

INVESTIGATION OF INSECTICIDAL ACTIVITIES OF ESSENTIAL OIL EXTRACTED FROM
SOME SELECTED PLANTS AGAINST MAIZE AND BEAN WEEVILS

BY,

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DECLARATION

I Kiprotich Caleb, BU/UP/2019/1629, do hereby declare that the work contained in this research report was obtained from experiments carried out under the guidance of my supervisor. Therefore, it is my original work and has never been submitted or published for any award of a degree to any academic institution.

Signature 

Date *01st/08/2023*

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APPROVAL

This is to certify that the project titled investigation of insecticidal activities of essential oil extracted from some selected plants against maize and bean weevils has been done under my guidance and supervision.

Signature 

Date 01/06/2023,

Dr. KAMOGA OMAR

SUPERVISOR

DEDICATION

I dedicate this research work to the Almighty God who has brought me this far. To my parents, brothers, lectures and friends who continually gave me love, moral and financial support to undertake my studies. You have indeed helped me come this far. God richly bless you

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ABSTRACT

Maize and beans are the worldwide basic staple foods especially in the developing countries but unquantifiable amount is lost through insect pest infestations. *Sitophilus zeamais* Motschulsky and bean weevils are among the dominant pest of maize grains beans in tropics. They usually infest maize and beans either just prior to harvest or during storage in traditional structures such as granaries, nylon bags, gourds, storage rooms in a house and warehouse. Adult weevils perforate the grains as they feed and females lay hundreds of eggs inside which continue to destroy the kernel as they develop. This result into loss of agronomic, nutritional and commercial value of the grains causing high level of food insecurities and stunted economic growth leading a vicious cycle of poverty. Currently, the control of Bean weevils and *Sitophilus zeamais* predominantly depend on the use of synthetic insecticides. However, the use of synthetic insecticides has implications with regard to human health and environmental risks, problem of pest resistance and resurgence of insect infestation. Therefore, new and efficient substance with low environmental impact are needed to control insect pests during grain storage. The objective of this research is to establish the insecticidal activity of selected local plants (such asgarlic and lemongrass) to extract their essential oil, determine repellency effect and contact toxicity which are, safer and environmentally-friendly insecticides. In the study, plant materials will be collected, extracted, steam distilled and applied on insects .This research study aimed at extracting essential oil from garlic bulbs and lemongrass, and determination of the repellency and toxicity effect rate against maize and bean weevils when essential oil is used as an insecticide. Garlic and lemongrass essential oil was extracted by hydro distillation using distillation apparatus for 14 hours and yield was 8ml each. Garlic and lemongrass essential oil contained active ingredients which show repellency and toxicity effect against of maize and bean weevils. The repellency and contact toxicity was determined by using a total of 100 maize weevils and 100 bean weevils in five different concentrations of 72.7%, 66.6%, 57.1%, 40% and 0.00%, first dilution yielded 70%, second concentration yielded 50%, third dilution yielded 40%, fourth dilution yielded 20%, and zero dilution yielded 0.00% s , Generally, from the above results, bean weevils are said to be more susceptible to garlic EO and lemongrass compared to the maize weevils, this is because the bean weevils had a high repellency and mortality rates as compared to maize weevils as subjected to both oils at the same time. It has also been noted from the above that the repellent effects of garlic and lemongrass oils are more effective compared to the contact toxicity since at 57.1% v/v concentration, gave 100% of the insects had been repelled away as soon as the oil was administered and 90% of the insects were dead after 25minutes when garlic and lemongrass

oil was sprayed over their bodies. More research to be done on the toxicity of prolonged use of organic insecticide on human. There is need also to elucidate the precise mechanisms by which they exert their insecticidal effect

CHAPTER ONE:

1.0 INTRODUCTION

1.1 Background

Maize grain and beans are the major diets of millions of people in the world (Nwosu, 2016). It holds strong promise against poverty and global food crises. They are cash crops as well as an industrial raw material (Makate, 2010). *Sitophilus Zeamais* Motschulsky also known as maize weevil is a cosmopolitan insect and considered the primary pest of maize; it also attracts wheat, rice, sorghum and processed food (Tripathi, 2018). It is estimated that the Brazilian production of maize in 2019/2020 will be around 98.4 million tons (Companhia Nacional de Abastecimento, 2019); it is, however, reported that 20% of this amount will be lost due to the attack of pests on crops, mainly *S. zeamais* (Silva et al., 2017). The control of maize and bean weevils depends mostly on the use of chemical insecticides (e.g. bifenthrin, fenitrothion, and pirimiphos-methyl). The uncontrolled application of these substances leads to many problems such as environmental contamination, development of resistant insects, and adverse effects on human health (Bravo et al., 2011). This fact has highlighted the need for more environmentally friendly pesticides, which are safe for humans (Dutta, 2015; Ebadollahi, 2011). In this respect, primary and secondary metabolites from plants, such as lectins, organic and aqueous extracts, and essential oils (EOs), have been reported as insecticidal agents against insect pests (Benelli et al., 2017; Raliya et al., 2018). The interest in these plants is not only because of environmental concerns trailing the use of chemically synthesised plant protection products, but also because of farmer and consumer preference for organic farming strategies and produce, respectively (Slusarenko et al. 2008; Nwachukwu et al. 2012). For many such plants, protection against pathogens and pests often comes in the form of sulphur-containing secondary metabolites synthesised following external attacks on them (Nwachukwu et al. 2012). There are a variety of insecticides that have toxicological properties used for the control of maize weevil; however, garlic essential oil could be an alternative for the control of stored products. *Allium sativum* Linnaeus (garlic) is monocotyledonous genus that has been assigned to the Amaryllidaceous Liliaceae, and a distinct family the Alliaceae. It is a plant with long, flat grass like leaves and a paper hood around the flowers. The greenish white or pink flowers are found grouped together at the end of a long stalk. It is a food crop extensively cultivated worldwide with garlic oils

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