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Mortality analysis of *Paracocuccus marginatus* against *Calotropis gigantean* and *Curcuma nilgherrensis*

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Abstract

To evaluate the mortality of *Paraccous marginatus* against *Calotropis gigantea* and *Curcuma neilgherrensis*. The methanol extract of *Calotropis gigantea* and *Curcuma neilgherrensis* were tested against *Paraccous marginatus.* The mortality was observed 24 h and 48 h after treatment, data was noted to probit analysis to determine lethal concentration (LC50) to mortality 50 percent of treated larvae of tested species. The larval mortality was found in methanol and acetone extracts of *C. Gigantean* and *Curcuma neilgherrensis* against Paraccous marginatus with LC 50 values of 0.5ppm, 1.0ppm and 1.5ppm. The result was that mortality more than 50 death was observed in *Calotropis gigantean(CG)* and *Curcuma neilgherrensis* (CN) at 1 hour and 1.5 hours Group 4, high concentration of *CG* and *CN* values being 50.35 ±0.24, 55.2 7±0.13 (CG), 20.39 ±0.21 and 26.21±0.17 (CN). When compared to methanol extract, the mortality rate was less in acetone extract. The death rates were found to be lower for the LC_{50} value of 0.5 and highest for 1.5 hours. The survival rate found to be reducing as the LC_{50} value increases. While comparing the four samples *Calotropis gigantea* methanolic extract inferred that the highest percentage of mortality was found to be 84 for methanol and 50 for acetone extract. Whereas in *Curcuma neilgherrensis* the methanolic extract death rate was 76% and 40% in acetone extract. These results suggest that the effective plant crude extract have the potential to be used as an ideal eco-friendly approach for the control of disease vectors. The study provides the first report on the larvicidal activity of crude solvent extracts of different mealy bug in Adult.

Key words: Mortality, *Paraccous marginatus, Calotropis gigantean, Curcuma neilgherrensis and* LC_{50} .

Introduction

Agricultural production in India has not increased as anticipated, despite an increase by 12 percent per year in pesticide usage. The main objectives of most poor farmers are food security and enhanced revenue. Many crops known to have pesticide activity, however, are not widely used. While some pesticide crops are abundant and include exotic native and weedy species, others are less commonly accessible, and their use may bring species at danger of over-harvesting and have an adverse effect on the biodiversity of the ecosystem. Pesticides are substances or mixtures of pest prevention, destruction, killing, control or mitigation substances. Pesticide crops are naturally occurring plant-derived pesticides, sometimes referred to as botanical pesticides. Pesticide crops are our oldest type of pest control and take advantage of the natural herbivore defences created by a plant over millions of years of evolution. Most crops generate chemicals that prevent pests, often creating a compound combination that repels and stops feeding on herbivores. These compounds may even be poisonous to the herbivore in big enough amounts.

During the development of synthetic pesticides, pesticide crops were used for decades and were commonly used in corporate agriculture until the 1940s. Overuse of synthetic pesticides resulted to issues that were not expected at the moment of their implementation, such as pollution, growth of resistance and health issues. Cancer, negative immune system impacts, dysfunction of neurodevelopment, metabolic diseases such as diabetes, disruption of the endocrine system and infertility are some of the health hazards connected with constant exposure to synthetic pesticides (Gilden *et al.*, 2010; Rahimi and Abdollahi, 2007). WHO states that as a direct consequence of pesticide poisoning, 200,000 individuals are at risk globally each year (CAPE, 2009; Belmain *et al.*, 2013).

Innovation in the use of pesticide crops is therefore a means of decreasing the price of manufacturing and enhancing current understanding about the use of pesticide crops in the control of agricultural pests. Small farmers had been familiar with the use of pesticide crops for a long time in history. In many developing nations, several indigenous groups have not fully embraced the use of pesticide crops as a more environmentally friendly and cost-effective option despite the available information on the usefulness of botanical pesticides (Nyirenda and Sileshi, 2011).

In India (Mazid, 2011), the records between 2005 and 2011, reveal that there are only 2.89 percent of the bio pesticides are used. Though massive study is generally carried out on plant extracts against insect pests that have not been transmitted to local farmers. This seems to be a significant reason why farmers do not use the technology (Stevenson *et al.*, 2012). There are other literatures, on the other hand, which reported the potential use of crude extracts, simply prepared and to a large extent less concentrated that become more toxic (Isman, 2008).

Materials methods

Calotropis species, belonging to the family of Asclepiadaceae in plant kingdom, are the well known plants throughout the tropical world and they are native to the tropical and subtropical parts of Asia and Africa. It is represented in India by two species viz. C.procera and C.gigantean. It is a corrosive poison. The poisonous substances are calotropin, uscharin, calotoxin and calactin.
Due to the presence of these components, the plants are resistant to phytopathogens and insects in leaves where the latex circulates abundantly. The milky latex of the plant is rich in lupeol, calotropin, calotoxin and uscharidin, the latex protein.Selection of Pesticidal plants Nilgiri Turmeric is a dwarf plant with rootstock smallm white inside. Leaves are lanceshaped, pale green, shortly stalked. Leaves with stalks are a foot or longer. Blade is hairless, narrowed at both ends. Flower spiked are 5-10 cm long, 3-5 cm in diameter. Flowering bracts are pale yellowish green. Bracts of coma are pink. 2.5-3.5 cm. Flowers are about 2.5 cm across. Petals are pale, ovate, lip circular, deflexed, notched. Nilgiri Turmeric is found in Western Ghats - Konkan region, Nilgiris.

4.1 Collection of Plant Materials

The fresh samples of *Calotropis gigantea* and *Curcuma neilgherrensis* were collected randomly from the yercaurd Hills, Tamil Nadu. Sample materials were washed under running tap water, air dried and then homogenized to fine powder and stored in airtight bottles in refrigerator.

4.2 Preparation of Extracts

Soxhlet extraction technique was used to prepare crude sample extract. Approximately 20gm of powdered sample material was consistently packed into a thimble and extracted individually with 250ml of various solvents (methanol, acetone and petroleum ether). The elimination process must be continued for 24 hours or until the extractor solvent in the siphon tank becomes colourless. The sample was subsequently drawn in a beaker and retained on a hot plate and heated at 30-40^{o}C till all the solvent was evaporated. Dried extract was held at 4^{o}C in the fridge for future use.

RESULTS AND DISCUSSION

5.5 Mortality Analysis

5.5.1 Mortality Analysis of *Calotropis gigantea* against *Paracoccusmarginatus*

The effectiveness of plant extracts against *Paracoccus marginatus* is shown in the Table for various exposed time intervals (0.5, 1 and 1.5 hours) for *Calotropis gigeantea* and *Curcuma neilgherrenis* mortalities. The mortality percentage varies from plants to plants and based on exposure time. Multiple regression techniques were used in order to determine the main factor for each phase, using the techniques. This was done at every point for all mortality variables. As noted in this research, its highest value was 55.27 percent at 1.5 hours of exposure in the *Calotropis gigantea*Group 4sample treated with methanolic extract. The result was that mortality more than 50 death was observed in *Calotropis gigantea* at 1 hour and 1.5 hours Group 4, high concentration of *Calotropis gigantea*, the values being 50.35 ±0.24 and 55.2 7±0.13.Whereas more than 50 percent mortality in *Calotropis gigantea* acetone extract was observed in Group 4 with exposed time of 1.5 hours, value being 53.24 ± 0.12. When compared to methanol extract, the mortality rate was less in acetone extract.

*Calotropis gigeantea*and *Curcuma neilgherrensis* toxicity of raw plant extracts to *Paracoccusmarginatus* can rely on various variables, including chemical composition of raw plant extracts and insect sensitivity. However, the mortality rate increases with the increase in concentration and the exposure time and affirms the statement that the insecticide impacts on two insect pest species of stored-products of the VerbascumcheiranthifoliumBoiss ethanol extract were also reported by Khoshould and Khayamy (2008) and the exposed insects increased with increasing exposures and doses intervals.

Table 8: Mortality of Methanolic extract of *Calotropis gigantea* against *Paracoccus marginatus* Cumulative Percentage Mortality at Exposed Period

Treatment	Exposed Period (Hours) Mortality %		
	0.5	1.0	1.5
Group 1 (Control)	2.19 ± 0.15	6.16 ± 0.11	7.20 ± 0.04
Group 2 C.G (Low)	24.31 ± 0.45	28.26 ± 0.13	29.42 ± 0.42
Group 3 C.G (Mid)	39.33 ± 0.35	42.55 ± 0.48	45.19 ± 0.03
Group 4 C.G (High)	48.17 ± 0.08	50.35 ± 0.24	55.27 ± 0.13

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Figure 16: Mortality of Methanolic extract of *Calotropis gigantean* against *Paracoccus marginatus* Cumulative Percentage Mortality at Exposed Period

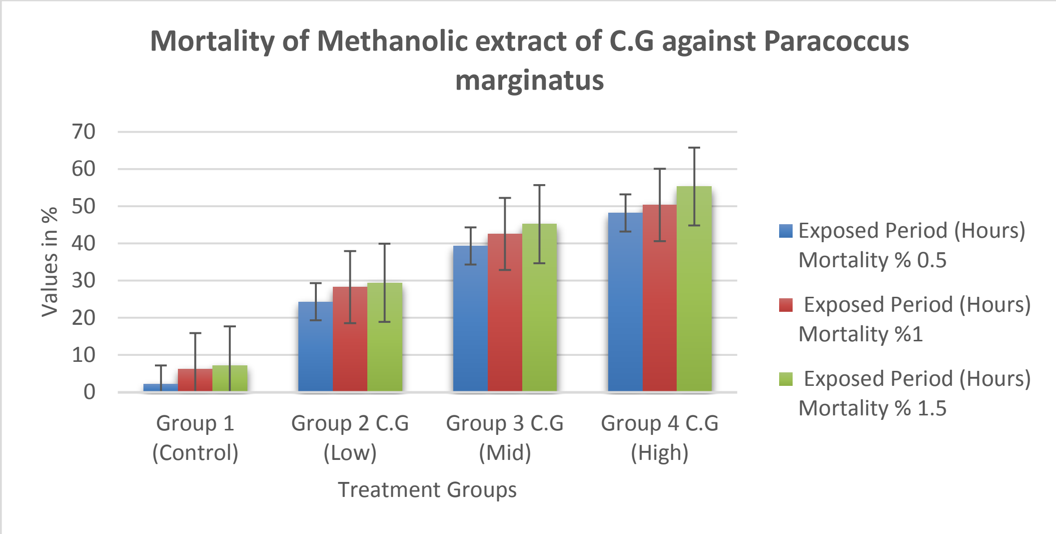
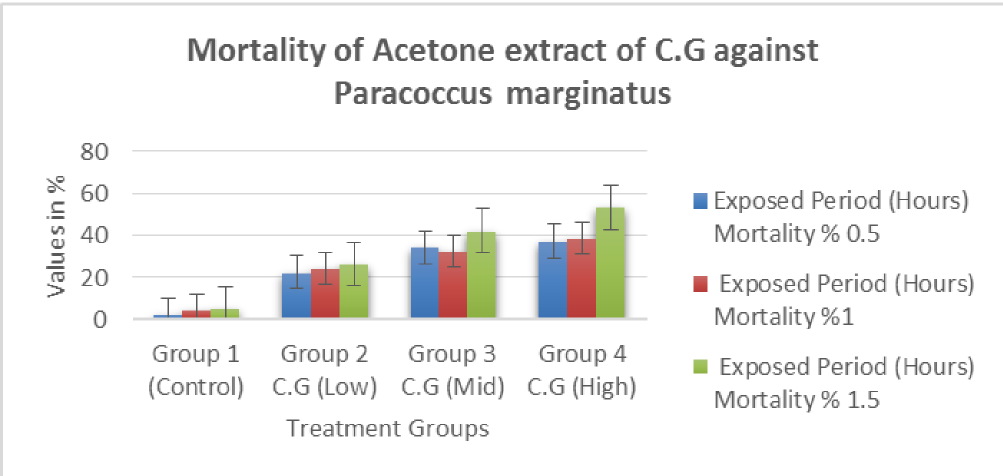


Table 9: Mortality of Acetone extract of *Calotropis gigantea* against *Paracoccus marginatus* cumulative Percentage Mortality at Exposed Period

Treatment	Exposed Period (Hours) Mortality %		
	0.5	**1.0**	**1.5**
Group 1 (Control)	2.12 ± 0.13	4.18 ± 0.09	5.10 ± 0.03
Group 2 C.G (Low)	22.27 ± 0.42	24.20 ± 0.11	26.20 ± 0.38
Group 3 C.G (Mid)	34.24 ± 0.30	32.12 ± 0.41	42.10 ± 0.01
Group 4 C.G (High)	37.19 ± 0.18	38.32 ± 0.20	53.24 ± 0.12

Figure 17: Mortality of Acetone extract of *Calotropis gigantea* against *Paracoccus marginatus* cumulative Percentage Mortality at Exposed Period



The findings showed that the botanical extract was efficient in insects and Iram*et al*., 2013, showed that the ethanol extract was considerably stronger than its powder form. Different researchers reported some other results. Fang *et al.*, 2002 stated that Tribolium species are among the less vulnerable and often harder to kill insect pests of stored products than other stored-product beetles but the toxicity order differs often based on their specific insecticide. Inspectors of stored products have been notified of monoterpenes, a significant component of essential oils(García *et al*., 2005; Habig*et al*., 1974).

5.5.2 Mortality Analysis of *Curcuma neilgherrensis*against *Paracoccusmarginatus*

Three different time periods namely 0.5, 1 and 1.5 hours were taken as the period of exposure for the *Curcuma neilgherrensis* with three different concentrations against *Paracoccus marginatus* and compared with the control. The correct mortality percentages were then computed with the Abbott formula and the outcomes are shown in Table. Unlike *Calotropis gigantea*, the mortality rate is not high for *Curcuma neilgherrensis* and is almost half the value. The maximum mortality rate is 26.21 ± 0.17 in 1.5 hours and 25.20 ± 0.13 in acetone extract. More or less, similar values are obtained both for methanol and acetone extracts. The mortality percentage was directly proportional to the level of concentration of plant extract. However, the results indicate that *Calotropis gigantea* was able to induce more than 50% mortality at 1 hrs, and reached its maximum value of 100% at 2 hrs.The elevated concentration of the crude plant extract used for the mortality test could be ascribed to these contradictions and differences.

Table 10: Mortality of Methanolic extract of *Curcuma neilgherrensis* against *Paracoccus marginatus* cumulative Percentage Mortality at Exposed Period

Treatment	Exposed Period (Hours) Mortality %		
	0.5	**1.0**	**1.5**
Group 1 (Control)	2.19 ± 0.15	6.16 ± 0.11	7.20 ± 0.04
Group 2 C.N (Low)	10.45 ± 0.30	16. 19 ± 0.06	23.45 ± 0.45
Group 3 C.N (Mid)	13.41 ± 0.44	18.21 ± 0.05	25.42 ± 0.44
Group 4 C.N (High)	16.33 ± 0.36	20.39 ± 0.21	26.21 ± 0.17

Figure 18: Mortality of Methanolic extract of *Curcuma neilgherrensis* against *Paracoccus marginatus* cumulative Percentage Mortality at Exposed Period

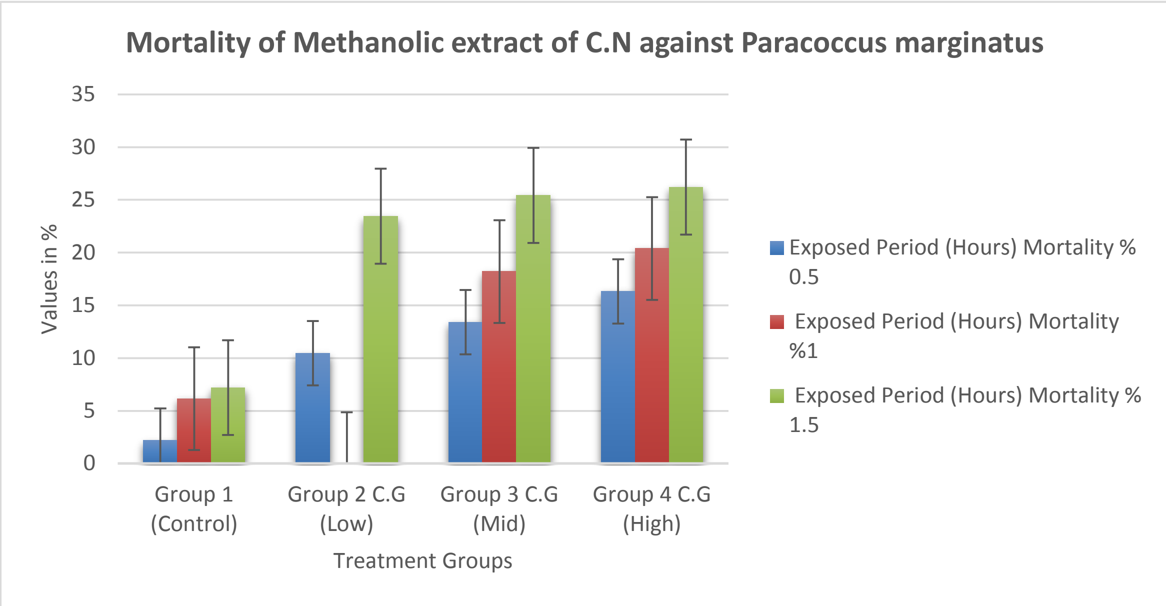
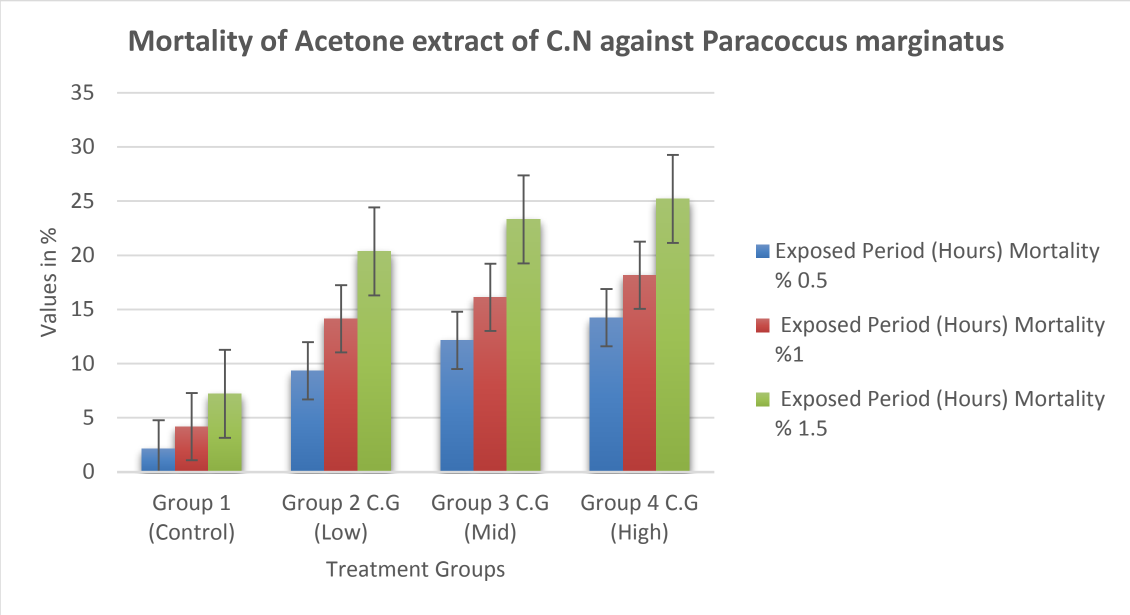


Table 11: Mortality of Acetone extract of *Curcuma neilgherrensis* against *Paracoccus marginatus* cumulative Percentage Mortality at Exposed Period

Treatment	Exposed Period (Hours) Mortality %		
	0.5	1.0	1.5
Group 1 (Control)	2.12 ± 0.13	4.18 ± 0.09	7.20 ± 0.04
Group 2 C.N (Low)	9.35 ± 0.26	14.15 ± 0.05	20.35 ± 0.40
Group 3 C.N (Mid)	12.15 ± 0.40	16.11 ± 0.04	23.32 ± 0.40
Group 4 C.N (High)	14.23 ± 0.31	18.16 ± 0.20	25.20 ± 0.13

Figure 19: Mortality of Acetone extract of *Curcuma neilgherrensis* against *Paracoccus marginatus* cumulative Percentage Mortality at Exposed Period



The findings for the other plant extracts for the *Curcuma neilgherrensis* larvae were also encouraging.There was an important impact compared to a control of the mortality rate of *P. marginatus* using all bio-rational substances. Bio-rationals provide eco-friendly management against *P. marginatus* with regard to the setting and not chemical insecticides (Mani *et al.*, 2012).

5.6 LC_{50} value of *Calotropis gigantea* and *Curcuma neilgherrensis* leaf extract

The LC_{50} values of *Calotropis gigantea* and *Curcuma neilgherrensis of* methanol and acetone extract at different hours (0.5, 1 and 1.5) were studied and reported. Results of probit analysis for analysing the dose-response data are presented in Table. 50 number of insects were tested at different concentrationto examine the survival of the insects. The death rates were found to be lower for the LC_{50} value of 0.5 and highest for 1.5 hours. The survival rate found to be reducing as the LC_{50} value increases. While comparing the four samples *Calotropis gigantea* methanolic extract inferred that the highest percentage of mortality was found to be 84 for methanol and 50 for acetone extract. Whereas in *Curcuma neilgherrensis* the methanolic extract death rate was 76% and 40% in acetone extract. Of the four samples selected the highest performance was found in *Calotropis gigantea* methanolic extract. The results prove that the insecticidal activity varied with plant species and exposure time.

Table 12: LC_{50} value of *Calotropis gigantea* and *Curcuma neilgherrensis* leaf extract on *Paracoccus marginatus* Adult

Parameters	No of insect introduced	No of insects killed	Probit killed (%)
Conc % Leaf C.G (Methanol)			
Control	50	-	-
0.5	50	28	56
1.0	50	32	64
1.5	50	42	84

Conc % Leaf C.G (Acetone)			
Control	50	-	-
0.5	50	10	20
1.0	50	21	42
1.5	50	25	50
Conc % Leaf C.N (Methanol)			
Control	50	-	-
0.5	50	18	36
1.0	50	31	62
1.5	50	38	76
Conc % Leaf C.N (Acetone)			
Control	50	-	-
0.5	50	9	18
1.0	50	14	28
1.5	50	20	40

In coincidence with the results obtained, Sumathi *et al*. (2017) examined the bio-efficacy of the extract of Calotropis Gigantea, which was tested in *Ailanthus exelsa* in the therapy process against papaya mealy bug. As reported by Saxena, (1987), in order to recognize the adverse effects of chemical insecticides, attention was now turned to non-chemical pest management techniques. Researches are carried out to explore the possibility of plant-based substances or mixtures, biopesticides, to avoid, repel and kill insects and pests. As stated by Sastry and Kavathekar(1990), species of *Calotropis* are extremely prospective plant resource specific classes that can prevent or repel grazing livestock.Suresh kumar(2013), has explained that the past employees had recorded the existence in multiple areas and particularly on the leaves of *Calotropis gigantea* of efficient phytochemicals, which are accountable for their biological activities, particularly their insecticidal operations. Many employees have also recorded insecticide activity and compounds in many crops against various groups of fungi as reported by Rajam(1991); Jeyasankar&Jesudasan, (2005); Jeyasankar, (2012).

CONCLUSION

The present research confirms that the *Calotropis gigantea* &*Curcuma neilgherrensis*are toxicant or biopesticidal property and growth regulating agent against *Paracoccus marginatus*. Both plants play an important role of biopesticidal activity against the *Paracoccus marginatus* adults. These pesticides are not harmful to the environs living beings or other creatures. There is no poisonous pollutant by the use of said bio pesticides in the environment. This sector needs more technical input in the shape of research technology and human resource development. A number of plant materials have been traditionally used for pest control for centuries. These have been widely studied against insect pests of field crops and storage. Unlike ordinary insecticides based on single active ingredients, the bioactive components of plants are a complex array of novel compounds with diverse behavioural and physiological effects on insects. Commodities treated with plant extracts repel insects and deter their feeding. However, the complexity of chemical structure of majority of these compounds precludes their synthesis on a practical scale. Therefore, the use of simple formulations of plant derivatives such as oils and extracts needs to be popularized. Use of pesticidal herbs as method from ancient time pointedly add to the production and sustainability of living creatures and also a feasible method for controlling pest as explained by Amoabeng et al., (2014) and Mkenda et al., (2015). Moreover, the elderly person who was possessing the information of their usage and preservation are dying without suitable documents and as such the knowledge is not passed on to the successive generations. In order to preserve the left over details of the pesticide herbs and plants, additional study is needed. Users of pesticides could feel it is cost effective when plants with pesticide nature are used.

Preparation of extracts, storage and application also needs to be fine-tuned to make their use reliable and easy for farmers. Furthermore, there is need to promote policy that would facilitate the use of pesticidal plants use through commercialization at local village levels using crude preparations but also for larger scale production. Closing the considerable knowledge gaps and surmounting the lack of commercial incentives or revenues to drive policy and uptake of pesticidal plant products remain the key challenges. Influencing policy is a particular challenge as most regulation is based on those designed for large-scale synthetic pesticide products that have been the mainstay of pest management in North America, Europe, Japan and Australia (Isman, 2006; Sola et al., 2014). So, outcome of the present research work is more beneficial to the farmers, prevention of agricultural pests and helps to increase the crop production as well as saving the medically important host plants.

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