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Study on Homemade Bio-Pesticides and Organic Pest Management in Organic Farming

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----------ABSTRACT----------

Homemade bio-pesticides are prepared by household members using local resources without having any scientific study or research. It is usually very old aged trustworthy practices by inherently. The study was conducted overwhelming the period of 3 months started from July 01 to September 01 from concentrating Delduar Upazila under Tangail district with the view to know about homemade bio-pesticides in relation to their use, formulations and safe use in organic farming management. Homemade bio-pesticides are always friendly environment, safe, low cost or free of cost locally available resources utilization system through engaging family labor. The common understanding on homemade bio-pesticides and organic pest management was very positive. Both preventive and control measures were taken by the farmers in the study area. Perching, light trap and cultural practices were very much common in pest management. Neem leaves, Neem kernel, Vasaka leaves, cow dung, cow urine and the use of death craves & goat were widely used for the preparation of homemade bio-pesticides. Most of the respondents were mentioned that caterpillar was controlled through perching. Stem borer, rat, aphids and rice weevils are the common pest for organic crops production. Garlic, Onions, Basil, Sunflower and Marigold were widely used to repel the insect pests. Lack of appropriate formulation, pest specific application, time of application, frequency study on efficacy of homemade bio-pesticides were lacking from science and statistic back. More research could be helpful in safe use of it and increased the efficacy rate and could be ensured wider acceptance in the organic farming practices.

KEYWORDS: *Homemade bio-pesticides; insect repellent crops; preventive measures; control measures; biological control; efficacy*

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I. INTRODUCTION

The use of homemade bio-pesticides in the farming practices is old aged practices. It is very much friendly environment and can obtain from nature directly. It is almost free of cost and there is no negative impact on human health, soil, animals, plants and environment. Bio-pesticides are derived from natural materials such as animals, plants, bacteria, and minerals. Bio-pesticides tend to be less toxic, more quickly biodegradable, and more targeted to the specific pest [1]. Now-a-days it is widely used due to increased environmental awareness and the pollution potential and health hazards from many conventional pesticides, as well as increasing global demand for organically grown food, are driving the use of homemade bio-pesticides.

Homemade bio-pesticides having several advantages:

- Friendly environment than conventional pesticides.
- Offer more targeted activity toward desired pests,
- Often are effective in very small quantities, thereby offering lower exposure. They decompose quickly, leaving virtually no harmful residue and allow field re - entry almost immediately after application.
- Can be used in rotation with conventional pesticides when used in Integrated Pest Management (IPM) programs. Such programs can offer high crop yields while dramatically reducing the use of conventional pesticides.
- Engage family labor.

The recognition of homemade bio-pesticides has broadened to a large extent in recent years, as extensive research has enhanced their effectiveness. A number of research centers around the world are undertaking research aimed at improving techniques for the augmentation and application of bio-pesticides, with the objective of improving the commercial feasibility of producing and using bio-pesticides.

According to the EPA, bio-pesticides have divided into three major classes based on the type of active ingredient used, namely microbial, biochemical, or plant incorporated protectants.Microbial pesticides derive from naturally occurring or genetically altered bacteria, fungi, algae, viruses or protozoans. The aim of action is to suppress the pests either by producing a toxin specific to the pest, causing disease, preventing establishment of other microorganisms through competition, or various other modes of action [2].Biochemical pesticides are very much closely related to conventional chemical pesticides. It can be distinguished from conventional pesticides by its non-toxic mode of action toward target organisms and its natural occurrence [3]. With a narrower target range of pests, they also tend to have a more specific mode of action [2].Bio-pesticides are often designed to control a pest population to a manageable level rather than completely eradicate a target pest [4]. Homemade bio-pesticides provide benefits to humans and ecosystems including increased food safety, worker safety, and reduced concerns for development of pest resistance to existing control tools.

In light of these advances, there is need comprehensive study on homemade bio-pesticides. This study is designed to cover aspects of inputs used in bio-pesticides, formulations and applications and problems related to homemade bio-pesticides used in organic farming. Pests are classified as 'major' or 'minor' depending upon the extent of damage they cause in any particular ecosystem. They are also classified according to their mode of feeding, such as leaf feeders, sap suckers, stem and fruit borers, root feeders etc. It has been recommended that an insect becomes an economic pest when it causes a yield loss of 5-10%. In any local pest complex, there are usually few major pests that cause most of the damage, and their control is urgently required. The most serious one of the major pests is often designated as the key pest in each agro-ecosystem. Usually they have a high reproductive potential, and often a good survival mechanism and found in abundance during a crop season (regular pests), while others may assume pest status occasionally in certain years (sporadic pests). Some pests normally cause negligible damage, but may become highly destructive if prevail favorable environmental conditions. Over 700 insect and mite pest species of different field crops, fruit trees, and stored products have been recorded from Bangladesh. Of these more than 200 species are considered as major. However, the list cannot be considered as a complete one.

Diseases are caused by pests such as insects, bacteria fungi and others. Among the chemical pollutants, the greatest culprits are the chemical pesticides. The environmental impact of chemical pesticides is often greater than what is intended by those who use them. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, including non-target species, air, water, bottom sediments, and food. Though there can be benefits using pesticides, inappropriate use can counter productively increase pest resistance and kill the natural enemies of pests. Many users are inadequately awarded about risks, and the necessary precautions in the safe application of such toxic chemicals. Pesticides can contaminate in many ways including unintended land and water when they are sprayed aerially or allowed to run off fields, or when they escape from production sites and storage tanks or are inappropriately discarded.

The amount of pesticide that migrates from the intended application area is influenced by the particular chemical's properties: its propensity for binding to soil, its vapor pressure, its water solubility, and its resistance to being broken down over time. Factors in the soil, such as its texture, its ability to retain water, and the amount of organic matter contained in it, also affect the amount of pesticide that will leave the area. Some pesticides contribute to global warming and the depletion of the ozone layer. Integrated Pest Management developed in 1970s as a response to the negative side effects of using pesticides. Pests were becoming resistant to chemical treatments, and the health farmers, farm workers and consumers was in danger. These hazards were far greater in third world countries and today's evidence suggests that the situation has become even more volatile. The latest WHO fingers suggests that atleast 3 million, and perhaps 25 million agricultural workers are poisoned each year by pesticides and some 20,000 deaths can be directly arrributely to agro chemical use studies from the Philipplies have computed the alarming costs of pesticides to the national economy,showing these negative effects extend far beyond the individual.

1.2 STUDY OBJECTIVES

The main objective of this study is to know the usefulness of homemade bio-pesticides in organic farming. The other objectives are to:

- know the common pest in the study area
- list down the name of materials used for home made bio-pesticides
- know the benefits of pest management in organic farming
- find out the problems related to organic pesticides
- identify the factors influencing homemade bio-pesticides and make appropriate recommendations.

II. METHODOLOGY

The study was concentrated in one union from Delduar Upazila under Tangail district over a period of one month from July 2012 to August 2012. The entire work involves field work, gathering information about the study area and focused on group activities including respondents selection, raport building with the respondents and preparation of sample structure. The work also consists of preparation of questionnaire and field test of questionnaire with the targeted people. Finally interview was made with the guided and field tested semi-structured questionnaire in the study area.Total 3 groups were conducted for the study. Among three groups one interview was conducted with the farmers group having age below 30years, one with the farmers group having age between 30-50 years and another farmers group having age over 50 years. Total 12 respondents were selected for the interview randomly.

i) Category A: farmers age below 30 years;
ii) Category B: farmers age between 40-50 years;
iii) Category C: farmers age above 50 years

Finally all the data were collected and analyzed and presented in tabular form in this report.

III. RESULTS: HOMEMADE BIO-PESTICIDES FOR ORGANIC PEST MANAGEMENT

3.1 Meaning of organic pest management

Organic pest control is known to be a method that utilizes natural resource in order to be able to eradicate different kinds of pests, primarily various insect species that destroy vegetation. This also involves the control of different weeds that can hinder the growth of your plants as well. It is known to be a very significant part of a program called integrated pest management. On an average 83.33% farmers were mentioned that organic pest management is the management system of pests using natural resources followed by control of pest without chemicals and control pest by nature itself (Table 3.1).

Table 3.1 meaning of homemade bio-pesticides in organic farming

Meaning of homemade bio-pesticide	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Use of Natural Resources to control pest	4(100)	4(100)	3(75)	10(83.33)
Control the pest without chemical	2(50)	2(50)	1(25)	5(41.66)
Leave the environment to control the pest own self	1(25)	2(50)	0(0)	3(25)

N=number, figure in parenthesis indicates percentage value

3.2 Common Pest in the study area

It has been told that an insect becomes an economic pest when it causes a yield loss of 5-10%. In any local pest complex, there are usually few major pests that are the most important. These cause most of the damage, and their control is urgently required. The most serious one of the major pests is often designated as the key pest. 83.33 % farmers were mentioned that stem borer is common major pest in the study area (Table 3.2).

Table 3.2 common pests in the study area

Common pest in the study area	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Apian	3(75)	3(75)	1(25)	7(58.33)
The rice weevil	2(50)	2(50)	3(75)	7(58.33)
Cheri Cutter Pillar	3(75)	1(25)	2(50)	6(50)
Rat	4(100)	4(100)	1(25)	9(75)
Stem borer	3(75)	3(75)	4(100)	10(83.33)
Yellow Mite	4(100)	2(50)	2(50)	8(66.66)
Pamri pest	3(75)	3(75)	3(75)	9(75)
Rice Hispor	4(100)	1(25)	1(25)	6(50)
Potato tuber worm	2(50)	4(100)	1(25)	7(58.33)
Aphids	3(75)	2(50)	3(75)	8(66.66)

N=number, figure in parenthesis indicates percentage value

3.3 Methods of organic pest management

3.3.1 Perching

Perching is a common method of organic pest management. It is easy and very widely utilized method for rural farming. To do the perching a person need to put a long stick in the middle of the targeted crops field, So that birds come and set on the stick and they eat harmful pests. 75% farmers said that it is a affective method of organic farming (Table 3.3).

Table 3.3 pest management through perching

Name of the pest	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Cater pillar	2(50)	4(100)	3(75)	9(75)
Rats	1(25)	1(25)	1(25)	3(25)
Pamri	3(75)	3(75)	2(50)	8(66.66)

N=number, figure in parenthesis indicates percentage value

3.3.2 Use of Neem/ Vasaka leaves

One of the most common forms of organic pest management is use of neem and vasaka leaves. Farmers make paste of with neem and vasaka or dry it and mix it with water and applies it on the affected crops in the field.66.66% respondents were recognized that it is very much effective in controlling beetles followed by aphids and stem borers (Table 3.4).

Table 3.4 pest management through using neem and vasaka leaves

Name of the pest	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Stem borer	3(75)	1(25)	2(50)	6(50)
Aphids	4(100)	2(50)	1(25)	7(58.33)
Beetles	2(50)	3(75)	4(100)	9(75)

N=number, figure in parenthesis indicates percentage value

3.3.3 Use of Cow dung and cow urine

The most popular type of organic pest control system on the study area is use of cow dung and cow urine. Farmer usually mixed cow dung or cow urine with water and applies it on the affected crops in the field. Corresponding (table 3.5) 66.66% respondents were reported that it is very useful against all kind of harmful mite and Cheri caterpillar followed by the rice weevil respectively.

Table 3.5 Pest management through using of cow dung & urine

Name of the pest	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
All kind of harmful mite	4(100)	3(75)	1(25)	8(66.66)
The rice weevil	3(75)	1(25)	2(50)	6(50)
Cheri cater pillar	2(50)	2(50)	4(100)	8(66.66)

N=number, figure in parenthesis indicates percentage value

3.3.4 Use of death craves and stomach of cow\ goat

It is also a well known type of pest control system in the study area.66.66% respondents said that the use of death craves and stomach of cow and goats were very much effective in controlling aphids & pamri pests followed by yellow mite and Ghandhi pest respectively (Table 3.6).

Table 3.6 pest management through using stomach of cow &goat

Name of the pest	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Ghandi Pest	2(50)	1(25)	3(75)	6(50)
Aphids	1(25)	3(75)	4(100)	8(66.66)
Pamri	1(25)	3(75)	4(100)	8(66.66)
Yellow mite	2(50)	2(50)	3(75)	7(58.33)

N=number, figure in parenthesis indicates percentage value

3.3.5 Use of insect repellent crops (onion, garlic and sun flower)

Farmer's plant onion, garlic and sun flower on the middle of the main crops so that pests are not able to come in the fields because of the smell of onion, garlic and sun flower (Table 3.7). 66.66 % respondents were reported that it is very much effective in controlling all kinds of pests in crops.

Table 3.7 pest management through insect repellent crops

Name of the pest	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Semi borer	1(25)	4(100)	1(25)	6(50)
All kind of pest	2(50)	3(75)	3(75)	8(66.66)
Pamri Pest	3(75)	1(25)	2(50)	6(50)

N=number, figure in parenthesis indicates percentage value

3.3.6 Preventive measures to control pest

Organic pest management system mainly depends on preventive measures of organic farming.66.66% said that Use of pest resistant variety seeds & mixed cropping followed by cover crops, good soil management and crop rotations respectively is the common and most effective form of pest preventing system (Table 3.8).

Table 3.8 pest management through using preventive measures

Name of the pest	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Use of pest tolerable seeds	1(25)	4(100)	3(75)	8(66.66)
Crop rotations	3(75)	1(25)	1(25)	5(41.66)
Mix cropping	4(100)	3(75)	1(25)	8(66.66)
Cover crops	1(25)	4(100)	1(25)	6(50)
Good soil management	1(25)	1(25)	4(100)	6(50)

N=number, figure in parenthesis indicates percentage value

3.4 Benefits of organic pest management

Organic pest control methods are non-hazardous to the health of both human and animal population. 66.66% of the respondents of the study area were reported that organic pest management system is low cost, help to produce Chemicals free food, environment friendly and 83.33% respondents were mentioned that the method is easy to apply (Table 3.9).

Table 3.9 benefits of homemade bio-pesticides in organic farming

Benefits	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Low cost	4(100)	3(75)	1(25)	8(66.66)
Environmental friendly	2(50)	2(50)	4(100)	8(66.66)
Tasty food	3(75)	1(25)	3(75)	7(58.33)
Help to produce Chemical free food	4(100)	2(50)	2(50)	8(66.66)
Healthy	4(100)	3(75)	1(25)	8(66.66)
Easy to apply	3(75)	4(100)	3(75)	11(83.33)

N=number, figure in parenthesis indicates percentage value

3.5 Problems of Homemade bio-pesticides

Homemade bio-pesticides are derived from nature friendly inputs and not having detrimental effect to the environment or in human health. Several problems were recognized by the respondents of which not readily available in the market followed by can't store for long time, labour intensive, lack of training, lack of knowledge on specific formulation and bad smell (Table 3.10).

Table 3.10 Problems in homemade bio-pesticides

Problems	Farm category			All N=12
	Category A N=4	Category B N=4	Category C N=4	
Bad smell	3(75)	2(50)	1(25)	6(50)
Labour intensive	4(100)	3(75)	2(50)	9(75)
Lack of knowledge on specific formulation	3(75)	3(75)	1(25)	7(58.33)
Can't store for long time	4(100)	4(100)	3(75)	11(83.33)
Not readily available in the market	4(100)	4(100)	4(100)	12(100)
Lack of training	3(75)	3(75)	2(50)	8(66.66)

N=number, figure in parenthesis indicates percentage value

IV. DISCUSSION

Different approaches to pest control are equally notable. In chemical farming, a specific insecticide may be applied to quickly kill off a particular insect pest (animal). Chemical controls can dramatically reduce pest populations for the short term, yet by unavoidably killing (or starving) natural predator insects and animals, cause an ultimate increase in the pest population. Repeated use of insecticides and herbicides and other pesticides also encourages rapid natural selection of resistant insects, plants and other organisms, necessitating increased use, or requiring new, more powerful controls.There are also some general challenges with use of bio-pesticides. They tend to be more slow-acting [2] and may be very specific to the life cycle of the pest. Other attributes such as persistence in the environment have both a benefit and challenge that must be balanced. For example, a bio-pesticide that degrades very quickly in the environment (benefit) may also have a short shelf life or limited field persistence [2] requiring multiple applications. Having a narrow target range and very specific mode of action can be seen as both a benefit and a challenge [2] . While one benefit of specificity is lower impact on non-target species, one challenge is that control of the dominant pests on a given crop may require more than one product and may be more costly. Also as noted, bio-pesticides fall on a continuum of breadth of specificity: some active ingredients are highly specific to a particular organism at a particular window of opportunity; others have a broader mode of action.Bio-pesticides are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals" [1].Some essential oils work as repellents, and their mode of action would be as a fragrance." [4].There are almost 122 biochemical pesticide active ingredients registered with the EPA, which include 18 floral attractants, 20 plant growth regulators, 6 insect growth regulators, 19 repellents, and 36 pheromones [2].Neem materials can affect insects, mites, nematodes, fungi, bacteria, and even some viruses. Despite being derived from natural and renewable sources, the use of Neem products raises some concerns due to its relatively broad-spectrum activity.

Insect growth regulation is one of multiple functions provided by the constituents of this plant oil. Among the isolated Neem constituents, limonoids (azadirachtin) are effective in insect growth-regulatory activity. Azadirachtin does not directly kill pests, but alters the life-processing behavior in such a manner that the insect can no longer feed, breed or undergo metamorphosis [5]. More specifically, neem (azadirachtin) disrupts molting by inhibiting biosynthesis or metabolism of ecdysone, the juvenile molting hormone [6].

For all crop types, bacterial bio-pesticides claim about 74% of the market; fungal bio-pesticides, about 10%; viral bio-pesticides, 5%; predator bio-pesticides, 8%; and "other" bio-pesticides, 3% [7].At present there are approximately 73 microbial active ingredients that have been registered by the US EPA. The registered microbial bio-pesticides include 35 bacterial products, 15 fungi, 6 non-viable (genetically engineered) microbial pesticides, 8 plant incorporated protectants, 1 protozoa, 1 yeast, and 6 viruses [4].

The most widely used microbial pesticides are subspecies and strains of Bacillus thuringiensis (Bt), accounting for approximately 90% of the biopesticide market [8].In mid 2002, EPA had registered 36 pheromones, which comprised over 200 individual products [6] . Insect sex pheromones can be used alone to manage pest populations when pest pressure is moderate to low, such as after several years of consecutive use. Other practical uses include, "in survey traps to provide information about population levels, to delineate infestations, to monitor control or eradication programs, and to warn of new pest introductions" [6]. Currently there are no adequate regulations to provide meaningful ecosystem-level protection, such as protection of birds,pollinators, and aquatic systems [9].

In contrast, organic farming tends to tolerate some pest populations while taking a longer-term approach. Organic pest control involves the cumulative effect of many techniques, including:

- allowing for an acceptable level of pest damage;
- encouraging predatory beneficial insects to control pests;
- encouraging beneficial microorganisms and insects; this by serving them nursery plants and/or an alternative habitat, usually in a form of a shelterbelt, hedgerow, or beetle bank
- careful crop selection, choosing disease-resistant varieties
- planting companion crops that discourage or divert pests;
- using row covers to protect crops during pest migration periods;
- using pest regulating plants and biologic pesticides and herbicides
- using no-till farming, and no-till farming techniques as false seedbeds
- rotating crops to different locations from year to year to interrupt pest reproduction cycles;
- Using insect traps to monitor and control insect populations.

Each of these techniques also provides other benefits—soil protection and improvement, fertilization, pollination, water conservation, season extension, etc.—and these benefits are both complementary and cumulative in overall effect on farm health. Effective organic pest control requires a thorough understanding of pest life cycles and interactions. Organic pest management is similar to integrated pest management in some respects.Some attributes of bio-pesticides can be seen as both benefits and disadvantages. For example, the specificity of many bio-pesticides minimizes the negative impact on non-target organisms because they are designed to target a specific pest. The benefits of this can be 8 profound: by focusing on an individual pest, bio-pesticides are generally much less toxic than conventional pesticides. However, as noted above, some bio-pesticide products are broader spectrum actors and consequently can have negative impacts on non-target species. These broader systemic impacts could be better understood – and anticipated – if the right questions are asked.

V. CONCLUSION AND RECOMMENDATIONS

In the end of my study I can say that organic pest management system is an environmental friendly, low cost, and healthy method of pest control system. Gradually farmers getting aware of this method and this pest management system are getting popular day by day because of its beneficial features. Bio-pesticides are a set of tools and applications that will help our farmer's transition away from highly toxic conventional chemical pesticides into an era of truly sustainable agriculture. Of course bio-pesticides are only a part of a larger solution; sustainable agriculture is a broad and deep field. But helping farmers move from their current chemical dependency to organic agriculture and beyond requires tools for the transition and tools for a new era. Bio-pesticides can and will play a significant role in this process.There remain, however, serious questions about the safety of these products from both a human and ecosystem health standpoint. Current regulations do not go nearly far enough in evaluating systemic broader impacts of bio-pesticides. By definition, green chemistry is about continuous improvements aimed at reducing or eliminating hazard. Fully defining hazard is difficult. Even products hailed by green chemistry and regulators alike as safer for human health may turn out to have unforeseen negative environmental health impacts- for example, Spinosad, a green chemistry award winning bio-pesticide, is significantly safer for humans than other treatments but is toxic to bees.

We must encourage pest management solutions and regulations to continuously evolve and ensure that multi-disciplinary teams, including green chemists, environmental health sciences and other sciences, approach these products systemically to both discover and refine them. Bio-pesticides offer powerful tools to create a new generation of sustainable agriculture products. They are the most likely source for alternatives to some of the most problematic chemical pesticides currently in use that are under ever-increasing scrutiny. Bio-pesticides

may also offer solutions to concerns such as pest resistance to traditional chemical pesticides, public concern about side effects of pesticides on the surrounding environment and ultimately, on human health.

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