



National Institute of Plant Health Management

Department of Agriculture, Cooperation & Farmers Welfare
Ministry of Agriculture & Farmers Welfare, Government of India
<http://niphm.gov.in>



Plant Health News Letter

Volume: 6

April - June 2016

Issue: 2

IN THIS ISSUE

Theme Article Page 2-5

- Vermitechnology

Special Event Page 6-7

- Workshop on Pesticide Formulation Technologies
- Off Campus Training Programme on Post Entry Quarantine & Biosecurity at Sikkim
- Meghalaya RKVY project
- Quarantine Pests: Detection and Identification
- New Initiatives

Capacity Building Page 8-14

- Plant Bio-security
- Plant Health Management
- Pesticide Management
- Plant Health Engineering
- Vertebrate & Urban Pest Management

Achievements Page 14

- Certificate of Appreciation

NIPHM Activities Page 15-16

- Additional Secretary visit
- Swachta Pakhwada
- Plantation day

From the Director General's Desk



Mrs. V. Usha Rani, IAS
Director General

The green revolution has resulted in boosting the production due to intensive agriculture although it has resulted in good harvests and productivity by reaping three crops in a year with good irrigation facilities, there was no thought about its adverse impact on the soil conditions and the environment. With the extensive use of chemical fertilizers and improper irrigation, Productivity of the soil is getting reduced considerably. Application of chemical fertilizer as such without conservation of soil fertility,

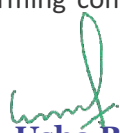
not only results in depletion of soil nutrient reserves but it also disrupt the biological eco balance of soil - plant system. The permanent and low cost solution to overcome the impact of chemical fertilizers is to develop a farming system which is economically productive and long lasting in sustainable farming by simple and inexpensive practices like vermi-technology.

Use of bio-fertilizers, biopesticides, vermicompost, biological pest control techniques will certainly fit with organic farming. Application of nutrients through organic sources stimulates the activity of soil microorganisms, improves the structure/texture of soil, plant nutrients holding capacity and increases the availability of plant nutrients.

Vermi-technology is the most suitable remedial alternative and low cost technology being widely adopted by the farmers in our country. The utilization of vermicompost give plant growth, good yield, maintain the soil fertility, results in several benefits to farmers, industries, environment and overall national economy.

Vermicomposting is a process in which biological degradation of organic wastes takes place in controlled conditions, by the action of earthworms and microorganism. Microorganisms and earthworms are important biological organisms helping nature to maintain nutrient flow from one system to another and also minimize environmental degradation. Epigeic earthworms such as *Eisenia andrei*, *E. fetida*, *Perionyx excavatus* and *Eudrilus eugeniae* are generally used for vermcomposting because of their natural ability to colonize organic wastes, high rates of consumption, digestion and assimilation of organic matter, tolerance to a wide range of environmental factors, short life cycles, high reproductive rates, and endurance and resistance to handling, show good potential for vermicomposting.

The National Institute of Plant Health Management is popularising vermicomposting as one of the component in the Plant Health Management through various capacity building training programmes to the agricultural and horticultural extension functionaries, Agri-buissness entrepreneurs and farmers etc., It is hoped that the various functionaries from the country will take advantage of these programmes and transfer the skill to the farming community for sustainable agriculture.


(Smt. V. Usha Rani, IAS)
Director General

Theme Article
Vermitechnology
Dr.P.Sakthivel, Asst. Scientific Officer (VPM), NIPHM

India is an agriculture based country, farmers need adequate resources to replenish soil fertility and maintain the productivity of soil. The green revolution relied mostly on chemical inputs to achieve higher productivity. Intensive agriculture with high dependence on chemical inputs has contaminated our soil, air, water and food. Farmers are in need of alternative solution to replace the chemical inputs. In recent days, the use of organic inputs like vermicompost, biofertilizers and biopesticides are becoming popular. Among the organic manure, vermicompost is one of the best which contains rich nutrients, growth regulators like hormones which are required to plant growth. In recent years, disposal of organic wastes from various sources like domestic, agriculture and industrial has caused serious environmental hazards and economic problems. It is estimated that nearly 700 million t organic waste is generated annually in our country which is either burned or land filled. Burning of organic wastes contributes tremendously to environmental pollution. This process also releases large amounts of carbon dioxide in the atmosphere, a main contributor to global warming together with dust particles. Burning also destroys the soil organic matter content, kills the microbial population and affects the physical properties of the soil. The wastes can be recycled through vermitechnology in which the nutrient flows from one system to another are maintained and environmental hazards can be minimised. Earthworms play an important role in the decomposition of organic matter and soil metabolism through feeding, fragmentation, aeration, turnover and dispersion. Many reports states that one acre of land can contain up to 3 million earthworms the activities of which can bring up to 8-10 tons of 'top soil' to the surface (in the form of vermicast) every year. Presence of worms regenerate compacted soils and improves water penetration in such soils by over 50%. This is the reason Sir Charles Darwin called the Earthworms as "Farmers friend" and Aristotle termed as "the intestines of earth and the restoring agents of soil fertility". The earthworms can be effectively utilised to process household garbage, city refuse, sewage sludge and waste into valuable compost. Vermitechnology is both ecologically and economically viable process and can be adopted a common man. Vermitechnology is a branch deals with three components 1. Vermicomposting 2. Vermery and 3. Vermiwash.

Vermicomposting

It is a technology of converting organic waste into fine granular useful products through the earthworms and

microorganisms. The earthworms feed on the organic waste and the earthworms' gut acts as a bioreactor whereby the vermicasts are produced and excreted by the earthworms. It contains rich in nitrogen (N), phosphorous (P) and potassium (K) as well as trace elements depending on the feedstock type used. Although it is a microorganism, that biochemically degrade the organic matter, they are the crucial drivers of the process, as they aerate and fragment the substrate there by drastically altering the microbial activity and further decomposition. The application of vermicompost helps in increasing the organic matter content of the soil, in maintaining soil natural productivity. The soil enriched with vermicompost provides additional substances that are not found in chemical fertilizers. Vermicomposts work as a 'slow-release organic fertilizer' with their continued application of the 'organic nitrogen' and other nutrients in compost tends to be released at constant rate from the accumulated 'humus' and the net overall efficiency of NPK over a period of years is considerably greater than 50% of that of chemical fertilizers.

Earthworm species suitable for vermicompost

Earthworms play a key role in soil biology as versatile bioreactor. The earthworms are a group of invertebrates belonging to the phylum Annelida and class Oligochaeta and represented by more than 1000 species. Various earthworms have been recommended for vermicomposting and ideal species are European red worm. *Eisenia fetida*, African Night crawler, *Eudrilus eugeniae*, Asian worm, *Perionyx excavatus*, *Lampito mauritii*. All the four types are adaptable to changing conditions and have lower chances of compromising on the vermicompost process. However, *Eudrilus eugeniae* has the high rate of reproduction and it is capable of converting large quantity of organic matters.

Description of the suitable species:

***Eisenia foetida*:** world's most widely used earthworm in the vermitechnology for vermicomposting. They are distributed throughout the India. They are generally called red worm / tiger worm/ pink worm / purple worms. It appears in red, brown or purple or dark color. Ventral body pale in color. The adult worm weighing about 1500mg and attain reproduction capability within 50-55 days of hatching from cocoon. In adult worm, the clitellum spreads over 7-9 segments in length over XXIV, XXV, or XXVI to XXXII segments. This earthworm can tolerate wide fluctuations of temperature and humidity. The culturing process of speices is very easy due to feeding adaptability or adjustment to organic matters. The conversion efficiency is very high. They have fast growing rate.

***Eudrilus eugeniae*:** This species perhaps fastest growing nature and second most widely used earthworm for vermicomposting. This species originally distributed in West Africa and presently distributed in most part of the world. It commonly known as African Night Crawler. In India especially in southern region commonly used species for the vermiculture. It is red to dark violet in color. The general coloration like animal flesh. The length of this species ranges from 32 – 140 mm, diameter is 5-8 mm and total body segments ranging from 145 -196. In mature worm, the clitellum spreads over 5-6 segments numbering XIII or XIV to XVIII. It grow fast than the other species and range from 5- 13mg/day. The attain maturity within 40 days. The total life span is 1 to 3 years. They are low temperature tolerate, however, they can tolerate high temperature as well (45. F).

***Perionyx excavates*:** It is commonly called as Blue worm or Asian worm. In India, this species is distributed in Western and Eastern Himalayas, Bengal (Calcutta, Rajasthan, Sibpur), Maharashtra (Mumbai) and Andaman islands. This species was widely used for vermicomposting purpose in many parts of the world. The body colour is deep purple to reddish brown in the dorsal surface and pale colour in lower side. The body length ranges from 23 to 120mm with a diameter of 2.5mm. The clitellum ring shaped covering five segments on XIII to XVII. The body weight is maximum is 600mg and life span is 46 days. It attains maturity within 21-22 days and lay the cocoon by 24th day. This is almost double the reproduction rate and most commonly used earthworm for vermiculture. The cocoon incubation period is approximately 18 days. It is also one of the important suitable species for vermicomposting in tropical regions as they live and thrive in temperatures between 20 – 35 degrees Celsius.

***Lampito mauritii*:** This species distributed throughout the India (except Uttar Pradesh). The body coloration is dark yellow except at the anterior end which has purplish tinge. The total body length 80–210 mm with diameter of 3-5 mm. They have 166-190 body segments and the clitellum spread over to four body segments on XIV to XVII and it is ring shaped. Male pores on papillae, female pores nearer each other in pairs on XIV segments had spermathecal pores, in three Process of vermicomposting. Vermicomposting has been done by using different methods such as tank method, pit, windrow/heap method depend upon the amount of production and composting structure. Vermicomposting can be done in pits, concrete tanks, well rings, brick-linked grouwer beds, wooden or plastic crates, tarpaulin sheets, etc.,

*Eudrilus eugeniae* (African Night Grawler)*Eisenia foetida* (Red Worms)*Lampito mauritii* (Indian Worms)*Perionyx excavates* (Asian Worms)**Table 1. Growth parameters of Four earthworm species**

Growth parameters	<i>E. eugeniae</i>	<i>E. foetida</i>	<i>L. mauritii</i>	<i>P. excavatus</i>
Duration of life cycle (days)	110	72	108	70
Mature worm length (cm)	14	6	10-20	4-6
Cocoon production No./worm/day	1 in every 5 days	1 in every 3 days	1 in every 5 days	1 in every 1 days
Time of Cocoon production (Days)	55	60	65-75	45
Juveniles from Cocoon	1-5	5	1-3	1-3
Maximum body mass (g)	4	1.5	3-50	0.6
Growth rate (mg/worm/day)	5.10	2.5	4	3.5

Small scale vermicomposting:

It can be done under covered areas with a shady place. It should be protected from the climatic adversaries like heavy rains, prolonged spells of high or low temperature and also from predators like ants, rodents, and birds etc. small scale vermicomposting is easiest methods and it can be adopted by any farmers.

Large scale or outdoor vermicomposting:

In this method all the agricultural plant waste, municipality waste can be composed after pre-treatment to be heaped and mixed with small quantities of cow dung. In addition inoculum for enhancing the decomposition process and eventual faster decomposition.

The following steps need to be followed for large scale production

- Construction of concrete tank / pit (7 m Length X 1m Width X 0.6 m Depth) (the size is depending upon the availability of raw materials). The tank should have exit hole for removing excess water.
- At the bottom of the tank, prepare a layer of 5cm thick containing broken bricks and pebbles. This is to remove



Tank method

Pit method

windrow method

the excess water in the tank. A second layer of soil (10 cm thickness) and then red soil needs to be added. The unit is covered with thatch grass or any other locally available materials.

- Variety of biological waste materials such as cow dung, domestic wastes, kitchen waste, crop residue, leaf litters, etc., can be used for vermicomposting. If plant residues the wastes materials should be chopped and mixed with cow dung in 60:40 / 70:30 ratio to accelerate the decomposition process. The mixture should be kept for partial decomposition for 25-30 days.
- Placing the partially decomposed biological waste materials transferred to the tank up to 2.5 feet height from bedding material (where sieved sand/soil layer of 1-2 inch is used as bedding material).
- Inoculation of earthworm FLD conducted by KVK, Chirang on low cost vermicompost unit
- (mixture of epigic and anecic earthworms @ 1000 numbers of earthworms per 1 sqm area) over the layers of partially decomposed biological waste materials. The earthworms immediately go towards the bottom.
- The bed is covered with jute bags/ hay.
- On the bed spray water every 2-5 days depending upon the climatic conduction, turn compost periodically for the better aeration and monitor for moisture status.
- After 45 – 60 days when the top most layer turns brownish black in colour with granular structures then the material is ready to harvest.
- Prior to harvest stop watering and make a heap. Keep it for half a day. The earthworm will gather at the bottom of the heap. Then remove the heap and earthworms are settled down at the bottom. Another method of harvesting vermicompost is to push the decomposed manures to the one side of the bed and fill the other side with fresh partially decomposed matters and moist the bed wait for one or two days. The worm will automatically move to freshly filled side and then scoop out the vermicompost.
- Then sieve vermicompost with 2mm wire mesh through the harvester and earthworms as well as earthworm cocoons filtered at the harvester can be reused for next batch of vermicomposting.

Recommendation of doses

- Vermicompost should be used as a component of integrated nutrient supply system. Vermicompost can be used to all the crops (agricultural, horticultural, ornamental and vegetables at any stage) at any stage. The doses of vermicompost application depend upon the type of crop grown in the field/nursery. For fruit crops, it is applied in the tree basin. For the field crops 5-6 t/ha vermicompost is used by mixed with seed at the time of sowing or by raw application when the seedling are 12-15 cm in height.
- For vegetables and fruit crops the amount of vermicompost ranges from 400-500g / plant and 5 -10 kg/ tree, respectively. It can be applied along with cow dung by spreading a thin layer and water sprayed on the surface after covering with soil.
- For Pots cultivation it can be applied @100-200 g/pot.
- The vermicompost also used as a carrier media for application of bio fertilizers like Trichoderma, Pseudomonas and Micorrizha.

Advantages of Vermicompost

- Composting is one of the most effective and possible way by which problems associated with the organic wastes can be resolved & provide clean and healthy environment.
- Vermicompost is rich in plant nutrients and provides the essential nutrient element.
- Provides excellent effect on overall plant growth, encourages new shoots, leaves and improves the quality and self life of the produce.
- Improves soil structure, texture, aeration, water holding capacity and prevents soil erosion.
- Rich in beneficial micro flora such as N-fixers, P-solubilizers, cellulose decomposing micro flora etc.
- Rich in several enzymes like amylase, lipase, cellulase and chitinase and growth regulators such as auxins, gibberellins etc. which continue to break down organic matter in the soil (to release the nutrients and make it available to the plant roots) even after they have been excreted.
- Soil pH is neutralized by the buffering action of vermicompost.
- Prevents nutrient losses.
- Vermicompost is free from pathogens, toxic elements, weed seeds etc.
- Availability of nutrients from vermicompost is faster due to its narrow C: N ratio
- Minimizes the incidences of pests and diseases in crop.
- Enhances the decomposition of organic matter in soil

- Enhances the water holding capacity and nutrient supplying capacity of the soil, so as to develop resistance in plants to pests and diseases.

Vermery:

It is techniques of rearing and multiplication of the earthworms for the vermicomposting preparation. Prepare a mixture of cow dung and dried leavers 1:1 ratio and release the earthworms @50 number/10kg of mixture and mix dried grass /leaves or husk and keep it in shade. Sprinkle water over it time to time to maintain the moister level. Earthworms multiply 300 times within one or two months. All types of organic wastes like animal by-products (cow dung, Buffalo dung and urine, goat and sheep droppings, pig slurry), crop residues and by-products (rice straw, cereal residues and pulses residues, pressmud, rice husk, tobacco wastes, tea waste), forest residues, city refuse, aquatic biomass (water hyacinth) can be utilised along with cow dung for vermiculture. However, meat and dairy product were not suitable for vermiculture. It is usually best to rear earthworms in the closed containers/ concrete tank. The rearing containers are to be kept in a cool protected place. The wormery should have more surface area than the depth because it provide more air and thereby quicker feeding and breeding of the worms.

Vermiwash:

Vermiwash is a dark brown in colour liquid fertilizer collected by allowing excess water to saturate the actively vermicomposting substrate in which the water washes the substrate in such a way that the vermicast excreted by the earthworms feeding on the substrate as well as the earthworm's body surface. It contain vitamins, hormones (Auxin and gibberlins), enzymes (cocktail of protease, amylase urease and phosphatase), microbes (nitrogen fixing bacteria such as Azotobacter sp., Agrobacterium sp., and Rhizobium and some phosphate solubilising bacteria) in addition to macronutrients and micronutrients. Vermiwash can also be used as a foliar spray whereby it acts as a pesticide in sustainable agriculture.

Vermiwash Unit:

It can be set up in a large container made of concrete or plastic barrel. A hole is drilled at the base of the container to fix a tap to it. At the bottom of the barrel, fill gravel or broken small pieces of bricks upto height of 10-15 cm. On that arrange another layer with coarse sand 40-45 cm. Hay may be placed on top of this layer of soil. Introduce about 2000 earthworms into the container. Predecomposed organic wastes is spread and moisten the different layers by using

water. The unit is moistened every day. To get vermiwash continuously suspend a small bucket with some holes. Cotton wicks/or bamboo sticks are place in the holes so that water can trickle down. The water slowly percolates through the compost carrying with it nutrients through the filter unit. Fill the container with 4-5 lits water everyday. After 10 days vermiwash starts forming in the container. Everyday about 3-4 lits of vermiwash can be collected. The collected Vermiwash should be stored in cool dry place. The vermin wash may be diluted and can be treated as pesticide on certain crops.

Dosage:

Root dip/Stem dip.

The seedlings before transplanting are dipped in vermiwash solution which is diluted 5 times with water for 15-20 minutes and then transplanted. Similarly the cuttings can also be dipped in the solution.

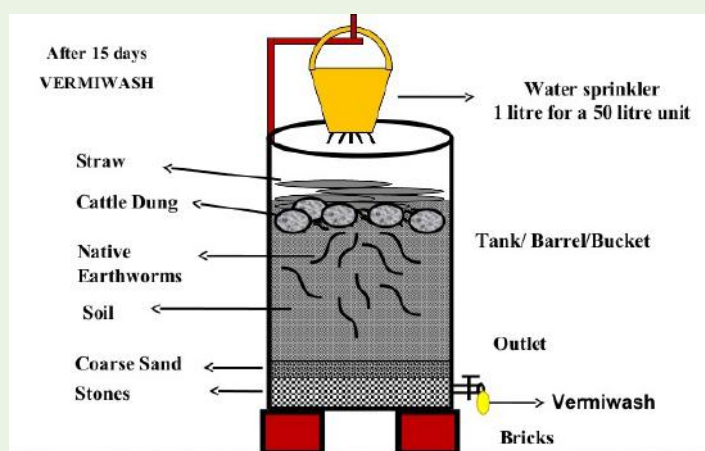
Foliar spray

Vermiwash is diluted in water 5 times and sprayed on the foliage of crops. It provides the plant with vital nutrients but also helps to control plant disease.

Soil drench

Vermiwash is diluted 10 times with water and the soil is drenched with the solution to prevent some of the soil borne pathogens.

Vermicomposting is an advantageous technology for waste management. Vermicomposting results in earthworms, vermicompost and vermiwash as products. The cost of



production of vermicompost is very low as compared to chemical fertilizers if the farmers start to produce at their farm level. Considering this importance, NIPHM is popularising vermicomposting as a one of the source of component of plant health management to the various stake holders.

Special Events: Workshop on Pesticide Formulation Technologies

The developments in Pesticide Formulations is dynamic, for bringing out physically and chemically stable compositions suitable to different situations, for effective management of target pest through uniform applications. Use of various other ingredients such as surfactants, emulsifiers, wetting agents, polymers, *etc.* in newer formulations makes difference in pesticide efficacy, spread and safety to environment. A one day "Work shop on Pesticide Formulation Technologies" was organised by NIPHM, in association with Institute of Pesticide Formulation technology (IPFT), Gurgaon, on 17th June 2016 with an aim to spread the developments in formulation technologies for better use and safety. A total of 55 representatives from different pesticide formulating industries participated in the workshop.

Dr. Ch. Sreenivasa Rao, Director, Pesticide Management welcomed the guest speakers and participants and gave an overview of the aims and objectives of the workshop. Mrs. V. Usha Rani, IAS, Director General, NIPHM, Hyderabad, in her inaugural address, stressed the importance for new technologies in pesticide formulation in an effort to minimise the environmental contamination and the acceptance by the farmers. The Director General also emphasised the role played by the biological pesticides in plant protection and to address the issues on food safety due to pesticide residues in food and environment.

Dr. S. K. Raza, Director, IPFT, delivered the key note address with introduction on Research & Development activities of IPFT, particularly about technologies developed at IPFT in chemical and biological pesticide formulations. Dr. P. K. Pathanjali, Chief, Formulations, IPFT and Dr. Pinki Bhandari, Deputy Chief, Bioscience, IPFT, were also delivered lectures on various aspects of pesticide formulations. An interactive session was organized between participants, IPFT and NIPHM scientists on various issues pertaining to pesticide Formulations.



Off Campus Training Programme on Post Entry Quarantine & Biosecurity at Sikkim

The unregulated movement of plants in to the state either through local trade or through collection and cultivation of Orchids at NRC for Orchids may pose risk of new plant pests introductions into the state. Since, Sikkim being an organic state the ICAR Research Complex for North Eastern Hilly region Tadong, Gangtok organised an awareness programme on plant quarantine in collaboration with NIPHM to prevent possible entry of exotic plant pest into the state.

The two days State Level Workshop on Post Entry Quarantine programme was held from 6th to 7th May 2016 at Conference hall, ICAR Research Complex for NEH Region, Tadong, Gangtok. The Programme was inaugurated by Chief Guest Dr. Thomos Chandy, IFS, Principal Secretary, Forest, Env.& Wildlife Management Department, Government of Sikkim. Dr.N.Sathyanarayana, Director, NIPHM, Dr. P. T. Bhutia, Director, Department of Horticulture, Dr. Avasthe, Joint Director, ICAR presided over the inaugural function.

Dr. N. Sathyanarayana & Ms. S. Latha from NIPHM along with Dr. Kalita, Principal Scientist, ICAR delivered the lectures for creating awareness on Plant Biosecurity, Plant Quarantine, Post Entry Quarantine, Import-Export procedures, Phytosanitary certification and Phytosanitary treatments, area wide management of fruit-fly using low cost traps & lures. The programme was attended by 90 officials representing Department of Horticulture, Department of Forest, ICAR Scientists, Spice Board officials and progressive farmers.



Meghalaya RKVY project

Under RKVY project 2013-14 entitled Adoption of AESA based Biointensive Pest Management Strategies and Promotion of Decentralized Biocontrol Agents and Biopesticides Production Centres through Farmer Self Help Groups in Meghalaya, a consultancy visit cum training programme was made by NIPHM officers (Dr. K. Vijaya lakshmi, Director-PHM, Dr. Girish AG- AD/PD, Mrs. N. Lavanya, SO-BC) to Meghalaya from 25th to 29th April, 2016 along with the officers from Department of Agriculture, Govt. of Meghalaya from 25th to 29th April 2016.

The training programmes were organized in 5 different clusters at Edenbari, West Garo and South West Garo hills, East Khasi Hills, Pynthornein, Jowai in West Khasi Hills, Mairang where farmers were given hands on training on on-farm mass production of *Trichoderma*, *Pseudomonas* as well as mass production of *Corcyra* for preparation of Tricho-cards and predators. A meeting was held with the Masters Trainers officials including Deputy Director of Agriculture, Meghalaya and progressive farmers from East Khasi Hills at MAMETI, Upper Shillong. The progressive farmers shared their experiences on use of *Trichoderma*, *Pseudomonas* and Tricho cards. In addition NIPHM low cost natural enemy friendly light traps were demonstrated and distributed to the farmers of the East Khasi Hills cluster. A total of 120 farmers were trained along with master trainers.



Quarantine Pests: Detection and Identification

Plant pests cause great damage in field and storage and hence are considered as threat to biosecurity. Reliable detection methodologies and accurate and timely diagnosis is paramount in identification of plant pests of quarantine concern to prevent entry, establishment and spread of pests of concern to any country. NIPHM organized 15 days programme on 'Quarantine Pests: Detection and Identification' from 6th – 20th April, 2016 and 7 officials from Bangladesh were trained. The participants learnt about the concepts of quarantine pests, economic impact of introduced pests and important pests of quarantine significance to South Asia. The participants got hands-on experience in collection and preservation of plant pathogens, pinning and preservation of insect specimens and procedures to be followed for dispatching the specimens for identification to diagnostic centers.



Detection and Identification' from 6th – 20th April, 2016 and 7 officials from Bangladesh were trained. The participants learnt about the concepts of quarantine pests, economic impact of introduced pests and important pests of quarantine significance to South Asia. The participants got hands-on experience in collection and preservation of plant pathogens, pinning and preservation of insect specimens and procedures to be followed for dispatching the specimens for identification to diagnostic centers.

New initiatives

NIPHM organised a training program from 6th - 10th June, 2016 on "Proficiency Testing Organiser as per ISO 17043-2010" in collaboration with EU-Capacity Building Initiative for Trade Development in India (CITD). In the training programme, staff of Pesticide Management Division and Export Inspection Council, Government of India had participated.



Capacity Building

Quarantine Pests: Detection and Identification (31st March to 20th April, 16)

This programme aims to create a pool of experts in detection and diagnosis of pests of quarantine significance. The programme is designed to update the knowledge of participants in advances in detection and diagnosis apart from developing hands-on skills on various detection and diagnostic methods. Nineteen participants from different



States of Bihar, Jammu & Kashmir, Gujarat, Kerala, Maharashtra, Uttar Pradesh, Himachal Pradesh, and Madhya Pradesh attended the training. The participants learnt about the concepts of plant quarantine regulations, import and export procedures for plants and planting material, impact of introduced pests and pests of quarantine significance. The participants got hands-on experience in diagnosis of quarantine pests and seed health testing methods such as dry seed examination, incubation methods, serological and nucleic acid based methods.

Quarantine pathogens: Seed Health Testing Methods and Molecular Diagnostic Techniques (11th-18th, April, 2016)

Plant pathogens detection and identification forms the basis for measures to be initiated for pest incursion or management of the pest. An eight days training programme was organized in which 4 participants from Tripura, Haryana, Andhra Pradesh and Maharashtra were trained. The participants were exposed to various methods in detection and identification of seed borne plant pathogens, stored grain pests and weeds and got trained in different diagnostic methods.

Forced Hot Air Treatment (9th - 13th, May, 2016):

The packaging material is one of the most threatening pathways for incursion of timber pests across the globe. Forced Hot Air Treatment (FHAT) is one of the approved treatments for packaging material under International Standard for Phytosanitary Measures 15 (ISPM -15). In India, National Standard for Phytosanitary Measures – 9 (NSPM-9) has been developed which prescribes the



treatment procedures and steps to register. It is essential to certify the FHAT facilities to ensure that wood packaging material is treated and marked in consistence with the provisions of ISPM -15.

NIPHM offered a specialized training programme on FHAT for industry stakeholders and twenty four participants from private industries attended the same. The topics covered included critical requirements for establishing FHAT facilities, calibration of sensors, placement of sensor, identification of coolest point, safety precautions, conducting the treatments, use of appropriate mark and



record keeping in accordance with ISPM – 15 and NSPM – 9. The participants also learnt the pests associated with wood packaging materials.

Orientation programme for Post Entry Quarantine Inspection Authorities (6th -10th, June, 2016)

Confinement of imported plant propagative material under Post Entry Quarantine (PEQ) for a specific period is adopted as an appropriate phytosanitary measure in cases where a quarantine pest is difficult to detect or requires more time



for accurate diagnosis. Post entry quarantine allows time for the expression of signs or symptoms of pests of concern, and appropriate treatment if necessary. Directorate of Plant protection, Quarantine and Storage has entrusted the responsibility to inspection authorities notified in Schedule-

Capacity Building

XI of Plant Quarantine Order, 2003 to certify the PEQ facility and to carry out the inspection of imported planting materials in a confined area.

Fifteen participants attended this Orientation programme and learnt the role and responsibilities of Inspection Authorities in safeguarding the nation from ingress of exotic pests, protocols to be followed in establishing and certification of open field or closed PEQ facilities. They also learnt the significance of PEQ inspections at required intervals and skills for detection and identification of quarantine pests, preservation of specimens, forwarding of specimens to nodal laboratories for authentication, applying appropriate mitigation measures in the event of detection of quarantine pests, reporting the clearance from PEQ and Import non-compliance (if any) for different types of planting materials as per the Standard Operating Procedures.

Plant Quarantine National Regulations And Procedures (20th-24th June, 16)

NPPO is responsible for safeguarding the country's agricultural economy and the biodiversity from the ravages of exotic pests. The different stakeholders viz., plant quarantine officials, Phytosanitary Certificate issuing authorities and Post Entry Quarantine inspection authorities, importers and exporters of agricultural commodities need to acquire appropriate knowledge on plant quarantine regulations, procedures and documentation in order to safeguard Biosecurity and to facilitate safe trade.



A training programme on Plant Quarantine National Regulations and Procedures was conducted from 20th to 24th June, 2016 and 31 participants from government sector and 2 participants from private industries attended the training programme. The participants learnt the importance of International conventions, National Regulations on imports and Standard Operation Procedure for exports. Further, through mock exercises & practical scenarios, the participants learnt the procedures for use of on-line PQIS software and procedures to be followed in import/export of seeds, plants, bulbs, grains, fruits, GMOs, Germplasm and bio-control agents.

Training programme on “Establishment of mother cultures of different bio-control agents and Mycorrhiza” for KVK Scientists (21st to 23rd April, 2016)

A special training programme to KVK Scientists of SAUs, ICARs and NGO-KVKs was organized at NIPHM from 21st to 23rd April, 2016. During the training course, participants have learnt various techniques of biological control of pests, establishment of mother cultures of BCA, biopesticides & Mycorrhiza, low cost on-farm production of techniques and assessing the quality parameters of various biopesticides. The programme was attended by 37 KVK Scientists from different States.



Induction Training (02nd to 14th June, 2016)

NIPHM and MANAGE, Hyderabad have jointly organized the induction training programme to newly recruited Horticultural extension officers of Tamil Nadu state. The programme was designed with various aspects of Plant Health Management with special focus on “On farm level mass production of biocontrol agents, biopesticides and Mycorrhiza”. The trainees were also exposed to the topics in principles of biosecurity and management skills, marketing, work ethics, etc. The duration of the training programme was two weeks (8 days at NIPHM and 5 days at MANAGE). During the I Quarter, the training programme was organized from 02nd to 14th June, 2016. The programme was attended by 39 newly recruited Horticulture Officer from Department of Horticulture, Tamil Nadu.



Capacity Building

Refresher Training Programme to Agri-entrepreneurs on "on farm production of biocontrol agents and Microbial biopesticides (13th - 17th June, 2016)

In collaboration with MANAGE, Refresher Training Programme was conducted to Agri entrepreneurs for 5 days on "On farm production of biocontrol agents and Microbial biopesticides" from 13th - 17th June, 2016 to expand their agribusinesses operations and enter into new areas of entrepreneurship. In this training programme, a total of 34 participants were given hands-on experience on mass production of various parasitoids, (*Trichogramma*, *Bracon*, *Chelonus blackburnii*, etc.), predators, (*reduviids*, *coccinellids*, *Chrysoperla*, etc.) microbial biopesticides (*Trichoderma*, *Pseudomonas*) and biofertilizers. They were also trained in vermicompost preparation, seed treatment with microbial biopesticides (biopriming), pesticide application techniques, rodent pest management, fruit fly traps and lure preparation. In addition they got acquainted with the new concepts of pest management i.e. AESA based PHM in conjunction with Ecological engineering for pest management.

**NIPHM'S Banner Training Programme on AESA and EE based IPM and allied subjects (16th- 20th May, 2016 and 13th - 17th June, 2016)**

Two special NIPHM Banner Training Programmes on AESA &



Ecological engineering based IPM and allied subjects were conducted for 5 days duration for the officers of the State Department of Agriculture. A total of 15 participants from Punjab, Maharashtra, Karnataka participated in the programme.

On-Farm Production of Bio control Agents & Microbial Bio pesticides to Promote AESA based Plant Health Management in conjunction with Ecological Engineering for Pest Management (13th - 22nd June, 2016):

NIPHM is committed to train a pool of Master Trainers in on-farm production of biocontrol agents and microbial biopesticides to promote AESA based PHM in conjunction with Ecological Engineering for pest management. A ten days training programme on On-Farm Production of Bio control Agents & Microbial Bio pesticides to Promote AESA based Plant Health Management in conjunction with Ecological Engineering for Pest Management was organized from 13th to 22nd June 2016. The technologies covered under this programme are (i) mass production of parasitoids such as *Trichogramma*, *Chelonus*, *Bracon*, *Goniozus* etc. (ii) mass production of predators such as *Chrysoperla*, *Reduviid*, *Spiders*, *Coccinellids* etc (iii) mass production of microbial biopesticides such as *Trichoderma*, *Metarhizium*, *Verticillium*, *Beauveria*, *Nomuraea*, *Paecilomyces*, *Pseudomonas*, *Bacillus* and (iv) Entomopathogenic nematodes. A total of 10 trainees from Karnataka, Maharashtra and Punjab attended this programme.

**Refresher training programme on new dimensions in agriculture extension for middle level extension functionaries (19th - 25th May, 2016 and 14th - 15th June, 2016)**

NIPHM and MANAGE have jointly organized two refresher training programmes of five days duration to the middle level extension functionaries on various aspects of plant health management. In this programme the participants were given training on various low cost on farm mass production techniques of biocontrol agents and microbial biopesticides. A total of 28 participants attended this training programme.

Capacity Building

Training programme to Agricultural students of Raichur, Karnataka (25th to 27th May, 2016 and 16th to 21st May, 2016)

The B.Sc (Agi) 4th year students from University of Agricultural Sciences, College of Agriculture, Raichur, Karnataka were trained at NIPHM in two batches on "On-farm production of Biocontrol agents and microbial Biopesticides". For first batch training programme was organized from 25th to 27th May, 2016 with 39 students and second batch from 16th to 21st May, 2016 with 39 students.

The students were exposed to various plant health management principles like Biological Control; Mass Rearing of Host Insects for Production of NPV; Preparation of Trichocard; Use of Neem Seed Kernel Extract (NSKE); Mass Production of Fungal and Bacterial Biopesticides viz., *Trichoderma spp.*, *Metarhizium sp.*, *Beauveria Pseudomonas sp.*, *Bacillus spp.*, etc., Preparation of Mother Cultures of Biopesticides; Isolation and Mass Multiplication of Entomopathogenic Nematodes etc. The training given to the Agricultural students would enable them to transfer these technologies to farmers during the RAWE programme.

Economic Importance of Plant Parasitic and Entomopathogenic Nematodes (20th -24th June, 2016):

Plant parasitic nematodes (PPNs) are one of the most important and difficult to manage pests of agri-horticultural crops. Changing climate and agricultural practices are leading to resurgence of nematode problems in newer crops and geographical localities. Due to the absence of effective synthetic chemical nematicides, and inadequacy of the



present management approaches, there is an urgent need to organize awareness training programme and develop environmentally viable, economical nematode management options using modern biological tools and techniques. Hence, five days training programme was organized on "Economic importance of plant parasitic and entomopathogenic nematodes". In this training programme, a total of 21 participants (Scientists and Assistant Professors) have participated from various states such as Manipur, Haryana, Madhya Pradesh and Tamil Nadu.

The objective of the training programme was to impart knowledge on Plant Parasitic and Entomopathogenic Nematodes. Participants were trained on a wide range of basic and applied topics related to plant parasitic nematodes and entomopathogenic nematodes, nematode management in poly-house and main field, detection and identification of Quarantine nematodes and their control measures. The participants were trained in use of Entomopathogenic nematodes in Insect pest management, and its mass production and application techniques.

Training programme on Integrated Pest Management on Vegetable from 22 to 24 June, 2016 (3 days):

Training programme on IPM of Vegetables was conducted for 22 horticulture farmers from Virudhunagar District, Tamil Nadu. They were trained in On-farm production of Biocontrol agents and Microbial Biopesticides to promote AESA based PHM in conjunction with Ecological Engineering for Pest Management. The farmers were also given hands on practice in on-farm mass production techniques of host insect, *Corcyra*. Parasitoids and predators such as *Trichogramma*, *Chelonus*, *Bracon*, *Goniozus*, *Reduviid bug*, *Coccinellids* and in microbial biopesticides such as *Trichoderma*, *Pseudomonas* and *Mycorrhiza*. Further, the farmers were trained in Vermicompost preparation, seed treatment with microbial biopesticides (biopriming), fruit fly trap and lure preparation, rodent pest management, pesticide application techniques etc.

**Plant Parasitic Nematode Management in Guava Orchards**

To sensitize the Telangana & AP farmers about the new nematode infestation in Guava orchards, a special training programme on "Plant Parasitic Nematode Management in Guava Orchards" was organized at NIPHM for the farmers of Telangana and Andhra Pradesh States from 4th to 6th June 2016 (3days). Total 17 farmers have participated in this programme. The farmers were explained about the new nematode problem in guava orchards and various management strategies were suggested to control the pest.

Capacity Building

Workshop on fruit fly management (10.06.2016)

Participated in one day workshop conducted by Horticulture Department on production and pre & post harvest technologies and plant protection measures in mango at Chittoor on 10.06.2016. In this Workshop, information on biology its infestation and various control measures for fruit fly were suggested. Demonstration of low cost fruit fly trap and lure preparation was also done. More than 400 farmers have participated in the workshop and many farmers showed interest in low cost fruit fly trap preparation.

Inspection Sampling and Prosecution Procedures under Insecticide Act 1968

This program of 6 days duration is conducted for capacity building of the Insecticide Inspectors appointed under section 20 of the Insecticide Act 1968, for enforcement of the Act which helps them understand the Act and Rules and procedures to be followed for successful enforcement of the act. This course is organized from 03.05.16 to 08.05.16. a total of 14 participants underwent this particular program from various states. The participants are trained to equip themselves on the salient features of the Insecticide Act 1968, Insecticide Rules 1971, their implementation giving emphasis on the role of Insecticide Inspectors, duties & Responsibilities, the procedures for sampling, an exposure to the Procedures and methods of analysis of synthetic pesticides, Bio products and the interpretation of the Analytical Reports besides Procedures for prosecution including the evidence act & Criminal procedures.

**Method Validation in Pesticide Residue Analysis & Measurement of Uncertainty:**

The Course is aimed to equip the participants to acquire the skills exclusively in development and validation of analytical methods for Pesticide Residue Analysis besides calculation of Measurement Uncertainty. Two scientists underwent this training program from 16.5.16 to 21.5.16.

Documentation Procedures for NABL Accreditation for PTL & PRLs

A 4 days duration training program is conducted during 24.05.16 to 27.05.16 with a participant strength of 4, to acquaint the procedures in preparing different kinds of documents to implement the quality system as per the requirement of ISO/IEC 17025-2005 so as to help the participants prepare for the accreditation of their laboratories. Participant will be able to prepare various documents like Quality Manual, Quality System Procedure, Standard Operating Procedures, Work instructions, different forms and formats, Maintenance of various records in their Laboratories.

**Refresher Program on Analysis of New molecules of Pesticides:**

A refresher programme for the Analysts working in Pesticide Testing laboratories was organised to enhance their skills in dealing the problems on the analysis of new pesticide molecules. Major focus is given on Instrumental methods of analysis. The course was conducted for 12 participants from 15.6.16 to 24.6.16

**Laboratory Quality System Management and Internal Audit as per ISO/IEC 17025-2005:**

The Analysts and the Managers of the Laboratories are imparted training Quality system procedures so as to equip themselves with the procedures of internal audit and quality management of the Laboratories and to organise the labs so as to obtain the accreditation by the NABL and also to

Capacity Building

maintain the stipulated conditions in the Laboratory under ISO certification for continuous performance. The participants also are given training on internal audit of the Laboratory. The program was conducted with 15 participants from 27.06.16–02.07.16



Appropriate pesticide Application Techniques and Farm Level Storage Structures (21.04.2016 to 28.04.2016)

The main purpose of pesticide application technique is to achieve maximum efficacy with minimum side effects on non-target organisms. The knowledge on farm level storage structures enhances the farmers to safely store the produce and also can sell it when there is a better market price. 31 participants from various states attended the training programme. The participants gained knowledge on use of spraying techniques and farm level storage practices. Institutional visits of IGMRI and FCI, Cherlapally were also organized to show different storage structures, method of storage and construction specifications of godowns.



Safe and Judicious Use of Chemical Pesticides (20th to 27th June, 2016)



NIPHM organized a training programme on Safe and

Judicious use of chemical pesticides from 20th to 27th June, 2016. Total of 37 participants from 11 states attended the training programme. Participants were trained on various aspects like appropriate selection of spraying techniques, dosage requirements, pesticide formulation and their properties, quality control of pesticides, judicious use of rodenticides, safe use of pesticides and precautions to be taken while spraying and storage of pesticides. Practical sessions were organized on application techniques, selection of suitable nozzles, calibration of the sprayers, and their operation. An Institutional visit to ICRISAT was organized to get acquainted with different farm equipment.

One month training for B.Tech Agricultural Engineering students (01.06.2016 to 30.06.2016)

A tailor made training program was made for one month duration for private agricultural Engineering College students covering an overview of the agricultural engineering aspects. A batch of 27 students has undergone the training programme. The programme gives an overall idea of agricultural engineering and also an exposure to job opportunities in various fields. Exposure visits were organized to ICRISAT, CRIDA research farm, IGMRI, cold storage and Pioneer seed. The project works were assigned to evaluate the field efficiency of lever operated knapsack sprayer, NIPHM low volume battery operated sprayer, ASPEE battery operated sprayer, power sprayer, foot operated sprayer and rocker sprayer.



In-plant training for B.Tech Agricultural Engineering students of 4 months (commenced from 06.06.2016 to 06.10.2016)

A four months training programme was scheduled covering major aspects of agricultural engineering. During their schedule they have learnt various aspects on appropriate pesticide application techniques, safe and judicious application of chemicals, storage problems at farm and commercial level, storage structures. Total 20 B.Tech final year students from College of Agricultural Engineering, Bapatla (13) and Madakhasira (7) are attending the training programme. As part of the training program Institutional exposure visits to nearby Institutes were arranged to get acquainted with various activities.

Capacity Building

15-days certificate course on 'Urban Integrated Pest Management':

NIPHM organised a 15-days certificate course on 'Urban Integrated Pest Management' to private pest control industry professionals (operators) on consultancy basis from 04.04.2016 to 08.04.2016. A total 09 participants from Odisha, Telangana, Karnataka, Goa, West Bengal, Maharashtra states were attended the training. Participants were undergone field based training on biology and management of mosquitoes, termites, flies, cockroaches, rodents, stored insect pests and other pests present in urban areas, store grain pest detection and management methods. They were also exposed to zoonosis and their role for emergency preparedness. Participants imparted with safe and judicious pesticide application techniques.

**Refresher Training on 'Rodent Pest Management':**

NIPHM organised a 7-days refresher training on 'Rodent Pest Management' to the state agriculture officers, agriculture extension functionaries from 07 to 13 June, 2016. A total 15 from states of Telangana (04), Andhra Pradesh (04), Nagaland (03), Odisha (03), Himachal Pradesh (01) were attended this training. Participants were trained in several basic concepts on rodent pest management with hands on practicals related to eco-safe, non chemical management based on village mapping, seasonal calendar, rodent breeding profile in agriculture and horticulture crops.



Achievements

The Proficiency Testing Centre (PTC), Pesticide Management Division (PMD) has been accredited in accordance with the standard ISO/IEC 17043:2010 (Conformity Assessment-General Requirements for Proficiency Testing) as Proficiency Testing Provider in the Field of Chemical Testing, by National Accreditation Board

for Testing and Calibration Laboratories, an autonomous body under the Department of Science and Technology, India. The certificate number is P-0015, valid until 23rd May, 2018. The scope of accreditation includes pesticide residues in Water, Fruits, Vegetables, Cereals and Pulses and Pesticide Analysis in Pesticide Technical and Pesticide Formulation samples. These Proficiency Testing schemes are open for all accredited laboratories and laboratories going for accreditation.

Presentation on FULBRIGHT fellowships for higher education in USA on 21-04-2016:

NIPHM in collaboration with United States-India Educational Foundation (USIEF), Hyderabad organized a presentation on "Fulbright Fellowship Opportunities to the U.S." to faculty and Ph.D research scholars on 21-04-2016 at New Auditorium Mahatma Gandhi Block Building, NIPHM, Hyderabad. The Coordinator Mrs. Prania, USIEF, Hyderabad gave detailed presentation on various fellowships offered by USIEF annually for Indian aspirants. The scope for getting post graduate and doctorate education and post doctorate research were presented and discussed in detail. The presentation also highlighted the some of the aspects related to the preparation of project selection of host institute, host scientist and submission of the proposal. The event was attended by more than 50 participants comprising of faculty members and students from Indian Institute of Rice Research (IIRR), Indian Institute of Millets Research (IIMR), Indian Institute of Oilseed Research (IIOR), College of Agriculture of PJAUT and College of Veterinary Sciences, MANAGE, Directorate of Poultry Research and NIPHM.



Dr. Ashok M. R. Dalwai, IAS, Additional Secretary, DAC & FW, Ministry of Agriculture & FW Visited NIPHM and inaugurated the Sports & Recreation Centre on 19 April, 2016



Swachhta Pakhwada (16 to 31 May, 2016)



Plantation Day, 2016



International Yoga Day 21 June



Clean India Campaign Program

National Institute of Plant Health Management is actively participating in clean India Campaign i.e. Swatch Bharat Abhiyan. In the series of various actions and activities of the Abhiyan, a sanitation programme was organized at village Panchayat Kismatpur Distt. Ranga Reddy (TS) on 26-05-2016. Presiding over the event, Mr Swamy Goud, Chairman Legislative Council of Telangana has administered the 'Cleanliness Pledge' with 125 villagers followed by cleaning the common area in the village. Dr. O.P. Sharma, Joint Director, NIPHM has motivated the villagers to keep the village clean and called the gathering stating 'my garbage-my responsibility' for keeping the surrounding clean.



वर्ष 201६-१७ हेतु राजभाषा कार्यान्वयन समिति की प्रथम बैठक संपन्न

दिनांक 27-05-2016 को श्रीमती वी.ऊषारानी, भा.प्र.से., महानिदेशक, रावस्वाप्रसं (एनआईपीएचएम) की अध्यक्षता में वर्ष 2016-17 हेतु राजभाषा कार्यान्वयन समिति(राकास) की पहली बैठक आयोजित हुई। बैठक में महानिदेशक के समक्ष जनवरी-मार्च, २०१६ की तिमाही हिंदी प्रगति रिपोर्ट प्रस्तुत की गई। उन्होंने उक्त तिमाही प्रगति रिपोर्ट की समीक्षा की एवं पिछले बैठक के दौरान लिये गए निर्णयों पर की गई कार्यवाई पर संज्ञान लेते हुए संस्थान में राजभाषा कार्यान्वयन हेतु कई निदेश भी दिये। महानिदेशक ने कहा कि संस्थान में आगे भी राजभाषा अधिनियम की धारा 3(3) का अनुपालन शत-प्रतिशत किया जाए। बैठक में उपस्थित अधिकारियों को सूचित किया गया कि एनआईपीएचएम वेबसाइट का मुख्यपृष्ठ (होमपेज) सोफ्टवेयर ट्रांसलेटर के माध्यम से हिंदी में अनुवाद कर दिया गया है एवं इस विषय पर उन्होंने निदेश दिया कि एनआईपीएचएम वेबसाइट की शेष सामग्रियों का भी हिंदी अनुवाद शीघ्र किया जाए। संस्थान में चलाये जा रहे प्रशिक्षणों की पाठ्य सामग्री का शीघ्र हिन्दी में अनुवाद करवाने का निर्णय लिया गया। ताकि देश के विभिन्न क्षेत्रों से आने वाले प्रशिक्षार्थियों एवं कृषक समुदायों को हिन्दी में पाठ्य सामग्री एवं वीडियो उपलब्ध हो सके। महानिदेशक ने निदेश दिया कि संस्थान के वार्षिक प्रशिक्षण कैलेंडर 2016-17 में हिंदी प्रेरक उद्घरण दिया जाए।



Editor

Dr. Ch. Sreenivasa Rao, Director, Pesticide Management Division

Associate Editor

Dr. C. S. Gupta, Assistant Scientific officer(PP)
asoppniphm2-ap@nic.in

Published by:
Registrar

National Institute of Plant Health Management (NIPHM)
Department of Agriculture, Cooperation & Farmers Welfare,
Ministry of Agriculture & Farmers Welfare, Govt. of India
Rajendranagar, Hyderabad - 500 030, INDIA. Ph: +91 40 24013346,
Tele Fax: +91 40 24015346; niphm@nic.in; registrarniphm@nic.in