

I. Trap Technology

A. Species profiling of soil arthropods through light trap:

The light trap of NCIPM (with timer) will be installed for few months to monitor scarabaeid beetles activity (according to agro ecological region of each center) and the light sources will be switched on for few hours every day during evening to catch the adults. Daily collection of beetles be sorted species wise and correlated with corresponding weather data pertaining to Temperature, Relative Humidity, Rainfall etc. The GPS will be used to record the geographical details with respect to distribution pattern of species restricted by altitude/latitude/longitude.

All centres will do this experiment (funded as well as non-funded).

B. Pheromone (Leader Dr. K. Mohini, HPAU, Palampur): The concerned centre will isolate gland of the relevant species and solvent extract of glands as well as whole body; isolation of pheromone by confinement and rinse method and trapping of volatiles/pheromones by using suitable adsorbents. The extracts containing the pheromone will be analysed in GCMS to identify the compounds. Bioassay will be carried out with relevant species to establish the efficacy of identified compound.

Jorhat – *L. mansueta*

Bangalore – *H. serrata*

Palampur – *B. coriacea*, *H. Longipennis*

Kasargod – *L. coneophora*

C. Population Monitoring of soil arthropods and their extent of damage in different crops:

Visual monitoring of soil arthropod pest species and their extent of damage in different crops will be recorded. Survey will be carried out once in a month and extent of damage to different crops by soil arthropod pest species be reported periodically in MPR. All information should be supported by GPS locations.

All centres will do this experiment (funded as well as non-funded).

D. Monitoring of natural enemies of soil arthropods:

To monitor the prevalence of natural enemies (parasitoids, predators & pathogens) of major soil arthropods, seasonal soil sampling be done in the endemic pockets. Each centre will undertake the sampling method of each organism according to the cropping system. Natural enemies should be sent to Dr. M. Nagesh, Principal Scientist, NBAll, Bangalore, who will act as Nodal Officer on behalf of this group and will facilitated its identification and culturing and providing necessary details regarding receipt No. and code numbers.

All centres will do this experiment (funded as well as non-funded).

II. MANAGEMENT OF WHITEGRUBS THROUGH CHEMICALS:

Insecticides be applied in soil, seed, furrows/ through seed treatment if the sowing time coincides with the emergence of beetles. If the crops are sown much earlier than beetle emergence, the insecticides be applied by soil drenching method in standing crops at the time of occurrence of eggs and neonate first instar grubs. In areas where both the situations occur (crops sown earlier than monsoon and crops sown with the onset of monsoon coinciding with beetle emergence) trials should be laid out separately for both the situations. In all the cases the critical timing of pesticide application should be according to the presence of eggs and first instar grubs for targeting the key species of each region. Pesticides residues analysis and B:C should also be given. Correlation of grub population with damage needs to be established.

A. Evaluation of granular insecticides against white grub:

Treatments	Hills	Plains
Chlorpyriphos 10G	2 kg a.i./ha	2 kg a.i. /ha
Phorate 10G	2.5 kg a.i./ha	2.5 kg a.i. /ha
Carbofuran 3G	750 g a.i./ha	750 g a.i./ha
Clothianidin 50 WDG (Dantotsu)	120 g a.i./ha	120 g a.i./ha
Fipronil 0.3G	-	50g a.i./ha
Fipronil 0.3G	-	100g a.i./ha
Thiamethoxam 25WG (Actara)	80 g a.i./ha	80 g a.i./ha
Amamectin Benzoate 5% SG (Proclaim)	12.5 g a.i./ha	12.5 g a.i./ha
Imidacloprid 70 WG (Admire)	300g a.i./ha	300ga.i./ha
Untreated control		

Crops

Potato	:	Jorhat and Palampur
Areca nut	:	Bangalore
Soyabean	:	Ranichauri
Groundnut	:	Durgapura

B. Evaluation of some liquid insecticides against white grub:

Treatment	Hill		Plain	
	Seed treatment/ soil furrow application	Drenching in standing crop	Seed treatment/ soil furrow application	Drenching in standing crop
Quinalphos or chlorpyrifos	400 g a.i./ha	800 g a.i./ha	400 g a.i./ha	800 g a.i./ha
Imidacloprid 17.8 SL	48 g a.i./ha	60 g a.i./ha	48 g a.i./ha	60 g a.i./ha
Thiamethoxam 70WS	80 g a.i./ha	150 g a.i./ha	80 g a.i./ha	150 g a.i./ha
Thiamethoxam 25 WS	80 g a.i./ha	150 g a.i./ha	80 g a.i./ha	150 g a.i./ha
Bifenthrin 10EC	50 g a.i./ha	200 g/ha	50 g a.i./ha	200 g/ha
Fipronil 5SC	-	-	100 g a.i./ha	150 g a.i./ha
Clothianidin 50 WDG (Dantotsu)	120 g a.i./ha	150 g a.i./ha	120 g a.i./ha	150 g a.i./ha
Imidacloprid 600 FS	500 g a.i./ha	750 g a.i./ha	500 kg/ha	750 g a.i./ha
Acephate 50% + imidacloprid 1.8%	4 g/ kg seed or 1.25 kg/ha	1.25 kg/ha	4 g/ kg seed or 1.25 kg/ha	1.25 kg/ha
Untreated check				

Crops

Potato	:	Palampur, Modipuram
Areca nut	:	Bangalore
Soyabean	:	Ranichauri
Groundnut	:	Durgapura, Modipuram
Colocasia	:	Jorhat

III. Microbial Control of Whitegrubs

A. Management of white grubs through bio-control agents

Treatments:

1. *Heterorhabditis indica*
2. *Steinernema abbassi*
3. *Steinernema glaseri*
4. *Metarhizium anisopliae*
5. *Beauveria bassiana*
6. *H. indica* + *M. anisopliae*
7. *H. indica* + *B. bassiana*
8. Local isolates

Crops

Potato	:	Palampur, Modipuram
Areca nut	:	Bangalore
Soyabean	:	Ranichauri
Groundnut	:	Durgapura
Green gram	:	Jorhat
Tapioca	:	Kasargod

The material will be supplied by Dr. M. Nagesh along with detailed protocol and detailed methodology. Application of biopesticides should coincide with mass emergence of beetles after first shower of monsoon.

B. Study of local isolates of Bacteria for their infectivity against whitegrubs (BANGALOE CENTRE ONLY):

The existing isolates would be screened against *Holotrichia serrata* larvae and the active isolates identified. These would be further tested against *Holotrichia* species and *Leucopholis* species as many times as possible to identify the most consistent relatively high activity isolate. Two to three such isolates would be field tested.

C. EPN STUDIES (KASARGOD): Collection of local isolates of EPN and their testing against *Lecopholis coneopora*

IV. Taxonomy of Whitegrubs (BANGALORE CENTRE ONLY): Collection and curation of Whitegrubs of the subfamily melolonthinae and other sub-families from different parts of India. Description and illustrations of the whitegrubs spp. would be continued.

V. Social Engineering (Leader –ARS, Durgapura)

For beetle management all centres will survey and suggest endemic areas of whitegrub infested districts. The prominent Tehsils with respect to prevalence of whitegrubs will be sortlisted and further 4-5 villages will be selected on the basis of cropping pattern and host trees. Campaigns will be organized to educate the people about the adult management with light and/or pheromone traps. Emphasis will be on pre-monsoon training to the villagers including children as well as women. Constitution of village task forces to tackle the beetle management programme. With onset of monsoon message will be delivered to the villagers through mobile SMS involving local KVKs/department of Agriculture about the importance of spraying of host trees and installation of lures. **ALL CENTRES TO CONDUCT THIS ACTIVITY ON ONE SPECIES OF IMPORTANCE.**

VI. Management of termites through chemicals

Treatments	Plain	Hill
Thiamethoxam 25 WG	3.2 g/kg seed	3.2 g/kg seed
Imidacloprid 17.8 SL	3.0 ml/kg seed	3.0 ml/kg seed
Acephate 50% + imidacloprid 1%	4 g per kg seed	4.0 g/kg seed
Fipronil 5 SC	6.0 ml/kg seed	-
Fipronil 5 SC	10.00 ml/kg seed	-
Fipronil 5 SC	15.00 ml/kg seed	-
Thiamethoxam 35 FS	2.4 ml/kg seed	2.4 ml/kg seed
Imidacloprid 600 FS	500 g ai/ha	500 g ai/ha
Clothianidin 50 WDG	2.0 g/kg seed	500 g ai/ha
Control		

Crops

Wheat	:	Palampur
Wheat, Chickpea, Groundnut	:	Durgapura
Sugarcane	:	Jorhat

VII. Cutworm

A. Monitoring of Cutworm

Center: Jorhat, Palampur and Ranichauri will monitor the population of the cutworm through light trap and pheromone traps.

(The availability of pheromone traps to be ensured from PCI)

B. Management of cutworms: Palampur, Jorhat and Ranichauri centres to do location specific trials. The detailed protocol will be sent to the Coordinator.

VIII. Soil Micro-arthropods (Leader – Dr. Badal Bhattacharya, AAU Jorhat)

1. Extraction of soil micro-arthropods from different ecosystems.
2. Study of micro-arthropods fauna especially collembolan and mites
3. Rearing technology of collembolla and mites.

All centres to take up work on 1 and 2, however, work on 3 will be done by Jorhat centre only. The detailed methodology will be supplied by Dr. Badal Bhattacharya to all centres.

IX. Location Specific Trials

Each center will conduct experiments of local importance based on the feed back received from different sources and will communicate the details of the trial to the Project Coordinator at the earliest so that same may be included in the final program for 2012-13.

As strictly directed by Asstt. Director General (PP), Ranichauri centre will generate the data regarding whitegrub species profiling, bioecological studies and development of management strategy of sugarcane whitegrub existing as major problem in sugarcane growing area of Uttarakhand State particularly Haridwar and Dehrudun districts.

Palampur centre will undertake studies on bioecology of important species of their area.