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Research Article

Susceptibility and Adaptability of Weevil and Grasshopper as its Influenced by Organo-Pesticides (Goat Urine-Ginger extract)

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Abstract

Application agro-pesticides have significant impact on both beneficial and non-beneficial pests. It is important to develop organo pesticide with little or no side effect the beneficial pest. Therefore, this study was carried in the year 2022 in Biotechnology Laboratory at Jigawa State polytechnic with aim of determine the influence of organo pesticide on the susceptibility and adaptability of weevil and grasshopper. Basic procedures were taken to produced organo-pesticide such as collection goat urine and ginger extract, sterilization, crushing, fermentation and storage room temperature for 14 days. Each of the ten samples of weevil and Grasshopper were subjected to the effect of organo-pesticide. Data collected were subjected to descriptive statistic such as percentage using Statistical Package for Social Sciences (SPSS). Results showed that bean weevils had 100% mortality rate followed by grasshopper with 60 percent. The extract had high effect to store pest (bean weevil) than field pest (grasshopper). Therefore, recommended that more studies should be carried out to with use of different plant and animal extracts for assessing the effectiveness of the bio-pesticide on several insects to reconfirmed the findings.

Keywords: Susceptibility; Adaptability; Weevil; Grasshopper; Influenced; Organo; Pesticides

Introduction

Human environment and Agricultural crops are under constant assault by insect pests, making of insecticides to have paramount importance to reduce losses [1]. Synthetic insecticides such as organophosphates are important and effective tools in modern crop management. However, they cause serious threats to the environment and to people. Humans come in contact with dangerous pesticides on food, in water and in the air near farms. This "pesticide drift" occurs when pesticide dust and spray travel through wind to places unexposed to pesticides. Almost 98 percent of sprayed pesticides do not reach their targets. They penetrate to groundwater, pollute streams and harm wildlife, including natural predators of the targeted pests. Older pesticides such as DDT killed bald eagle, birds, fish and even people [2]. Specialists representing various areas of the vast field of biology are contributing-entomologists, pathologists, geneticists, physiologists, biochemists, ecologists-all pouring their knowledge and their creative inspirations into the formation of a new science of biotic controls [2]. The perception that pesticides are harmful to human health and the environment has led to the implementation of more restrictive legislation dealing with allowable chemicals and residue levels. Other problems associated with excessive use of pesticides are the development of resistant strains to thiabendazole. Exploring the potential

to utilize the pesticidal properties of plants and animals has become a key focus of research in pest control. Some plants are known to contain bio-active metabolites, which show antifeedant, repellent and toxic effects on a wide range of insect pests [3]. Many plants can protect themselves against insects by producing their own chemical defences that are toxic or repellent Jessica [4]. Bio-pesticides are naturally occurring substances from living organisms (natural enemies) or their products (microbial products, phyto-chemicals) or their by-products (semio-chemicals) that can control pest by nontoxic mechanisms (Salma and Jogen, 2011). Organization for Economic Co-operation and Development (2009), viewed bio-pesticides as manufactured mass produced agents derived from natural sources living micro-organisms and sold for use to control pests. According to Suman [5], bio-pesticides encompass abroad array of microbial pesticides, bio-chemicals obtained from micro-organisms and natural sources. Historically, bio-pesticides has been associated with the biological control and by implication, the manipulation of living organisms [6]. Biopesticides are usually inherently less harmful/toxic and cause less environmental load or pollutions. They are usually designed to only one specific pest or, in some cases, a few target pests as opposed to chemical that have a broad spectrum activity. Although the knockdown effect of bio pesticide was proved to be Delayed, and plus being costlier, it is reported that it reduced the number of application and are less prone to Resistance. In recent decades, the focus on crop production have stated to shift from yield to quality and safety. Evidences suggest that bio- pesticide is an important component for promoting sustainable agriculture; hence it has gained lots of interest in the last decade particularly in view of the growing demands for organic foods [7]. For a time in memorial, several biopesticide effect and efficiency have been assess by many scientist such as [8] that tested the biological effects of a neem-based biopesticide on the repellency, mortality, oviposition, and development of Asian Citrus Psyllid (*Diaphorina citri*) demonstrated that neem was effective in controlling the brown citrus aphid, *Toxoptera citricida* (*Kirkaldy*) and important vector of citrus tristeza virus [9] used Garlic (*Zingiber officinale*) to produce a biopesticide that is naturally with fungicidal and pesticide properties that work effectively on controlling pests and makes an excellent economical, non-toxic biological pesticide for use in agriculture. Amuji [10] investigated the effectiveness of ginger as a bio-control method of controlling pests and insects on agricultural crops. Chemical made pesticides used in the farms are very toxic to the extent that the toxin tends to accumulate in the plant and translocated to different part of the plant such as seed which when consumed by human cause health effect. Constant damage to agricultural products is usually controlled by using chemicals that are toxic to even the insect which causes the damage. However, some biological agents are reported to possess certain pesticidal effects, hence this study aimed at determining pesticidal properties of Crude Garlic-goat urine extract crude on some selected insects.

Materials and Method

Description of the study area

The study was be conducted in Dutse 11°42′04″ N, 9°20′31″ E. The rock city located in north western Nigeria. It is the capital city of Jigawa State and home to Federal University Dutse, Research Institute for Date Palm (Sub-Station) and State polytechnic in Dutse. The capital has an estimated population of 153,000 (2009), and total area of 7,382km2 currently the largest city in Jigawa State. The climate is classified as tropical with clearly defined wet and dry seasons and a mean annual temperature of 26 °C [11-13]. The city experiences two distinct seasons; the wet season which lasts from June to September with mean temperature of 31 °C but may linger until October, whereas the dry season extends from October to May [12]. During the dry season, mean daily temperature ranges from 20 °C in the cooler months of October to February to 42 °C during the hotter months of March to May. Annual rainfall ranges from 600 to 1000mm. Soil well known to be fertile ranging from sandy-loamy, pH ranges from 6.07-6.72, nitrogen content ranges from 0.63-1.64g/kg, phosphorus 6.25 to 12.04mg/kg and potassium ranges from 0.18-0.63cmol/kg respectively [14,15]. The main vegetation type is Sudan savanna. As the state capital, during the last two decades, Dutse have faced a series of lands destruction in the name of urbanization including the construction of the first Airport in the state and other Estate. Raised in food and shelter needs in order to meet the demand of the increasing population of Dutse has also accelerated the used of herbicides in the farmlands, human settlements. Cash crops, such as potato, mango, peanut, bean, cotton, sugarcane, date and several types of vegetables, are produced in large quantities. Agricultural activities are not the major threat but the rate at which the farmers are using herbicides now in Dutse is highly alarming [12].

Sample Collection and Preparation

The goat urine was collected from Jigawa state polytechnic Bitanul garden and the Ginger was bought from Dutse Ultra-Modern market. The plant was washed, blended and store in the clean container prior to use. Glass equipment's such as measuring cylinder, conical flask, and funnel were autoclaved at 121°C for 15min to achieve sterilization. 50ml of goat urine were measured using measuring cylinder and added into bottle container, 25 gram of fresh ginger was weighed and grinded, then added into goat urine container and stored at room temperature for about 14 days (2 weeks) for fermentation [16]. The fermented mixture of goat urine and Ginger were sieved to remove the ginger residue. 50ml of the produced biopesticide were then diluted with 50ml of water and carefully shake before spraying on insect/ pest of interest [16].

Bio-pesticide effect testing on the selected insected

Effect of the biopesticide produced were tested by spraying it on subject at the same concentration, and the mortality rate were observed. The biopesticide effect were found to be very effective due to the fact that, (goat urine and ginger) contain substances such as urea, sulphur and allicin that kill insects [16].

Data analysis

The data were analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics such as: percentage.

Results

Several steps, method and procedures were followed to obtain a compilation of the experiment by successful production of biopesticide from goat urine and ginger extract mixture which effectiveness were tested on various insects/ pest (Table 1). It was observed that, the mortality rate varies on the type of insect's pest tested. Total of 10 individuals of Grasshopper and Beans weevil were subjected to the test in order to determine the effectiveness of the produced biopesticide. The study found that, Beans weevils were more susceptible to the biopesticide with 100% mortality rate the followed Grasshopper which had 60%.

Table 1: Showing the effect of Goat urine-ginger extract on selected insects.

S.No	Type of Insect	Total Number	Mortality Rate	Survivor	Percentage(%)
1	Grasshopper	10	6	4	60%
2	Beans weevil	10	10	10	100%

Discussion

Bio-pesticides are now being recognized as growing components in the crop-protection armory. Key elements impacting future developments and acceptance include limited funding for research and development, limited shelf-life, high specificity (which can also be an advantage), limited persistence in the environment (in some instances also considered an advantage) and variable field performance [17]. Many of these obstacles will be overcome as greater knowledge and experience of their use is incorporated into the selection and marketing of new products, thereby allowing companies to introduce improved products into global markets. Results from this study proved that, goat urine-ginger extract possesses a high level of bio-pesticidal effect, because looking at the Table one, it is enough to say that this is very good and working biopesticide. Results from the study are in agreement with the findings of some other literatures. The mortality rate of the insects treated with biopesticide could be due to toxic effects of the extract against the insects, this is in line with the [7,16] that uses the extract as biopesticides. No effect was reported from the use of prepared/produced biopesticide sample. The biopesticide was produced and tested effectively as required and has non-toxic and non-allergic effects to humans and other related animals [18-23]. Environmentally, the production was pollution free and doesn't involve in any known toxic chemical reactions. The raw materials use for the production was entirely cheap and natural products. The study shows that, use of bio pesticides is markedly safer for the environment and users, and more sustainable than the application of chemicals, their use as alternatives to chemical pesticides, especially as components in Integrated Pest Management (IPM) strategies, is of growing interest. The major advantage of the use of biopesticide for crop pest's management is environment safety along with their host specificity. Besides, the associated costs for the development and the registration of the biopesticide are comparatively lesser than that of the chemical pesticides [24-29].

Conclusion and Recommendations

The bio-pesticide were successfully produced from goat urine-ginger extract; its effectiveness was determined on different pests. The results of the study have shown a promising pesticidal/ insecticidal activity of goat urine-ginger extract in controlling pest/ insects on both storage and treatment. The study believed that goat urine-ginger extract could replace the use of conventional synthetic chemical pesticide containing harmful chemicals as well as residue that may affect human and the environment. The study recommended the use of goat urine-ginger extract as biopesticides for the control of insect's pests to both small scale and large-scale farmers as an alternative to the issue of synthetic chemical looking at the fact that it's environmentally friendly and healthier for both humans and animals. It can be used to protect several agricultural products from pest since it contains pesticidal properties, readily available, cheaper and less toxic to the immediate consumers. It is further recommended that; more researches should be carried out on assess the effectiveness of the biopesticide on several insects to reconfirmed the findings. Different other plant and animal parts should be used and produce more biopesticide of various kind to determine the most effective one in order to minimize the use of chemical pesticides.

Rererences

1. Wei Z, Edward K, Felix B, Prapti B, Gerrit G, et al. (2018) Farmers perceptions of crop pest severity in Nigeria are associated with landscape, agronomic and socio-economic factors Agriculture, Ecosystems & Environment 259:159-167.
2. USEPA (2023) The Case of DDT: Revisiting the Impairment.
3. Kabrambam D, Adesina JM, Rupjyoti B, Dinabandhu S, Yallappa R (2021) Main plant volatiles as stored grain pest management approach: A review. Journal of Agriculture and Food Research 4(2).
4. Jessica YC, Hoang VT, Jorrel M, Anna B (2020) Plant defense chemicals against insect pests agronomy. Agronomy 10(8): 1156.
5. Suman G, Dikshit AK (2010) Biopesticides: An eco-friendly approach for pest control. Journal of Biopesticides 3(1): 186-188.
6. Jitendra K, Ayyagari R, Dharmendra M, Vachaspati M (2021) An overview of some biopesticides and their importance in plant protection for commercial acceptance. Plants 10(6): 1185.
7. Emmanuel OF, Grace NI, Matambo T (2021) Biopesticides in sustainable agriculture: A critical sustainable development driver governed by green chemistry principles. Frontiers in Sustainable Food Systems 5: 619058.
8. Salman A, Shafiq MA, Mohammad M (2020) Toxic effects of neem based insecticides on the fitness of Helicoverpa armigera (Hübner). Crop protection 68: 72-78.
9. Halbert SE, Brown LG (2023) Brown citrus aphid, toxoptera citricida (Kirkaldy) (Insecta: Hemiptera: Aphididae). IFAS.
10. Amuji CF, Echezon BC, Dialoke SA (2012) Extraction fractions of ginger (s Roscoe) and residue in the control of field and storage pests. Journal of Agricultural Technology 8(6): 2023-2031.

11. Chen Y, Yan F, Chai Y, Liu H, Kolter R, et al. (2013) Biocontrol of tomato with disease by Bacillus subtilis isolates from natural environment depends on conserved genes mediating biofilm formation. Environ Microbiol 15: 848-864.
12. Salami KD, Odewale MA, Gidado AH, Adam ZA (2019) Pre-germination Treatments on Seeds of Balanites aegyptiaca (L) Delile and Influence of Potting Mixtures on the Early Growth. Journal of Forestry Research and Management 16(1): 107-117.
13. Sulaiman IM, Rosli R, Amy YT (2018) Seasonality, habitat type and locality influenced bird assemblage structure in Nigeria. Journal of African Ornithology 89(3): 221-231.
14. Zangina AS (2015) Land use land cover changes in Dutse (1986–2014), Jigawa State, Nigeria. Ahmadu Bello University.
15. Salami KD, Aminu M, Ilu KJ, Lawal AA, Folohunsho WO (2022) Evaluation of stem volume, litter fall, Soil fertility of Azardirachta indica A. JUSS and Eucalyptus camadulensis Dehnh at Shelterbelt in Kiyawa, Jigawa state, Nigeria. International Journal of Agricultural Sustainability 9(01): 560 -569.
16. Salami KD, Abdulhakeem L, Ilu KJ, Folorunsho WO Aminu M (2021) Evaluation of stem volume, litterfall, and soil fertility of azadirachta indica (a. juss) and eucalyptus camaldulensis (dehnh) at shelterbelts in Kiyawa, Jigawa State, Nigeria.
17. Brooklyn Botanic Garden (2000) Natural disease control: A common-sense approach to plant first aid. New York, USA.
18. Leonard GC, Julius JM (2000) Biopesticides: A review of their action, applications and efficacy. Pest Management Science 56(8): 651-676.
19. Andreeilee BF, Santoso M, Maghfoer MD (2015) The effect of organic matter combination and azola dosage (Azolia pinnam) on growth and the production of paddy (Oryzasp.) Ciherang variety. Research Journal of Agronomy 9(1-6): 1-4.
20. Bastiaans L, Paolini R, Baumann DT (2008) Focus on ecological weed management: what is hindering adoption? Weed Research 48: 481-491.
21. Block, Masamha, Fadzirayi, Mukutirwa (2010) Journal of Agricultural Technology 8(2): 479-492.
22. Boyetchko S, Pedersen E, Punja Z, Reddy M (1998) Formulation of biopesticides. In Hall FR, Menn JJ (Eds.), Biopesticides: Used and Delivery Methods in Biotechnology (487-508). Humana Press in Biotechnology.
23. Bus VG, Bongers AJ, Risse LA (1991) Occurrence of Penicillium digitatum and P. italicum resistant to benomyl, thiabendazole and imazalil on citrus fruit from different geographic origins. Plant Dis 75(11): 1098-1100.
24. Casals C, Teixido N, Vinas I, Silver E, Lamarca N, et al. (2010) Combination of hot water, Bacillus subtilis CPA-8 and sodium bicarbonate treatment to control post harvest brown rot on peaches and nectarines. European Journal of Plant Pathology 128: 51-63.
25. Chandler D, Bailey A, Tatchell GM, Davidson G, Greaves J et al. (2011) The development, regulation and use of biopesticides for integrated pest management. Philos Trans R Soc Lond B Biol Sci 366(1573): 1987-98.
26. Chauhan RS, Singh BP, Singhal LK (2001) Immunomodulation with kamdhenu Ark in mice. Journal of Immunology and Immunopathology 3(1): 74-77.
27. Damodhar VP, Shinde VV (2010) Effect of cattle urine sprays on yield and quality of mango (Mangifera indica L.) cv. Alphonso. The Asian J Horticulture 5(2): 307-308.
28. Desai ST (1997) Chemical industry in the post independence era: A finance analysis point of view. Chemical Business11(1): 25 - 28.
29. Komazaki S (1987) Growth and reproduction in the first two and summer generations of two citrus aphids, Aphis citricola van der Goot and Toxoptera citricidus (Kirkaldy) (Homoptera: Aphididae), under different thermal conditions. Applied Entomology and Zoology 23: 220–227.