ALL INDIA COORDINATED RESEARCH PROJECT ON BIOLOGICAL CONTROL OF CROP PESTS AND DISEASES
(AICRP-BC)

Technical Programme
(2022-23, 2023-24 & 2022 - 2025)

AICRP on Biological Control of Crop Pests
NATIONAL BUREAU OF AGRICULTURAL INSECT RESOURCES
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Karnataka

Formulation of technical programme 2022 - 2025

New experiments

CROP WISE PROGRAMME

1. MAIZE

1.1 Evaluation of native isolates of entomopathogens (ANGRAU & UAS (R) against maize Fall armyworm (RARS Anakapalle, UAS Raichur, COA, Tripura)

Objective		To evaluate the native isolates of entomopathogens against maize FAW
Crop	:	Maize
Variety		Location specific recommended variety
Treatments		3
Replications		7
Plot size /Replication		40 m^2
Treatments	:	T1: *Bacillus thuringiensis* RARS TPT-C33 1% @ 10ml/L T2: *Bacillus thuringiensis* NBAIR Bt 25 @10ml/L T3: POP recommendation (Spraying Azadirachtin 1500 ppm @ 2 ml/L at 15 days after sowing + Chlorantraniliprole 18.5 SC@ 0.4 ml/L at 25 days after sowing + Emamectin benzoate 5SG@ 0.4gm/L at 35 days after sowing T4: Untreated control Three sprays :20, 35 and 50 days after sowing
Observations	:	Number of larvae per plot Number of damaged plants per plot Number of dead larvae due to Bt per plot 20 plants will be randomly selected for FAW incidence and larval mortality

1.2 Large scale demonstration of bioefficacy of multiple insecticide tolerant *Trichogrammachilonis*NBAIR MITS for the management of fall armyworm in maize (RARS Anakapalle. UAS Raichur)

Objective		To demonstrate the bioefficacy of multiple insecticide tolerant *Trichogramma chilonis*for the management of fall armyworm in maize
Crop		Maize
Variety		Location specific recommended variety
Area		10 ha
Location		Ranasthalammandal, Srikakulam district
Treatments	:	T1: Multiple insecticide tolerant *Trichogramma chilonis* cards (50,000 eggs/ha) (2 releases, first release after one week of sowing & second one after one week of first release) T2: POP recommendation (Insecticidal check : Spraying Azadirachtin 1500 ppm @ 2 ml/L at 15 days after sowing + Chlorantraniliprole

		18.5 SC@ 0.4 ml/L at 25 days after sowing + Emamectin benzoate 5SG@ 0.4gm/L at 35 days after sowing
Observations	:	Number of damaged plants per plot; Number of dead larvae per plot; Percent egg parasitism; Number of predators per plant; Grain yield; 50 plants will be randomly selected for FAW incidence and larval mortality

1.3 Large scale demonstration of BIPM module for the management of maize FAW (RARS Anakapalle; SKAUST Jammu; MPKV Pune; TNAU Coimbatore; ICAR-IIMR Hyderabad; UAS Raichur; PAU Ludhiana; AAU Jorhat; PJTSAU Hyderabad; ICAR-IIMR (WN) Hyderabad; ICAR-NBAIR Bengaluru; CAU Pasighat, AAU Anand)

Objective		To demonstrate the BIPM module for the management of maize FAW
Crop		Maize
Variety		Location specific recommended variety
Plot size /Replication		5 ha
Treatments	:	T1:BIPM module • Installation of pheromone trap @ 10 traps/acre • Release of *Trichogramma chilonis*(1,00,000 eggs/ ha) (2 releases, first release after one week of sowing & second one after one week of first release) • NBAIR Bt-25 @ 10ml/L (1-2 sprays depending on pest incidence, first spray after 20 days after sowing to target early instars of FAW larvae) • ICAR-NBAIR *Metarhizium anisopliae* (Ma-35) @ 5g/L (1-2 sprays depending on pest incidence), first spray 10 days after first spray of Bt-25 to target late instars of FAW larvae • Collection and destruction of egg masses of fall armyworm at regular interval T2: POP recommendation (Spraying Azadirachtin 1500 ppm @ 2 ml/L at 15 days after sowing + Chlorantraniliprole 18.5 SC@ 0.4 ml/L at 25 days after sowing + Emamectin benzoate 5SG@ 0.4gm/L at 35 days after sowing
Observations	:	50 plants will be randomly selected for FAW incidence and larval mortality Number of damaged plants per plot Number of dead larvae(due to bacteria/virus/fungus) per plot Percent egg parasitism Number of predators per plant Final yield

MILLETS

2. SORGHUM

2.1 Demonstration of BIPM module for the management of FAW on Sorghum and Millets (ICAR-IIMR, Hyderabad, UAS Raichur)

Objective		To demonstrate the efficacy of BIPM module for the management of sorghum FAW
Crop		Sorghum
Location		03 (Warangal, Solapur, Bellary)
Cultivar		CSV 29R
Plot size /Area		2 ha
Treatments	**:**	T1: Biointensive module: Release of *Trichogramma chilonis* 1 lakh/ha (2 releases, first release one week of planting & second one after one week of release + spray of *Metarhizium anisopliae* NBAIR Ma 35 @ 5 ml/litre at 20, 45 DAE T2:POP recommendation (Seed treatment with Fortanza duo @ 6 ml/kg of seed) T3: Untreated control
Observations	**:**	**Select 20 plants per plot and take observations on following parameters**: • Number of egg patches per plot what is plot size??? • Number of larvae per plant/plot • Number of damaged plants/plot • Number of dead larvae (bacteria/virus/fungus) per plot • Percent egg parasitism • Final grain?? Yield

PULSES

3. Chickpea

3.1 Biological suppression of chick pea pod borer *Helicoverpa armigera* and soil borne diseases of chickpea (Fusarium wilt, Dry root rot and Collar rot) (AAU Anand, MPUAT-Udaipur; PAU Ludhiana; UAS Raichur, IGKV Raipur; AAU Jorhat, SKUAST Jammu, COA Tripura)

Objective	:	To evaluate microbial biopesticides to suppress chick pea pod borer *Helicoverpa armigera* and soil borne diseases of chickpea (Fusarium wilt, *Macrophomina* Dry root rot and Collar rot)
Crop		Chickpea
Variety	:	Location specific recommended variety
Design of experiment	:	Randomized Block Design.
Treatment	:	5
Replication/	:	5
Plot size/ Replication	:	$40m^2$
Cropping season	:	Rabi

Treatment details	:	T1: Seed treatment with @10g/Kg and soil application twice @5kg/ha of *Trichoderma harzianum* NBAIR strain at 25 & 50 days after sowing + Spraying of *Bacillus thuringiensis* NIBSM Bt 18 1% @10ml/L two sprays at pod initiation and pod formation stage at 15 days interval T2: Seed treatment with @10g/Kg and soil application twice @5kg/ha of *Trichoderma asperellum* NBAIR TATP at 25 & 50 days after sowing + Spraying of *Bacillus thuringiensis* NIBSM Bt 18 1% @10ml/L two sprays at pod initiation and pod formation stage at 15 days interval T3: Pheromones traps @ 25/ ha (NBAIR Product) T4: POP recommendation (Quinalphos 25EC @250g a.i/ha – recommended newer generation biorational insecticide may be incorporated and Carbandazim+ Mancozeb soil drenching@ 1g/L at 25 & 50 days after sowing T5: Untreated control
Observations	:	• Number of larvae/ m row length before spray and 3, 7, 10 and 15 days after spray • Disease incidence at 30, 60, 90 days after sowing • Total and damaged pods at harvest. • Record natural enemies from 5 plants in each plot. • Pod yield will be recorded on whole plot basis.

3.2 Large scale demonstration of bioefficacy of *Bacillus thuringiensis* against chickpeapod borer (PAU, Ludhiana)

Objective	:	Large scale demonstration of bioefficacy of *Bacillus thuringiensis* against chickpea pod borer
Crop	:	Chickpea
Location		Bathinda, Mansa and Sangrur, Ludhiana
Variety	:	Location specific recommended variety
Area	:	4 ha
Treatments	:	T1: *Bacillus thuringiensis kurstaki* NBAIRBt G4 10ml/L T2: POP recommendation (*Bacillus thuringiensis kurstaki* DOR Bt 10ml/L 2 sprays (First spray at pod initiation and second 10 days after)
Observations	:	• Number of larvae/ m row length before spray and 3, 7 and 10 after each spray • Total and damaged pods at harvest • Natural enemies / m row length • Pod yield • Incremental benefit cost ratio

3.3 Large scale demonstration of entomopathogenic fungi, *Metarhiziumrileyi* againstchick pea pod borer, *Helicoverpa armigera* (UAS, Raichur)

Objectives	:	Large scale demonstration of entomopathogenic fungi, *Metarhizium rileyi* against chick pea pod borer, *Helicoverpa armigera*
Crop	:	Chickpea
Variety	:	Region specific recommended variety
Location		Dhummansur Village, Humnabad Taluk, Bidar district, Karnataka
Area	:	50 ha
Treatments	:	T1: *Metarhizium rileyi* KK-Nr-1 (1×10^8 spores/g) @ 5 g/L T2: POP recommendation (Emamectin benzoate 5 SG @ 0.2 gm/L) 2 sprays (First spray at pod initiation and second 10 days after)
Observations		Number of defoliating larvae of *H. armigera*per meter row length - and grain yield will be recorded

4. RED GRAM

4.1 Evaluation of bio-control agents against pod borers in red gram (UAHS, Shimmoga, COA Tripura, Lembucherra)

Objective	:	Evaluation of bio-control agents against pod borers in red gram
Crop	:	Red gram
Variety	:	BRG-5
Design of experiment	:	Randomized Block Design.
Treatments		3
Replications		7
Plotsize/Replication	:	40^2
Cropping season	:	Kharif
Treatments	:	T1: *Bacillus thuringiensis* (NBAIR *Bt*G4 2%) @ 10ml/L T2*:* POP recommendation (Chlorantraniliprole 18.5% SC@ 0.4 ml/lit) T3: Untreated control 3 sprays at pre flowering, post flowering and pod formation stage
Observations	:	• Number of larvae/ m row length before spray and 3, 7, 10 and 15 days after spray • Total and damaged pods at harvest. • Record natural enemies from 5 plants in each plot. • Pod yield will be recorded on whole plot basis
Approved to continue the experiment with one best organism		

5. GREEN GRAM

5.1 Evaluation of different entomopathogens against spotted pod border, *Maruca vitrata* in green gram (AAU Anand; SKUAST Jammu; TNAU Coimbatore; RARS Anakapalle)

Objective	:	Evaluation of different entomopathogens against spotted pod border, *Maruca vitrata* in green gram
Crop	:	Green gram
Variety	:	Location specific recommended variety
Design of experiment	:	Randomized Block Design.
Treatment	:	3
Replication	:	7
Plotsize/Replication	:	$40m^2$
Treatments		T1: *Bacillus thuringiensis* NBAIR *Bt*G4 2% @ 10 ml/lit T2: POP recommendation (Azadirachtin 1% 1500ppm @ 2 ml/L T3: Untreated control Two sprays : First spray at flowering stage and second spray 15 days after first spray
Observations	:	• Pod damage (%) recorded at 15 days after spraying • Number of larvae/meter row length • Yield (q/ha)

6. COWPEA

6.1 Evaluation of entomopathogens against cowpea sucking pests (MPKV- Pune; SKUAST, Jammu; KAU, Vellayani; KAU Kumarakoam)

Objective	:	Evaluation of entomopathogens against cowpea sucking pests
Crop	:	Cowpea
Variety	:	Location specific recommended variety
Design of experiment	:	Randomized Block Design.
Treatments	:	3
Replications	:	7
Plot size /Replication	:	$40m^2$
Treatments	:	T1: *Lecanicillium saksenae* KAU (1×10^8cfu/ml) @5ml/L T2: POP (Thiamethoxam 50 WP @ 2g/10 L seed treatment??? Or select recommended biorational insecticides for foliar application T3: Untreated control

		Two sprays at 15 days interval when the pest reaches ET
Observations	:	Aphids: Pre-spraying count and post-spraying count of aphids on five randomly selected plants (terminal shoots) of each plot before as well as 3, 7 and 10 days after each treatment Pod bug: Pre-spraying count and post-spraying count of pod bugs per plot before as well as 3, 7 day and 10 days after each treatment. Yield (kg)

Oil Seeds

7. GROUNDNUT

7.1 Evaluation of entomopathogens against leaf miner and tobacco caterpillar in groundnut (UAS Raichur; ANGRAU Anakapalle; TNAU Coimbatore)

Objective		To evaluate the entomopathogens against leaf miner and tobacco caterpillar in groundnut
Crop		Groundnut
Variety		Regional specific recommended variety
Design of experiment		RBD
Treatments	:	4
Replications	:	5
Plot Size/Replication	:	50 m^2
Treatment Details		T1: *Metarhizium rileyi* KK-Nr-1 (1×10^8 spores/g) @ 5 g/L T2: *Bacillus thuringiensis* RARS TPT-C33 2% @ 1ml/L T3: POP Recommendation (Emamectin benzoate 5 SG @ 0.2 gm/L) T4: Untreated control
Observations	:	Pre and post treatment observations on Number of active leaf miner per 20 leaflet Damaged plants /plot due to *Spodoptera litura* Number of dead larvae (bacteria/virus/fungus) per plot Pod and Halum yield

COMMERCIAL CROPS

8. SUGARCANE

8.1 Field evaluation of ICAR-NBAIR endophytic entomopathogenic strains against shoot borers (*Chilo infuscatellus* and *Chilo sacchariphagus indicus*) in sugarcane (ANGRAU, Anakapalle)

Objective	:	To evaluation of ICAR-NBAIR endophytic entomopathogenic strains against shoot borers
Crop		Sugarcane
Variety		Region specific recommended variety
Design of	:	RBD

experiment		
Treatments		3
Replication		7
Plot size /Replication	:	50 m^2
Cropping season	:	Kharif
Treatments	:	T1: Sett treatment with *Metarhizium anisopliae* NBAIR Ma-35 ($1x10^8$ spores/ml) @ 5 g/L+ Spraying *Metarhizium anisopliae* NBAIR Ma-35 T2: Spraying chlorantraniliprole 18.5@ 0.3 ml/L T3: Untreated Control Sett treatment at planting and spraying 3times at 14 days interval from 25 days after germination.
Observations	:	• Cumulative incidence of early shoot borer up to 120 days after planting • Internode borer incidence (%) in 50 canes • Internode borer intensity (%) i.e., number of bore holes per cane in 10 m row length • Cane yield data (t/ha) and single cane weight (kg/cane) • Sucrose (%) and incremental benefit cost ratio at harvest.

8.2 Field evaluation of *Metarhizium anisopliae* against Sugarcane white grub *Holotrichia serrata* (SBI Coimbatore; PJTSAU Hyderanad; UAS Raichur)

Objective	:	To evaluate entomofungal pathogen *Metarhizium anisopliae* against *Holotrichia serrata*
Crop		Sugarcane
Variety		Region specific recommended variety
Design of experiment	:	RBD
Treatments		3
Replication		7
Plot size /Replication	:	50 m^2
Cropping season	:	Kharif
Treatments	:	T1: *Metarhizium anisopliae*SBI Ma-16 ($1x10^8$spores/ ml) 5 ml/L T2: POP Recommendation (Imidacloprid 40 %+ Fibronil 40% WG 200 g/ acre) T3: Control Two soil applications will be done during July and September
Observations	:	No. of grubs observed in 10 m row length of the crops Cane yield in each treatment
Approved to continue the experiment with one best organism		

8.3 Field evaluation of *Aschersonia placenta* against sugarcane whitefly *Aleurolobus barodensis* in endemic location (SBI Coimbatore)

Objective	:	To evaluation of *Aschersonia placenta* against sugarcane whitefly *Aleurolobus barodensis* in endemic location
Crop		Sugarcane
Variety		Region specific recommended variety
Design of experiment	:	RBD
Treatments		3
Replication		7
Plot size /Replication	:	$50m^2$
Cropping season	:	Kharif
Treatments	:	T1: Application of *Aschersonia placenta* SBI AP 01 ($1x10^8$spores/ ml) 5 ml/L T2: POP Recommendation (Chlorpyriphos 20 EC (300g a.i./ha) T3: Untreated control
Observations	:	The population of whitefly nymph, puparia, and adult per cm^2 will be taken in the top, middle and basal portion of five sugarcane leaves at three spots in treatment plots of 1 cent size, with required replications. Pre-treatment observations on the whitefly population before imposing treatments will be taken. Post-treatment counts will be taken one month after the treatment. Fungal recovery if any would be observed. Natural enemy incidence if any, will be observed among different treatments.

8.4 Large scale demonstration of EPN against white grubs in sugarcane ecosystem (MPKV Pune, SBI Coimbatore)

Objectives	:	To demonstrate Entomopathogenic nematode *Heterorhabditis indica* NBAIR against white grubs in sugarcane ecosystem
Crop	:	Sugarcane
Variety	:	Region specific recommended variety
Location		DondaTal Khel, Pune district
Area	:	6 ha
Treatment		T1*: Heterorhabditis indica* NBAIR WP formulation T2: POP recommendation (Imidacloprid 40 %+ Fibronil 40%WG 200 g/ acre)
Observation		No. of healthy clumps and dead clumps / 1 m row length before application of EPN Percent reduction of white grub population Yield of sugarcane

9. Field evaluation of microbial antagonistic organisms against root knot nematode and fusarium wilt disease complex of FCV Tobacco (Centres: ICAR- CTRI RS, Hunsur).

Objective	:	To evaluate microbial consortia against root knot nematode and Fusarium wilt disease complex in FCV tobacco grown in light soils of Karnataka.
Crop		FCV tobacco
Variety	:	Region specific recommended variety
Design of experiment		RBD
Treatments		Five
Replications		Four
Plot size / Replication		40 m^2
Treatment Details		T1: *Bacillus subtilis* NBAIR BS1 (1 x 10^8cfu/ g) enriched coco-peat @ 20g / plant at planting and at 30 DAP. T2: *Trichoderma asperellum* NBAIR TATP (2 x 10^6 spores / g) enriched coco-peat@ 20g / plant at planting and at 30 DAP. T3: *Bacillus subtilis* + *Trichoderma asperellum* enriched coco-peat @ 20g / plant at planting and at 30 DAP. T4. POP (Carbofuran3G @ 1g + Carbendazim 2g/L at planting and at 30 DAP.) T5. Control
Observations		1. Per cent wilt disease incidence at 60 DAP 2. Root Knot Index (0 -5 scale) at time of pulling 3. Final soil nematode population (/100g. soil) 4. Number of Galls / g. root 5. Number of Egg mass / g. root 6. Tobacco yield parameters (Green Leaf, Cured Leaf & Bright Leaf yields) 7. Cost : Benefit ratio

VEGETABLES

9. TOMATO

9.1 Evaluation of Predatory mite *Neoseiulus longispinosus*for the management of spider mite *Tetranychus urticae* in tomato under polyhouse conditions (Dr YSPUHF Solan)

Objective		To evaluate predatory mite *Neoseiulus longispinosus* for the management of spider mite *Tetranychus urticae* in tomato under polyhouse conditions
Crop		Tomato
Design of experiment		RBD
Treatments		4
Replication		6
Variety	:	Location specific popular variety
Plot size/Replication	:	30 m^2
Treatments	:	T1: 3 releases of predatory mite *Neoseiulus longispinosus*@ 10 per plant at weekly interval T2: 3 releases of an anthocorid predator *Blaptostethus pallescens* @ 20 per plant at weekly interval T3: Chemical control: Spiromesifen 240SC @100 g.a.i ha^{-1} at 15 days interval T4: Control
Observations	:	• First release/ treatment will be initiated at the first appearance of the mite • Observations on mite count will be recorded at weekly intervals. • Yield data at each picking will also be recorded.

10. OKRA

10.1 Evaluation of entomopathogens against sucking pests of Okra (hoppers, aphids and Whitefly) (ICAR-IIHR Bengaluru, AAU Anand, AAU, Jorhat)

Objective		**To evaluate entomopathogens against sucking pests (hoppers, aphids and Whitefly) of Okra**
Crop		Okra
Pest		Sucking pests
Variety	:	Region specific recommended variety
Treatments		3
Replications		7
Plot size / Replication	:	50 m^2
Treatments	:	T1: Oil based formulation of *Metarhizium anisopliae* IIHR Strain @5ml /L
		T2: POP Recommendation (Imidacloprid 17.8 SC @0.3ml/l)
		T3: Control

		Five rounds of spray at weekly intervals starts a five days after sowing
Methods and observations	:	Population of hoppers and thrips a day before application and 3rd, 7th day after application (4 leaves/plant) Record hopper damage symptoms and YVMV incidence. Marketable yield at harvest replication wise in each treatment

11. CUCUMBER

11.1 Efficacy of reduviid predator *Sycanus collaris* against tobacco caterpillar *Spodoptera litura* on cucumber in polyhouse (KAU Thrissur, NIPHM Hyderabad)

Objective		To evaluate the reduvid predator *Sycanus collaris* against tobacco caterpillar *Spodoptera litura*on cucumber in polyhouse
Crop		Cucumber
Pest		Tobacco caterpillar *Spodoptera litura*
Variety	:	KPCH 1
Treatments		3
Replications		7
Plot size / Replication	:	10 m^2
Variety	:	KPCH 1
Treatments	:	T1: Release of *Sycanus collaris* @ 20 nymphs/10m^2 T2: Recommended insecticide T3: Control
Methods and observations	:	Third instar larvae of *S. litura* will be released on to the cucumber plant at the rate of ten larvae per plant, 20 days after planting. Fifth instar nymphs of *S. collaris*will be released after two days establishment of pest on crop. Mortality of *Spodoptera litura* will be assessed 1, 3 and 5 days after release of predator Yield per plant

11.2 Demonstration of *Neoseiulus longispinosus* for the management of spider mites in cucumber in Polyhouse (YSPHUF Solan)

Objective	To demonstrate the efficacy of *Neoseiulus longispinosus* for the management of spider mite
Location	Solan district, Himachal Pradesh
Crop	Cucumber
Pest	Spider mite
Variety	University recommended variety
Area	1000m^2
Treatments	T1: Release of *Neoseiulus longispinosus*@ 50 per plant 3-4 times at weekly interval starting from the first appearance of spider mite T2: Spiromesifen 240SC @100g.a.i ha^{-1} at 15 days interval
Methodology and observations	1. Pre-treatment count of mites 2. Post treatment count of mites at 7 days interval 3. Yield

12. BITTER GOURD

12.1 Evaluation of BIPM practices against sucking pests and fruit flies *Zeugodacus cucurbitae* in bitter gourd (ICAR-IIVR Varanasi, KAU Kumarakoam, AAU, Jorhat; IIVR Varanasi)

Objective		Evaluation of BIPM practices against sucking pests and fruit flies *Zeugodacus cucurbitae* in bitter gourd
Crop		Bitter gourd
Pest		Sucking pests and fruit flies *Zeugodacus cucurbitae*
Variety	:	Regional specific recommended variety
Treatments		3
Replications		7
Plot size / Replication	:	40 m^2 (follow standard plot size of one cent 8x5 m)
Treatments	:	T1: BIPM practices • Installation of cue lure @ 15/ha for monitoring for fruit flies • Spray of *Lecanicillium lecanii NBAIR* Vl*8* 5 g /L + Neem oil (2.5 ml/L) for sucking pests • *Bacillus thuringiemsis* NBAIR Bt G4 @10ml/Lfor leaf Webber (*Diaphania indica*) T2: POP Recommendation (Jaggary 1% + Malathion 50 EC@2ml/L T3: Untreated control practice
Observations	:	For pre and post treatment observation 5 plants will be selected randomly from each sub plots and per cent damaged fruits will be recorded after imposing each treatment at 7 and 10 day interval. Epilachna beetle, whitefly, jassids, Cucumber moth (*Diaphania indica*) will be observed in each sub plot considering randomly selected 5 plants. Both nymphs and adult of aphid will also be collected on the basis of number of population per leaf. Natural enemy complex will also be recorded per plant basis. Yields of marketable fruits at each harvest will be pooled together to get the average yield.

13. CAULIFLOWER

13.1 Large scale field evaluation of Biointensive management practices for the pests of cauliflower (YSPUHF Solan, CAU Pasighat, AAU, Jorhat)

Objective		To evaluate the Biointensive management practices for cauliflower pests
Crop		Cauliflower
Pest		Aphids, *Brevicoryne brassicae* and *Pieris brassicae*

Variety	:	Region specific recommended variety
Design of experiment		RBD
Treatments		3
Replications		7
Plot size / Replication	:	500 m^2
Treatments	:	T1: BIPM • Mustard as trap crop • One spray of Azadirachtin 1500 ppm (1%EC) (2ml/L) • Release of *Chrysoperla zastrowi sillemi* (4 larvae/infested plant) will be released 7 days after the application of Azadiractin concentration • Mechanical destruction of egg masses and early gregarious larval instars of *Pieris brassicae* • Two sprays of *Bacillus thuringiensis* NBAIR BTG4 10ml/L). First spray with the initiation of lepidopteran pest and subsequent spray at ten days interval T2: POP recommendation () T3: Control
Observations	:	Aphid and caterpillar counts will be recorded at weekly interval starting from the first appearance of the pest until harvest

14. ONION

14.1 Evaluation of Bio-efficacy of entomopathogens against onion thrips (*Thrips tabaci* L.) (TNAU Coimbatore, AAU Anand)

Objective		**To evaluate the Bio-efficacy of entomopathogens against onion thrips (*Thrips tabaci* L.)**
Crop	:	Onion
Variety		Region specific recommended variety
design of experiment		RBD
Treatments		3
Replications		7
Plot size/ Replication		20 m^2
Pest	:	Onion thrips

Treatments	:	T1: *Lecanicillium lecanii* NBAIR Vl8 (1x 10^8 spores/g) @ 5g/L) + Azadirachtin 1500ppm @ 2 ml/lit T2: POP recommendation (Dimethoate 30 EC) T3: Control First spray will be carried out with the initiation of pest and subsequent two sprays will be carried out at ten days interval. Five plants will be randomly selected from net plot area and observations will be recorded. Number of thrips per plant will be recorded before treatment application and at 3rd, 7th and 10th day after each spray.
Observations		No. of thrips/ plant Bulb yield - kg/plot

Fruit Crops

15. BANANA

15.1 Evaluation of entomopathogens against banana Pseudostem weevil, *Odoiporous longicollis* (KAU Vellayani, KAU Kumarakoam, KAU Thrissur)

Objective		To evaluate entomofungal pathogens against banana Pseudostem weevil *Odoiporous longicollis*
Crop	:	Banana
Variety		Nendran
design of experiment		RBD
Treatment		3
Replications		7
Plot size/Replication		50 m^2
Pest	:	Pseudostem weevil
Treatments	:	T1: Sucker treatment with talc formulation of Beauveria bassiana NBAIR Bb5a @ 20g/L + Soil drenching with NBAIR Bb5a @ 20g/L + Application of NBAIR Bb5a capsules in the leaf axils at 5,6 and 7 MAP + Application of NBAIR B5a capsules into the bore holes T2 : POP recommendation(application of Fipronil 0.3 G or Carbosulfan at 0, 3,and 5 months after planting T3: Control
Observations		No of plants showing symptom of weevil attack on pseudostem Yield per plot

15.2 Evaluation of entomopthogens against banana rhizome weevil *Cosmopolites sordidus* (KAU Vellayani, KAU Kumarakoam)

Objective		To evaluate of entomopthogens against banana rhizome weevil *Cosmopolites sordidus*
Crop		Banana

Variety		Nendran
design of experiment		RBD
Treatment		3
Replications		7
Plot size/Replication		50 m^2
Major Pest		Banana rhizome weevil *Cosmoplitus sordidus*
Treatments		T1: Rhizome treatment with talc based *Metarhizium anisopliae* NBAIR Ma4 20g/L before planting + pit application of NBAIR Ma4 capsules @ 4 capsules per plant at 0, 3, 5, and 7 MAP T2: POP recommendation (Fipronil 0.3G @ 10g /plant at 0.2 and 5MAP) T3: control
Observations		No. of infested rhizomes per plot Yield per plot

16. Apple

16.1 Demonstration on management of apple root borer using *Metarhizium anisopliae* (YSPUHF Solan, SKUAST Srinagar)

Objective		To demonstrate the bioefficacyof *Metarhizium anisopliae* against apple root borer
Crop		Apple
Variety	:	Region specific recommended variety
Location		Kotkhai, Rohru and Kalpa blocks
Plot size/Area		5 ha
Treatment details		T1: Powder formulation of *Metarhizium anisopliae* NBAIR Ma 4 ($1x10^8$ spores/g) @ 30g per tree mixed with enriched FYM as soil application during July- August, i.e., at the time of emergence of new grubs) T2: POP Recommendation (Chlorpyriphos 20 EC @ 0.04%)
Observation to be recorded		Number of live and dead larvae will be counted at the time of basin preparation and percent mortality will be calculated

16.2 Demonstration of Biointensive pest management module for codling moth, *Cydia pomonella* infesting apple in Ladakh (SKUAST–K Srinagar)

Objective		To demonstrate the bioefficacy of Biointensive pest management module for the management of codling moth, infesting apple in Ladakh sucking pests in cotton
Crop	:	Apple
Variety	:	Red delicious and others
Location	:	Nurla, Mingy and Saliskot Villages, Kargil &Leh (Ladakh)
Area		1 ha

Treatment	:	T1 :BIPM module • Three sprays of Liquid formulation of *Bacillius thuringienis* (Commercial formulation) @ 2 ml/ L • Pheromone dispensers at the time of biofix • Pheromone traps @ 20 traps/ ha for trapping male adults (SK-CM Lure, SKUAST-K Product) • Pheromone traps @ 20 traps/ ha for trapping both male and female (SK-Combo Lure, SKUAST-K Product • Cydia Granulosis virus, (CpGV) @ $1x10^{12}$ OBs/ha • Trunk banding with gunny material for 1 st generation summer larvae and another at pre-harvest of fruits for trapping overwintering larvae. T2: POP Recommendation (Chlorpyriphos 1 ml/L)
Observations	:	• % fruit damage • % reduction in damage over control • Yield • C:B ratio

PLANTATION CROPS

17. COCONUT

17.1 Area-wide demonstration of biological suppression of black headed caterpillar using *Goniozus nephantidis* and *Bracon brevicornis* (ICAR-CPCRI Kayankulum; DRYSRHU- HRS- Ambajipeta)

Objective		To demonstrate of the bioefficacy of parasitoids *Goniozus nephantidis* and *Bracon brevicornis* for the management of coconut black headed caterpillar
Crop		Coconut
Location	:	
Area		10 ha
Treatments	:	T1: Augmentative release of *Goniozus nephantidis* and *Bracon brevicornis* @ 20 parasitoids/palm T2:POP Recommendation (Chlorantraniliprole 18.5 SC@ 0.4 ml/L)
Observations	:	Pest incidence/ leaflet, Infested leaflets in a frond, parasitism percentage, Pre-release and post-release data on pest incidence.

17.2 Area wide demonstration of an entomofungal pathogen *Metarhizium majus* for the management of coconut rhinoceros beetle (ICAR-CPCRI Kayankulum; DRYSRHU-HRS- Ambajipeta)

Objective		Area wide demonstration of an entomofungal pathogen *Metarhizium majus* for the management of coconut rhinoceros beetle
Crop		Coconut

Location	:	Vallikunnan Panchayat, Mavelikara
Area		1500 ha
Treatments	:	T1: *Metarhizium majus* CPCRI Mm 601) $5x10^{11}$spores m^{-3}(5g/L) followed by *in situ* incorporation of *Clerodendrum infortunatum* along with crown cleaning and leaf axil filling with botanical cakes T2: POP Recommendation (Wooden ash 1kg/ m^3cowdung pit)
Observations	:	Pre-treatment and post-treatment pest incidence level (six-monthly interval) Palm health improvement

18. Tuber Crops

18.1 Large scale suppression of cassava mealybug (*Phenacoccus manihoti*) using parasitoid *Anagyrus lopezi* (TCRS, Yethapur,TNAU)

Objective	:	To suppress cassava mealybug population
Crop	:	Tapioca
Variety	:	Region specific recommended variety
Pest	:	Cassava mealybug
Location	:	Pethanaickenpalayam, Salem District
Area	:	20 ha (2 locations @10 ha per location)
Treatments	:	T1:Release of *Anagyrus lopezi* @ 500/ha T2:Azadirachtin0.03%@3ml/l T3: Thiamethoxam 25 WG @0.5g/l
Observation		Cassava mealy bug infestation Parasitization (%) Establishment of parasitoid

19. PLANT DISEASES EXPERIMENTS

19.1 Large scale demonstration of Pant Bioagent (PBAT-3) for the management of rice sheath blight (GBPUAT, Pantnagar, NCIPM New Delhi, PAU Ludhiana)

Objective	To demonstrate the Pant Bioagent (PBAT-3) for the management of rice diseases
Crop	Rice
Variety	Region specific recommended variety
Location	Udham Singh Nagar, Nainital District, Uttarakhand.
Area	GBPUAT, Pantnagar- 200 ha NCIPM New Delhi 2 ha

Treatments	T1: PBAT -3 formulation • Seed bio-priming through Pant Bioagent formulation, PBAT-3 (*T.harzianum*Th14 + *Pseudomonas fluorescens* Psf 173) @ 10g/kg of seeds. • Seedling dip with PBAT 3@ 10 g/ L for about 30 minutes. • Two sprays of PBAT 3 @ 10 g/ L on standing crop (Tillering phase) at 10-12 days intervals T2 : POP Recommendation (Carbendazim 2g/L drenching and spraying)
Observations to be recorded:	• Disease incidence (Sheath blight**)** • Grain yield of crop (kg/ha) • Cost-benefit ratio.

19.2 Demonstration of the bioefficacy of *Trichoderma asperullum* KAU strain application for the management Fusarium wilt in cowpea (KAU, Kumarakoam, KAU Vellayani)

Objective		To demonstrate the bioefficacy of *Trichoderma asperullum* KAU strain application for the management Fusarium wilt in cowpea
Crop		Cowpea
Variety	:	Region specific recommended variety
Plot size /Replication		1 ha
Treatment details		T1: Talc based formulation of the *Trichoderma asperullum* KAU strain 2×10^6 spores @ 20 g $kg^{-1}$of seed + basal application (multiplied in cowdung + neemcake 9:1 ratio) @ 250 g /plant and soil drenching @20 g/L at 20,40 and 60 DAS T2: POP Recommendation (Seed treatment with carbendazim @ 2g kg^{-1}
		of seed followed by soil drenching @ 0.2 per cent at 15 DAS)
Observation to be recorded		• Disease incidence (%) at 30, 45, 60 DAS • Shoot and root growth (in cm) • Yield (kg/ha) • C:B ratio`

19.3 Demonstration of the bioefficacy of *Trichoderma asperullum* for the management of Fusarium wilt and root rot of pea (Dr YSRUHF Solan, GBPUAT Pantnagar)

Objective		To demonstrate the bioefficacy of *Trichoderma asperullum* UHFTa1for the management *Fusarium* wilt and root rot of pea
Crop		Pea
Variety	:	Region specific recommended variety
Plot size/Replication		5 ha

Treatment details		T1: Talc based formulation of the *Trichoderma asperullum*UHFTa1 2×10^6 spores /g seed treatment @ 20 g $kg^{-1}$of seed + basal application (multiplied in cowdung + neemcake 9:1 ratio) @ 50 g /plant and soil drenching @20 g/L at 20,40 and 60 DAS T2: POP Recommendation (Seed treatment with carbendazim @ 1g kg^{-1} of seed followed by soil drenching @ 0.2 per cent at 15 DAS)
Observation to be recorded		i) Disease incidence (%) ii) Shoot and root growth (in cm) iii) Pod yield (kg/ha) iv) C:B ratio

19.4 Large scale demonstration of Pant Bioagent (PBAT-3) for the management of fusarial wilt of pea (GBPUAT, Pantnagar, Dr YSRUHF Solan)

Objective	Large scale demonstration of Pant Bioagent (PBAT-3) for the management of fusarial wilt of pea
Crop	Pea
Variety	Region specific recommended variety
Location	Nainital District, Uttarakhand.
Area	25 ha
Treatments	T1: Seed bio-priming through Pant Bioagent formulation, PBAT-3 (*T. harzianum*Th14 *Pseudomonas fluorescens* Psf 173) @ 10g/kg of seeds+ Soil application of PBAT @5 kg/ha +Spray of PBAT 3 @ 10 g/L on standing crop at 10-12 days intervals T2: POP Recommendation (carbaendazim Seed treatment @1g/kg and drenching @1g/ L)
Observations to be recorded:	• Disease incidence (wilt**)** • Grain yield of crop (kg/ha) • Cost-benefit ratio.

19.5 Management of stem rot *Macrophomina phaseolina* in sesame using biocontrol agents (RARS, Anakapalle, SKUAST, Jammu)

Objective		To manage the stem rot *Macrophomina phaseolina* in sesame using biocontrol agents
Crop		Sesame
Variety	:	Regional specific recommended variety
design of experiment		RBD
Treatments		3
Replications		7
Plot size/Replication		40 m^2
Treatment details		T1: *Pseudomonas fluorescens* NBAIR-PFDWD soil application @ 5 kg/ha T2: POP Recommendation(Carbendazim seed treatment @1g/kg seed + carbendazim soil drenching @ 1g/L) T3: Untreated Control

Observation to be recorded		• Germination (%) • Root and shoot length (in cm) • Stem rot incidence (%) at 30 and 60 days after sowing • Grain yield (kg/ha) • C:B ratio

19.6 Evaluation of biocontrol agents against sugarcane red rot, smut and wilt (Centre: SBI, Coimbatore, MPKV Pune)

Objective		To evaluate the biocontrol agents sugarcane red rot, smut and wilt
Crop		Sugarcane
Variety	:	Region specific recommended variety
design of experiment		RBD
Treatments		3
Replications		7
Plot size/Replication		50 m^2
Treatment details		T1:Mechanized sett treatment+ soil application of (45 & 90 DAP with *Paenibacillus alvei* AFG 3 + *T. harzianum* SBI T20 T2*:* POP Recommendation (Azoxystrobin 23 SC 0.5 ml/L) T3:Control Liquid formulations of the bioagents 2×10^6spores/ml and fungicide will be applied as sett treatment using sett treatment device developed at Plant Pathology Lab, Sugarcane Breeding Institute
Observation to be recorded		• Per cent germination (30DAP) • Per cent Disease incidence (45DAP, 60DAP, 90DAP) • No. of healthy shoots/ stalks (120DAP, 180DAP, 240DAP)
		• Yield (kg/ha) • C:B ratio

19.7 Evaluation of microbial antagonists for the management of ginger rhizome rot (CAU, Pasighat, AAU Jorhat, KAU, Kumarakoam)

Objective		**To evaluate the microbial antagonists for the management of ginger rot disease**
Crop		Ginger
Variety	:	Region specific recommended variety
design of experiment		RBD
Treatments		3
Replications		7
Plot size/Replication		50m^2

Treatment details		T1: Powder formulation of *Trichoderma harzianum*AAU-MC2:Rhizome treatment (@ 20 g kg^{-1}+basal application (multiplied in cowdung + neemcake 9:1 ratio) @ 100 g /plant and soil drenching @20 g/L at 10,20 and 40 DAP T2: POP Recommendation (Copper hydroxide soil drenching @2g/L) T3: Control
Observation to be recorded		Disease incidence during cropping stage Disease incidence after harvest Yield data (Kg/ha) C:B ratio

19.8 Evaluation of promising strains of antagonistic fungi against Mulberry wilt and root rot diseases (Centers: SKUAST, Jammu and CAU, Pasighat)

Objective	-	To evaluate the promising strains of antagonistic fungi against Mulberry wilt and root rot diseases
Crop	-	Mulberry
Variety	:	Location specific popular Mulberry variety
Plot size	:	40 m^2
Treatments	-	3
Replications	:	10
Design	:	RBD
Treatments	:	1. *Trichoderma asperellum* NBAIR-TATP (drenching @10 gm / L) 2. Carbendazimdrenching @ 2g/L) 3. Control (Untreated)
Method of application:		Three soil drenching of talc based antagonistic fungi at 10-14 days interval as soon as the wilt or root rot symptoms noticed.
Observations	:	• Per cent disease incidence before and after drenching (%) • Yield (kg/plant) • CB Ratio • Record of natural enemies (earthworms, earwigs, spiders, Coccinellids and Chrysopa) from 5 plants in each plot. (Number/plant) (1 Day after drenching, 30 DAD and 60 DAD) • Phytotoxicity effect should be observed (7 and 15 days after drenching) parameters like leaf injury on tips/surface, wilting, necrosis, vein clearing, epinasty and hyponasty were taken into consideration.

19.9 Evaluation of biocontrol agents against tapioca stem and tuber rot (TCRS, Yethapur, TNAU)

Objective		To evaluate the biocontrol agents against tapioca stem and tuber rot
Crop		Tapioca
Variety	:	Region specific recommended variety
designof experiment		RBD
Treatments		4
Replications		5

Plot size/ replication		50 m^2
Treatment details		T1:Mechanized sett treatment + soil application of *Trichoderma asperullum* TNAU Tv1(45 &90 DAP) T2: Mechanized sett treatment + soil application of *Trichoderma asperellum* NBAIR-TATP(45 &90 DAP) T3:Carbendazim drenching @ 2g/l T4:Control
Observation to be recorded		• Percent establishment(30 DAP) • Percent Disease incidence (45 DAP,60 DAP, 90 DAP) • No. of healthy shoots/ stalks (120 DAP, 180 DAP, 240 DAP) • Yield(kg/ha) • C:Bratio

Foumulation of technical programme (2022 to 2025)

Ongoing Experiments

I. BIODIVERSITY OF BIOCONTROL AGENTS FROM VARIOUS AGRO- ECOLOGICAL ZONES

Objectives: To study the diversity of natural enemies of insect pests and plant pathogens crops in different agro-ecological zones catered by the all the AICRP centers.

II. SURVEILLANCE FOR PEST OUTBREAK AND ALIEN INVASIVE PESTS

III.

Name of the study/trial	:	**Surveillance for pest outbreak and alien invasive pests - Crop Pest Outbreak Report (CPOR)**
Objectives	:	To monitor and report the incidence, buildup and outbreaks of insects and diseases of different crops in the region catered by the AICRP center.
Trial allotted centers	**:**	**All Centres**
Method	:	Visit, survey and surveillance and interaction with state/line department officials and local farmers.
Periodicity	:	Once in a month.
Target area	:	Covering the district where centre is located and 2-3 adjoining districts. In case of pest outbreaks, affected area may be specifically visited.
Desirable important information	:	1. Specific site & date visited-District, Mandal (Taluk), village (Give specific GPS coordinates, if available). 2. Area covered in ha 3. No. of crops specifically examined and Variety grown 4. Major insects and disease (s) noticed and natural enemy occurrence 5. Severity of damage (low, moderate, severe) 6. Age of crop in severely damaged field(s) (in DAT/DAS and years for field and tree/ horticultural crops, respectively) 7. Previous crop grown in the area 8. Occurrence of the pest in weeds in surrounding area of the crop 9. Plant protection measures adopted by the farmer prior to the visit 10. Advice given to the farmer and follow up report if any

Crop Pest Outbreak Report Proforma

Name of Centre: Date visited:

1.	Site details	Village(s) with GPS Co-ordinates, Mandal/Taluk/ District

2.	Crop details	Crop*: Variety : Age of Crop (DAS/DAT/: Years in case of perennial crop: Area cultivated (ha) :
3.	Pest Scenario: Insects Natural enemy occurrence	Name of Insect: Level of infestation: Low/Moderate/Severe Predators: (Coccinellids/ Chrysopids/Spiders/Others) Parasitoids:
4.	Disease Scenario	Name of Disease: Per cent disease incidence:
5	Previous crop grown in the area	
6	Occurrence of the pest in weeds (identification where possible)in surrounding area of the crop	
7	Plant Protection measures followed by the farmer	
8	Advice given to the farmer	
9	Sender's name	

*for each crop separate proforma to be used

For each insect, level of infestation, *viz*., Low/Moderate/Severe should be specified,

- **Low-**Pest is present at lower population with no significant damage to the crop
- **Moderate-**Pest population is nearing Economic Threshold Level (ETL) and needs constant monitoring to prevent economic damage
- **Severe** -Pest damage is higher and the crop needs control measure to avoid crop losses

Submission of report

- **As early as possible by e-mail (aicrp.nbaii@gmail.com),but not later than 5th of each month.**
- Send the insects and its natural enemies including spiders if any, desired for identification to the Director, ICAR-NBAIR, H A Farm Post, P B No 2491, Bellary Road, Hebbal, Bengaluru 560024.
- Photographs of the insect and disease damage symptoms, life stages of insects, natural enemies and field visits (wherever possible) should be sent along with this report.
- In case of no pest outbreak in the centres for the reporting period, Nil report should be sent.

Cropwise Programme

CEREALS

1. RICE

Evaluation of entomopathogens against sucking pests of rice (Rice bug *L.acuta,* and Green leafhopper and Plant hopper (*Sogatella* sp))MPKV Pune; ICAR-IIRR Hyderabad)

Objective		To evaluate the entomopathogens against sucking pests of rice
Crop		Rice
Variety	:	Regional specific recommended variety
Treatments		5
Replications	:	4
Design of experiment	:	RBD
Plot size/Replication		$40m^2$
Date of sowing	:	As per the package of practice
Treatments	:	T1- *Lecanicillium saksenae* KAU ITCC7714 ($1x10^8$ spores/g) @ 5 g/l T2- *Beauveria bassiana* NBAIR Bb 5a ($1x10^8$ spores/g) @ 5 g/l T3- POP of university (Thiamethoxam 0.2 g/L) T4- Untreated First spray at panicle initiation and second spray two weeks after the first spray.
Observations	:	The population of bug and plant hoppers and leafhopper will be recorded from 25 hills selected at random at weekly interval starting from 20 days after transplanting

Field evaluation of entomopathogens and plant growth promoting bacteria against Rice stem borer, Leaf folder, Brown planthopper (ICAR-NRRI, Cuttack; TNAU-TRRI Aduthurai; UASRaichur;ICAR-IIRR Hyderabad)

Objective		To evaluatethe entomopathogens against rice stem borer, leaf folder, Brown planthopper Suggestion: Actual species name for stem borer to be mention in the report.
Crop		Rice
Variety	:	Region specific recommended variety
Design of experiment	:	RBD
Treatments	:	4
Replications		6
Plot size/Replication		$40\ m^2$
Treatments	:	T1. *Bacillus albus* NBAIR BATP (1×10^8cfu/ml) 10ml/L T2. *Bacillus thuringiensis* NRRI BtBiocb 7 (1×10^8cfu/ml) 10ml/L T3. POP of University (Thiamethoxam 0.2 g/L) T4.Control (Untreated) Three rounds of foliar sprays of liquid formulations of entomopathogens has to be given at 14 days' interval
Observations	:	• Mean No. of dead heart/white ear/sq. m. (weekly intervals) • Mean No. of damaged leaves per sq. m. (weekly intervals)

		• The population of plant hoppers will be recorded from 25 hills selected at random at weekly interval starting from 30 days after transplanting (DAT) from each plot. • The population of predators will be also recorded at weekly intervals. • Growth promotion character viz., plant height (cm), biomass (gm) • Yield (kg/plot)

1.3 Management of rice stem borer and leaf-folder using entomopathogens (KAU Thrissur)

Objective		To evaluate entomopathogens against stem borer and leaf folder in rice
Crop		Rice
Variety	:	Jyothi
Design of experiment	:	RBD
Treatments	:	5
Replications		4
Plot size/Replication		40 m^2
Treatments	:	T_1: *Heterorhabditis indica* NBAIR strain@ $1.2x10^9$ IJs ha^{-1} T_2:*Bacillus thuringiensis* NBAIR BtG4 10 ml/L T_3: *Beauveria bassiana* NBAIR Bb5a ($1x10^8$ spores/g) @ 5 g/l T_4: POP Recommendation (Chlorantraniliprole 18.5 SC @ 3ml/10ml) T_5: Untreated control Treatments will be applied twice based on ETL
Observations	:	• Mean No. of dead heart/white ear/sq. m. • Mean No. of rolled leaves per sq. m. • Yield kg/plot

1.4. Large scale demonstration of bio-intensive pest management on rice

(KAU Thrissur; PAU Ludhiana; OUAT Bhubaneswar; RARS Anakapalle; AAU Jorhat; IGKV Raipur;ICAR-NCIPM New Delhi;ICAR-IIRR Hyderabad; UBKV Pundibari; CAU Pasighat)

Objective		To demonstrate the bio-intensive pest management on rice
Crop		Rice
Variety	:	Region specific popular rice variety
Location		Farmersfields
Plot size/ Area		KAU Thrissur(150 ha), PAU(50 ha), OUAT(10 ha), RARS Anakapalle(30 ha), AAU Jorhat (50 ha); IGKV (5ha), ICAR-NCIPM (1ha), IIRR (3 ha), UBKV Pundibari (3 ha)
Treatments	:	T1 = BIPM Package • Seed bio-priming with *Pseudomonas fluorescens* 10g/L • Seedling root dip with *Pseudomonas fluorescens*@10 g/L for 1hour before transplanting • Need based application of azadirachtin 1500 ppm@ 2ml/L/ *Beauveria bassiana*NBAIR Bb 5a foliar spray

		@5g/kg for sucking pests. • Two sprays of *Pseudomonas fluorescens*@ 10g/L against foliar diseases after transplanting and 20 days after transplanting. • Releases of *Trichogramma chilonis* and *Trichogramma japonicum* @ 100,000/ha (5-6 releases to be made during season) at 7 days interval starting from 30 DAT for stem borer and leaf folder infestation T2 = POP recommendation
Observations	:	• Observation on diseases incidences and plant growth parameters (number of tillers/hill, root and shoot length, fresh and dry weigh of root and root etc) • Observations on pest incidence as well as natural enemies will be recorded on total of 50 hills in BIPM block & 50 hills in FP block at vegetative stage (45 and 60 DAT for dead heart and leaf folder damage) and at reproductive stage (for white ear damage). • Observations on natural enemies like predators and parasitoids by visual or sweep net count and by collection of egg masses for stem borer. • At each observation, record total tillers, dead hearts, total leaves, damaged leaves, total panicle bearing tillers, white ear heads and number of plant hoppers/ hill • Record the yield from 6 places of 5x5 m area from each replication • Cost-benefit ratio to be worked out

2. MAIZE

Large scale demonstration of *Trichogramma chilonis* against maize stem borer *Chilo partellus* (MPUAT Udaipur and **UAHS Shivamogga)**

Objective		To demonstratethebioefficacy of *Trichogramma chilonis* against maize stem borer*Chilo partellus*
Crop		Maize
Variety	:	Location specific recommended variety
Area		MPUAT Udaipur (2 ha) UAHS Shivamogga (4 ha)
Locations		
Treatments	:	T1: Three releases of*Trichogramma chilonis* @ 100,000/ha/release at 15, 22 and 29 days after crop germination. T2: POP recommendation(Quinolphos 25EC 2ml/L)
Observations		• Dead hearts from 20 randomly selected plants at 30 DAS • Yield (t/ha) and incremental benefit cost ratio • Percent parasitism

3. MUSTARD

3.1 Evaluation of entomopathogens against mustard aphid (SKUAST-K Srinagar; SKUAST- Jammu; CAU Pasighat; AAU, Jorhat)

Objective		To evaluate the entomopathogens against mustard aphid
Crop		Mustard
Variety		Regional specific recommended variety
Design of experiment		RBD
Treatments	:	7
Replications	:	3
Plot Size/Replication	:	40 m^2 /plot
Treatment Details		T1- *Beauveria bassiana* NBAIR Bb 5a (1×10^8 spores/g) @ 5g/L + Azadirachtin 1500 ppm @ 2 ml/L T2- POP recommendation (Imidacloprid 17.8 SL @ 0.4ml/L) T3- Control Spray schedule: Two sprays at 15 days interval when the pest reaches ET
Observations	:	No. of aphids per 10 cm twig from ten randomly selected plants No. of Coccinellids per five plants Seed Yield

4. COTTON

Evaluation of efficacy of entomofungalpathogens for the management of sucking pests in cotton(UAS Raichur; TNAU Coimbatore; AAU Anand ANGRAU Anakapalle; PJTSAU Hyderabad; PDKV Akola)

Objective		To evaluate the efficacy of entomofungal pathogens for the management of sucking pests in cotton
Crop		Cotton
Design of experiment		RBD
Treatments	:	3
Replications	:	7
Plot Size /Replication	:	400 m^2
Variety		Region specific recommended variety
Treatment Details		T1: Powder formulation *Lecanicillium lecanii* NBAIRVl 8 ($1x10^8$spores /g) @ 5 g/l T2: POP Recommendation (biorational insecticide i.eSpiromesifen 240SC @ 7 ml/10 L) T3: Control Two sprays will be given at 15 days interval soon after the incidence starts

Observations	:	• Aphids, Jassids, whiteflies and thrips / 3 leaves (top, middle and lower canopy) in 5 randomly selected plants in each plot will be recorded before spray, 3 and 7 days after spray will be recorded. • Cadavers without apparent sporulation along with leaves will be brought in the laboratory and incubated under optimal condition. After 5 days cadavers will be observed for signs of fungal infection and sporulation. • Yield (Q/ha)

4.2 Large scale evaluation of biointensive management of pink bollworm on *Bt* cotton (UAS Raichur; TNAU Coimbatore; AAU Anand, PJTSAU Hyderabad; PAU Ludhiana)

Objective		To evaluate bio-intensive module for the management of pink bollworm in Bt cotton
Crop		Cotton
Variety		Region specific recommended variety
Design of experiment		RBD
Treatments		3
Replication		10
Plot size / Area		400 m^2
Treatment details	:	T1: Standard practice of plant protection till 55th day or appearance of PBW. The following inputs to be provided for PBW. • Timely sowing (upto Mid-May) • Erection of pheromone traps (Funnel type) @ 2 trap/ acre for Monitoring and 20 trap/acre for Mass trapping • Releases of *Trichogrammatoidea bactrae* 100,000/ha, five releases starting from 55 days after germination (Two release at flowering time and third release at boll formation stage • Application of azadirachtin 1500 ppm @ 2ml/L of water T2: POP recommendation (Lambda-cyhalothrin/ Profenophos 50EC 2ml/L) T3: Control Note: Isolation distance of 100m should be maintained if Trichogramma is used in the experiment.

5. SUGARCANE

Large scale demonstrations of *Trichogramma* spp. (ICAR-NBAIR HTTS) against borers (early shootborer, top borer and stalk borer) in sugarcane (PAU Ludhiana; OAUT Bhubaneswar; UAS Raichur)

Objective		To demonstrate the bioefficacy of *Trichogramma* spp. against sugarcane borers
Crop		Sugarcane
Variety	:	Location specific recommended variety
Plot size/ Area		PAU Ludhiana (2000 ha) OUAT Bhubaneswar (20 ha) UAS Raichur (20 ha)
Treatment	:	T1: • Eight releases of *T. chilonis* @ 50,000/ha at weekly interval from mid-April to end-June (for early shoot borer, *Chilo infuscatellus* • Eight releases of *T. japonicum* @ 50,000/ha at weekly interval from mid-April to end-June (for top borer, *Scirpophaga excerptalis*) • 10-12 releases of *T. chilonis* @ 50,000/ha at weekly interval from July to October (for stalk borer, *Chilo auricilius*) T2: POP Recommendation (Chlorantraniliuprole 18.5 SC 375 ml /ha)
Observations	:	• Pre-release infestation, *i.e.*, per cent dead hearts due to early shoot borer and top borer • Post-release count of percent dead hearts at fortnight interval up to 3 months • Per cent cane attacked at harvest • Cane yield data • Incremental benefit cost ratio

6. TOMATO

6.1 Demonstration of bio intensive pest management practices for the management of insect pests (fruit borer/pinworm/ sucking pests) of tomato (UBKV Pundibari; YSPUHF Solan; MPUAT Udaipur; SKUAST-K Srinagar; CAUPasighat; AAU Jorhat; PJTSAU Hyderabad)

Objective		To demonstrate the efficacy of bio intensive pest management practices for the management of insect pests (fruit borer/pinworm/ sucking pests) of tomato
Crop		Tomato
Variety	:	Location specific popular variety
Location		Farmers fields
Plot size/ Area	:	5 ha
Treatment	:	T1:BIPM Module • Spraying of *Lecanicillium lecanii* NBAIR VI-8

		(1×10^8spores/g) @ 5g/L and installation of yellow sticky trap @50 number/ha for sucking pests • Installation of Pheromone traps @ 20/ha against fruit borer and pinworm (NBAIR Product) • Release of *Trichogramma chilonis* @ 50,000/ha per release (6 releases) from flower initiation stage at weekly intervals for fruit borer • *Trichogramma achaeae* @ 50,000/ ha per release (6 releases) for pinworm • Spraying of Azadirachtin 1500 ppm @ 2 ml/lit T2: POP Recommendation The treatment applications will be started at initial occurrence of fruit borer/pinworm. Six releases of parasitoids at weekly interval and three sprays of biopesticides will be given during evening hours at fortnightly interval.
Methodology and observations	:	• Randomly select 10 plants/40m^2 crop area and observe all the leaves for presence of leaf mine / sucking pests caused by the larva. • Randomly select 10 plants/ 40m^2 crop area and observe all the fruits for presence of holes/ damage caused by the larva. Observations will be recorded at fortnightly interval from fruit formation to last harvest. • Sucking pests if any, data will be recorded as per standard protocol • Fruit damage percentage and yield will be recorded • Cost-benefit ratio.

7. BRINJAL

Evaluation of entomopathogens against *Myllocerous subfasciatus* on brinjal (ICAR-IIHR Bengaluru, CAU Pasighat)

Objective		To evaluate the entomopathogens against *Myllocerous subfasciatus* on brinjal
Crop		Brinjal
Design of experiment		RBD
Treatments		7
Replication		5
Variety	:	Location specific popular variety
Plot size/Replication	:	40 m^2
Treatments	:	T1: *Metarhizium anisopliae* IIHR Strain oil formulation ($1x10^8$ spores/ml) @5 ml/L T2: *Beauveria bassiana* IIHR Strain ($1x10^8$ spores/g)WP formulation @5 g/L T3: *Metarhizium anisopliae* NBAIR Ma4 ($1x10^8$ spores /g) WP

		formulation @5 g/L @ 5g/L T4: *Beauveria bassiana*NBAIR Bb-5a (1x10^8 spores /g) WP formulation @5 g/L T5: *Heterorhabditis indica* NBAIR H38@ 2.5 10^9 IJs ha^{-1} T6: POP recommendation (Chlorpyriphos 2 ml /L) T7: Untreated control
Observations	:	Pre and post treatment infestation at fortnightly interval. Destructive sampling may be done to count the grubs Yield of healthy marketable fruits and cost-benefit ratio.

Demonstration of bio intensive management practices for the management of pests (fruit borer/ sucking pests) of Brinjal (KAU Vellayani; KAU Kumarakoam; AAU Anand; OUAT, Bhubaneswar; TNAU Coimbatore; PJTSAU, Hyderabad; CAU Pasighat)

Objective		To demonstrate the efficacy of bio intensive management practices for the management of insect pests of brinjal
Crop		Brinjal
Variety	:	Location specific popular variety
Location		
Plot size/ Area	:	3 ha (KAU Vellayani& KAU Kumarakoam: 0.5 acre**)**
Treatment	:	T1:BIPM Module • Use of pheromone traps for mass trapping @30/ha against fruit borer (Sun Agro's product) • Release of *Trichogramma chilonis* @ 100,000/release against brinjal fruit and shoot borer, 10-12 releases to be made at 30 days after transplanting & need based spray of *Bacillus thuringiensis* (NBAIRBtG4) 2ml/L • *Lecanicillium lecanii*Vl 8(1 x 10^8 spores/ ml @ 5g/L) for sucking pests. • *Heterorhabditis indica* NBAIR H38@ 2.5 10^9 IJs ha^{-1} T2 = POP Recommendation The treatments will be imposed at initial occurrence of fruit borer/sucking pests. 10 to 12 releases of parasitoids at weekly interval and three sprays of biopesticides will be given during evening hours at fortnightly interval.
Methodology and observations	:	For Brinjal fruit and shoot borer • Pre-release observation –No. of shoots damaged. For this, ten plants from each replication will be selected, tagged and observation will be taken at 15 days interval. • Observations such as number of damaged fruits, weight of damaged fruits, number of total fruits and weight of total fruits from each plot will be taken to calculate the per cent infestation. Observation will be recorded at 5 days interval. For sucking pests: • Pre-treatment observations on no. of nymphs and adults of sucking pests (mealybug/whitefly) per leaf will be taken before application of the treatment, and post-treatment

		observations will be taken at 5, 10 and 15 days after each treatment (DAT). Observations of sucking pest population (no. of nymphs and adults per leaf) will be recorded on leaves from the top, middle and bottom of 10 randomly selected plants per treatment. • Yield of healthy marketable fruits and cost benefit ratio will be worked out.

7.3.Evaluation of promising strains of entomopathogens against Brinjal shoot and fruit borer (*Leucinodesorbonalis*) (Centers: RARS Anakapalle, MPKV Pune and SKUAST Jammu)

Objective		To **evaluate of promising strains of entomopathogens against Brinjal shoot and fruit borer**
Crop		Brinjal
Variety	:	Location specific popular variety
Plot size	:	40 m^2
Treatments		4
Replications	:	6
Design	:	RBD
Treatments	:	1. *Pseudomonas entomophila* strain NBAIR-PEOWN **(**10 gm / L) 2. *Beauveriabassiana*strain NBAIR-Bb5a (5 gm / L) 3. Chemical check - Chlorantraniliprole 18.5 SC 30g a.i./ha 4. Control (Untreated)
Method of application:		Three foliar sprays of talc based biopesticides at 14 days interval as soon as the pest population is seen till the peak fruiting period is over.
Observations	:	• Pre-spraying count and post-spraying count (weekly intervals) of shoot damage (%) • Fruit damage (%) (weekly intervals) • Growth promotion characters *viz.*, plant height (cm) at 60 and 90 DAT, biomass (g) • Yield (kg/ha) • CB Ratio • Record of natural enemies (earthworms, earwigs, spiders, Coccinellids and Chrysopa) from 5 plants in each plot. (Number/plant) (1 DAT, 30 DAT and 60 DAT) • Phytotoxicity effect should be observed (7 and 15 days after spray) parameters like leaf injury on tips/surface, wilting, necrosis, vein clearing, epinasty and hyponasty were taken into consideration.

8. OKRA

Demonstration of bio-intensive management practices for the management of pestsin okra (IGKV Raipur; CAU Pasighat; ICAR-IIHR Bengaluru)

Objective		To demonstrate the BIPM practices against pests of Okra
Crop		Okra
Variety	:	Region specific recommended variety
Location		
Area		2.5 ha
Treatments	:	T1: BIPM • Installation of pheromone trap for *Helicoverpa armigera* & *Earias vittella*@ 30 traps/ha at 30 DAS. • Yellow sticky traps @20/ha for maintaining of sucking pests. • Six releases of *Trichogramma chilonis*@ 50000/ ha at weekly interval with the initiation of pest. • Two sprays of *Bacillus thuringiensis* NBAIR BTG4 ($2x10^8$cfu/g) 1% WP 10g/L. First spray with the initiation of lepidopteran pest and subsequent spray at ten days interval • One spray of Azadirachtin 1500 ppm (1% EC) @ 2ml/L with the initiation of sucking pest and subsequent spray with *Lecanicillium lecanii*NBAIR Vl-8 ($1x10^8$cfu/g) 1% WP (5g/L) at ten days interval. T2: POP Recommendation
Observations	:	Catches of *Helicoverpa armigera* and *Earias vittella*in pheromone trap will be recorded at weekly interval from the installation of pheromone trap. The observations on larval population of *H. armigera* and *E. vittella*will be recorded from ten randomly selected plants per repetition at weekly interval with the initiation of pest. The observations on sucking pest population will be recorded from three leaves (upper, middle and lower) of ten randomly selected plants per repetition at weekly interval with the initiation of pest. Natural enemies: The population of natural enemies will be recorded from 10 plants of each quadrate at 15 days interval Fruit damage (%) - The observations on fruit damage on number and weight basis will be recorded from each treatment at each picking. Fruit yield (healthy marketable fruit) q/ha C:B ratio

9. CHILLI

9.1 Evaluation of entomopathogens againstsucking pests of chilli (thrips, aphids and Whitefly) of chilli*)* (ICAR-IIHR Bengaluru; UAS Raichur; MPKV Pune; PJTSAU Hyderabad, HRS Ambajipetta; CAU Pasighat, ICAR – IIVR; AAU, Jorhat; CTRI-Rajahmundry)

Objective		To evaluate of entomopathogens against sucking pests of chilli
Crop		Chilli
Pest		Sucking pests
Variety	:	Region specific recommended variety
Treatments		4
Replications		5
Plot size / Replication	:	30 m^2
Treatments	:	T1: Oil based formulation of *M. anisopliae* IIHR Strain (1x10^8 spores/g)@5ml /L
		T2: Powder formulation *Beauveria bassiana* NBAIR Bb5a (1x10^8spores/g) @5 g/ L T3: POP Recommendation (Imidacloprid @0.3ml/L) T4:Control Five rounds of spray at weekly intervals starts a five days after transplanting
Methods and observations	:	• Population of white fly, aphids and thrips a day before application and 3rd, 7th day after application. (4 leaves/plant) • Record hopper damage symptoms and ChLCVincidence. • Marketable Yield at harvest replication wise in each treatment

10. CABBAGE

10.1 Evaluation of Biointensive management practices for the cabbage pests (aphids *Brevicoryne* spp. / *Myzus* spp. and Diamond back moth, *Plutella xylostella*) (MPKV Pune; CAU Pasighat; IIVR Varanasi)

Objective		To evaluate theBiointensive management practices for cabbage pests (Sucking pests and DBM)_
Crop		Cabbage
Pest		Aphid and Diamond back moth
Variety	:	Region specific recommended variety
Design of experiment		RBD
Treatments		3
Replications		7
Plot size / Replication	:	100 m^2
Treatments	:	T1 : BIPM

		• Growing Indian bold seed mustard as trap crop @25:2 • Installation of pheromone trap for *Plutella xylostella* @ 12 traps/ha at 30 DAT • Eight releases of *Trichogramma chilonis*@ 100000/ ha at weekly

		interval with the initiation of pest • Two sprays of *Bacillus thuringiensis* NBAIR BTG4 (2×10^8cfu/g) 1% WP (5g/ L). First spray with the initiation of lepidopteran pest and subsequent spray at ten days interval • One spray of azadirachtin 1500 ppm (1%EC) (2ml/L) with the initiation of sucking pest/aphid and subsequent two sprays with *Lecanicillium lecanii*NBAIR Vl-8 (1×10^8cfu/g) 1% WP (5g/L) at ten days interval. T2: POP Recommendation (Spraying 5% NSKE) T3: Control
Observations	:	Catches of *Plutella xylostella* in pheromone trap will be recorded at weekly interval from the installation of pheromone trap. The observations on larval population/plant of lepidopteran pest will be recorded from ten randomly selected plants per repetition at weekly interval with the initiation of pest. The observations on aphid population/plant will be recorded from ten randomly selected plants per repetition at weekly interval with the initiation of pest. Fruit damage (%) - The observations on fruit damage on number basis will be recorded from each treatment at each picking. Yield (healthy marketable cabbage heads) q/ha C: B ratio

11. CITRUS

Evaluation ofentomopathogens against citrus thrips and green mites (rust andgreen mites) (CRS Tirupati)

Objective		**To evaluate entomopathogens against citrus thrips and mites**
Crop		Citrus
Variety	:	Sathugudi
Design	:	RBD
Treatments	:	3
Replications		7
Plot size		50 m^2
Treatments	:	T1: *Beauveria bassiana* NBAIRBb5a *(*1×10^8 spores/g) @ 5.0 g/L T2: POP Recommendation (Acephate 75 SP @ 0.1%) T3: Control Spray should be initiated immediately after fruit set (10 days after flowering). First spray at the peak activity of the pest and second at 14 days after first spray
Observations	:	The per cent leaf infestation due to thrips on foliage at 0 days (pre count) and 3, 7 and 14 days after second spray and for fruits, the percent infested fruits will be counted. The population counts of mitesbefore and 3, 7 and 14 days after treatmentwill be recorded. In case of rust mites, observation on infested fruits (%) before harvest will be noted The yield data (tonnes/ha.)

12. LITCHI

12.1 Bio-intensive pest management practices for the management of Litchi fruit borer, *Conopomorpha sinensis* in litchi (PAU ludhiana)

Objective		To evaluate the Bio-intensive pest management practices for the management of Litchi fruit borer
Crop	:	Litchi
Variety		Region specific recommended variety
design of experiment		RBD
Treatments		3
Replications		7
Plot size/ Replication		100 m^2
Pest	:	Litchi fruit borer
Treatments	:	T1: BIPM • Ploughing in orchard during March-April • Regular clean cultivation throughout the year • Regular collection and destruction of fallen infested fruits during May-June • Light trap @ 1 per acre • Releases of *Trichogramma embryophagum* @ 4000 parasitized eggs per tree 5-7 times at 7-10 days interval starting from initiation of flowering to colour break stage T2: POP Recommendation T3: Untreated control
Observations		Total and infested fruits from 5 trees in each unit to work out per cent damage Marketable yield

13. COCONUT

Biological suppression of rugose spiralling and nesting whiteflies on coconut(CPCRI Kayankulum,DRYSRHU HRS Ambajipetta, UBKV Pundibari)

Objective		To suppress rugose spiralling and nesting whiteflies on coconut
Crop		Coconut
Design of experiment		RBD
Treatments	:	3
Replications	:	7
Plot Size/Replication	:	4palms for each replication
Variety		Region specific recommended variety
Treatment Details		T1: Foliar application of *Isaria fumosorosea* (Pfu-5) 1 x10^8 spores/ml (5 gm /L) plus Tween 80 1 ml/L (two spray at 15 days interval) T2: POP Recommendation (Neem oil 0.5% plus 0.005% soap powder) T3: Control (Two sprays at 15 days intervals).

Large scale suppression of coconut rugose spiralling whitefly using parasitoid *Encarsia guadeloupae* and *Apertochyrsa astur* (TNAUCoimbatore; DRYSRHU- HRS-Ambajipeta)

Objective		To suppresscoconut rugose spiralling whitefly
Crop		Coconut
Variety		Region specific recommended variety
Pest		Rugose spiralling whitefly
Location	:	Chinnapampalayam
Area		25 ha
Treatments	:	T1: *Encarsia guadeloupae* natural conservation + release of *Apertochyrsa astur* eggs @1000/ha + yellow sticky traps @ 20/ha T2:POP Recommendation (Neem oil 0.5% plus 0.005% soap powder)

Large scale demonstration on management of coconut rugose spiralling whitefly using entomofungal pathogen, *Isaria fumosorosea* (ANGRAU Anakapalle)

Objective		To demonstrate the bioefficacy of entomofungal pathogen *Isaria fumosorosea* for the management of rugose spiralling whitefly on coconut
Crop		Coconut
Location	:	Farmers fields in Srikakulam, Vizianagaram districts
Area		40 ha
Treatments	:	T1: Spraying *Isaria fumosorosea* (Pfu-5) @ 1 x10^8 spores/ml (5 ml /L) Three sprays at 15 days interval covering the entire leaflet, fronds and directed lower side of leaves. T2 POP Recommendation(Neem oil 0.5% plus 0.005% soap powder)
Observations	:	<u>Palm infestation :</u> Pre (one day before) and post treatment count on 7 and 14 days after treatment: 1. Percentage of leaves infested/palm (no. of leaves infested by RSW /total leaf per palm), 2. Intensity of pest damage from 10 infested leaflet/fronds per palm from the outer/middle whorl representing four directions (no. of leaflets infested by RSW/ total leaflets per leaf) 3. Ten leaflets from each palm for assessment live colonies (Low: 0-10 live egg spiral or adult/leaflet; Medium: 11-20 live egg spiral or adults/leaflet; Severe: more than 20 egg spirals or adults /leaflets), pest stages. <u>*Isaria* infection can be observed on eggs, nymphs, adults:</u> Mycelial growth on eggs (shrunken egg, dark brownish egg), nymphs (reddish spot, shrinken body, turn into pale yellowish brownish over the time) and on adults (mummified adults: newly emerged adults unable to expand the wings, fly). Natural parasitism by *Encarsia guadeloupae* may be also observed

14. PLANT DISEASES EXPERIMENTS

14.1 Evaluation of antagonistic microbes against brown spot, blast and sheath blight of rice (Centres: ICAR-NRRI Cuttack; AAU Anand; AAU Jorhat; PAU Ludhiana; UAS Raichur)

Objective		To evaluate the antagonistic microbes against brown spot, blast and sheath blightof rice
Crop		Rice
Variety	:	Region specific recommended variety
design of experiment		RBD
Treatments		3
Replications		7
Plot size /Replication		$50m^2$
Treatment details		T1: *Pseudomonas fluoresens* NBAIR PFDWD (Seed treatment @10 g/litre +Seedling dip @ 10 gm / litre+ Foliar spray @ 10 gm/litre on standing crop at 10 days interval, i.e. 40, 50, 60 and 70 days after transplanting (DAT). T2: *Bacillus amyloliquefaciens* NRRI BS-5 (Seed treatment @10 g/litre +Seedling dip @ 10 gm / litre+ Foliar spray @ 10 gm/litre on standing crop at 10 days interval, i.e. 40, 50, 60 and 70 days after transplanting (DAT). T3:POP Recommendation (Application of Tebuconazole 50%+ Trifloxystrobin 25 %((75% WG) 1g/L T4: Untreated control
		• Per cent disease index (PDI) • Shoot and root growth (in cm) • Grain yield (Kg/ha) • C:B ratio

Evaluation of *Bacillus subtilis* TNAU BS1 against major diseases of rice (Blast andbrown spot) (TNAU Coimbatore)

Objective		To evaluate the *Bacillus subtilis* TNAU BS1 against major diseases of rice
Crop		Rice
Variety	:	Region specific recommended variety
Design of experiment	:	RBD
Treatments	:	3
Replications		7
Plot size/Replication		$50\ m^2$
Treatments	:	T1-*Bacillus subtilis* TNAU BS1 (Seed treatment (10g/kg) + soil

		application @ 5 kg/ha+ Foliar spray @10 g/L) T1-*Bacillus subtilis* NBAIR BS1 (Seed treatment (10g/kg) + soil application @ 5 kg/ha+ Foliar spray @10 g/L) T3-POP Recommendation(Application of Tebuconazole 50%+ Trifloxystrobin 25 % (75% WG) 1g/L T3 – Control
Observations	:	• Disease incidence • Shoot and root growth • Grain yield (Kg/ha) • C:B ratio

Large scale demonstration of Plant Bioagent (PBAT-3) for the management of rootrot complex disease of tomato (GBPUAT, Pantnagar, IGKV Raipur)

Objective	Large scale demonstration of Plant Bioagent (PBAT-3) for the management of root rot complex of tomato
Crop	Tomato
Variety	Region specific recommended variety
Location	Golapar area, Nainital district,Uttarakhand
Area	25 ha
Treatments	T1:PBAT -3 formulation • Seed bio-priming through Pant Bioagent formulation, PBAT-3 (*T. harzianum* Th14 + *Pseudomonas fluorescens* Psf 173) @ 10g/kg of seeds. • Seedling dip with PBAT 3@ 10 g/ L for about 30 minutes. • Two sprays of PBAT 3 @ 10 g/ L on standing crop (Tillering phase) at 10-12 days intervals T2:POP Recommendation (Carbendazim drenching @1g/L)
Observations to be recorded:	• Disease incidence (root rot complex**)** • Grain yield of crop (kg/ha) • Cost-benefit ratio.

ACRONYMS

AAU-A	Anand Agricultural University, Anand
AAU-J	Assam Agricultural University, Jorhat
ANGRAU	Acharya N.G. Ranga Agricultural University, Anakapalle
GBPUAT	Gobind Ballabh Pant University of Agriculture and Technology, Pantnagar
KAU	Kerala Agricultural University, Thrissur
MPKV	Mahatma Phule Krishi Vidyapeeth, Pune
PAU	Punjab Agricultural University, Ludhiana
PJTSAU	Pandit Jayashankar Telangana State Agricultural University, Hyderabad
SKUAST	Sher-e-Kashmir University of Agricultural Science & Technology, Srinagar
TNAU	Tamil Nadu Agricultural University, Coimbatore
YSPUHF	Y.S. Parmar University of Horticultural and Forestry, Solan
CAU	Central Agricultural University, Pasighat
MPUAT	Maharana Pratap University of Agriculture & Technology, Udaipur
OUAT	Orissa University of Agriculture & Technology, Bhubaneswar
UAS-R	University of Agricultural Sciences, Raichur
IGKV	Indira Gandhi Krishi Viswavidhyalaya, Raipur
KAU	RARS KAU-Regional Agricultural Research Station, Kumarakom
KAU	RARS KAU-Regional Agricultural Research Station, Vellayani
YSRUH	Dr. Y S R Horticultural University, Ambajipeta
UBKV	Uttar Banga Krishi Vishwavidyalaya, Pundibari, West Bengal
CISH	Central Institute of Subtropical Horticulture, Lucknow
CPCRI	Central Plantation Crops Research Institute, Kayamkulam
CTRI	Central Tobacco Research Institute, Rajahmundry
IIHR	Indian Institute of Horticultural Research, Bengaluru
IIRR	Indian Institute of Rice Research, Hyderabad
IIMR	Indian Institute of Millet Research, Hyderabad
IIVR	Indian Institute of Vegetable Research, Varanasi
NCIPM	National Centre for Integrated Pest Management, New Delhi