

Formulation of biopesticides from herbal extract comparative against white fly and fruit fly

Submitted in partial fulfillment of the requirements for the award of Bachelor of Technology Degree in Biotechnology

by

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SATHYABMA**

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade “A” by NAAC

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of G.Mathavi (38770011) who carried out the project entitled“

Formulation of Biopesticides from herbal extract comparative against white fly and fruit fly ” under our supervision from **January** 2021 to **March..**

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ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to **Board of Management of SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. we are grateful to them.

We convey our thanks to **Head of the Department Dr. V. RAMESH KUMAR \$ Mr. NARENDRAKUMAR, Department of Biotechnology** for providing us necessary support and details at the right time during the progressive reviews

We would like to express our sincere and deep sense of gratitude to our project guide to our Project Guide **Dr. N. Uthralakshmi, Department of Biotechnology** suggestions and constant encouragement paved way for the successful completion of our project work.

We wish to express our sincere thanks to Dr. J.V. Reji, Department of Plant Biology and Plant Biotechnology, Madras Christian College, for helping, guidance and suggestions for successful completion of our project work and heartfelt thanks to all Teaching and Non - Teaching staff members of the Department of Biotechnology who were helpful in many ways for the completion of the project work and heartfelt thanks to all Teaching and Non m - Teaching staff members of the Department of Biotechnology who were helpful in many ways for the completion of the project.

Finally, we express our sincere thanks to our parents, friends and others who helped us to complete this work

.

ABSTRACT

synthetic pesticides have been a major agricultural problem as they reduce soil fertility, affect the plant growth and intervene with the food web and biomagnification. produced from herbal plants are said to overcome the problem, as they intervene less with soil fertility and plant growth. This research is based on production of biopesticides from herbal plants and evaluating its toxicity on mealybugs in comparison with synthetic pesticides. The biopesticides were produced from 5 plants *namely _spodoptera fruhiperda, Agrotis ipsilon , harvesr pests white fly, fruit fly and Aloe barbadensis miller which was evaluated against aAzadirachta indica* for pesticidal activity. The crude extracts were purified and three pesticides which exhibited anti - oxidant activity were further evaluated and compared with the synthetic pesticide through insect repellency test.

Keywords : Biopesticide , azadirachta indica , synthetic pesticides, pesticidal activity, anti- oxidant activity, insect repellency test , herbal plants

CONTENTS

S.No	Content	
1 .	Chapter 1 – Introduction	8
	1.1 Biopesticides	3
	1.2. Types of Biopesticides	11
	1.2.1 Microbial pesticides	12
	1.2.2 Biochemical pesticides	13
	1.2.3 plant pesticides	14-16
	1.3 Historical overview of biopesticides	17-18
	1.4 Army worm	19-23
	1.5 cut worm	23-24
	1.6 post harvest pests	25-29
	1.7 neem soil borne pests	29-32
	1.9fruit fly	32-34
2 .	<u>chapter 2 Literature survey</u>	35
3.	<u>chapter 3 Aim and scope</u>	35-42
	3.1 Aim	43-44
	3.2 Scope	43-44
	3.3 Plant of work	44 -45

<u>Chapter 4 Materials and methods</u>	45
4.1 Collection of plant materials	45
4.2 Preparation of plant extracts	45
4.3 Preliminary screening of neem extracts	46-47
<u>Chapter 5 -Results & discussions</u>	48
5.1 Preparation of neem extracts	48
5.2 Preliminary screening of neem extracts.	49-55
6. <u>Chapter 6 -Summary & conclusion</u>	55-56
6.1 Summary	55
6.2 Conclusion	56-57
<u>7.References</u>	<u>57-60</u>

CHAPTER -1

1INTRODUCTION

Over the next 20 years, the need of agriculture has been of great importance in order to meet the rising needs of the human population (Chandler al, 2011). However, agriculture has faced the abundant destructive activities of pests like weeds, insects and other plant pathogens leading to a drastic decrease in crop yields (Salma \$ Jogen ,2011). There are estimated to be about 67,000 different species of pest that cause about 40 percent reduction in crop yield which in turn undermine food production among other things such as poor soil, inclement weather and farmers limited access to technical knowledge. This crisis was resolved to a great extent, with the use of chemical pesticides. Alongside the advances in crop nutrition, irrigation and plant varieties, they have also helped in However, the overuse of chemicals and their immoral use has given rise to many environmental concerns. The chemicals used to control the pests have led to degraded soils and unwanted pollution which in turn ensued nutritionally imbalanced and unproductive lands. This risk hazard also raised many food safety concerns among the domestic consumers and also posed a threat to exported crops (Gupta & Dikshit , 2010).

Furthermore, one of the main reasons for the concern of overuse of pesticides is due to the development of pesticides resistance in prominent pests and the remaining of

pesticide residue in dairy and agricultural products. The intensive use of pesticides in agriculture is a cause of serious concern. The problem is especially serious because the development of resistance to pesticides in important pests and the presence of pesticide residue in agricultural and dairy products. It was first reported in India in 1963 when a number of pests was found to resist the effects of DDT and HCH which are two of the most common pesticides used in the period of 1960s and 1970s.

Due to the resistance, the number of pests exhibiting pesticide resistance has increased. One of the most noted Resistance was witnessed in cotton, for which American bollworm is a serious pest. The bollworm has developed resistance to almost all pesticides in a number of regions, and is particularly serious in parts of Punjab, Haryana, Andhra Pradesh, Karnataka and Maharashtra. Other important

pests of cotton, white fly and jassid, have also developed pesticide resistance in some places. Growing pesticide resistance has led to large decrease in agricultural production as it is all consumed by pests. The losses are particularly serious in cotton. For instance, cotton production declined by about 50% in Punjab during the years 1997 and 1998. This had a terrible outcome of cotton farmers to commit suicide in the affected areas (Alam, 2000)

Studies show that one of the main reasons for pesticide resistance is due to the extensive use of pesticides on pests and its host plants. Pesticides of bogus quality, which are more common in small town and villages, have also contributed to resistance in many areas. Their contribution mainly includes the manufacture of sub-standard pesticides where the pests are repeatedly exposed to only a low concentration of pesticides which in turn provides to the build-up of resistance, without destroying the pests. This was observed in Bidar (Karnataka) where more than brands of pesticides were found to be sub-standard in 1988-99, a time when the problem of pest

resistance was at its peak. Similarly, in Punjab, the licenses of 115 pesticide producers were cancelled for selling sub - standard pesticide.

The other important problem caused by the excessive and inappropriate use of chemical pesticides concerns the presence of pesticide residue in food. Many of the pesticides currently being used have a tendency to survive in plants for a long time. They also enter the food chain and are found in meat and dairy products. The problem of pesticide residue is already a serious threat to health and environment in India. The incidence of pesticide residue is much higher in India than in developed countries. For example, according to one study, more than 80% of milk samples tested in India were found to contain residues of DDT and HCH. According to another study, residue of DDT and benzene hexachloride, both suspected carcinogens, were found in breast milk samples collected from mothers in Punjab. The amount of residue was very high and babies were ingesting 21 times the amount of these chemicals considered acceptable through their mothers' milk.

therefore, it had become imperative to find an eco - friendly alternative to overcome the drawbacks associated with synthetic pesticides. The use of biopesticides has offered an ecologically sound and effective solution to pest problems and provide a better solution than chemical pesticides (Salma & Jogen, 2011)

1.1. BIOPESTICIDES

Biopesticides are developed from naturally occurring living organisms such as animals, plants, and microorganisms (e.g., bacteria, fungi, and viruses) that can control serious plant-damaging insect pests by their nontoxic eco - friendly mode of action on

pests. They have gained more importance on pests as they pose less threats to the environment (Saxena& Pandey, 2001). One of the greatest advantages of biopesticides are:

1. They are characteristically less harmful than chemical pesticides.
- 2.They are target- specific and so they only attack the target pests unlike, chemical pesticides which also cause adverse effects on non-target organisms.
3. They are effective in small doses.
4. Unlike chemical pesticides, they are bio- degradable and hence, they don't leave any harmful residues in the environment.

When biopesticides are used as a constituent of pest management, its efficiency can be equal to that of the synthetic pesticides, particularly for crops like fruits,vegetables, nuts, and flowers. They also overcome the concern of residue problems especially for consumers of edible fruits and vegetables (Kumar, 2012). Biopesticides have been gaining importance with those concerned with developing environmentally friendly and safe integrated crop management (ICM)-compatible approaches and tactics for pest management. They have also gained attention in farmer's recent trend of "organically produced food" and the more effective introduction of "biologically based products" (Copping & Menn, 2000).

1.2 TYPES OF BIOPESTICIDES

Biopesticides mainly fall into three categories based on the active substances

- 1 Microbial biopesticides
2. Biochemical biopesticides
3. plant biopesticides / botanical pesticides

1.2.1. Microbial biopesticides

They contain a microorganism (bacterium, fungus, virus, protozoan or alga) as the active ingredient which are used for the biological control of plant pathogens such as pests, insects and weeds. Different microbial pesticides are responsible for control of different kinds of pests because each separate active ingredient is relatively specific for its target pests. For instance, certain type of fungi control weeds and other types that kill specific insects (Gupta & Dikshit, 2010). The most widely used organism in the development of microbial pesticides are varieties of insect pathogenic bacterium *Bacillus thuringiensis*, or Bt which provide control for insects present in cabbage, potatoes, and other crops. They produce a specific protein during the spore formation of the bacterium that is harmful to specific insects such as Lepidoptera, coleopteran and diptera (Chandler et al, 2011). The protein crystal that is produced during bacterial spore formation is known as the Bt δ -endotoxin which causes lysis of gut cells when consumed by pathogenic insects. This δ -endotoxin is host specific and cause death to host cells within 48h. However, it does not cause any harm to the surrounding environment including

vertebrates, humans and other beneficial organisms. These microbial Bt biopesticides are mass produced in fermentation tanks and formulated as sprays that have been used on broad-acre crops such as soya, maize, cotton and bean in the recent years.

certain other microbial pesticides attack other pest by out-competing the pest organisms. For instance, microorganisms like *Trichoderma harzianum*, *Rhizoctonia* and *Pythium* are used and are proven to be effective against plant pathogens. Similarly, *Coniothyrium minitans* are effective against *Sclerotinia sclerotiorum*, an important disease of many agricultural crops. Other microbial antagonists include bacteria, filamentous fungi and yeasts which are used as control agents of post-harvest diseases in certain fruits and vegetables. However, one of the drawbacks of microbial pesticides is that they need to be monitored continuously to ensure they do not become capable of harming non-target organisms, including humans.

1.2.2. Biochemical pesticides

Biochemical pesticides are naturally occurring substances that control pests by non-toxic mechanisms. These types of pesticides include substances that interfere with growth or mating, such as plant growth regulators, or substances that repel or attract pests, such as pheromones. Pheromones are certain chemicals produced by insects which is stimulated due to a certain behavioral reaction from other individuals. They can be known as sex pheromones, aggregation pheromones, alarm pheromones, etc., according to type of effects it

displays. They have become essential tools in monitoring and managing agricultural pest populations (Witzgallet al, 2004). In the recent years, there has been significant researches and information on insect pheromones and new opportunities have arisen to explore the use of semiochemicals in managing insect pest problems. Insect control by pheromones can be applied in integrated control in combination with other practices for an effective solution. Plant volatiles are recognized as an integral part of the pheromone system of various Coleopteran species studied so far. How the combinations of pheromones and plant volatiles are incorporated into the insects' olfactory systems so that they can discriminate pheromone molecules alone and pheromone plus odor plume strands and react behaviorally to these signals is a question of increasing importance

Currently, pheromones and other semiochemicals are used to monitor and control pests in millions of hectares. One of the major advantages of applying pheromones for monitoring pests are specificity, lower costs, ease of use, and high sensitivity (Witzgall et al, 2010). However, it is sometimes difficult to assess whether a natural pesticide can control the pest by a non-toxic mode of action. Therefore, Environmental Protection Agency (EPA) has established a committee to determine whether a pesticide meets the specified criteria for a biochemical pesticide (Salma&Jogen, 2011).

1.2.3 Plant Biopesticides

Plant biopesticides or Botanical pesticides are pesticidal substances that use the natural compounds from plant to give security to insect pests. Exploring the potential to utilize the properties of plants has become a key focus in pest control. Some plants are known bioactive metabolites, which show repellent and toxic effects on a wide range of pests. These compounds were initially used in the nineteenth century and by the early period of the twentieth century, their use and benefits have been

established worldwide (Morgan, 2004). Plants have been known to develop many strategies to defend themselves from predators due to the co-existence of plants and insects on the earth for almost three and a half million years. One such strategy is developing compounds that are highly toxic to insects (Warthen & Morgan, 1985). Plant pesticides can also be produced genetically and such pesticides are called as Plant-Incorporated-Protectants (PIP) or Genetically Modified Crops. These biopesticide substances produced by plants from genetic material that have been added or incorporated into their genetic makeup. For instance, using the process of genetic engineering, scientists take the gene that codes for Bt protein, that is host specific and can cause death within 48h, and introduce the gene into plant's own genetic material. Then the plant, instead of the Bt bacterium, manufactures the substance that destroys the pest. The protein and its genetic material, but not the plant itself, are regulated by EPA. These crystalline proteins are highly insecticidal at very low concentrations (Lacey & Siegel, 2000). These Bt insecticidal crystal proteins (ICPs) are non-toxic to humans

and other organisms and therefore been accepted as eco-friendly biopesticides and have been extensively used in horticulture, forestry, agriculture, animal health and mosquito control worldwide. The Bt strains are now toxic to number pests including coleopterans, lice, nematodes, mites and dipterans. However, they were initially found to affect a range of lepidopteran insects, which are recognized worldwide as major agricultural pests on crops (Kumaret al, 1996).

Plant biodiversity has proven to be effective as an effective source of biologically active materials for use in traditional crop protection. Either crude extracts of the plant materials or purified extracts of plant parts or the secondary metabolites are proven to be toxic to plant pathogens and act as defensive compounds. In the present economic world, there seems to be tremendous opportunities for the development of phytochemical-based biopesticides. Over the years, there are found to be more than 6000 plant species that have been screened for insecticidal activity and nearly 2500 species belonging to 235 plant families were found to possess considerable pest control activity. Various isolated compounds from plants indicate that approximately 350 compounds are insecticidal (Saxena, 1998). However, it is likely that many novel molecules that can be used against pests are yet to be discovered from many plant species for further development. Phytochemicals have been known

for their complexity of their chemical structures and biosynt

hetic pathways and have been investigated since the 1850s. Recognition of those novel components have fueled the research for new development of pesticides, insecticides, herbicides and so on. The most important defense produced by plant compounds to mediate a wide variety of interactions against the pests are plant secondary metabolites released into the environment. Some of these compounds are volatile or essential oil constituents, ketones, esters, aldehydes, aromatic phenols, mono- and sesquiterpenes, etc. (Croteau et al, 2000). Here are some common examples of the important bioactive plants: basil, neem, garlic, black pepper, catnip, artemisia, dahlia, hyssop, chrysanthemum, artemisia, ginger and so on. The organic compounds present in these plants are known to possess bio-pesticidal properties that have been in use for a long time. Pest control obtained from plant origin offer protection with less toxic effects on the ecosystem and also offer repellence effect on the insects. Therefore, some plants also act as repellents and when effective, it causes the target pest to make an oriented movement away from the source of stimulus and in case of no escape, it leads to the death of the pest (Owusu, 2001). on the insects. Therefore, some plants also act as repellents and when effective, it causes the target pest to make an oriented movement away from the source of stimulus and in case of no escape, it leads to the death of the pest (Owusu, 2001)

1.3. HISTONICAL OVERVIEW OF BIOPESTICIDES

Plant biopesticides have been a subject of research for long term with the aim to overcome one of the major problems faced in agriculture. The use of plant biopesticides was first brought up in 400 B.C through a written reference to the application of plant extracts against pests which is tracked back to Rome (Dayan et al, 2009). Botanical pesticides were considered as an important weapon for pest management in Egypt, India and Greece and also in Ancient China. It was also predominantly used in the United States in the late 1930s and early 1940s. Later in the 1980s and 1990s, the interest in the use of plant pesticides had started to increase significantly mainly due to concerns raised by the public due to exploit use of synthetic pesticides and their damage and impact on the crops and the environment. Presently, there are several dozens of plant pesticides are use of synthetic pesticides and their damage and impact on the crops and the environment. Presently, there are several dozens of plantpesticides are used commercially worldwide based on various extracts. According to Mwine et al. 2011, 34 species of plants are used in traditional agricultural practices for pest control in Southern Uganda.

One of the major reasons for the plants to exhibit biological activities against insects is due to the presence of secondary metabolites, some of which have been widely investigated (Chandra et al, 2008). The process of knowing and obtaining secondary metabolites against insects is by means of plant extracts, which can have variations according to the solvents used. Some of the most common plant metabolites are alkaloids and terpenoids that are reported as effective candidates for pesticidal compounds that could be a safer alternative for the use of synthetic pesticide in pest management (Joseph et al, 2012).

Secondary metabolites exhibit several properties against pests such as insecticidal activity where the substance or mixture of substances exert bioactivity due to their chemical nature (Celiset al, 2008). However, most of the metabolites exert different kind of where it inhibits the insect's development and behavior. Such activity can be divided into: repellence, antifeeding and deterrent activity (Eriksson et al, 2008), growth regulation, feed deterrence and oviposition deterrence. Repellent activity is exhibited when compounds present in plant release a foul odor or an irritant that causes insects to get away from them. Growth-regulating effect is shown by metamorphosis or provoking precocious moulting. The compounds exhibiting growth-regulation alter its hormone and causes sterility or death in insects. Whereas, anti-feedant activity is shown when the compounds, once ingested by the insect, cause it to stop feeding and eventually die of starvation.

Currently, more than 2000 plant species have been discovered that are known to have insecticidal properties where Asteraceae, Labiatae, Euphorbiaceae, Fabaceae, Meliaceae and Solanaceae families stand out. Among the metabolites with biological activities against insects are flavonoids, terpenoids, alkaloids, steroids and phenols (Orozco et al, 2006).

For this study, we have chosen five plants that have been known to exhibit pesticidal effects against number of pests *Justicia adathoda*, *Gliricidia sepium*, *Momordica dioica*, *Pongamia pinnata* and *Aloe barbadensis miller* and the compounds present in them are known to exhibit pesticidal effect and repellency effect against pests such as aphids, bedbugs, flies and especially mealy bugs

1.4 Army worm (S.frugiperda)

Taxonomic Tree

Domain : Eukaryota

Kingdom: Metazoa

Phylum : Arthropode

Subphylum : Uniramia

Class :Insecta

Oder :LEpidoptera

Family : Noctuidae

Genus :Spodoptera

Species : frugiperda

The fall *armyworm* (FAW) (*Spodoptera frugiperda*) is one of the devastating insect pest belonging to the family Noctuidae and falls in the Lepidoptera order. It is a polyphagous pest (Baudron et al., 2019) causing damage to economically important cultivated cereal crops such as maize, rice, sorghum, cotton and various vegetable crops and eventually impacts on food security . The FAW feeds on leaves, stem and reproductive parts of plant species (Tefera et al., 2019). It is native to tropical and subtropical regions of the America. FAW, which was first found in America, is one of the common pests of maize in South and North America.

An adult fall armyworm does have a capacity to fly over longer distances. The distance covered by one generation is estimated 300 miles. This fast migration rate may be due to the movement of air in weather fronts (Sparks,1979). Fall armyworm is the major insect pests of tropical regions of the Americas and a native to tropical and subtropical regions of the Americas.In late 2016 ,it was reported for the first time in West Africa and rapidly spread throughout Sub -

Saharan Africa (SSA) and later confirmed in forty four African countries (Sisay et al., 2019). The report suggests that the entry of both the strains of FAW from Americas to Africa was through commercial aircrafts, cargo containers or aeroplane holds and which later spread through the dispersal of wind (Day et al., 2018). Fall armyworm has been reported in many Asian countries. In Indian continent, it was first reported in 2018 in Karnataka. Later, it spread in different places like Bihar, Chhattisgarh, Gujarat, Maharashtra, Odisha, West Bengal etc (CABI, 2020). The insect pest has existed in Asian countries like China, Japan, Bangladesh, Cambodia, Indonesia, Myanmar, Korea, Thailand, Srilanka and Vietnam (FAO, 2019). Fall armyworm is yet to be recorded in some continent but the threat of its spreading is very high in a short time. In Nepal, it was first recorded in Nawalparasi district on 9th May 2019 (Bhusal and Bhattarai, 2019) and declaration of the invasion of FAW was made in the 19th meeting of Nepal Plant Protection Organization (NPPO) of Nepal (Go N, 2019). This pest has now been observed in fifteen districts of Nepal (Bajracharya and Bhatt, 2019)...

1The detection of fall armyworm is utmost important before the pest causes economic damage. Fernandez (2002) reported that it is recommended to use the control measures in the maize, only when the 5% of seedlings are cut or 20% of whorls of small plants (during the first 30 days) are infested with fall armyworm. Assefa and Ayalew (2019) revealed that larval stage of fall armyworm is the effective time for the proper management of the pest with timing (morning, afternoon or evening) when the management activity is done is indispensable.

This paper highlights the necessary information on the introduction and identification of the fall armyworm with its possible control measures.

Two strains of fall armyworm such as rice strain and corn strain are found (Nagoshi et al., 2007). Rice strain feeds on rice and other pasture grasses whereas the corn strain feeds on maize, cotton and sorghum (CABI, 2020). These strains are morphologically similar but can be differentiated at the molecular level. The fall armyworm invaded in Africa has a greater diversity than that found in America

which contains both the strains (Jacobs et al., 2018; CABI, 2020). Table 1 shows the classification of fall armyworm (*S. frugiperda*).

The lifecycle of the insect can be classified into four stages. The fall armyworm can be identified either by using morphological characters or through characteristic injury symptoms on susceptible crops or molecular characterizations (FAO and CABI, 2019).

The egg of fall armyworm is dome-shaped with a flattened base with 0.4 mm in diameter and 0.3 mm in length (Prasanna et al., 2018). Bajracharya and Bhat (2019) reported that eggs of the fall armyworm are creamy white in color with reticulate ribs covered with abdominal hairs. The female lays 100 to 200 eggs at a time in mass (Prasanna et al., 2018) on the upper, lower sides of the leaf, the stalk and the funnel of the maize plant (CABI, 2018b).

The newly hatched caterpillars at first and second instar are green in colour which turns into brown to black colour at the third to sixth instars (CABI, 2018b). The mature larva has a white inverted “Y” shaped mark on the front and its epidermis is rough or granular in texture (Prasanna et al., 2018) with four dark raised spots in the form of square (CABI, 2018b). The newly hatched larvae is observed to be burrowing in nature (CABI, 2017c). Capinera (2000) reported that the 1–6 instar have head capsule with 0.35, 0.45, 0.75, 1.3, 2.0, and 2.6 mm wide, and body lengths are about 1.7, 3.5, 6.4, 10.0, 17.2, and 34.2 mm, respectively. 1

- 1mFall armyworm are affected by climatic factors and changes in the climate may affect its distribution in various geographical regions. It has been reported that growth, abundance, survival, mortality, number of generations and other characteristics are highly affected by environmental condition (Ramirez-cabral et al., 2017).The pest overwintering mechanism governs the greater invasion of FAW. It thrives in cool, wet weather and

severe outbreaks after heavy rainfall and humid weather (Westbrook and Sparks, 1986). A warm and humid growing season with heavy rainfall is favorable for the survival and reproduction of the pest. The development of the pests ceases below the temperature of 10 degree Celsius (Assefa and Ayalew, 2019). For the efficient reproduction, tropical and subtropical areas are favored where more than ten generations of the fall armyworm per year are reported compared to just two generations in temperate areas (Assefa and Ayalew, 2019). A warm temperature accelerates the development of insects with probability of increasing the multiple generations of fall armyworm (Westbrook and Sparks, 1986).

A combination of communication methods (in public and private sectors) is required taking into account the information to be communicated and the control methods being promoted (Day et al., 2017). This is the first and the most important step for the management of the fall armyworm. The Asian countries like China, Bangladesh, Indonesia, Japan, Myanmar, and Srilanka are adopting this method to bring awareness among the people regarding the management of the devastating pest (FAO, 2019). ...

1.5 cutworm

Taxonomy Tree

Kingdom : Animalia

Subkingdom : Eumetazoa

Superphylum : Ecdysozoa

Class: Megacheira

phylum : Arthropod Family : Noctuidae

Abstract- Bioecology of common cutworms (S. litura) was diligently documented at the crop protection section of the Don Mariano Marcos Memorial State University -Sericulture Research and Development Institute, primarily aimed to generate substantial data for the formulation of control measures. Specifically, focused on the developmental stages, behavior and factors associated to their resurgence and geographical distribution.

Common cutworm is a complete metamorphic insect and considered as a serious pest of mulberry threatening sericulture farmers in their quest for quality leaves for silkworm rearing. Round- shiny white eggs are pile- up in 3 -4 layers and usually laid in 2- 7 batches. Incubation took place in 2-3 days.

On the other hand, newly hatched transparent green larvae have pin-sized black spots around their bodies. Color changes every after casting-off their old skin until reaching full maturity. Larvae development lasted for 19.36 days. Matured worms secured the ground for pupation making earthen cells as encasement. It was completed in 8-9 days and immediately after emergence of the moth, copulation follows that lasted for two days and four days egg laying period.

Outbreak and population build-up were influenced by biotic and abiotic factors (predators, parasites, disease causing organisms, host plants and weather

conditions). High population of cutworms and predators were noted throughout the year heavy downpour affected egg production.

Bioecology, cutworms, threshold, defoliation, feeding behavior, resurgence, distribution, fecundity, pupation, copulation, predators, parasites, outbreak, build-up, host plants.

They fed on plants belonging to 44 families preferably tobacco, cotton, ground nuts, cabbage, cauliflower among others. It was also found feeding on weeds such as *Amaranthus spinosus*, *portulaca*, *Zinnia elegans*, and *Chenopodium amaranticolor* (Prasad, 1997).

when conditions warrant their outbreak and population build-up. It is imperative therefore, to generate sufficient informations on its biological activities and factors associated on their resurgence and distribution for effective pest control. Insect pests cause great hazard to the world's vegetation and significant reduction of crop's output. Many multiply hundredfold in a short period feeding on leaves, stem and fruits to complete their development stages.

1.6 Harvest pests

Taxonomy Tree

Kingdom : Animals

Species : *Homo Sapiens*

Genus: *Homo*

Family : Hominids

Order : primate

Class : Mammals

Phylum : Chordates

A wide variety of fungal and bacterial pathogens cause post-harvest *disease* in *fruits* and vegetables. Some of these infect produce before harvest and then remain quiescent until conditions are more favourable for disease development after harvest. Other pathogens infect produce during and after harvest through surface injuries. In the development of strategies for post-harvest disease control, it is imperative to take a step back and consider the production and post-harvest handling systems in their entirety. Traditionally fungicides have played a central role in postharvest disease control. However, trends towards reduced chemical usage in horticulture are forcing the development of new strategies. This provides an exciting challenge for the 21st century. The objectives of this chapter are: i) to maintain the good quality of the produce grown so that the produce can be competitive in the various market places i.e. local or overseas; and ii) to reduce loss in quantity or volume and in the qualitative or nutritive value of the produce.

Recent Trends in Post Harvest Technology and Management during and after harvest through surface injuries. In the development of strategies for post-harvest disease control, it is imperative to take a step back and consider the production and post-harvest handling systems in their entirety. Traditionally fungicides have played a central role in post-harvest disease control. However, trends towards reduced chemical usage in horticulture are forcing the development of new strategies. This provides an exciting challenge for the 21st century. The objectives of this chapter are: i) to maintain the good quality of the produce grown so that the produce can be competitive in the various market places i.e. local or overseas; and ii) to reduce loss in quantity or volume and in the qualitative or nutritive value of the produce.

in the past three decades, many countries in Asia have promoted

horticulture and export market development to increase the income of farmers as they diversify from cereal cropping. Mango and banana are important crops in much of tropical and subtropical Asia, providing income and nutrition through fresh and processed product. However, their intrinsic short shelf life and susceptibility to fruit rots reduce marketability and profile .

fruits and vegetables, especially acidic, succulent and nutritious fruits and vegetables that suffer from rotting diseases (Philips, 1984; Moss, 2008). On average, 40% of fresh fruit and vegetables are lost to post-harvest disease (Irtwange, 2006), and such losses in China have been estimated as 4.5 billion US dollar per year (Hu and Zhang, 2007)

Controlling or reducing disease relies on integrated crop and post-harvest management, with attention to fungicide application, crop hygiene and nutrition, and the management of ripening, to optimise advantages conferred by the plant's natural resistance factors that prevent and delay disease development. Agricultural production and food distribution systems have evolved over many years to a complex system which allows for nearly year-round supply of most fresh commodities through long-term storage and long-distance shipments to consumers. The expectation of year-round supplies has resulted in increased challenges for post-harvest handling systems. The availability of fungicides for disease management likely played a major role in the evolution of our current system of food distribution. With the recent loss of registration of many post-harvest

The fresh produce industry must begin to place increased emphasis on other methods of pest management. Integrated post-harvest (IPM) is a system approach towards pest management where good management

practices are combined with one or more contributory treatments to result in an acceptable level of disease and insect control. A successful IPM system requires a higher degree of involvement with the post-harvest handling process including close observation and attention to details. Decisions on pest management strategies are made as a result of those observations (Mitcham, 1999).

The ability of the pest to infest the host depends on the effectiveness of its mechanisms of invasion. In many ways, the pest is dependent on the host's susceptibility and environmental factors. The development of a pest infestation depends on favourable conditions in the environment, the host and the pest. By manipulation of one of these three factors, we can reduce the level of pest problems. The host's suitability for pest infestation can depend on natural resistance, cultural practices, or the presence of wounds. The environment can be manipulated easily after harvest to provide a temperature or an atmosphere that is unfavourable to pests and favourable to the host (Mitcham, 1999).

Correct identification of the pathogen causing post-harvest disease is central to the selection of an appropriate disease control strategy. Many of the fungi which cause post-harvest disease belong to the phylum Ascomycota and the associated Fungi Anamorphici (Fungi Imperfecti) pathogen inhibition is greater when the antagonist is applied prior to infection taking place (Coates and Johnson, 1997). The genera *Phytophthora* and *Puccinia* are important post-harvest pathogens, causing a number of diseases such as brown rot in citrus (*Phytophthora*

citrophthora and *P. parasitica*) and cottony leak of cucurbits (*Pgthium* spp.). Rhizopus and Mucor are important genera of post-harvest pathogens in the Phylum zygomycota. Rhizopus stolonifer is a common wound pathogen of a wide range of fruits and vegetables, causing a rapidly spreading water...

n

recent years, there has been considerable interest in the use of antagonistic microorganisms for the control of post-harvest diseases. Such organisms can be isolated from a variety of sources including fermented food products and the surfaces of leaves, fruits and vegetables. Once isolated, organisms (whether they be bacteria, yeasts or filamentous fungi) can be screened in various ways for inhibition of selected pathogens. In the most reported cases, pathogen inhibition is greater when the antagonist is applied prior to infection taking place (Coates and Johnson, 1997). In Australia, only field applications of a non-antibiotic producing strain of *Bacillus* sp. have shown potential for the control of anthracnose in avocado. There are a number of reports in the literature concerning the biological control of wound pathogens in various fruits and vegetables. To be effective against wound pathogens, an antagonist must be able to successfully colonise wound sites to the exclusion of the pathogen. Lise Korsten's group has the longest history in this area, and they have focussed on using a gram positive bacterium, *Bacillus licheniformis*, that resists desiccation and is food safe. In general, minor reductions in disease occur at 10 °C and 25 °C, either alone or in combination with fungicides (Govender and Korsten, 2006). Although less publicized, significant reductions have also occurred with Gram negative bacteria and other amendments (Vivekananthana et al. 200

1.7 soil borne pests....

Taxonomy tree

Rising awareness of the adverse effects of *chemical pesticides* and an increasing

demand for organic fruits and vegetables have encouraged growers to transit to as

Management of soil-borne diseases of organic vegetables

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With the rising awareness of the adverse effects of chemical pesticides, people are looking for organically grown vegetables. Consumers are increasingly choosing organic foods due to the perception that they are healthier than those conventionally grown.

Vegetable crops are vulnerable to a range of pathogenic organisms that reduce yield by killing the plant or damaging the product, thus making it unmarketable. Soil-borne diseases are among the major factors contributing to low yields of organic produce.

Apart from chemical pesticides there are several methods that can be used to protect crops from soil-borne pathogens. These include the introduction of biocontrol agents against soil-borne plant pathogens, plants with therapeutic effects and organic soil amendments that stimulate antagonistic activities of microorganisms to soil-borne diseases. The decomposition of organic matter in soil also results

in the accumulation of specific compounds that may be antifungal or nematicidal.

With the growing interest in organic vegetables, it is necessary to find non chemical means of plant disease control. This review describes the impact of soil-borne diseases on organic vegetables and methods used for their control.

Rising awareness of the adverse effects of chemical pesticides and an increasing demand for organic fruits and vegetables have encouraged growers to transit to sustainable and organic production systems (Klonsky 2004). Such ecologically sound systems have the potential to address a number of ongoing issues in mainstream agriculture, namely pollution due to synthetic chemical fertilizers and pesticides, production losses due to pest and disease pressure, soil degradation, loss of soil fertility and productivity (Engindeniz and Cosar 2013). Organic farming pursues a course of promoting self-regulation and resistance which plants and animals possess naturally. Especially in poorer countries, it can contribute to purposeful socio-economic and ecologically sustainable development (Willer and Yussefi 2004). During the last decade, many countries of the European Union, the United States, and also countries in Latin America, Africa, Asia and Oceania have experienced a significant increase in certified organic farms. Almost 23 mln ha are managed organically worldwide. According to the International Trade Center, annual sales grew from US \$17.5 billion in 2000 to US \$21 billion in 2001. Growth rates for 2003–2005 are estimated to be from 5–15%. About 90 developin..

countries (of which about 15 are less developed) export certified organic products, namely tropical and off-season commodities (Willer and Yussefi 2000). Soil biology is directly linked to agricultural sustainability as it is the driving force behind decomposition processes that break down complex organic molecules and substances and convert them into plant available forms (Friedel et al. 2001). Large, stable, and active soil microbial communities are important for sustaining the productivity of soils under sustainable and organic farming systems. To develop such systems growers adopt strategies such as crop rotation, cover cropping, and application of organic amendments (manures and composts) that

significantly increase soil organic matter (SOM) and improve soil biology and quality (Buyer et al. 2010)

According to the USDA (United States Department of Agriculture) National Organic Standards Board (NOSB), organic agriculture is defined as “an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It is based on the minimal use of off-farm inputs and on

management practices that restore, maintain or enhance ecological harmony. The primary goal of organic agriculture is to optimize the health and productivity of inter-dependent communities of soil life, plants, animals and people”

1.8fruit fly

Taxonomic tree

kingdom: animalia

class: insecta

order: diptera

family: drosophilidae

genus: drosophila

species: drosophila

melanogaster mrigen

In the laboratory and in a cherry orchard, a proprietary, neem-based insecticide formulation was evaluated as a potential pest management tool for the western cherry fruit fly, *Rhagoletis indifferens* Curran. The insecticide was tested for its potential effects on oviposition, survival, behavior and reproduction. Using

adult *R. indifferens*, we found evidence for slight oviposition, deterrence in the field, but this effect was not duplicated in the laboratory. No behavioral changes were observed in adult Hies exposed to the insecticide under field conditions. A strong negative effect on the development of eggs and decreased survival of adults was seen when Hies ingested the insecticide extract with food and water immediately after eclosion. Total suppression of egg development was obtained in adults exposed continuously to concentrations of the insecticide >0.5%. By delayin

THE WESTERN CHERRY fruit fly, *Rhagoletis indifferens* Curran, is a key pest of cultivated cherries, *Prunus avium* L. and *P. cerasus* L., in British Columbia, Canada, and the Pacific Northwest of the United States (AliNiazee Harris 1989; Roit-berg and Angerilli 1989). Adult *R. indifferens* eclose over a period of 11 wk, beginning in late May and

The most important constituent of neem-based formulations is the triterpenoid azadirachtin, which is found primarily in the seed kernel of the neem tree. Azadirachtin is generally believed to affect the neurosecretory cells of the insect brain, disrupting both the synthesis and release of neurohormones that regulate the titer of ecdysteroids and juvenile

Hormones (Rembold 1989, 1995),, thus interfering with endocrine-regulated processes and development (Rembol 1989, Schmutterer 1995). Neem seed extracts contain a considerable number of additional bioactive compounds,

many of which function as anti feedants or oviposition deterrents (Schmutterer 1990, Jacobson 1989, Ascher 1993)

CHAPTER 2

2.1 LITERATURE SURVEY

A comparative study of *Momordica dioica* Roxb. ex Willd. and *M. cochinchinensis* (Lour.) Spreng, based on anatomical features is carried out since such work could better describe their systematic and taxonomic significance. Patches of sclerenchyma cells in the root cortex is more in *M. cochinchinensis* than in *M. dioica*. However, stem anatomy of both the species are remarkably different in terms of number of bicollateral vascular bundles, sclerenchyma layers and contour. Presence of globular and sessile cystoliths in the lower epidermis of *M. cochinchinensis* leaves and glandular trichomes with spherical head on the adaxial ridge of *M. cochinchinensis* midrib are distinct characters to differentiate with *M. dioica*. Petiolar anatomy reveals further disparate natures with trichome and contour though both the species have similar number of bicollateral vascular bundles and raphides in the ground tissue. A dichotomous key on the studied species is prepared based on anatomical features. The screening of antimicrobial activity was done using reported disc diffusion method on common gram positive and gram-negative bacteria whereas DPPH (2,2-Diphenyl-1-Picrylhydrazyl) and Nitrous oxide method was used to evaluate antioxidant activities of extract. The MEFMD showed the presence of phenolic compound, flavonoids and sterol whereas AEFMD showed the presence of flavonoids,

glycosides, alkaloids and amino acids . Total phenolic content was expressed as GAE (Gallic acid equivalent) in mg per gram dry weight of sample. MEFMD showed more promising antimicrobial and antioxidant activity as compared to AEFMD (Bumrela et al, 2009). It is traditionally used as astringent, febrifuge, antiseptic, anthelmintic, spermicidal. Also used in bleeding piles, urinary infection and as a sedative. Studies indicate that it possesses antioxidant, hepatoprotective, antibacterial, anti-inflammatory, anti-lipid peroxidative, hypoglycemic and analgesic properties. This majorly aims to highlight the ethnobotany, pharmacognostic and pharmacological uses of *Momordica dioica* (Bawara et al, 2010). The roots of plant material are taken which is shade dried and extracted with methanol using soxhlet extraction procedure. Anticancer activities were assayed with standard XTT colorimetric procedure against MCF- 7 and Hep-G2 cell lines. From the analysis, it was found that *Momordica dioica* showed good

cytotoxic activity on MCF-7 cell line at tested dose. Further work is in progress to evaluate the chemical constituents present in these plants (Kumar & Code, 2017). Increase in the levels of TBARS, HP and decrease in the levels of non- enzymatic antioxidants and activity of enzymatic antioxidants was observed in liver, kidney, pancreas, and serum of diabetic rats when compared with normal healthy rats. TBARS and HP levels were reduced while non- enzymatic and enzymatic antioxidant enzymes activity was increased in AEMD and glibenclamide- treated rats.

Furthermore, histological examination of liver, kidney, and pancreas of diabetic rats showed degenerative changes. AEMD treatment for 21 days rejuvenated liver, kidney, and pancreas histoarchitecture (Sharma & Singh, 2014). Use of *Gliricidia Sepium* leaf extract in the management of sickle cell disease: evaluation of possible adverse effect on liver functions in wistar rats (Xu et al , 2017). Formulas are differentiated based on the LC 50 ratio of each cultivar extract (Mortality data were analyzed by probit analysis to determine LC 50 , then continued with Anova test and LSD test

with SPSS 16.0) to determine the effectiveness of the formulation.

The results showed that crude leaf extracts of gamal from LU, PR, LB, and BL cultivars can kill papaya mealy bugs with the LC 50 - 72 values of 0.033%, 0.090%, 0.184% and 1.818% respectively. The bioassay test of the formulation showed a mortality rate up 86.7%. Thus, it can be concluded that the extract of gamal leaf water has the potential to be used as a natural insecticide (Nismah et al , 2019). Contemporary science has accredited their active action, and it has included in modern pharmacotherapy a range of drugs of plant origin, known by ancient civilizations and used throughout the millennia. The knowledge of the improvement

of ideas related to the usage of medicinal plants as well as the development of awareness helps to increase the ability of pharmacists and physicians to respond to the challenges that have emerged with the spreading of professional services in facilitation of man's life (Jasmine et al, 2017). The pesticidal effect of *Madre de cacao* (*Gliricidia sepium*), *Neem tree* (*Azadirachta indica*), *Garlic* (*Allium sativum*) extracts on cockroaches (*Periplaneta americana*). A completely

randomized design was used in the present study. A total of 539 cockroaches (*Periplaneta americana*) were prepared. In each group there were 4 cockroaches in 25 replicates. Pure plant extracts were used, so there were 5 treatment condition, the plant extract, positive control and negative control. A cage made of glass and wood was used to house the cockroaches. Soxhlet Extraction Machine was used to extract out the pure plant substance. A pumping spray was used to apply the plant extract on to the cockroaches (*Periplaneta americana*). Hundred twenty-five plastic containers were used for the application of the three plant extracts, the positive control and the negative control.

Aloe vera plant has been known for its different properties and benefits in the field of medicine, skin care and beauty products. Plants absorb a number of elements from soil, some of which have no known biological function and some are known to be toxic at low concentrations. Results reveal that the composition of metals in Aloe vera is dependent on the chemical composition of soil and its direct use as cosmetic and for medicine is not good. The results also showed that Aloe vera plant can also be used as a good Phytoremediation agent as it absorbs heavy metals from the soil in high quantity (Rai et al, 2011). Research has proven that adding Aloe Vera to one's diet improves digestion. As a general health tonic. Aloe Vera is a useful source of vitamins. Aloe Vera Gel contains a large range of vitamins – even vitamin B12, Vitamin A, contains B - Group vitamins, Vitamin C, Vitamin E and folic acid.

Aloe Vera Gel contains important ingredients including 19 of the 20 amino acids needed by the human body and seven of the eight essential ones that just cannot

be made (Rajeswari et al, 2012). Analysis of the results reveals that aloin A, the major metabolite of *A. vera*, at 0.02% w/v concentration possessed strong repellent activity (85.2 %) than sample AV 11a (gel of *A. vera*) at 5% w/v (82.7 %) after 24 - h of exposure. Interestingly, the percent repellency increases up to 5 - h in all extracts screened. Aloin A at 0.0024 mg/cm² showed 58.0% mortality against *S. oryzae* followed by sample AV 13b (leaf peel) at 0.6 mg/cm² (56.0%) after 14 days of treatment.

The content of Aloin A present in the six, exhibiting highest toxicity and repellency, was determined by Ultra Performance Liquid Chromatography. The percent repellency and toxicity of

A. vera vary with geographical location, plant parts, major metabolite concentration and exposure time. The potentiality of these plant extracts could be useful towards the development of effective bio repellent to *S. oryzae* in stored maize. The peel is the best part of the plant for the production of nutraceuticals or cosmetics products for its greatest number of bioactive compounds. This is a new and innovative finding since the only part used in traditional medicine is the gel of Aloe, and the peel is generally considered waste and discarded. *Aloe barbadensis miller* is a naturally occurring biomolecule. It undertaken to apply *Aloe barbadensis miller* solution on woven cotton textiles for antibacterial finish. With a view to understand the effect of various functional groups present in *Aloe barbadensis miller*, molecular characterization was done using Fourier transform infrared spectroscopy. A larger zone of inhibition in *Aloe barbadensis miller* treated fabrics reveal that the

antibacterial effect is more potent against both gram positive and gram – negative bacteria at different levels of concentration. Cotton fabrics also generate fragrance after treatment with *Aloe barbadensis* miller solution. Fragrance intensity ratings of 200 respondents have been recorded and analyzed.

The antimicrobial activity of methanol and leaf extracts of *Justicia adhatoda* was tested on *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Aspergillus niger*, *Aspergillus flavus*, *Fusarium oxysporum* and *Penicillium digitatum* by the disc diffusion method. Antibiotic was used as positive control (Sharma & Kumar, 2016). Histopathological examination showed the extracts led to serious midgut cell damage. *Justicia adhatoda* extracts led to reduced fecundity and oviposition of gravid females compared to controls. The extracts led to substantially reduced *A. aegypti* survival. We infer that the extracts have potential to reduce pathogen transmission by suppressing population growth of *A. aegypti*, and possibly other mosquito species (Thanigaivel et al, 2017). Also evaluation of the insecticidal activity of (acetone, methanol and water) crude leaf extract of *Adhatoda vasica* against *Brevicoryne brassicae*. The alcoholic extracts (5 %) that extracted by acetone and methanol showed 100 and 81.6% mortality of adult *B. brassicae*, respectively and 100 and 90% mortality of nymphs *B. brassicae*.

respectively. It can be concluded that the acetone and methanol crude leaf extract of *A. vasica* can produce high mortality percentage in (nymphs and

adults) of *B. brassicae*, so it can be used as insecticides. It has been established that up to 25% of the drugs prescribed in conventional medicines are allied directly or indirectly to natural substances mostly of plant origin. Hence, during the last few decades there has been an increasing interest in the study of medicinal plants and their long-established use in different countries. A wide range of phytochemical constituents have been isolated from *J. adhatoda* which possesses activities like antitussive, abortifacient, antimicrobial, cardiovascular protection, anticholinesterase, anti-inflammatory and other important activities. Some important bioactive compounds have been reported in various part of *J. adhatoda* are essential oil and quinazoline alkaloids. Hence, extract of *J. adhatoda* could form one of the best options for developing novel natural medicine (Dhankhar et al, 2011). and the major data on traditional uses as well as ethnopharmacological and toxicological studies, both published and unpublished, are reviewed and commented upon, the data have been evaluated from the point of view of correctness, reliability, relevance and importance for the overall evaluation of the safety of *A. vasica* (Claeson et al, 2000).

Hibiscus mealybug, *Maconellicoccus hirsutus* (Hemiptera: Pseudococcidae), is the major pest of many vegetables, fruits, crops, and ornamental plants causing losses to the farmers and its control has been an issue of significance in the pest management. The study showed that the least effective treatment observed was Advantage + Telsta with no mortality after 24 h and 25% mortality after 48 h at 0.14% concentration. The concentration 0.14% was highly effective in lowering the mealybug population and insecticide mixtures were effective in reducing mealybug

density. It emphasizes the use of such insecticide mixtures to develop better management strategy for mealybug populations attacking ornamental plants. However, effects of such insecticide mixtures on other organisms and biological data, and only two subfamilies emerged: Pseudococcinae and Phenacoccinae. Mealybugs are severe agricultural pests. According to Miller et al. (2002), 158 species of mealybugs are recognized as pests worldwide. These species most frequently originate from the Palearctic region (ca. 29%), followed by the Nearctic (17%), Neotropical (16%), Oriental (15%), Afrotropical (12%) and Australasian (11%) regions. Approximately 22% of the mealybug pests are polyphagous, 20% occur on grasses (e.g. sugar cane), 16% on citrus and tropical fruits, and 6% on coffee. Despite the negative impact of mealybugs against economically important crops, such as vineyards, there are few studies related to organic control using natural compounds (botanical extracts and/or essential oils) (Peschiutta, et al. 2018). Insecticides are considered to be the rapid method for the control of insect pests to overcome losses. In the current study, five different insecticides i.e. Chlorpyrifos, Lambda cyhalothrin, bifenthrin, deltamethrin and profenophos were evaluated against adult female of mango mealy bug using a leaf dip method. The data were recorded after 24, 48, 72, 96 and 120h. The Results indicated that profenophos was the most effective insecticide against adult female mealybug. Chlorpyrifos was least effective among all the tested insecticides in the laboratory. Several formulations have been done through these plants which forms an effective pesticides and other medical values which enrich the growth in agricultures.

CHAPTER 3

3.1 AIM:

To compare the toxic effects of synthetic pesticides and the biopesticides derived from four herbal plants against mealy bugs.

3.2. SCOPE:

The main scope of the study is to highlight the effects of biopesticides derived from five plants Army worm, cut worm, soli brone pests, friute fly. Harvest pests

and to compare its effect with that of synthetic pesticide . This study stresses on the adverse effects caused by the synthetic pesticides and to prove that biopesticides from herbal plants provide a much safer and effective alternative. The crude extracts of the above-mentioned plants and the purified compounds are tested against mealybugs. It's effects on the pest and the host plant is evaluated along with the effects of synthetic pesticide.

3.3 PLANT OF WORK

- Collection of plant material
- Neem extraction of plant material
- Preliminary screening of Neem extracts

CHAPTER 4

MATERIALS AND METHODS

4.1. COLLECTION OF PLANT

The selected plants namely Army worm , cut worm, and harvest pests, soil brone pests were collected from the ooty , Tamil Nadu, India. Brought home ...

4.2. PREPARATION OF NEEM WATER SPARY



Procedure :

The to make one litre of general purpose neem water spray ...

Strat with base:

look for 100% pure oils, also called crude or raw neem water ...

need to be cold pressed as heat destroys the azadirachtin and you might

like to look for organic neem water as well ensure no contamination with...

petrochemicals or solvents has taken place during the purification process...

just boil it for longer time

strong content will evaporate if we boil than 7 or 8 minits

MIX:

To make one of litre general purpose neem waterl spary.....

Pour and spray:

pour the mixture into a spray bottle into a spray is ready to use.....

you ii need to use the mix within 8 hours ingredients will start break down

the compounds derived from the neem tree are a type of bioinsecticides than can be used as an alternative to synthetic insecticides.....

the products derived from neem are very useful as bio pesticide against agricultural pests in ipm programmes...azadirachtin responsible responsible for storage effects on pests neem leaves are inexpensive and we can get it easilyunlike leaves we can't get the seeds to prepare neem oil it flowers and produce fruits only once in a year.....

4.3 PRELIMINARY SCREENING OF NEEM EXTRACTS

Effect on reproduction : Mortality of 5th and 2nd instar ligest meen lawed mortality 74.70%extra nymphal observed but azadirachtin....

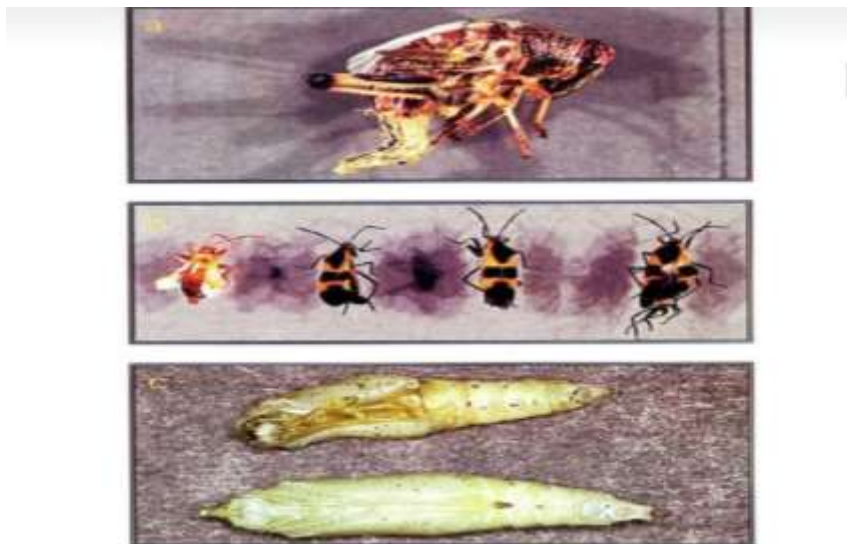
Timing dependence : I taken 4 leaf

Days different: I took take first neem pesticides apply tree hit the plant,,the insects in it were there four days ...after two weeks the plants are well grown...more time took more days.....it took you a long time to kill the repellent pests too.....

Then secondary work for harvest pests in two weeks the insects died well and the well grown plant was very nice

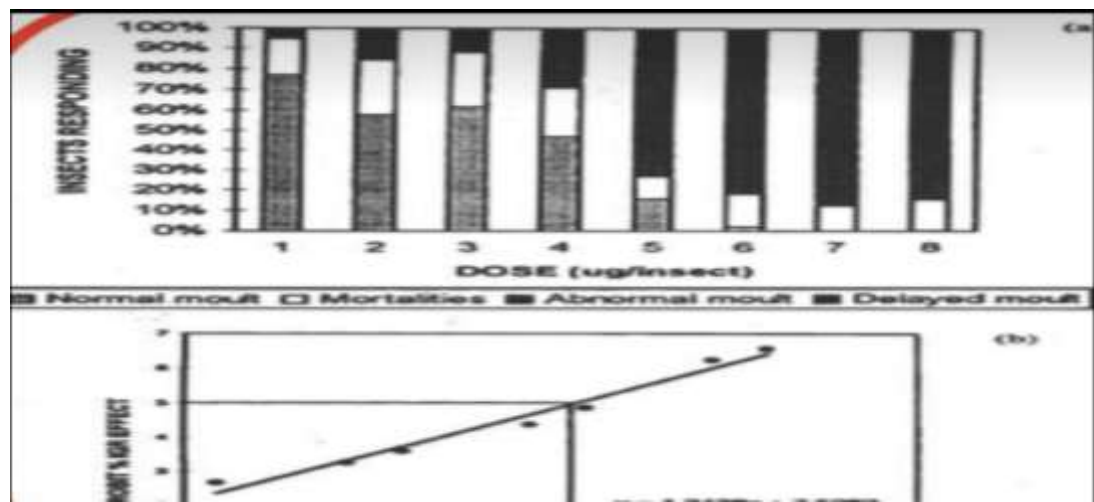
Fruit fly is the all leaves what the plants they have grown very nicely and quickly.....

Much faster than these three plants white fly insects were lost very quickly.....



Moulting abnormalities caused by azadirachtin treatment a- desert locust (*sgragaria*) showing death at eedysis (x1,5), b- - milkweed bug (*o. fasciatus*) showing moulting defects (x 1,5): e – cabbage white butterfly (*p. brassicae*) showing (tpo) VSs.normal pupa (bottom) (x 3)

PHYSICOLOGICAL EFFECTS



The physiological effect of azadirachtin are much more consistent than the antifeedant effects, and result from interference with growth and moulting, interference with reproduction with cellular processes. In all species tested dose response effects can be seen as reduced growth, increased mortalities, abnormal molts and delayed moulting. The effects are due to a disruption in the synthesis and release of hormones and this can be demonstrated by accurately timed injections of azadirachtin into the haemolymph of ecdysteroid leaves by radioimmunoassay revealed the normal peak of hormone release at day 8 of an 11 days instar.....

CHAPTER 5

5.1 RESULTS DISCUSSION

The neem extracts of five plant materials and *Army worm, cut worm, harvest pests, soil borne pests, fruit fly* *Aloe barbadensis miller* was obtained as a result of double ethanol extraction and 30ml of the above - mentioned crude extracts was acquired

TABLE:1

S.NO	plant	neem component	carrier	Pest targeted	effect	<100 value in ppm
1	Apply tree	Neem leaves extract 60%	Sliver NPS	Army worm	100% mortality of 5th and 2 nd instar	60.11%
2	Rose plant	Neem leaves extract 60%	Sliver NPS	Army worm	96.29% mortality	47.01%
3	Ricinus	Neem leaves extract 60%	Sliver NPS	Army worm	Highest neem lawed mortality 74.70%	97.90%
4	Jasmine Plant	Neem leaves extract 60%	Sliver NPS	Army worm	20% extra nymphal mortality is observed but azadirachtin has an inhibitory effect of fungi	63.49%

Effect of biopesticide against the army worm pest

TABLE 2

S.NO	Plant	Neem component	carrier	Pests targeted	Edffect	<(10valu in ppm
1	Apply tree	Neem leaves extract 60%	Silver NPS	Harvest pest	100%morlatity of 5st and 2 nd instral	60.11%
2	Rose plant	Neem leaves extract 60%	Silver NPS	Harvest pest	96.29% marlality	96.90%
3	Ricinu plant	Neem leaves extract 60%	Silver NPS	Harvest pest	Lighest meen lawed morlality 74.70%	62.49%
4	Jasmine plant	Neem leaves extract 60%	Silver NPS	Harvest pest	20%extra nymphal morality is obseved but azadirachtin has an inhibitory effect of fungi	45.01%

Effect of biopesticides aganist the harvest pests

TABLE 3

S.NO	Plant	Neem component	carrier	Pest targeted	effect	<(10valu in ppm
1	Apply tree	Neem leaves extract 60%	Silver NPS	Harvest pest	100%morlatity of 5st and 2 nd instral	60.11%
2	Rose plant	Neem leaves extract 60%	Silver NPS	Harvest pest	96.29% marlality	96.90%

3	Ricinu plant	Neem leaves extract 60%	Silver NPS	Harvest pest	Lighest meen lawed morlality 74.70%	62.49%
4	Jasmine plant	Neem leaves extract 60%	Silver NPS	Harvest pest	20%extra nymphal morality is obseved but azadirachtin has an inhibitory efect of fungi	45.01%

TABLE 4 effect of biopesticide against the fruit fly pests

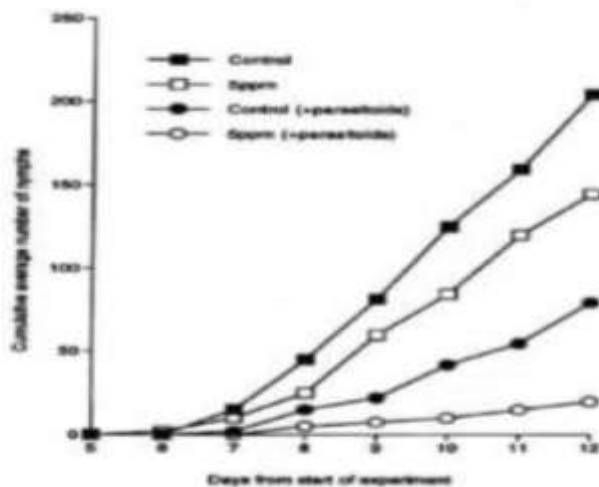
S.NO	PLANT	NEEM COMPONENT	carrier	Pest targetred	effect	<(10valu in ppm
1	ApPly tree	Neem leaves extract 60%	Sliver NPS	White fly	100%morlatity of 5st and 2 nd instral	25.19%
2	Rose plant	Neem leaves extract 60%	Sliver NPS	White fly	96.29% marlality	20.30%
3	Ricinus plant	Neem leaves extract 60%	Sliver NPS	White fly	Lighest meen lawed morlality 74.70%	30.89%
4	Jasmine plant	Neem leaves extract 60%	Sliver NPS	White fly	20%extra nymphal morality is obseved but azadirachtin has an inhibitory efect of fungi	31.49%

Effect of biopesticide the white fly pest

Behavioural sensitivity of insect to azadirachtin : the effective dose (ED₅₀) which causes 50% inhibition of feeding..

	ED ₅₀ (Ppm)
Lepidoptera	<0.001-50
Coleoptera	100-500
Hemiptera	100-500
Hymenoptera	100-500
Orthoptera	0.001 -> 1000

Now that is realized that disruption of growth and reproduction rather than antifeedancy are the main characteristic of pest control, neem is being used in the field at lower concentrations than those originally recommended (<100 ppm ai) ... the value of low concentrations of neem in pest control has generated research into combined approaches using both neem and beneficial species.....



Neem pesticides may play a useful role in resistance management,,, it has been role to play in resistance management.. it has been demonstrated that the effect of neem in reducing levels of detoxification enzymes (due to its blockage of protein synthesis) may make insecticides more effective in resistant strains of

Neem control of Army worm



Before 15 day



After pesticidal activity of (Spodoptera

frugiperda....

.



Before 17 days fruit fly



After fruit fly reaction

(5.1 fruit fly)



before 19 days of cutworm

(5.2 Cut worm neem)



After cutworm



BEFORE harvest pests



After plant (5.3 pesticidal neem



Before soil brone bests



After soil brone pests

CHAPTER 6

SUMMARY AND CONCLUSION

6.1. SUMMARY

The study was focused on efficient biopesticides from herbal plants and evaluating its activity against mealybugs in comparison with synthetic pesticides.

Four plants namely – Army worm, cutworm, soil brone pestes, harvest pests, fruity fly , were extracted and their pesticidal activity was evaluated against mealybugs.

Fresh leaves of the mentioned plants were subjected to double - ethanol extraction, concentrated using rotary evaporator and the resultant extract were stored in room temperature for further analysis.

Preliminary screening of extracts was done white fly and fruit fly.

- Positive Anti - oxidant activity of all the plant extracts was observed which proves that ability to trap free radicals and inhibit the oxidative mechanisms that lead to degenerative diseases
- The pesticidal activity of plants was assessed by exposing them to the larvae of mealybugs for 48 hr and by observing the phenotypic changes and population count of the larvae of the mealybugs.
- The pesticidal activity of *Justicia adathoda* and *Pongamia pinnata* was found to be the highest through and *Justicia adathoda* also had the lowest IC 50 value – 139 µg/ml exhibiting a higher anti - oxidant activity compared to other extracts
- TLC of six plant extracts were done in order to find the appropriate solvent system for maximum purification of compounds. Larger Rf values were observed in most of the plant extracts indicating the presence of less polar solvent compounds in the plants.
- On performing the anti - oxidant assay, three plant extracts namely *Momordica dioica*, *Justicia adathoda* and *Pongamia pinnata* exhibited anti - oxidant activity with *Pongamia pinnata* revealing a highest anti – oxidant activity (IC₅₀–83 µg/m).

Conclusion

neem has attracted worldwide attention in recent years due to its wide ranging properties it is considered to be a promising tree to neem are problems in the coming years As a matter of fact neem tree grows wild through the country the country but organized plantations of neem are necessary pesticides on insects in immediate leading to their death...

On the other hand the action of neem compounds is indirect and hence as compared in case biopesticide... However there is an added advantage with neem preparation that these are effective in one or the other way at each stage of the metamorphosis in the life cycle of the insects...thus the neem based product offers excellent

protenisl for the control of pests further chemical ...the neem based products coluld serve as models for dfuture pesticides in imp programmess...

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