Rice is the most important and extensively grown staple food crop in India. However, rice production has not kept pace with the population increase as the productivity remaining very low. Rice production is affected by number of bio-physical and socio-economic constraints among which the incidence of pests and diseases were found to be one of the major factors in limiting the rice production.

Effective crop protection is an integral component of efforts to increase and sustain rice yields. Considering the ill effects of indiscriminate use of chemical pesticides, integrated pest management is considered to be effective in controlling the pests. The use of biopesticides and biocontrol agents in integrated pest management is ecofriendly and cost effective. Neem products have been found to control a wide range of insect pests and plant disease organisms. Neem products repel insects, act as antifeedants, inhibit reproduction and cause other interruption (Schmutterer, 1990). Neem based insecticides were commonly available in the market and their use is increasing.

The rice crop is affected by pests like stem borer, leaf folder, brown plant hopper, green leaf hopper and ear head bug. The ear head bug is one of the important pests of rice generally appearing before the flowering stage and continuing up to milky stage and causes considerable reduction in the grain yield. In this context, present investigation was carried out to assess the effect of neem based insecticide in controlling the rice ear head bug. The study was conducted at Kattur village, near Chennai during August 2000 - January 2001 (Samba season) under the World Bank funded research project entitled "Institution Village Linkage Programme for Technology Assessment and Refinement in Coastal Agro-ecosystem of Tiruvallur district of Tamil Nadu" under National Agricultural Technology Project. During Participatory Rural Appraisal (PRA) exercises conducted at the village, it was revealed that indiscriminate use of insecticides and non-application of pesticides for control of ear head bug were found to be the farmer's practice. Farmer's belief was that rains can easily washout the insects and hence there is no need for insecticide application even beyond Economic Threshold Level (ETL).

Field investigations were carried out in 20 farmers' field to assess the effect of neem based bio-insecticide containing azadirachtin (0.03%) in controlling the ear head bug population on rice variety white ponni. The size of treatment plot is 1000 sq.m. The weather is moderately warm with rainy period between October to December. The soil of the village is moderately
Table 1. Effect of neem oil on ear head bug control

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Ear head nymphal population reduction</th>
<th>Grain yield (t/ha)</th>
<th>Returns Rs./ha</th>
<th>Cost of treatment (t)</th>
<th>Cost benefit ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flowering stage (%)</td>
<td>Milky stage (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Untreated field</td>
<td>25</td>
<td>15.2</td>
<td>3.56</td>
<td>18,374</td>
<td>-</td>
</tr>
<tr>
<td>Treated field</td>
<td>69</td>
<td>63.1</td>
<td>3.98</td>
<td>20,441</td>
<td>495*</td>
</tr>
</tbody>
</table>

*Cost of treatment includes cost of neem oil and spraying charges.

The neem based insecticide containing azadirachtin (0.03%) was sprayed at the rate of 500 ml/ha twice once at flowering stage and second at 15 days later. A control plot with no insecticide spray was maintained. Other practices like irrigation, manuring and weeding were followed as per the farmer's practice. The following formula was adopted to work out the cost benefit ratio:

\[
\text{Cost Benefit Ratio} = \frac{\text{Treatment yield x Value of paddy (Rs/kg)}}{\text{Basic cost of cultivation + Cost of protection}}
\]

The biometric observations, incidence of ear head bug were recorded at regular intervals. The grain yield was recorded. The rice fields treated with neem based insecticide (Azadirachtin 0.03%) recorded reduced incidence of ear head bug population by 24.2% over the control. Ear head bug population remained low in the plots treated with neem products (Durairaj and Venugopal, 1993; Raguraman and Rajasekaran, 1996). The nymphal population of ear head bug was assessed at two stages namely flowering and milky stages. The population ranged between 7-12 nos./sq.m.

There was concomitant increase in the yield of grain in the plots treated with neem based insecticide than the control. The plots treated with neem based insecticide recorded average grain yield of 3980 kg ha\(^{-1}\) while the control recorded average grain yield of 3560 kg ha\(^{-1}\). The neem based insectide treated plots recorded 11.79% increased grain yield over the control. The results are in line with the findings of Kaul and Sharma (1999) and Singh and Singh (1999). Further grain yield obtained by two groups of farmers were subjected to two sample t-test and the results (t\(^{38}_{df}\) calculated value 10.058) revealed that two groups of farmers significantly differ from each other. From this, it could be inferred that the application of neem oil as bio-insecticide has given good results as compared to control.

High cost benefit ratio was obtained from the treatemnt plot (2.74) compared to control plot (2.55). Based on the above results it may be concluded that application of neem based insecticide (Azadirachtin 0.03%) @ 500 ml/ha twice once at flowering stage and second at 15 days later reduced the incidence of ear head bug and increased the grain yield of ric and thus offering a harmonious approach to pest management. The farmers perceived that application of neem based insecticide is easy, safe and adoptable with observable results which facilitate fellow farmers for adoption of this eco-friendly farm technology. Farmer participatory wholesome IPM technology development, validation and transfer suited to the local needs will definitely improve the farm profitability and health security of the people at large.
References


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Research Notes
Performance evaluation of porous pipe irrigation in heavy soils

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An efficient irrigation system should provide maximum productivity per unit area with unit quantity of water. Subsurface irrigation is an efficient method of irrigation, in which water, nutrients and soil additives can be applied to the root zone that encourages deeper and more extensive root development resulting healthier and more productive plants (Murugaboopathy et al. 1991). Since water is applied below the soil surface, development of hardpan, sealing of soil strata, compaction of soil etc. can be avoided. The moist environment below the soil surface is conducive for the activities of earthworms and microbial life (Sohrabi and Gazori, 1997).

Porous pipe subsurface irrigation can be defined as "application of water below the soil surface at the root zone of the plants through tiny openings provided on the wall of the pipe at a rate that allows the soil to absorb the water at its natural rate" (Yoder et al. 1995). Porous pipe is made from recycled rubber and polyethylene. It allows both air and water to pass through pores provided in the wall at low pressure. Porous pipe is designed to operate at low poressure, which allows for smaller and less expensive pumping systems & smaller energy demands (Mohammad, 1998).

Moreover maintenance of porous pipe is minimal. Even though porous pipe subsurface irrigation has so many advantages, very little information available on the discharge availability and operating characteristics of the porous pipes in different soils. In this study, an attempt is made to study the hydraulic performance of porous pipe in heavy soil.

The experiment was conducted at the College of Agricultural Engineering, Tamil Nadu Agricultural University, Coimbatore during 2000-2001. The soil at the experimental site was sandy clay loam for the top 20 cm depth and sandy clay for deeper layers.

The discharge line of the experimental setup consists of a 3.75 cm diameter PVC pipe and 1.6 cm diameter porous pipe (outside diameter = 2.2 cm; inside diameter = 1.6 cm). A screen filter was provided in the delivery line for filtration. Ball valve and pressure gauge connected to the main line was used to set the operating pressure by controlling the flow. The porous pipe laterals of 10m lengths were connected to the main line by using start and washer connectors. In each line separate taps were provided to allow the water to flow only