

An earth-friendly herbal pesticide from *Pongamia pinnata* L.

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Abstract

Today use of hazardous chemical pesticides is a major environmental problem in global agriculture. The large scale use of these pesticides is degrading soil quality, underground and surface water quality, food quality of products. Herbal pesticides are a potential option for their chemical counterparts. It was observed that the crop fields where *Pongamia pinnata* trees are planted, there is less or no infestation of various insect-pests round the year. The trees of *Pongamia pinnata* are found all over India and the use of *Pongamia* as pesticide is cost effective, environment friendly and is in the reach of common villagers and farmers of India.

Keywords: *Pongamia pinnata*, Herbal pesticide, Insect –pests.

INTRODUCTION

In India as well as The World, pesticides were found to pollute every stream, wells, rainwater and groundwater. The intake of these pesticides via food chain above permissible limit may lead to hepatitis, kidney failure, and different types of cancers etc. Many of the chemicals used in pesticides such as DDT, Malathion, BHC, and Chlorpyrifos are non-biodegradable and persistent soil contaminants, whose impact may endure for decades and adversely affect soil quality. The use of pesticides decreases the general biodiversity in the soil¹. There are four major routes through which pesticides reach the water: it may drift outside of the intended area when it is sprayed, it may percolate, or leach, through the soil, it may be carried to the water as runoff, or it may be spilled, for example accidentally or through neglect. They may also be carried to water by eroding soil. Nitrogen fixation, which is required for the growth of higher plants, is hindered by pesticides in soil. The insecticides DDT, methyl parathion, and especially pentachlorophenol have been shown to diminish the legume-rhizobium. Reduction of this symbiotic bacteria results in reduced nitrogen fixation and thus reduced crop yield². Root nodule formation in these plants saves the world economy \$10 billion in synthetic nitrogen fertilizer every year. Besides this, chemical fertilizers disturb the pH of soil which results in decreased fertility. Pesticides can kill bees and honeybees which act as pollinators. The Environmental Protection Agency, USA estimates that US farmers lose at least \$200 million a year from reduced crop pollination because pesticides applied to fields eliminate about a fifth of honeybee colonies³.

It was observed that in and around the crop fields where *Pongamia pinnata* (karanj) is planted there is no infestation of various types of insect-pests, grass-hoppers, caterpillars, leaf-

hoppers etc. We have surveyed for other plants effective against insects-pests of plants. We tried *Annona squamosa*, *Clerodendron* and *Jatropha* plants, but found that it itself infested with some Beetles and grasshoppers.

EXPERIMENTAL METHODOLOGY

About the plant *Pongamia pinnata* (Karanj)

Pongamia pinnata has also been called *Derris indica*, *Pongamia glabra*, *Millettia pinnata* of family Leguminosae⁴. It is one of the few nitrogen fixing trees to produce seeds containing 30-40% oil. It is often planted as an ornamental and shade tree. This species is commonly called pongam, karanga, or a derivation of these names. It is a medium sized tree that generally attains a height of about 18 m and a trunk diameter of more than 50 cm. The trunk is generally short with thick branches spreading into a dense hemispherical crown of dark green leaves. The bark is thin gray to grayish-brown, and yellow on the inside. The taproot is thick and long; lateral roots are numerous and well developed. The plant contains some insecticidal properties⁵.

Preparation of P.H.P.

The P.H.P. (Pongamia Herbal Pesticide) was prepared (Fig-1) with the mature leaves of *Pongamia pinnata* (Karanj). To prepare P.H.P. we took 200 grams of mature, thoroughly sterilized, healthy leaves of *Pongamia* (Table -1). Soaked it in 500 ml water overnight and then grind it. The water in which the leaves were soaked was used to dissolve the extract in grinder, filtered it with a filter paper. Then water is added in the conical flask to make final volume 1 liter. After filtration of juice some residue of leaves is left which may be used as soil treatment agent. The whole procedure was done under Laminar air flow to avoid any microbial contamination.

OBSERVATION

In the month of June 2011 the major experimental part of this work was started in the Crop fields of our college. We decided to test our herbal pesticide (P.H.P.) on that crop field where rice was planted. Three different blocks of rice field were selected sized 25x

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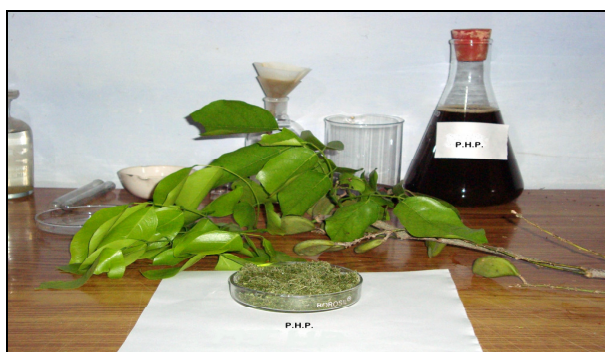
25 meters. The blocks were named as 'A', 'B' and 'C'. The distance between these fields was 50 meters. The 'A' block was treated with 1% DDT every month. The 'B' block was taken as 'Control' in which no pesticide was used. The 'C' block was treated with 'P.H.P.' every month. The observations were recorded in ink as well as photographically every 15 days till the crop end in Oct 2011.

We found two types of data. In first type study we found that

infestation of insect-pests is highest in the Block 'B' where various insects were recorded, tolerable in Block 'A' and nil in block 'C' where P.H.P. was used as pesticide. It strongly shows that P.H.P. is a potential pesticide /insect repellent and it is more effective than DDT. Secondly we found that in the cropland where P.H.P. was used the yield is highest. The yield of DDT sprayed field is medium while lowest in the Control where no pesticide was used.

Table 1. Showing Standardization of *Pongamia pinnata* Leaf extract to prepare P.H.P.

| Pongamia leaves used per ltr. of water | Effect on grasshoppers | Effect on caterpillars | Effect on leaf suckers | Side effect |
|--|------------------------|------------------------|------------------------|--------------------------|
| 50 gms | Nil | Nil | Nil | Nil |
| 100 gms | Nil | Partial | Nil | Nil |
| 150 gms | Partial | Moderate | Nil | Nil |
| 200 gms | Total Control | Total control | Total control | Nil |
| 250 gms | Total Control | Total Control | Total Control | Damage to leaves of Rice |



RESULTS AND DISCUSSION

We observed that the block 'A' which was treated with DDT, was partially infection free. There were seen some insect pests and lesions on the Rice plants. The block 'B' which was taken as 'Control' and was not treated with any pesticide was found infested with various insect-pests. The block 'C' which was treated with P.H.P. (Herbal pesticide from leaves of *Pongamia pinnata*) was found totally free of any insect-pest. It was also observed that 5 ltr. Of P.H.P. is sufficient for a farmland of 25x25 meters in a crop season.

Further in last week of the investigations (Oct 19th 2011) when we observed the yield after threshing of paddy we found that the yield was 460 kg in the 'A' Block, 395 kg in 'B' Block and 530 kg in Block 'C'.

In our project we found that our herbal pesticide P.H.P. has totally controlled the insect pests of ornamental plants as well as crop plants such as Rice. Due to less infestation of insects the yield was also increased up to 30%. It means if we use P.H.P. in place of DDT and other chemical pesticides the overall production of our food-grains will increase by 30%. Again our dependency over chemical pesticide will decrease and it will again save our economy. Use of P.H.P. is free from all the side effects of chemical pesticides. Besides this, herbal pesticides such as P.H.P. are cost effective and easily available to poor farmers.

We can encourage farmers to grow this plant on the side of their farmlands and in barren lands. It will also increase the fertility of soil by nitrogen fixation⁶. Further investigations are in progress.

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REFERENCES

- [1] Ritter L, Solomon KR, and Forget J, Stemeroff M, and O'Leary C. *Persistent organic pollutants: An Assessment Report on: DDT, Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated Biphenyls, Dioxins and Furans*. Prepared for The International Programme on Chemical Safety (IPCS), within the framework of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), Dec 1995.
- [2] D.N. Nayak and V. Rajaramamohan Rao, *Pesticides and nitrogen fixation in a paddy soil*, Soil Biology and Biochemistry Volume 14, Issue 3, 1982, Pages 207-210
- [3] L. Radunz and E. S. C. Smith, *Entomology*, Darwin, July 1996 .
- [4] ICFRE (Indian Council of Forestry Research and Education). Undated. *Pongamia pinnata*. Forest Research Institute, Dehra Dun, India. 12 p.
- [5] Anon. *Biological control agents of social forestry insects*. Entomology Research Institute, Loyola College, Madras, India. 1994. 11 P.
- [6] Misra, C. M. and Singh, S. L. *Ecological evaluation of certain leguminous trees for agroforestry*, Nitrogen Fixing Tree Research Reports, 1987. 5: 5.