style-type: none"> <li>Completion report may be submitted.</li> </ul>
27.	<b>CPPS/CBE/NEM/VEG/2019/001.</b> Evolving an integrated nematode management for cucumber and capsicum grown under polyhouse condition. Period: August 2019 to July 2022 Dr. P. Kalaiarasan, Asst. Professor (Nematology) Department of Nematology, TNAU,Coimbatore-641003.	<ul style="list-style-type: none"> <li>The project may be continued. The technology module should be developed for cucumber and capsicum under protected cultivation.</li> </ul>
28.	<b>CPPS/PLR/NEM/VEG/2018/001.</b> Survey and identification of nematode associated with vegetables in Cuddalore district. Period: Nov 2018 to Oct 2021 Dr. K. Senthamizh Asst. Professor (Nematology) VRS, Palur, Cuddalore District.	<ul style="list-style-type: none"> <li>The project may be continued. The map should be developed for distribution of nematodes.</li> </ul>
<b>III.</b>	<b>SPICES AND PLANTATION CROPS</b>	
1.	<b>CPPS/VPM/AEN/SPC/2019/001</b> Identification of coconut hybrids, dwarf genotypes and local tall ecotypes for resistance against major coconut pests and diseases for the Eastern zone of Tamil Nadu Period: Apr. 2019 to May 2022 Dr.V.G.Mathirajan, Asst.Prof. (Ento.) Dr. M. Surulirajan, Asst. Prof. (Plant Patho.) Coconut Research Station, Veppankulam	<ul style="list-style-type: none"> <li>To be continued</li> </ul>
2.	<b>CPPS/KDM/ENT/2020/001</b> Damage Potential and Management of Rhinoceros Beetle in Juvenile Coconut Gardens being established after Gaja Cyclone in Thanjavur District Period: Jan.2020 to Dec.2022	<ul style="list-style-type: none"> <li>To be continued</li> </ul>

	Dr.V.G.Mathirajan, Asst.Prof. (Ento.) Coconut Research Station, Veppankulam	
3.	<b>CPPS/VPM/ENT/SPS/2018/CP179</b> Pheromone monitoring and mass trapping of red palm weevil in 'Gaja' cyclone affected coconut gardens of Thanjavur District Period: Jan.2019 to Sep.2020 Dr.V.G.Mathirajan, Asst.Prof. (Ento.) Coconut Research Station, Veppankulam	<ul style="list-style-type: none"> <li>• Completion report should be submitted on or before 31.5.2021</li> <li>• Publication may be made in high rated journals</li> </ul>
4.	<b>CPPS/ENT/KKM/SPC/2020/001</b> Augmentation and Conservation of beneficial insects for the sustainable management of Rugose Spiralling Whitefly in coconut gardens Period: July 2020-June 2023 Dr. T. Abdul Razak, Professor (Entomology), AC & RI, Killikulam	<ul style="list-style-type: none"> <li>• To be continued</li> </ul>
	<b>CORE PROJECT</b>	
5.	<b>CPPS/ CBE/ ENT/ SPC/ 2018/ CP070</b> Bio-intensive management of Rugose spiraling whitefly, <i>Aleurodicus rugioperculatus</i> Martin in coconut Period: Oct. 2018 – Sept. 2020 Dr. T. Srinivasan, Asst. Professor (Entomology), TNAU, Coimbatore	<ul style="list-style-type: none"> <li>• Completion report approved</li> </ul>
6.	<b>CPPS/ECK/ENT/SPC/2021/001</b> Bioecology and management of coconut rugose spiraling whitefly (RSW) <i>Aleurodicus rugioperculatus</i> Martin Period: September 2020– October 2022 Dr. A.Kalyana sundaram, Associate Professor (Ento.), AC&RI, Echangkottai, Thanjavur	<ul style="list-style-type: none"> <li>• To be continued</li> </ul>
7.	New: Dissipation pattern of chlorantraniliprole and thiamethoxam in curry leaf Period: July, 2020 - July 2022 Dr. K.Bhuvaneswari , Professor (Entomology) Department of Agricultural Entomology, TNAU, Coimbatore.	<ul style="list-style-type: none"> <li>• Hazard index may be worked out for all detected pesticides</li> </ul>
	<b>CORE PROJECT</b>	
8.	<b>CPPS/ENT/SPC/2018/CP018</b> (Core project) Insect diversity studies and standardization of mass multiplication potential natural enemies for curry leaf insect pests Period: September 2018 to March 2020 Dr.N.Chitra, Associate Professor (Entomology) Department of Agricultural Entomology, TNAU, Coimbatore.	<ul style="list-style-type: none"> <li>• Completion report should be submitted on or before 31.5.2021</li> </ul>
9.	<b>CPPS/PKM/ENT/SPC/2020/001</b> Biological nanoparticles for the management of	<ul style="list-style-type: none"> <li>• To be continued</li> <li>• Monthly report for the URP should be</li> </ul>

	cigarette beetle, <i>Lasioderma serricornis</i> (Fabricius) and pathogens ( <i>Aspergillus flavus</i> , <i>Alternaria alternate</i> and <i>Fusarium oxysporum</i> ) of stored coriander seeds Period: July, 2020 to June, 2022 Dr. M. Kannan, Assistant Professor (Entomology), Department of Nano Science & Technology, TNAU, Coimbatore Dr. S. Sundravadana Assistant Professor (Pl. Pathology), Department of Spices and Plantation Crops, TNAU, Coimbatore	submitted to the HDAE
<b>b.</b>	<b>Plant Pathology</b>	
10.	<b>CPPS/BSR/PAT/SPC/2019/001.</b> Studies on the effect of silicon on the control of rhizome rot, leaf blotch and leaf spot of turmeric. Period: March 2019 to April 2022 Dr. Sangeetha Panicker, Professor, ARS, Bhavanisakar	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
11.	<b>CPPS/CBE/PAT/SPC/2019/001.</b> Enumeration of mycoflora associated with coriander ( <i>Coriandrum sativum</i> L.) seeds, their deteriorative effects and management. Period: September 2019 to March 2022 Dr. S. Sundravadana, Assistant Professor, Department of Spices and Plantation Crops, TNAU, Coimbatore.	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
12.	<b>CPPS/ALR/PAT/CNT/2020/001.</b> Development of integrated disease management strategy for bud rot in coconut. Period: October 2019 to December 2022 Dr. E. Rajeswari, Associate Professor CRS, Aliyar Nagar	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
<b>c.</b>	<b>Nematology</b>	
1	<b>CPPS/PPI/NEM/BLP/2019/001.</b> Bio-seedlings for nematode management in Black pepper Period: August.2019 to July.2022 Dr. T. Senthilkumar, Asst. Professor (Nematology), Horticultural Research Station, Pechiparai	<ul style="list-style-type: none"> <li>The project may be continued.</li> </ul>
<b>IV.</b>	<b>Medicinal and Aromatic &amp; Flower Crops</b>	
<b>a.</b>	<b>Entomology</b>	
1.	<b>CPPS/TRY/ENT/FLO/2020/001</b> Bio-suppression of mealybugs in flower crops Period: July 2020 to June 2023 Dr. G. Preetha, Asst. Professor (Entomology)	<ul style="list-style-type: none"> <li>To be continued</li> </ul>

	Agricultural College and Research Institute, Killikulam	
2..	<p><b>CPPS/TRY/ENT/FLO/2020/001</b> Insecticide Resistant Management of Jasmine bud worm, <i>Hendecasis duplifascialis</i> in Tamil Nadu Period: December 2019 to November 2021 Dr.R.P.Soundararajan, Associate Professor (Ento.), Horticultural College &amp; Research Institute for Women, Trichy Dr.K.Ganesan, Asst. Prof. (Ento.), ARS, Bhavanisagar Dr.K.Suresh, Asst. Prof. (Ento.), AC&amp;RI, Madurai</p>	<ul style="list-style-type: none"> <li>• Madurai centre may be deleted</li> <li>• Proposal may be submitted for extension of the project for six months</li> </ul>
<b>b.</b>	<b>Plant Pathology</b>	
3.	<p><b>CPPS/CBE/PAT/MED/2018/001</b> <i>Bacillus</i> spp. mediated management of root rot diseases of <i>Gloriosa superba</i> Period: January 2018 to Dec.2020 Dr. P. Muthulakshmi, Assoc. Prof. (Pl. Path.), HC&amp;RI, TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>• The status of completion report may be updated.</li> </ul>
<b>c.</b>	<b>Nematology</b>	
4.	<p><b>CPPS/CBE/NEM/MED/2019/001.</b> Evaluation of <i>Pochonia chlamydosporia</i> for the management of root-knot nematode, <i>Meloidogyne incognita</i> in medicinal coleus (<i>Coleus forskoholii</i>) <b>Period:</b> Oct. 2019 - Sep. 2021 Dr. N. Swarnakumari, Asst. Professor (Nematology) Dept. of Nematology, TNAU, Coimbatore</p>	<ul style="list-style-type: none"> <li>• The project may be continued.</li> </ul>

## VII GENERAL REMARKS

1. Priority to be given for the root wilt disease in coconut and development of management strategies to manage the disease (Action: TNAU, Coimbatore and CRS, Aliyarnagar).
2. Management of basal stem rot disease in coconut through microbial consortia may be taken up through action plan projects (Action: TNAU, Coimbatore and CRS, Aliyarnagar).
3. The Plant Pathologist working at ARS, Aruppukottai may be involved in other action plan works in addition to routine works based on cropping status. The Pathologist at ARS, Aruppukottai has to submit a status report on the technologies developed so far and popularized for management of diseases in arid zone fruits (Action: Plant Pathologist, ARS, Aruppukottai).
4. Holistic strategy may be developed for pest, disease and nematode under protected cultivation in cucumber (Action: Agrl. Entomology, and Nematology, TNAU, Coimbatore).
5. In the adoption proposals in future, the cost of each treatment should be given (Action: All the scientist conducting OFT).
6. Compatibility chart may be prepared for all the formulations of pesticides used in horticulture crops (Action: Professor and Head, Dept. of Agrl. Entomology).

## VIII LIST OF PARTICIPANTS

S. No.	DIRECTORATES, RESEARCH STATIONS, KVKS AND DEPARTMENTS
1.	Directorate of Research, TNAU, Coimbatore
2.	Dr.K.Sooriyathasundram- Controller of Examination, TNAU, Coimbatore
3.	Directorate of Extension Education, TNAU, Coimbatore
4.	Directorate of Open and Distance Learning, TNAU, Coimbatore
5.	Centre for Plant Protection Studies, TNAU, Coimbatore
6.	Center for Plant Molecular Biology, TNAU, Coimbatore
7.	Director, Seed Center, TNAU, Coimbatore
8.	Director of Natural Resource Management, TNAU, Coimbatore
9.	Directorate of Crop Management, TNAU, Coimbatore
10.	Centre for Plant Breeding and Genetics, TNAU, Coimbatore
11.	Director Water Technology Centre, TNAU, Coimbatore
12.	Director TRRI, Aduthurai, TNAU, Coimbatore
13.	Dean(Hort.), TNAU, Coimbatore
14.	Dean(Hort.), TNAU, Periyakulam
15.	Dean(Hort.), TNAU, Trichy

16.	Dean(Agri.), TNAU, Madurai
17.	Dean(Agri.), TNAU, Killikulam
18.	Dean(Agri.), TNAU, Trichy
19.	Dean(Agri.), TNAU, Kudumiyamalai
20.	Dean(Agri.), TNAU, Eachangkottai
21.	Dean(Agri.), TNAU, Vazhavachnur
22.	Dean(Ag.Engg.), TNAU, Coimbatore
23.	Dean((Ag.Engg.), TNAU, Kumulur
24.	Principal, Institute of Agriculture, TNAU, Kumulur
25.	The Professor and Head, Dept. of Fruit Science, TNAU, Coimbatore
26.	The Professor and Head, Dept. of Vegetable Science, TNAU, Coimbatore
27.	The Professor and Head, Dept. of Spices and Plantation Crops, TNAU, CBE
28.	The Professor and Head, Dept. of Flori. and Landscape Architecture, TNAU, CBE
29.	The Professor and Head, Dept. of Medicinal and Aromatic Crops, TNAU, CBE
30.	The Professor and Head, Dept. of Fruit Science, TNAU, Periyakulam
31.	The Professor and Head, Dept. of Vegetable Science, TNAU, Periyakulam
32.	The Professor and Head, Dept. of Spices and Plantation Crops, TNAU, PKM
33.	The Professor and Head, Dept. of Floriculture and Medicinal Crops, TNAU, PKM
34.	The Professor and Head, Dept. of Postharvest Technology, TNAU, Coimbatore
35.	The Professor and Head, Dept. of Horticulture, TNAU, Madurai
36.	The Professor and Head, HRS, TNAU, Thadiyankudisai
37.	The Professor and Head, HRS, TNAU, Kodaikkanal
38.	The Professor and Head, HRS, TNAU, Pechiparai
39.	The Professor and Head, FRS, TNAU, Thoivalai
40.	The Professor and Head, CRS, TNAU, Sankarankovil
41.	The Professor and Head, CRS, TNAU, Aliyarnagar
42.	The Professor and Head, CRS, TNAU, Veppankulam
43.	The Professor and Head, ARS, TNAU, Pattukottai
44.	The Professor and Head, HRS, TNAU, Yercaud
45.	The Professor and Head, HRS, TNAU, Ooty
46.	The Professor and Head, GRS, TNAU, Theni
47.	The Professor and Head, VRS, TNAU, Palur
48.	The Professor and Head, ITC, Chennai
49.	The Professor and Head, RRS, TNAU, Paiyur
50.	The Professor and Head, RRS, TNAU, Viruthachalam
51.	The Professor and Head, ARS, TNAU, Bavanishagar
52.	The Professor and Head, ARS, TNAU, Aruppukkottai
53.	The Professor and Head, TCRS, TNAU, Yethapur
54.	The Professor and Head, ARS, TNAU, Virinjipuram
55.	The Professor and Head, Dept. of Entomology, TNAU, Coimbatore
56.	The Professor and Head, Dept. of Pathology, TNAU, Coimbatore
57.	The Professor and Head, Dept. of Nematology, TNAU, Coimbatore

58.	The Professor and Head, Dept. of Biochemistry, TNAU, Coimbatore
59.	The Professor and Head, Dept. of Bio-Technology, TNAU, Coimbatore
60.	The Professor and Head, Depart.SOA, TNAU, Coimbatore
61.	The Professor and Head, Dept. of Renewable Energy Engineering, TNAU, CBE
62.	The Professor and Head, Farm Machinery and Power Engineering, TNAU, CBE
63.	The Professor and Head, Dept. of Bio-energy, TNAU, Coimbatore
64.	The Professor and Head, Dept. of Post Harvest Technology, TNAU, Coimbatore
65.	The Professor and Head, Dept. of Food Processing, TNAU, Coimbatore
66.	The Professor and Head, Dept. Crop Physiology, TNAU, Coimbatore
67.	The Programme Co-ordinator, KVK, TNAU, Tindivanam
68.	The Programme Co-ordinator, KVK, TNAU, Viruthachalam
69.	The Programme Co-ordinator, KVK, TNAU, Madurai
70.	The Programme Co-ordinator, KVK, TNAU, Pongalur
71.	The Programme Co-ordinator, KVK, TNAU, Needamangalam
72.	The Programme Co-ordinator, KVK, TNAU, Aadudurai
73.	The Programme Co-ordinator, KVK, TNAU, Tirur
74.	The Programme Co-ordinator, KVK, TNAU, Ramnad
75.	The Programme Co-ordinator, KVK, TNAU, Santhiyur
76.	The Programme Co-ordinator, KVK, TNAU, Paparappatti