Series 1

Review of Literatures of Botanical Based Insecticides

Abstracts of Research Article Published

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MANAGING SWEETPOTATO WEEVIL (*CYLAS FORMICARIUS FABRICIUS*) IN WEST BENGAL, INDIA, BY SOME CHEMICALS, BIOPRODUCTS AND SEX PHEROMONE TRAPS

The efficacy of sex pheromone traps, entomopathogenic fungi *Beauveria bassiana* and *Metarhizium anisopliae*, chemical insecticides monochrotophos 36% SL, imidacloprid 17.8% SL and profenophos 50% EC, and soil amendment with mustard and neem (*Azadirecta india*) cakes for the management of *Cylas formicarus* in terms of yield attributing characters, average seasonal catch of male weevils per trap and their effect on storage root production were investigated. Results indicated that root zone application of *B. bassiana* significantly reduced the intensity of root damage followed by use of sex pheromone traps of *C. formicarius*, and that both the treatments were statistically at par. Vine dipping in monochrotophos followed by two sequential applications the same chemical, and soil amendment with neem cake also gave effective reductions in weevil damage to the crop. The effect was comparable to that from the use of *B. bassiana*, pheromone traps, monochrotophos and amendment with mustard cake. Very minimal crown infestation was observed in the plants sprayed with imidacloprid and profenophos. Trapping of the weevil by sex pheromone was found to very effective in reducing the weevil population. The population of the weevils peaked during the month of March which coincides with active tuberization, and the percentages of crown and root damage were significantly low compared with the un-trapped plots.

J. Tarafdar, M.A. Sarkar, **ISHS Acta Horticulturae 703**

EFFECT OF OIL CAKES ON SOIL BORNE DISEASE MANAGEMENT AND SOIL MICROFLORA IN APPLE

Soil borne diseases are difficult to control as the fungicides applied to soil are vulnerable to physical, chemical and biological interactions in the rhizosphere that render them ineffective. The decomposition of organic matter helps in alteration of biotic conditions of soil and reduction in inoculum potential of the pathogens. In the present investigations effect of organic amendments was studied on the management of soil borne diseases prevailing in apple nurseries. Symptom appearance was delayed by oil cakes. Disease incidence in case of neem cake was minimum (60.88%) followed by mustard cake (70.07%) giving 31.65 and 21.33 per cent disease control under pot culture conditions. Under natural epiphytotic conditions the incidence of soil borne diseases was 20.90 per cent and was reduced to 4.59 per cent when the nursery soil was amended with neem cake. Total microbial population (fungal, bacterial and actinomycetes) increased as a result of amendment of soil with oil cakes compared to untreated control.

A. Sharma, S.K. Sharma, ISHS Acta Horticulturae 696

STUDIES ON THE MODE OF ACTION OF NEEM (*AZADIRACHTA NDICA*) LEAF AND SEED EXTRACTS ON MORPHOLOGY AND AFLATOXIN PRODUCTION ABILITY OF *ASPERGILLUS PARASITICUS*

Morphological changes of a toxigenic isolate of *Aspergillus parasiticus* cultured in the presence of aqueous leaf and seed extracts obtained from neem, *Azadirachta indica* A. Juss (syn. *Melia azadirachta* L.), a potent inhibitor of aflatoxin biosynthesis, was studied. Mycelial samples obtained from *A. parasiticus* cultures exposed to an effective concentration of the leaf and seed extracts (50% v/v in culture media) produced approximately 90 and 75%, less aflatoxins respectively. Under these conditions semi-thin longitudinal and cross sections of the mycelia and vesicles showed attenuation of the cell wall at variable intervals causing deformation of the mycelium, vacuolation of the mycelial cytoplasm and vesicles. Herniation of the cytoplasmic contents which were protruding from the mycelium resulting in irregular mycelial shape. In addition, some mycelia showed a cleft between the cell wall and cytoplasm. Data obtained from microscopic observations may suggest that

irreversible inhibition in aflatoxin biosynthesis by fungi due to neem extracts is partly due to mycelial cell wall damages.

M.R. Abyaneh, A. Allameh, T. Al-Tiraihi, M. Shams, **ISHS Acta Horticulturae 675**

EFFICACY OF NEEM FORMULATIONS COMPARED TO CHEMICAL INSECTICIDES AGAINST HOPPERS AND LEAF WEBBER

Neem formulations consisting Azadirechtin are safer, cheaper and environment friendly. Presently, several of these compounds have been registered in India and are available in the market. Studies conducted in 1996–97 and 1997–98 against two major pests of mango. The hoppers and leaf webber *Orthaga euadrusalis* walker indicted that freshly prepared 4% neem seed kernel extract (NSK) and 0.2% nimbicidine and deltamethrin gave significant reduction in hopper population (16 and 15.5 hopper per 5 panicles as compared to control (47.6 hopper per 5 panicles). These were at par with cypermethrin (0.0025%) and imidacloprid (0.002%) and monocrotophos (0.05%). Population of pollinators was not affected. NSK at 4% effectively reduced hopper population upto 50% even after 7 days of spray, which was comparable to deltamethrin and cypermethrin and better than quinalphos.

Against leaf webber, Nimbicidine 0.2% and Nemactine 0.4% were better than carbaryl 0.1% and somewhat at par with endosulfan (0.07%) and imidacloprid (0.02%). Neem formulations such as Rakshak (0.2%), Neem gourd (0.4%) were inferior to the above and vangourd (0.4%) was the most inferior to the 4^{th} instar larvae.

G. Singh, ISHS Acta Horticulturae 509

Status report on Musa nematode problems and their management in India

Investigations were carried out on the management of the burrowing nematode, *R. similis*, infesting banana cv. Dwarf Cavendish, by integrating eco-friendly components such as oil cakes (neem and pongamia, each at 500 g/plant), a biological control agent (*T. viride* at 10 g/plant) and a nematicide (carbofuran 3G at 40 g/plant). Among the different treatments, combination of neem cake, Carbofuran

and *T. viride* was most effective in reducing the nematode population, improving plant growth and increasing fruit yield (76.3 t/ha) with wider cost:benefit ratio (1:2.9)

The effect of organics and inorganics for management of root-lesion nematode, *P. coffeae* was studied in six commercial cultivars of banana *viz.*, Nendran, Karpuravalli, Rasthali, Robusta, Monthan and Poovan. The results revealed that a significant reduction in *P. coffeae* population and increase in yield were recorded in plants which received 50% N applied through neem cake (Sundararaju and Kumar 2002). An attempt was also made to study the best treatment and variety based on nematode population on banana using artificial networks (Sundararaju *et al*. 2002). They studied the population pattern of plant- parasitic nematodes from a field trial carried out on locally available organic manures in banana cv. Karpuravalli (ABB). Analysis of soil and root samples revealed the presence of *P. coffeae, M. incognita, H. multicinctus* and *H. oryzicola*. All four nematodes were found to be significantly lower in plants which received distillery sludge at 2.5 kg + vermicompost at 1 kg + neem cake at 1 kg + poultry manure at 2.5 kg at 3, 5, 7 months after planting compared with control plants. It was also at par in treatment with distillery sludge at 2.5 kg + 1 kg neem cake applied at the same time intervals. The root-lesion and root-gall indices were higher in control plants registering 4.0 and 3.7, respectively. Thus, the present study exhibits the significant role of organic amendments in the nematode management strategies on banana (Sundararaju *et al*. 2002).

An investigation was also carried out for the management of major nematodes infesting banana, namely *P. coffeae* and *M. incognita,* using different neem formulations (Econeem, Nimbicidine and Neemgold) and plant growth promoter (Biovita). These were then compared with the standard treatment (Carbofuran 3 G). The results revealed that all treatments were found effective in reducing the nematode population with enhanced plant growth compared with control plants. Among the three neem formulations evaluated, Econeem and Nimbicidine showed maximum efficacy in reducing the nematode population with increased plant growth. However, the plants treated with Carbofuran 3G recorded the maximum plant growth with absolute control of nematode population. Maximum bunch weight of 18 kg was recorded in plants treated with Carbofuran at 50 g/plant and Biovita at 30 ml/ plant applied twice a year. Meanwhile, 17 kg, 16 kg and 15 kg bunch weight was recorded with respect to Biovita at 20 g/plant, Carbofuran at 40 g/plant and Neemgold at 10

and 20 g/plant, Biovita at 15 ml/ plant and Nimbicidine at 30 ml/plant. Thus, both nematodes not only delayed the duration of crop cycle but also limited the yield up to 44.4% in cv. Nendran (Sundararaju and Cannayane 2003). A field experiment carried out for the management of *P. coffeae* using press mud recorded significant reduction in nematode population and increased plant growth as compared to the control. However, press mud application was at par with Carbofuran treatment. The use of press mud is economical and environmentally safe as compared to chemical nematicides (Sundararaju *et al*. 2002). Another experiment was carried out with locally available plant species against *P. coffeae* under *in-vitro* conditions. Among the ten plant extracts tested, *Azadirachta indica* (Neem tree) exhibited maximum mortality of *P. coffeae* when exposed to 20 h at 80% concentration of plant extract. This was followed by *Vitex negundo* and *C. juncea* (Sundararaju and Cannayane 2002). These plant species were further tested using their dry and fresh leaves against the root-lesion nematode, *P. coffeae* in banana cvs. Nendran and Rasthali under field conditions. All the botanicals were effective in reducing the nematode population and significantly increased the plant growth and yield compared to untreated control. Among the different botanicals tried, *A. indica*,*Calotropis procera*, *Datura stramonium*, *C. juncea* and *V. negundo* were found to be superior and effective in significantly reducing the nematode population and increasing the yield (Sundararaju *et al*. 2003).

PRESENT STATUS AND FUTURE OF THE HORSE-CHESTNUT LEAFMINER (*CAMERARIA OHRIDELLA*) CONTROL IN POLAND

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The horse-chestnut leafminer appeared in south part of Poland in 1998[1] and distributed very fast over the whole country. Experiments with control of this pest were carried out in urban areas on old tress with circumferences between 60 cm and 330 cm. The first experiment with application of Imicide (10% imidacloprid) according the Mauget system was established in July 2000. Further experiments with product of polish company - Best-Pest from Jaworzno named "Gel to control of *Cameraria ohridella* and *Guignardia aesculi* on horse-chestnut trees using microinjection technique", which contains 12% imidacloprid and 8% tebuconazole were carried out in 2001-2002. This product was applied using injection technique. The holes were drilled in trunks approximately 1 m above the ground at angle of 45°, every 15 cm of circumference. The diameter of holes was 8 mm and they penetrate 70 mm into the xylem and allows to hide 2.7 mL of product inside the trunk. The results of these researches were published earlier[2].

This product on base of these data was registered by Ministry of Agriculture and Village Development in Poland on March 4, 2003. It allowed for application of this product using injection technique to about 20 thousand trees by professional workers from April do May 10, 2003. Efficacy of this product was estimated in sample of 60 leaves taken from every of three treated trees and untreated ones based on the number of large mines (over 0.5 cm long) or percentage of damaged leaves classified in five categories. Effectiveness of treatments checked in June and August, 2003 ranged from 30.0% till 94.9% and from 42.2% till 93.4%, respectively depending on time of application and circumference of trunks. The second polish product - Treex 200 SL (20 g/L abamectin + 180 g/L propiconazole) was tested in 2003. It was applied in April and at the beginning of May using injection technique. The results obtained in August and September were excellent, treated trees were quite green comparing to untreated ones, which lost all leaves. The third polish product - Bioneem 020 SL (20 g/L azadirachtin) will be tested in 2004. The technique of application will be improved by introducing Chemjet tree injector, which allows to decrease the number and size of holes drilled in trunks.

CONTROL OF THE HORSE CHESTNUT LEAF MINER WITH NEEMAZAL T/S

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In tree nurseries the indication "against mining microlepidopteran caterpillars on ornamental plants" or "biting insects (enclosing mining moths) on ornamentals" can get used. This failed in public green areas because of fearing "... in several cases hazardous effects to the health of humans and animals ..." (Act of Plant Protection 1998). It must guarantee an easy and secure reduction. This leaded the author to an insecticide made of the kernels of the neem tree *Azadirachta indica* A. JUSS. The alley trees, proposed for the test, were situated inside a park of a big city including 90 trees of *Aesculus hippocastanum* in an age of about 80 years up to 25 meters high and a soil surface covering with plants. A strong populations pressure of the

leaf miner grew up in 2000 and destroyed the foliage surface up to 95%. Pheromone traps, depot proves and a phenological monitoring on the trees and the moths determined the time of application "flight of the moth and begin of egg deposition = full flowering of the chestnut". The trial was carried out with NeemAzal T/S in a concentration of 0.3 % under use of a "spray gun" of fire brigade according to the principles of good professional practice.

The activity of the moths never got affected by the application. The treaty worked to the mining over 6 weeks. The 2nd and 3rd generations did not react. The population pressure and the immigration out of the neighbourhood was too high. The aim of the trial "reducing the damage of the leaf surface by horse chestnut leaf miner on white horse chestnut inside urban areas with one application of NeemAzal T/S" succeeded. The efficacy of spraying the pesticide was moderate and not exceeding the 1st generation. One reply of the application could improve the efficiency. A shoot painting with neem on nursery trees was successful.

SYSTEMIC APPLICATIONS OF BIOINSECTICIDES FOR CONTROL OF *AESCULUS HIPPOCASTANUM* AGAINST *CAMERARIA OHRIDELLA*

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The insecticidal properties of neem bioinsecticides were evaluated against the horse-chestnut leafminer, *Cameraria ohridella* (Lepidoptera, Gracillariidae) on the horse-chestnut trees (*Aesculus hippocastanum* L., Hippocastanaceae). The insecticide was applied by means of the systemic tree injection tube inserted into trunks. On 20.4. 2003, undiluted formulation NeemAzal-T (contained 5% azadirachtin) or NeemAzal-U (contained 16 % azadirachtin) was injected into horse chestnut tree (15 – 18 cm diameter at breast height) at 0.08, 0.15, 0.25 g of active ingredient per 1 cm of diameter at breast height (hereafter AICDBH). After 60 h all of the contents had entered the trees. The effective dosage of azadirachtin was obviously lower than 0.15 g AICDBH as comparable foliage protection was achieved at 0.08 g AICDBH that resulted in 78.6% (for 1st generation) and 68.6 % (for 2nd generation) pupae reduction. These

systemic injections with formulations containing azadirachtin provided long-lasting insecticidal activity. A dosage of ≥0.15 g AICDBH in the horse-chestnut tree was effective against 1st; 2nd and 3rd generations for at least 23 weeks, and dosages 0.25 and 0.15 g AICDBH that resulted in 100 and 99.7 % (for 1st generation) and 100 and 99.1 % (for 2nd generation) pupae reduction, respectively. For 3rd generation and dosages 0.25 and 0.15 g AICDBH was expressed as the number of pupae/ leaf for 0.0 and 0.2 pupae, respectively.

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MONITORING OF *CAMERARIA OHRIDELLA* IN THE PARK GROUNDS OF THE CASTLE SANSSOUCI, POTSDAM, GERMANY

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First evidence *of Cameraria ohridella* was found in Brandenburg in 1997/98. Until 2000 the state was colonized region-wide, in 2002 severe damage attracting public attention appeared. As Potsdam and its castles attract thousands of tourists every year, municipal authorities and the park management are trying to find concepts dealing with *Cameraria*. In spring 2002 the University of Potsdam started a monitoring programme to record ecological data of Cameraria and infested chestnut trees. The following aspects have been investigated: 1. Recordal of the activity of *Cameraria ohridella* by means of pheromone traps 2. Supervision of damage of chestnut trees using a newly developed digital sampling and evaluation method 3. Measurement of physiological parameters in the metabolism of damaged leaves 4. Compilation of a GIS-based land register of the different chestnut tree species and hybrids in the city of Potsdam 5. Testing the effectiveness of the preparation Neem-Azal on single trees First monitoring results and deriving questions for future studies are presented. Research is made in cooperation with the municipal authorities of Potsdam, the foundation "Preussische Schlösser und Gärten" (Prussian Castles and Gardens) Berlin-Brandenburg and the Department of Consumer Protection and Agriculture Brandenburg.