

EVALUATION OF EFFECTIVENESS OF ECO-FRIENDLY BIO-PESTICIDE EXTRACTED FROM CUSTARD APPLE SEEDS ON WHITE MEALY BUGS

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Abstract—White mealy bugs (*Planococcus pacificus*) are soft white mealy covering insects. It attacks on the plants like guava, apple, orange and various types of horticultural crops. It feeds on the plant sap. It lives in a colony and multiplies in population, 6-8 times within a period of 2-3 weeks. They usually damage the plants by disfiguring of leaves and fruits which is caused due to excess production of wax during reproduction and by the honeydew secreted by the mealy bugs. It brings down the crop yield nearly 40% and also carries viruses of communicable diseases. At present commonly used synthetic pesticides are maldison, dimethoate and methylated spirits. They work by leaving its residue on the crop surface during harvest. In the present work eco-friendly bio-pesticide is extracted from custard apple seed (*Annon Squamosa*) and its effectiveness is evaluated on white mealy bugs.

Index Terms—White mealy bugs, pest, synthetic pesticide, custard apple seeds and effectiveness.

I. INTRODUCTION

Mealy bugs [4,7,8] (*Planococcus pacificus*) are one of the most persistent pests of many plants. They are easily recognized by the white mealy covering over their body and the long tail like processes, which project from the margins and the rear or wings. They feed by sucking the plant sap. A long tail white mealy bug is shown in Fig.1. The adults grow 2-4 mm long and cluster in dry sheltered sites such as in the crown, at the base of petioles at rachis junctions and on the underside of fronds.

Mealy bugs feed on plant juices and heavy infections may seriously weaken the host plant. The more usual form of damage is disfiguration of leaves and fruits caused by the excess wax produced during reproduction and by the honeydew, secreted by the mealy bugs. Sometimes a black,

sooty mould grows on this honeydew, further disfiguring the host plant.



Fig.1.Long tail white mealy bug.

They are gregarious and are usually to be found in colonies. Whenever they feed, their waxy secretions litter the surface and sooty mould commonly grows on the honeydew. Mealy bugs are common pest of guava plant in greenhouses and severe infestation can weaken the plant. Colonies are frequently attended by ants, which may also discourage the natural enemies. A colony of white mealy bugs on guava tree leaf surface is shown in Fig.2.

There are three or four generation each year, depending on climate. During summer all life stages are found on the leaves and fruits, but as the weather become colder the mealy bugs retreat under the bark of the host plant. Here reproduction continues, but at a much slower rate throughout the winter. Breeding activity increases in spring and many crawlers are born at just the right time to start feeding on the new foliage. The life span of each generation is greatly dependent on

temperature and can be from 1 to 4 months depending on the time of a year.



Fig.2.Colony of white mealy bugs on guava tree leaves surface

Mealy bugs are capable of a rapid buildup in numbers. The long tail mealy bug (*Pseudococcus longispinus*) is the commonest species and it has been shown to produce about 200 young's in 2-3 weeks. The young mealy bugs resemble in adults and usually feed with them. Each young mealy bug progresses through three nymphal moulds before it becomes an adult. Mealy bug attacks wide variety of plants and are widely distributed in tropical, subtropical and temperature regions.

To maintain the yield of crops, it is necessary to keep the pests away from the crops by using pesticide. At present most commonly used synthetic pesticides for controlling mealy bugs are maldison, endosulfan, lindane, Malathion, dimethoate and methylated spirits. [3] These are neurotoxin, non-biodegradable, having irritating odour, cause respiratory problems and cancer, reduce soil fertility, deplete earthworms, leaves large amounts chemical residue on crops, pollute air and water and causes memory losses.

Hence, an eco-friendly bio-pesticide is the present day needs which is generally derived from naturally occurring material. Oil extracted from ginger and neem seeds are used as bio-pesticides since olden days. In the present investigation, oil is extracted using hexane as a solvent from custard apple (*annona squamosa*) seeds and used as bio-pesticide to control the mealy bugs.

Custard apple commonly known as sitaphal is one of the finest fruits introduced in India from tropical America. It is also found in wild form in many parts of India. It is cultivated in Andhra Pradesh, Assam, Bihar, Karnataka, Maharashtra, Orissa, Tamil Nadu and West Bengal. Custard apple seeds are abundantly available from the nature. Oil extracted from it can

be used as pesticide against a number of common pests like white mealy bug, aphid, termite, etc. The oil extracted [2] from custard apple seeds [6] contain acetogenin a group of powerful respiratory inhibiting toxic components, which is responsible to act as a bio-pesticide.

II. MATERIALS AND METHODS

A Material/Instruments

- Three-necked Round Bottom Flask (RBF)
- Thermometer
- Custard Apple seeds
- Basket Heater
- Agitator
- Spray Gun
- Condenser

B. Extraction of Bio-pesticide

Experimental setup used in the present work is shown in Fig.3. It consists of a three-necked Round Bottom Flask (RBF) of 1-liter capacity. A thermometer is inserted at one neck of RBF through a thermo well, while a condenser is attached at the other neck for condensing the vapor or minimizing the carryover of the solvent. The test sample with solvent is agitated with an impeller centrally placed through the middle neck of RBF .

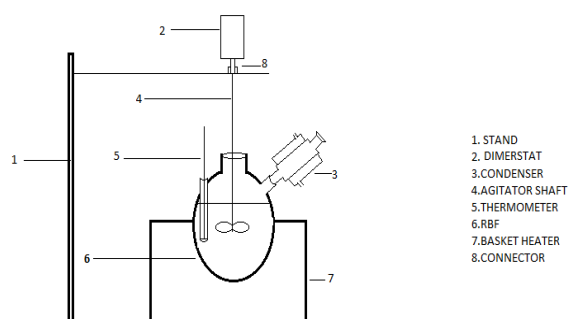


Fig.3.Extraction unit (RBF)

The stirrer was introduced through Teflon 'o' ring from the center neck of RBF and connected to the motor. The impeller speed was maintained constant by means of dimerstat. The extraction vessel RBF is supported by a cylindrical basket heater, which provides the energy input into the agitated vessel for extraction. Energy input to this heater was controlled using an autotransformer.

The custard apple seeds are collected, freed from dirt and sun dried to remove moisture. The seeds are then decorticated mechanically, to separate the kernel from the hulls as they contain very less amount of oil. The kernels are then ground to fine particles. Then the particles are taken to an extraction vessel and the solvent is added. The contents are agitated for different temperature and time periods. Then the mixture of oil, solvent and kernel are taken out from the extraction vessel (RBF). The solid particles are separated in a filtration unit. The solvent is separated from the oil in simple distillation units and reused. The oil obtained is then tested.

C. Preparation and Application of Bio-pesticide

The oil obtained as in above is tested for its pesticidal properties by standard methods. After testing the various properties of the oil, it is applied on white mealy bugs on the guava tree leaf surface. Before applying the oil on mealy bugs on guava tree leaf surface pre preparation of the blank solution is done. The blank solution is prepared by mixing 6 parts of labolene soap with 94 parts of water. To this blank solution required percentage of custard seed oil is added and sprayed on the pest attacked surface with a spray gun [1]. A spray gun is shown in Fig.4.



Fig.4. Spray Gun

In the present work (*Planococcus pacificus*) white mealy bugs with wings on guava tree leaf surface is selected for investigation to find the effectiveness of bio-pesticide extracted from custard seeds. The surface covering the insect (mealy bugs) is selected and marked with a marker. Inside the marked area number of white mealy bugs is counted with help a needle. Then, the prepared bio-pesticide is sprayed with the help of spray gun. After a time period (say 1, 2 day) the mealy bugs are counted again. If the concentration of the pesticide is not enough to eradicate the pest, then it is increased to higher

concentration. Guava tree, leaf surface on which investigation is done shown in Fig.5.



Fig.5. White mealy bugs inside a marked area on guava tree leaf surface

III. RESULTS AND DISCUSSIONS

Oil solution of (blank 0.0%, 0.15%, 0.30% and 0.75% are prepared by mixing with labolene soap solution and sprayed in one shoot on white mealy bug present on the guava tree leaves surface affected by white mealy bugs. The numbers of white mealy bugs left on the leaves surface after spraying the pesticide solution are counted on day basis and are given in the Table 1, Table 2, Table 3 and Table 4 corresponding to the concentration of the pesticide.

Table.1 Pesticidal Test on White mealy bug (oil 0.0%)

Sl. No.	No. of Days	No. of White mealy bug
01	00	26
02	01	24
03	02	21
04	03	20
05	04	19
06	05	18
07	06	18

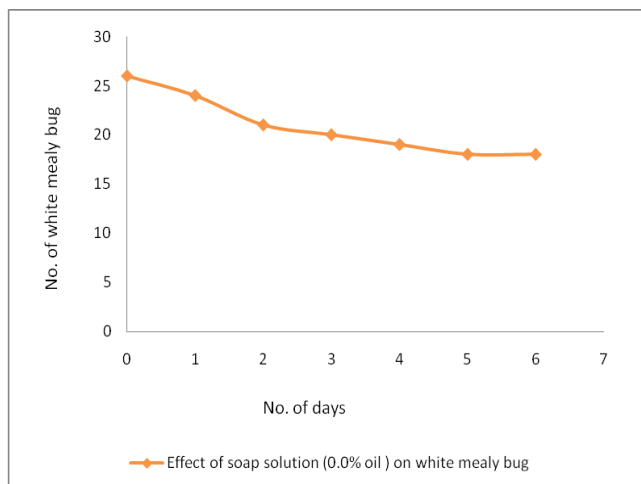


Fig.6. Effect of soap solution (0.0 % oil) on white mealy bugs

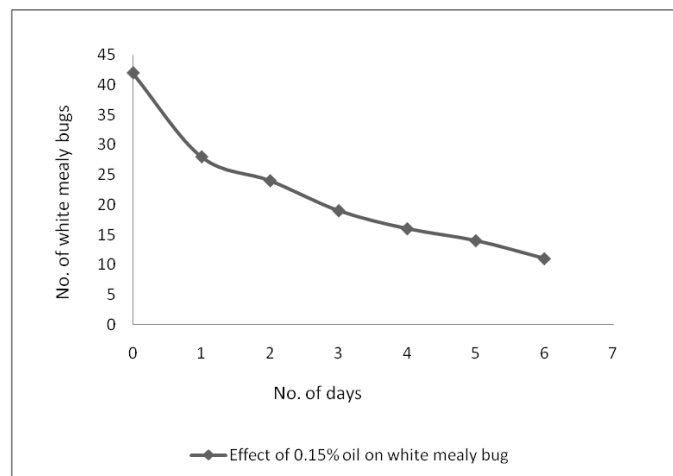


Fig.7 Pesticidal Test on White mealy bug (oil 0.15%)

The trend of reduction of white mealy bug from the guava tree leave surface against the days at various concentration of oil is shown in Fig.6, Fig.7, Fig.8 and Fig.9 respectively. It is observed from the figures that at lower concentration of oil a few white mealy bugs are still alive. As the concentration of oil increases from 0.00% to 0.75% the number of mealy bugs decreases to zero within 2 days. Hence, the oil solution of 0.75% is effective to keep away the pests.

Table.3. Pesticidal Test on White mealy bug (oil 0.30%)

Sl. No.	No. of days	No.of white mealy bugs
01	0	34
02	1	30
03	2	2
04	3	1
05	4	0
06	5	0
07	6	0

Table.2. Pesticidal Test on White mealy bug (oil 0.15%)

Sl. No.	No. of days	No.of white mealy bug
01	0	42
02	1	28
03	2	24
04	3	19
05	4	16
06	5	14
07	6	11

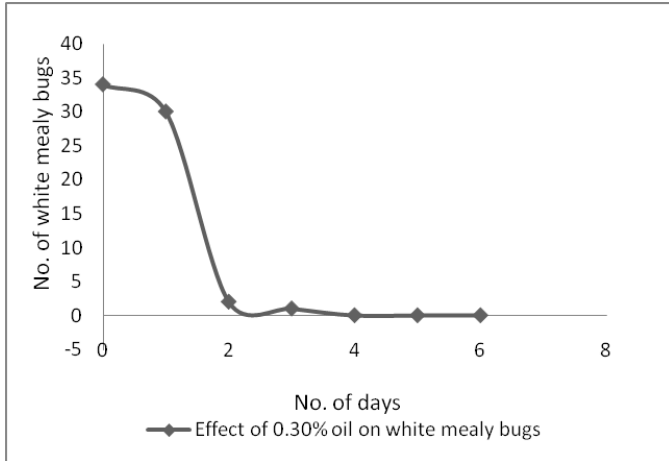


Fig.8. Effect of 0.30% oil on white mealy bugs

Table.4. Pesticidal Test on White mealy bug (oil 0.75%)

Sl. No.	No. of days	No. of white mealy bugs
01	0	43
02	1	2
03	2	0
04	3	0
05	4	0
06	5	0
07	6	0

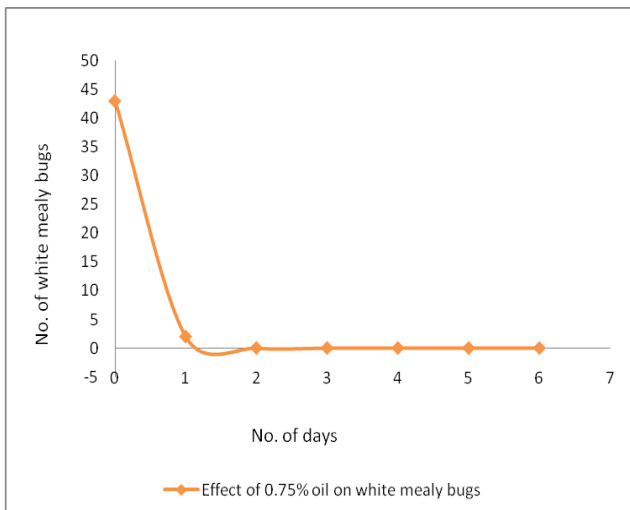


Fig.9. Effect of 0.75% oil on white mealy bugs

Table.5. Comparison of effect of Bio-pesticide on White mealy bugs

Sl. No.	No. of days	No. of white mealy bugs			
01	0	26	42	34	43
02	1	24	28	30	2
03	2	21	24	2	0
04	3	20	19	1	0
05	4	19	16	0	0
06	5	18	14	0	0
07	6	18	11	0	0

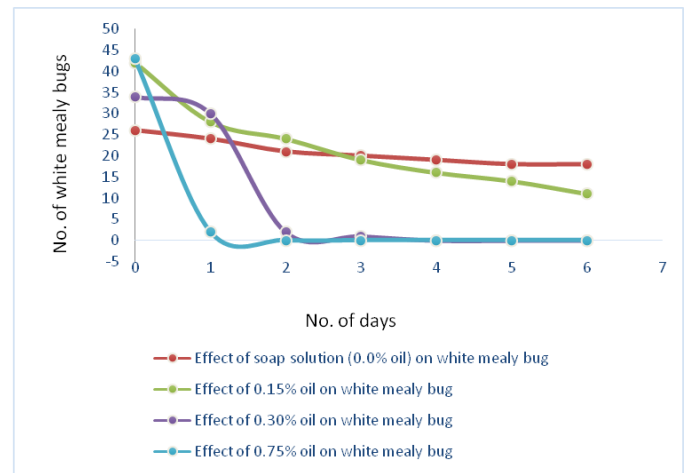


Fig.10. Comparison of effect of Bio-pesticide on white mealy bugs

IV. CONCLUSIONS

Now-a-days white mealy bug attacks on fruit as well as horticultural crops are very high. It brings down the yield by 40 %. To maintain the crops yield pesticide should be used but not the synthetic pesticide maldison, dimethoate and methylated spritis. It should be replaced by bio-pesticide. Following conclusions are made in the present investigation.

- Bio-pesticide extracted from custard apple seed 0.75% is enough to eradicate the white mealy bugs from the guava tree leaf surface within 2 days.
- This bio-pesticide is eco-friendly and will not cause water or air pollution.
- No problems in spray of ant quantity.
- It is biodegradable.

- It does not deplete earthworm and maintain the soil fertility.

In India with increase in population, environmental pollution is increasing day by day. They come from industry, automobile and also due to the synthetic pesticide used in the field for crop protection against the pests. Now-a-days these synthetic pesticide residues found in almost all food ingredients. Hence, it is high time to replace the all synthetic pesticide by bio-pesticide. Otherwise the day is not far there will be danger to human kind.

V.ACKNOWLEDGEMENT

We thankfully acknowledge the help from Dr. Ravishankar, Prof. G.K. Mahadevaju, Dr. Murthyshekar, Prof. M.R. Rajani, Prof. H.N. Pradeep, Prof. B.S. Thirumalesh, Department of Chemical Engineering, Dayananda Sagar College of Engineering, Bangalore. We would also like to thank Dr. Hemachandra Sagar, Chairman, Dr. Premachandra Sagar, Vice-Chairman, Sri Galiswamy, Secretary, Dr. S.C. Sharma, Director, Dr. C.P.S. Prakash, Principal, Dayananda Sagar College of Engineering, Bangalore for their encouragement and help rendered.

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