National Institute of Plant Health Management
Department of Agriculture & Cooperation
Ministry of Agriculture, Government of India

Plant Health News Letter

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From the Director General's Desk

Dr. K. Satyagopal, I.A.S.

The agriculture sector faces challenges due to climate change, threat to agro-ecosystems due to intensive agriculture and vulnerability of crop productivity due to increase in threats of pests as a consequence of increase in global trade. Moreover climate and weather can substantially influence the development and distribution of pests. There is a dire need to enhance productivity besides reducing crop losses to ensure food security. Pesticides continue to play a significant role in reducing crop losses due to pests. However, in view of the deleterious effects pesticides have on environment and human health, there is a need for promotion of safe & judicious use of pesticides.

Public concern about the use of pesticides has high-lighted the need to make pesticide application as efficient as possible to minimize human exposure (including operators, bystanders and consumers of produce) and environmental pollution while increasing the bioefficacy of the pesticides. Selection of proper application technique and the choice of corresponding delivery systems is absolutely essential to ensure successful pest management in a safe & judicious manner.

Advances in pesticide application technology has helped in reduced pesticide use and increased application efficiencies. Precision farming technology enables accurate pesticide applications using GPS-controlled navigation. Modern electronics has improved application accuracy with electronic flow meters, pressure gauges, speed sensors, and system computers. Application rate efficiencies are also improved with advanced boom flotation, nozzle design, sprayer electronics and controls, and computer control with GPS and GIS. Two ways to increase coverage are to reduce droplet size; and to increase carrier volume (application rate). Selection of sprayers and specifically nozzles for a given situation and crop are key to success in pesticide application. Spray drift and the risks associated with the application of pesticides in agriculture are attracting increasing attention.

It is critical that farm advisors, producers, spray operators, spray equipment manufacturers and pesticide manufacturers understand the full complexity of these issues .There needs to be a renewed emphasis on training and education, and the development of a new level of professionalism for operators, in order to meet the demands of the community by selection of most appropriate equipment, nozzles, droplet size and calibration of the appliances. This will help reduce contamination in the environment, residue levels in food, improve efficient pest management, and enable increase in productivity and returns while ensuring safety for all.

NIPHM is in the forefront in the specialized area of Pesticide Application Technology and has been involved in capacity building programmes as well as in technology innovation and adoptive research. The Institute has developed affordable appliances to enable safe and judicious application of pesticides such as the Hand Shake Duster, Swing Sack Granule Applicator, Rotary Applicator, Trolley Mounted Solar Assisted Low Volume Sprayer, Low Volume Battery Operated Backpack Sprayer, Wick Weed Applicator, etc and many more are on the anvil. NIPHM builds the capacity of Agricultural Extension functionaries, who in turn educate the farmers to facilitate selection of appropriate pesticide application techniques and promote safe & judicious use of pesticides.

This combination of adoptive research, development of appropriate technologies and capacity building activities can empower the farming community to choose appropriate techniques for pest management in the broader context of IPM. I hope the Agricultural Extension Officers will take advantage of the capacity building programmes in the specialized area of Pesticide Application Techniques, which are offered in the country only by NIPHM.

(K. Satyagopal)
Director General

Special Event

NABL Accreditation for Pesticide Formulation & Residue Analytical Centre of Pesticide Management Division, NIPHM

The Division of Pesticide Formulation & Residue Analytical Centre laboratory, Pesticide Management Division of NIPHM has been accredited by National Accreditation Board for Testing & Calibration Laboratories (NABL), New Delhi for satisfying the "General Requirement for Competence of Testing & Calibration Laboratories" as per the International standards of ISO 17025: 2005, (certificate number: T- 2219 valid from 4th May 2012).

Theme Article
Pesticide Application Engineering
Er. G. Shankar

Pesticides Application in Pest Management

Pesticide application is a complex process starting with product selection and an understanding of the target, and then using the best practice available to accurately distribute the product. This complex process requires a high level of knowledge and understanding, practical skills, well maintained and calibrated equipment, and probably most importantly a desire or will to protect the environment.

Pesticide application plays an important role in pest management. It refers to the practical way in which pesticides (including herbicides, fungicides, insecticides, or nematicides) are delivered to their biological targets (e.g. pest organism, crop or other plant). Proper technique of application of pesticide and the equipment selected for applying pesticide are vital to the success of pest control operations. The pesticide application process involves an active ingredient (natural or synthetic) contained within a product being put into solution with water and sometimes adjuvants, then atomised and distributed to the target. Not all pesticides applied reach the target. In some post emergent spraying cases only 5-20% of the product applied effectively reaches the target. The rest either misses the target but remains within the zone being treated, runs off the target reaching the soil, or moves off target in vapour or mist as drift.

Air assisted orchard sprayer developed in technical consultation with NIPHM

Influencing Factors

The main purpose of pesticide application technique is to cover the target with maximum efficiency and minimum efforts to keep the pest under control as well as minimum contamination of non-targets. All pesticides are poisonous substances and they can cause harm to all living things. Therefore their use must be very judicious. The application techniques ideally should be target oriented so that safety to the non-targets and the environment is ensured. Therefore, proper selection of application equipment, knowledge of pest behaviour and skillful dispersal methods are vital. The requirement of coverage and spray droplet size depend upon the mobility & size of the pest. Two ways to increase coverage are to reduce droplet size; and to increase carrier volume (application rate). Selection of sprayers and specifically nozzles for a given situation and crop are key to success in pesticide application. Spray drift and the risks associated with the application of pesticides in agriculture are attracting increasing attention. The mode of action of pesticide, its relative toxicity and other physicochemical properties, help to decide the handling precautions, agitation requirement etc.

Even though good quality pesticide is used and optimum timing for the application of pesticide is also adopted; unless the pesticide is applied properly it will not yield good results. Therefore, the quality of application of pesticides is very important in pest control operations. Adherence to the following points can ensure it; 1. Proper dosage should be applied evenly; 2. The toxicant should reach the target; 3. Proper droplet size; 4. Proper density of droplet on the target.

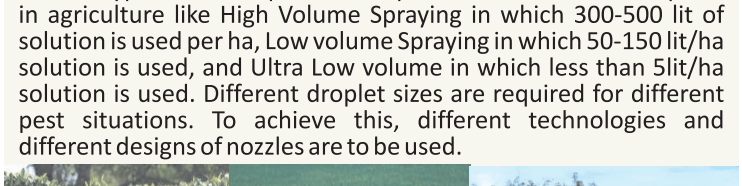
Climate also directly affects pesticide applications including: longevity, drift and deposition, and ultimately the efficacy. The average surface temperature has increased by about 0.6°C (1°F). Snow cover and ice extent have decreased. The sea level has risen by 10 to 20 cm (4 to 8"). Weather variability and climate change affect the application of pesticides in agriculture, in turn impacting the environment. Using panel data regression it has been found in the US that weather and climate differences significantly influenced the application rates of most pesticides. The projection results are seen to vary by crop, region, and pesticide

Climate change will have important implications for insect conservation and pest status. Current best estimates of changes in climate indicate an increase in global mean annual temperatures of 1[o] C by 2025 and 3[o]C by the end of the next century as per UNEP assessments. Such increases in temperature have a number of implications for temperature-dependent insect pests and the techniques of application of new generation pesticides for management of the pests given the increasing demand on requirement of food for our increasing population.

Safe & Judicious use

The appropriate or judicious use of inputs thus play a major role in maintaining the standards in the agriculture which enables the farmers to obtain maximum returns from his occupation. Mechanization of agriculture has made the occupation less tedious, time saving and profitable and enables improvement in his standard of living. While the total power input in agriculture in India is only 1.231 kW/ha , the contribution of human power is 0.087kW/ha and the rest are mechanical, electrical or animal. From the available statistics, India produces about 1,00,000 power sprayers costing Rs.450 million and about 8,10,000 Hand operated sprayers costing about Rs.1000 milion. About 300 manufactures, some of them with ISI certification, are in the field who are producing the equipments in large as well as small scale. It is also to be noted that though 27 standards are defined to ensure the quality of PP equipments, most of them are reaching to the famers without passing any tests which makes the quality of PP operation very poor. Quality equipment ensures safety in operation for application of highly poisonous chemicals in the field, and proper maintainability to ensure efficiency.

Various types of techniques are adopted to control the insect pests in agriculture like High Volume Spraying in which 300-500 lit of solution is used per ha, Low volume Spraying in which 50-150 lit/ha solution is used, and Ultra Low volume in which less than 5lit/ha solution is used. Different droplet sizes are required for different pest situations. To achieve this, different technologies and different designs of nozzles are to be used.



Losses due to drift, runoff, etc amount to more than 50-60% of pesticides applied.

Loss of applied pesticides due to drift, runoff and non-deposition on target areas leading to improper pest control and environmental contamination is the greatest hazard in our country. Unfortunately, most of the farmers are not aware about this due the poor transfer of technology or due to inadequate attention to this subject, which makes the pest management operation neither farmer friendly nor environment friendly. Proper selection of techniques, corresponding machine, calibrating the appliance, choice of nozzles and maintenance are very essential for any pest

management programme using pesticides, especially in the context of practicing AESA based IPM & PHM. Judicious adoption of appropriate technology could be made by creating proper awareness among all the stakeholders, and establishing trained manpower for selection, calibration, maintenance and related works in a suitable agri-service centre / clinic or an agricultural machinery advisory centre for correctly assisting farmers in their vocation.

Objective of Pesticide Application

The objective of the application of pesticide is to keep the pest under check. The pest population has to be kept suppressed to minimum biological activities to avoid economic loss of crop yields. Thorough killing of pest or eradication of pest is neither practical not necessary. The objective of pesticide application besides keeping the pest population under check should also be to avoid pollution and damage to the non targets.

The success of pest control operations by pesticide application greatly depends on the following factors:- 1. Quality of pesticide; 2. Timing of application; and 3. Application and coverage.

Different types of pesticides are used for controlling various agricultural pests. For example Insecticides are applied against insect pests, Fungicides against crop diseases Herbicides against weeds etc. in order to protect the crop losses. But it is essential that besides choosing an appropriate pesticide for application it has to be a quality product i.e., proper quantity of pesticide active ingredient *(a.i)* must be ensure that the quantity is maintained in production and marketing of pesticide formulations.

The application of pesticide is very successful when applied at the most susceptible stage of the pest. If the timing of pesticide application is carefully considered and followed, the results will be good pest control and economy. Therefore for large area treatment careful selection of equipment becomes necessary so that within the available ' Time ' the area could be treated.

Pesticides are dispersed by different methods like spraying, dusting etc. For spraying of pesticides different types of nozzles such as hydraulic, air blast, centrifugal and heat energy type are used. Water is a common carrier of pesticides but air or oils are also used as carriers. Selection of proper droplet is an important consideration. The shape, size and surface of the target vary greatly. For spraying against flying insects, the hydraulic nozzles will not be effective. Here we need fine size spray particles to remain airborne for longer time. However, for weed control operation usually the requirement is drift free application or coarse spray droplets. Adequate number of spray droplets should be deposited necessarily. For fungicide application the number of droplets deposited per unit area should be more and may be for translocated herbicide application it can be less in number. It may need fewer numbers of droplets to be deposited in case of highly mobile (crawling) insect pest.

The pesticides are formulated in liquid form, dust powder or granule forms such that it makes possible to apply small quantities of pesticides over large area. Some of the pesticides are applied as low as few gram *a.i.* per hectare. The method of setting the pesticide application equipment to ensure even distribution of certain quantity of pesticide over the desired area is called Calibration Therefore adoption of proper Application Technique and calibration is vital for uniform depositing of correct dose of pesticide. Nozzles play a very important role in achieving this essentiality, which is commonly overlooked. A nozzle essentially breaks the liquid into small droplets and throws them. All nozzles in the field produce a spectrum of droplets of different sizes. The hydraulic nozzles have wide range of size of droplets whereas the rotary nozzles have a narrow but more effective range.It should be understood that a droplet of 400µm diameter is 1000 times bigger in volume than a droplet of 40µm. As the volume of a spherical droplet is $4/3\ \Pi\ r^3$, if the droplet size could be reduced to half, then there will be 8 fold increase in the number of droplets and the coverage will be also increase. Due to inherent ability of fine droplets to penetrate the pest organism effectively and carry concentrated active ingredient, fine droplets can be highly efficacious if properly deposited on the targets. However, fine droplets also get drifted even in small wind velocities. It is very difficult to define the optimum size for field application due to diversity of targets. But on an average the smaller droplets are more effective.

Different target and optimum droplet sizes -

Flying insects:1-50µm; Insects on foliage: 30 - 50µm and Foliage soil(and avoidance of drift): 250-500µm

The small droplets mostly deposit by impaction and the large droplets by sedimention. The transport of very small drops is subjected to interaction between cross wind and gravity. So very small drops follow long trajectary than do the large drops. The small drops unable to settle on the target drift down the wind and cause pollution. The bigger drops fall down rapidly and small drops fall down slowly. In other words, small droplets remain airborn longer and therefore fall trajectory is affected by air movement. The cross wind influences the distance travelled by droplets before depositing. For example, a 10µm droplet can travel 2 km. distance when the wind velocity is 2 m/sec. and the height of release is 3 m.

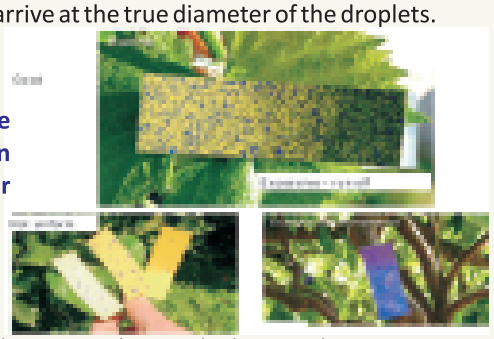
The air borne water droplets are also subjected to evaporation. The small droplets have overall increased surface area helping the rate of evaporation. Besides, higher temperature and low humidity also increases the rate of evaporation of very small droplets.

All spray nozzles in the field produce admixture of droplets, always too many small droplets than bigger droplets. But the volume of all the small droplets put together is less than the volume of few large droplets. Therefore, the bigger droplets assume importance when defining the effective diameter of droplets as far as pesticide distribution is concerned. These can be assessed quantitatively for evaluating the sprayer performance.

The spray droplets can be collected on natural surfaces and other artificial surfaces too. But collecting droplets on natural surface is obviously difficult as leaves are usually water repellant and the droplets coalition takes places. So there are special papers available for this purpose. Water sensitive paper has a yellow coating which turns blue whenever water droplets deposit. The blue stain size corresponds to droplet diameter. This is good for qualitative assessment, but has limited use for VMD measurements. Kromekote paper is another specially coated paper collecting coloured droplet stains. A soluble dye is added to spray mix suitably and sprayed on the Kromekote paper which leaves measurable stains. This is good for qualitative assessment as well as for quantitative assessment.

A compound microscope can be used for observing the droplets or stains/craters and use a stag micrometer for linear measurement of the diameter. The linear measurement has got to be corrected with the spread factor to arrive at the true diameter of the droplets.

Optimum coverage can be checked in the field with water sensitive papers



A Laser Beam Particle Size Analyser, which is modern equipment for droplet analysis, is more quicker, accurate and reliable. The spray from the nozzle is realeased to pass through a laser beam which when cut by the spray droplets of different sizes is difracted and a particular image is formed on the sensitized surface. The difracted images formed on the sensitized surface relay signals to a computer programmed for analysis. The VMD and various other information can be computed in this way.

Calibration of Sprayer

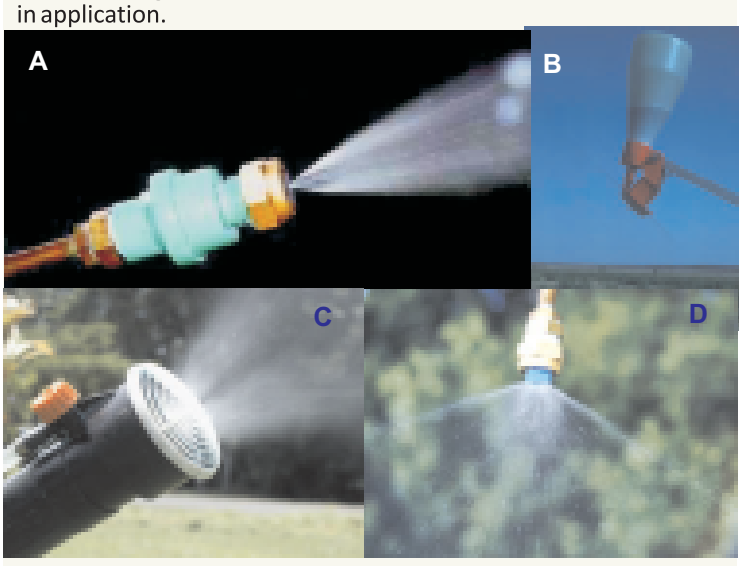
The rate of application of pesticide should be uniform over the whole of the field area. Too much application as well as too less application of pesticide dose are both undesirable.

The pesticide distribution by any sprayer is regulated by: 1. Nozzle spray discharge rate; 2.Swathwidth, and 3. Walking speed of operator.

R&D (Evaluation & Development)

Agricultural pesticides have adverse impacts on the environment and human health. These impacts are sensitive to climate change because pest pressure and optimal pesticide application rates vary with weather and climate conditions. A study in the US analyses data from 32 US states, 56 crops and 325 pesticides, to indicate the current average external cost of pesticide use in US agriculture as US$42 per hectare. Under projected climate change this value had increased up to $72 per ha by the year 2100. Such studies leading to improvisations & innovations are very important to a agrarian country like India. Temperature and precipitation variables have significant impacts on pesticide applications. A major concern involves the impact of climate change on pest populations. While more rainfall increases the plant protection needs for cereals and root crops, higher temperatures are likely to increase pesticide doses to fruits, and vegetables. In the above context, continuous innovations/upgradations on the application techniques and appliances are essential for safe & judicious use of pesticides.

Pesticides are conventionally applied as droplets using hydraulic atomizers, either on hand-held sprayers or tractor booms, where formulations are mixed into high volumes of water. The efficacy of applied pesticides increases with reduction in the sizes of the droplets. However, massive amounts of pesticides are wasted by run-off from the crop and into the soil, in a process called endo-drift, while air borne pesticide drift (exo-drift) causes much greater public concern, thus reducing the applied efficacy and increasing environmental contamination. Further, any change in doses due to climate change must also consider the drift losses for effectiveness in application.



A. Hydraulic Nozzle Hollow Cone (High Volume), B. Centrefugal Energy ULV CDA Applicator, C. Gasseous Energy Nozzle for Low Volume Application, and D. Hydraulic Energy Nozzle Flat Fan

Different droplet sizes have different dispersal characteristics, and are subject to complex macro- and micro-climatic interactions and wind speed. There are essentially three sets of conditions under which droplets move from the nozzle to the target. These are where: typically larger (>100 µm) droplets applied at low wind-speeds for residual applications; small droplets (<50 µm) that are usually considered most appropriate for targeting flying insects; and relatively small (50-150 µm) droplets in order to maximize "coverage" (droplets per unit area) for fungicide application.

Some Simple Plant Protection Equipment for Farmers

R&D efforts are being made in NIPHM to develop suitable application systems for safe & judicious application of pesticides. National Institute of Plant Health Management has developed a few simple plant protection techniques and equipment for adoption by small farmers in application of pesticides efficiently in order to protect their crops and stored food grains. Their design features and use are adapted for safe application of poisonous pesticides appropriately and affordably by the small and marginal farmers.

Hand Shake Duster: A simple and useful device to apply pesticide dusts in low height crops. This equipment is well suited for pesticide application for control of brown plant hopper (BPH) a serious pest in paddy crop in many parts of the paddy growing areas. BPH generally harbour at the lower portion of the paddy crop and hand rotary duster usually fails to apply the dust at the bottom of the crop. It can contain 2 kg dust which is emmited by shaking the duster by hand, in twirling or up down jerk motion. This is cheap and can be fabricated by local tinsmith. A farmer can cover one acre of paddy field in a day with the help of this duster. This could be utilised for other crops as well.

Wet Dusting Equipment for Dry Land Crops: It is particularly suitable for dryland crops. The losses in dust application due to drift can be minimised. Wet dusting is more effective and economical to farmer than mere dry dusting on crops. Small hand operated sprayer of two litres capacity is mounted on the lid of the shoulder mounted rotary duster. A nozzle is connected with a long hose pipe from the outlet of sprayer which is kept on the duster. In this process the dust particles become wet when released from the duster and also the leaves and other plant parts become wet and the dust depositing is improved. The operator of the duster carries the duster and sprayer combined. Four kgs of dust needs two litres of water for the wet dusting operations effectively. This equipment can also be used for simultaneous spraying and dusting of two pesticides if they are compatible.

Wick Application of Herbicides to Kill Weeds in a Row: In order to make herbicide application easier and less hazardous, one simple equipment was designed. This is called as "Wick Applicator for herbicides. Herbicides kept in the tank come down through wicks and when the wet wicks touch the weeds, the herbicide acts on weeds with the result weeds are killed.

The equipment consists of one herbicide tank, one wick chamber and wicks. This is mounted on wheel push hoe or sliding push frame. Some portion of the cotton wicks is inside the herbicide tank and a small length is hanging outside. The herbicide solution trickles down through these wicks. This equipment is pushed in between the rows of crops and the wicks wet by herbicide apply it on weeds for control. There is no danger of drift and it is effective & cheaper when compared to sprayers.

Swing Sack Granular Applicator: Many pesticides are now available in granule formulation. These granules are to be applied carefully. Since the cost of granule pesticide is considerable, they have to be applied precisely. There should be even distribution in the cropped area.Generally pesticide granules are brodcasted by hand. However, granules are also applied in furrows, on spot and broadcasting methods. The device namely swing sack applicator has been developed for scientific granule application.

It consists of a canvas sack to keep granule (2-3kg). The bag has a strap so that it could be hung to the shoulder. To the end of the bag, one 2 feet long conduit pipe is attached. The pipe has a issue head with a hole at its end. The hole determines the discharge. Two or three kg granules are loaded in the bag and bag is held in position with the strap on the shoulder. The operator holds the conduit pipe and begins to swing it. The granules are issued forcibly from the head and distributed over the area. A metal needle (4" long) is provided inside the bag at conduit pipe junction to cause agitation of granules and allow easy flow. This equipment is very simple and low cost. It can be made locally.

Three Nozzle Boom Adaptation with Knapsack Sprayer:

A knapsack sprayer has been modified with a boom attachment to enable the operator to spray behind away from his body, while also cover larger area with three cone nozzle system (unlike the existing one nozzle sprayed from front).This also helps improve productivity of the appliance as it would cover larger area safely with less fatigue to the operator. The picture indicates the sprayer under field trials.

Trolley Mounted Solar Assisted Low Volume Sprayer: A trolley mounted solar assisted low volume sprayer has also been developed by this Institute, which has attracted the Farmers as well as trainees of various Institutes during their visit to the Institute. NIPHM is striving to blend technology with affordability as well as improved efficiency in pesticide delivery systems to move towards reduced but uniform & more efficacious application. These technologies are being demonstrated and promoted among the farming community so as to enable the benefits of the same in scientific and safe pest management.

Capacity Building Programmes

The use and adoption of the technologies require trained manpower to select, calibrate, operate and maintain the appliances for effective outcome and create awareness and skill in these areas. The training programmes of the Division apart from proper selection of nozzles for various application requirements, proper selection of equipments, their calibration, maintenance and up keep, deals with different techniques of pesticide application technology like High Volume, Low Volume and Ultra Low Volume. It also covers miscellaneous equipments used for plant health management. Three 8-day courses were organized during June, 2011, August, 2011, and February, 2012. The focus of the training was to impart skills on 'Pesticide Application Technology' and *'Safe & Judicious use of pesticides'*. The course is practical oriented with seventy percent of the time spent in the laboratory/workshop.

Demonstration of trolley mounted Solar assisted low volume sprayer

The pesticide application involves introduction of a toxic molecule in acceptable levels for management of the pest. Hence the volume and size of droplets play a very important role in control of pests. The methodology of droplet generation and energy systems involved should be clearly understood. The short duration training programmes broadly cover -

- Importance of proper techniques of application, distribution and coverage.
- Different methods of spraying, dusting, granule application, soil injection, etc.
- Principles of High Volume, Low Volume, and Ultra Low Volume Spraying, and features of the appliances
- Spray Nozzles classification, selection
- Dusters/ Granule Applicators
- Calibration theoretical & practical
- Miscellaneous Application Equipment
- Power Sources used in Plant Protection Machines
- Chemical Formulations Properties, Safe & Judicious Use
- Weed and Rodent control techniques
- Maintenance, workshop exercises, etc.

The clientele of these programmes are officers of the State / Central Govt, Public & Private Sector and NGOs so that they can supervise the adoption of proper techniques by farmers at field level.

Conclusion

The practice of pest management by the rational application of pesticides is supremely multi-disciplinary, combining many aspects of biology and chemistry with: agronomy, engineering, meteorology, socio-economic and public health, together with newer disciplines such as biotechnology and information science. As the application technology is a specialized branch of study that needs to be incorporated properly to meet the challenges of efficacy and climate changes in plant health & pest scenario, there is a real need to address various emerging issues connecting pest management with appropriate affordable application technology, in which *research and training* should be a continuing process. The training programmes offered by NIPHM envisages creation of awareness in the proper adoption and advancements in the area of *Pesticides Application Technology* which will be highly beneficial to extension officers of the States and the farming community.

Training and demonstration of safe pesticide application technology

Capacity Building Programmes

Production Protocols for Bioagents and Biopesticides

Two programmes on production protocols for bioagents and biopesticides was organized from April 10th to 21st, and May 10th to 20th 2012. A total of 15 participants from Andhra Pradesh, Chattishgarh, Himachal Pradesh and Maharashtra were trained in various production protocols for mass production techniques of various egg-parasitoids, egg-larval-parasitoids, larval parasitoids, predators, antagonists and entomopathogens like *Trichoderma, Pseudomonas, Metarhizium, Verticillium*, etc. as well as mass multiplication of host insect-pests like *Corcyra cephalonica, Spodoptera litura, Helicoverpa armigera* and Potato Tuber Moth.

Training Course on Pest Surveilliance

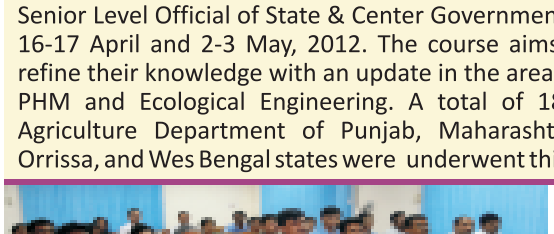
A training programme on Pest Surveillance was organized from 9th to 16th April, 2012. Nine officials from states of Chhattisgarh, Himachal Pradesh, Jammu & Kashmir, Maharashtra, Punjab and West Bengal participated. Early detection, appropriate sampling programme, technique and usage of appropriate tools form the major concurrence of pest surveillance. The focus of training remained on surveillance concept, need and methodology. The participants were trained on ISPM-6, sampling and surveillance methodologies. The stored pest surveillance was also a part of the training curriculum. Hands-on practice was imparted to the participants in laboratory and fileds.

Participants being awarded with the Certificate

Director General, NIPHM with trainees and faculty

AESA based PHM Training for Senior Level Officers

Two AESA based PHM training courses were developed for the Senior Level Official of State & Center Government Employees on 16-17 April and 2-3 May, 2012. The course aims to retune and refine their knowledge with an update in the areas of AESA based PHM and Ecological Engineering. A total of 18 officers from Agriculture Department of Punjab, Maharashtra, Meghalaya, Orrissa, and Wes Bengal states were underwent this course.

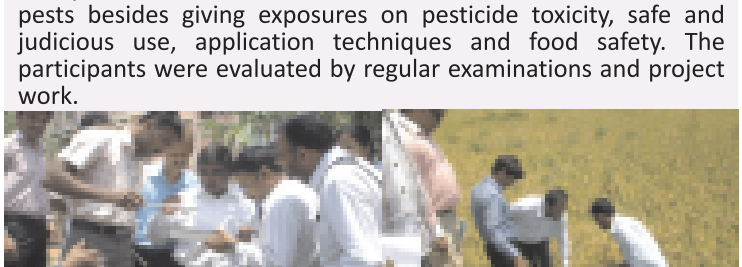


Participants of pesticide formulation training programme

Director General NIPHM with faculty and trainees

Certificate course on Urban Integrated Pest Management

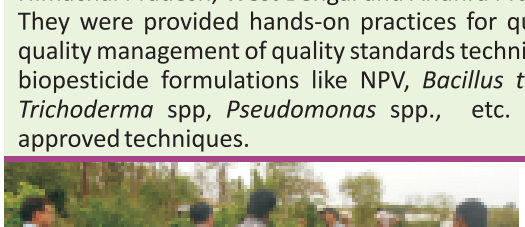
3rd Certificate course on Urban Integrated Pest Management was organized from 16th-30th April' 2012 for Pest control Professionals. A total 15 participants were given exposures to different aspects of the pests management like Biology and management of mosquitoes, termites, flies, cockroaches, rodents, stored insect pests besides giving exposures on pesticide toxicity, safe and judicious use, application techniques and food safety. The participants were evaluated by regular examinations and project work.



Field visit & group interaction of trainees in UIPM programme

Quality Assessment and Quality Management of Biopesticides

Training programme on Quality Assessment and quality management of biopesticides was organized from April 21st to 30th, 2012. A total number of 12 participants from Maharashtra, Himachal Pradesh, West Bengal and Andhra Pradesh participated. They were provided hands-on practices for quality analysis and quality management of quality standards techniques like testing of biopesticide formulations like NPV, *Bacillus thuringiensis* (B.t.), *Trichoderma* spp, *Pseudomonas* spp., etc. as per the CIBRC approved techniques.



Agro ecosystem analysis activity by the trainees

Pesticide Formulation Analysis Course

111th batch of Pesticide Formulation Analysis Course was concluded on April 23rd 2012. A total of 17 participants from the State Departments of Agriculture, Madhya Pradesh, Tamil Nadu, Andhra Pradesh, Private Industries and six PGDPHM student actively participated in these programmes. The first and second rank holder participants in the training programme were also felicitated by the Director General NIPHM.

Recognization of NIPHM as Research Institute by Osmania University

Senior Officers team from Osmania University visited Plant Health Management, Biosecurity, Pesticide Management, Plant Health Engineering divisions and various activities initiated by the NIPHM along with the future thrust areas for plant health management. NIPHM has been recognized as Research Institute by Osmania University which would facilitate in conducting collaborative research activities for awarding Ph. D. Degree in Life Science.

Dr. K Satyagopal, IAS & Director General, NIPHM interacting with Senior Officers of Osmania University

Pesticide Residue Analysis Course

69th batch of Pesticide Residue Analysis Course was conducted from 23rd May to 21st June, 2012. Nine participants from State Departments of Agriculture Maharashtra, Andhra Pradesh and PGDPHM students underwent this course. The topper participants in the training programme were also felicitated by the Director General NIPHM.

A view of practicals in the pesticides laboratory

Training on Forced Hot-Air Treatment

FHAT is one of the approved treatment under ISPM-15 for facilitating the international trade where wood packing materials are used. The Government of India has developed a National Standard on Phytosanitary Measure - NSPM-9 *viz.,* Guidelines for Certification of Forced Hot-Air Treatment Facilities for Wood Packaging Material. About 210 FHAT treatment providers have been accredited to carry out activities in accordance with ISPM 15 & NSPM 9. The high incidences of non-compliances reported on exported wood packing materials and absence of organised trainings for the persons involved in industry necessitated the need to organize this training on FHAT. The first batch of this course was conducted from 2nd to 6th April 2012, in which 28 participants were trained. 23 participants attended from private sector on paid basis and 5 belong to PGDPHM training programme. The participants were trained on important aspects of FHAT like concepts, construction and operations of FHAT fesility major timber log pests, calibrations etc. Revenue to the tune of three lakhs rupees was realised during the training programme.

Training on Vertebrate Pest Management

A training on Vertebrate Pest Management from 17th May to 6th June, 2012 was organized. 17 scientists from Andhra Pradesh, Karnataka, Tamil Nadu trained in different aspects of the pests management like Biology and management of Rodents, Ungulates, wild boar, Bird species and their managements. The participants were given field exposure on different vertebrate pest problem and their management in the field. Participants did 10 assignment on 10 major topics on VPM and presented these topics to the Training Faculties including Head of Entomology and Professors from ANGRU.

Director General NIPHM with faculty and trainees

Training Course on Principles of Pesticide Management

A training course on "Principles of Pesticide Management" was organized from 21st June to 9th July, 2012. A total of 18 participants from different State Departments of Agriculture including a Scientist from Grape Research Station, Horticultural University, Andhra Pradesh actively Participated in the programme.

Training on FFS Methodology

A Trainers Training program on "Farmers Field School (FFS) methodology" for the national level agriculture extension officers was organized from 18-25 June, 2012. A total of 8 agriculture, scientific and technical officers from State Agriculture Departments Chattishgarh, Himachal Pradesh and Tamil Nadu were participated. They were trained on organizing FFS program on various crops for technology transfer empowering the farmers through participatory approach .

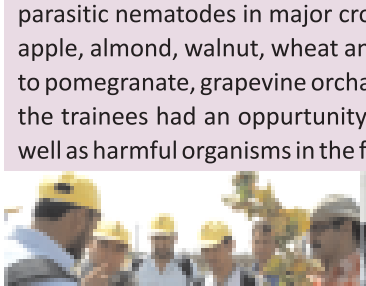
Valedictory Function for PGDPHM Programmes

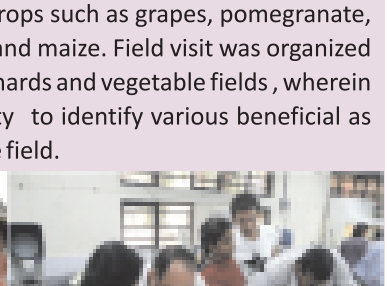
Post Graduate Diploma in Plant Health Management (PGDPHM) course was organized to promote environmentally sustainable plant health and Biosecurity management in India. The 12 months course commenced on 1st July, 2011 and continued up to 28th June, 2012. The course was offered to 18 agricultural professionals including 14 in-service candidates and 4 fresh graduates. The course focused on Plant Biosecurity and Agro-Ecosystem Analysis based Plant Health Management in addition to Vertebrate Pest Management, Pesticide Management and Pesticide Application Technology. PGDPHM programme participants were assigned project work in the 2nd semester under the guidance of faculty members. In addition to the PGDPHM Certificate the trainees also received the Certificates in the Specialization Courses. The topper of PGDPHM was awarded a cash prize of Rs. 5000/-.

1. Director General, NIPHM along with the faculty & participants.
2. The topper of PGDPHM receiving the award.

International Training Course on Plant Disease Diagnosis

A training programme on "Plant Disease Diagnosis" was organized for Afghanistan Officials under financial assistance from UNDP from 11th to 15th June, 2012. 10 Plant Protection Officials from Ministry of Agriculture, Irrigation and Livestock, Afghanistan attended the training. Major thrust was focused on detection and identification of plant pathogenic fungi, bacteria, viruses and parasitic nematodes in major crops such as grapes, pomegranate, apple, almond, walnut, wheat and maize. Field visit was organized to pomegranate, grapevine orchards and vegetable fields , wherein the trainees had an oppurtunity to identify various beneficial as well as harmful organisms in the field.





Trainees getting hands-on practice for disease diagnosis in field and lab.

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Welcome

Dr. P. Jeyakumar, Senior Scientist, National Centre for Integrated Pest Management (NCIPM), New Delhi Joined the National Institute of Plant Health Management (NIPHM) as Director-Plant Health Management on 28 June, on deputation

Forthcoming Training Events

- Conventional Methods in Pesticide Analysis: 1-21 August, 2012
- Instrumental Methods of Pesticide Analysis: 22 Aug.-11 Sept., 2012
- Refresher Course in Pesticide Formulation Analysis:11-31, October 2012
- Crop Specific AESA- Vegetables: 6 Sept. -5 Oct., 2012
- Crop Specific AESA- Vegetables: 1 - 30 November, 2012
- AESA & Ecological Engineering for Pest Management: 6-26 September, 2012
- AESA & Ecological Engineering for Pest Management: 1-21 November, 2012
- Production Protocol for Bioagents & Analysis of Microbial Biopesticides: 3-23 August, 2012
- Production Protocol for Bioagents: 3-13 August, 2012
- Quality Assessment and Quality Management of Microbial Biopesticides: 13-23 August, 2012
- FFS Methodology: 18-25 October, 2012
- Pesticide Application Technology: 22-29 October, 2012
- Integrated Rodent Pest Management: 8-14 August, 2012
- Integrated Soil Nutrient & Weed Management: 6-12 Sept., 2012
- Integrated Rodent Pest Management: 8-14 August, 2012
- Integrated Rodent Pest Management: 14-20 September, 2012
- Integrated Rodent Pest Management: 4-10 October, 2012
- Plant Health Management in Different Crops for Tobacco Board: 28 August- 3 September, 2012
- Plant Health Management in Different Crops for Tobacco Board: 21-27 September, 2012
- Plant Health Management in Different Crops for Tobacco Board: 9-15 October, 2012
- Safe and Judicious Use of Pesticides: 14-18 August, 2012
- Safe and Judicious Use of Pesticides: 25-29 September, 2012
- Ecological Engineering for Pest Management: 27-31 August., 2012
- Ecological Engineering for Pest Management: 29 Oct.-2 Nov., 2012
- Pest Surveillance: 16-23 August, 2012
- Quarantine Pest: Detection & Identification: 4-24 Sept., 2012
- Pest Surveillance: 11-18 October, 2012
- Molecular Diagnostic Techniques: 6-10 August, 2012
- Molecular Diagnostic Techniques: 16-20 September, 2012
- Seed Health Testing: 10-14 September, 2012
- Forced Hot Air Treatment: 6-10 September. 2012
- Forced Hot Air Treatment: 15-19 October. 2012
- Fruit Flies- Monitoring & Identification: 3-5 September, 2012
- Quarantine Weeds: Detection & Identification: 6-8 Sept., 2012
- Refresher Course on Phosphine Fumigation: 3-5 October, 2012

Nomination to attend the trainings may be sent to:
The Registrar, NIPHM Email:-niphm@nic.in