A COMPARATIVE STUDY OF BIOPESTICIDAL AND FERTLIZER POTENTIAL OF CITRUS SINENSIS (ORANGE FRIUT) PEELS AND EXTRACT IN CALABAR, CROSS RIVER STATE. NIGERIA

THEME: Investigating Earth as a System Together

NAME OF STUDENTS: EGBE GININI SUNDAY
KANU DEBORAH F.
MPAMAH GRACIOUS P.
INYANG REBECCA
ETIENAM ATIM JOY

GLOBE TEACHER: **MR. DAVID EKONG**

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FEDERAL GIRLS COLLEGE, CALABAR(FGCC), CROSS RIVER STATE, NIGERIA

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ABSTRACT

Insects act as both pests and vectors of disease-causing organisms to man and animals, thereby exposing them to secondary attacks. As grain pests, weevils cause harm, damage, destruction, reduction in grain quality and great economic loss. The use of synthetic insecticides have, over the years resulted in development of physiological resistance in the insects, environmental hazards as well as health problems to man and animals alike. The purpose of the study is to investigate ways of preserving food grains, growing plants effectively in a natural condition that could improve food security, maintain grain and crop quality for a longer pre and post-harvest period and provide alternative storage measure safer and less harmful to the environment, man and animals. This study assessed the Biopesticidal and fertilizer potencies of sweet orange (citrus sinensis) peels and extracts on beans weevils and maize plants.

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LITERATURE REVIEW

Citrus fruits are extensively consumed in many countries, and they are considered to be valuable health –promoting food as they contain biologically active components such as ascorbic acid, carotene (provitamin A) and group B vitamins, flavonoids, carotenoids, and phenolic acids, which have beneficial effects for human health (Turner and Burri, 2013). On the other hand, cultivation of crops is attacked by numerous pathogenic fungi and by pests. For this reason, plant protection agents are commonly applied in conventional cultivations (as well as in sustainable agriculture systems), at various stages of plant development, to control pests and diseases which can cause a reduction in yields (Damos et al., 2015). The main aim of this study was to ascertain the effectives of orange peels and orange extract in insect pest management(biopesticidal potential) and as an effective fertilizer.

STATEMENT OF PROBLEM

As with other fruits, citrus is attacked by several pre- and/ or postharvest pathogens that affect fruit quality. Green and blue mould infections caused by Penicillium spp (Droby et al., 1989), anthracnose caused by Colletotrichum gloeosporioides (Davies and Albrigo, 1994), and sour rot caused by Geotrichum candidum (Howard, 1936) are some of the major postharvest problems that cause market losses. In developing countries, where protection and proper handling of fresh fruits is inadequate, losses during transit and storage are even greater mounting up to about 50% of the harvested crop.

Currently, to minimize losses caused by citrus fruit pathogens and few other crop pests, synthetic chemicals are applied either pre or postharvest. However, the application of synthetic chemicals to control postharvest diseases often result in chemical residues on food that may affect human health. In addition, the development of chemical resistant strains may result in reduced efficacy of synthetic chemicals. Development and use of alternative pre and postharvest control options involving biological agents are critically important. Moreover, natural plant extracts may provide an environmentally safer, cheaper and more acceptable disease control approach. However this study is designed to investigate the effect of Citrus fruit(Orange) extracts and peels as a biopesticide and as a fertilizer.

RESEARCH QUESTIONS

1. What will be the effect of Citrus sinensis (Orange fruit) peels on crop pest?

2. What will be the effect of Citrus sinensis (Orange fruit) extract on soil fertility?

3. What is the advantage of Citrus sinensis (Orange fruit) peels and extract as a biopesticide and fertilizer over chemical fertilizers and pesticides?

COMMUNITY IMPACT

The use of synthetic insecticides has, over the years resulted in development of physiological resistance in insects, environmental hazards as well as health problems to man and animals alike. The advantages of using citrus peel extract are: it can be easily extracted from peel, is not toxic to mammals since citrus oil is one of the popular flavorings.

MATERIALS AND METHOD

Materials used for this study include;

- Galvage needle,
- syringe, hand gloves,
- Ham scope camera,
- blender,
- grinder,
- stainless steel plates,
- oven,
- mortar and pestle,
- measuring cylinder,
- corked bottles.

Collection and Identification of plant materials

The plant material used for insecticidal activities against beans and maize weevils was Citrus sinensis (Orange fruit) peel, and it was purchased from sellers at Watt Market, Calabar, Cross River State in the month of June during the day. They were taken to the Herbarium at Federal Girls College Calabar (FGCC), biology lab for identification.

METHODOLOGY

Plant extraction procedure

The peels were washed in water and sun dried for 2hours to reduce themoisture content. The peels were divided into 2 sets. The first set was dried in the hot air oven at 5^0C for 72 hours pulverized using mortar and pestle. The second set was not dried but pulverized using an electric blender. 1.5 liters of water was added to each pulverized material in different containers. Both materials were left overnight to soak and sieved, first with ordinary sieve and later with filter paper.

The solvents were then poured into stainless steel plates and put into hot air oven for 72 hours after which extracts from both fresh and dried peels were recovered and subjected to phytochemical screening by adopting the method of Harbone (Harbone,1973). It is important to note that we got some of our data from the GLOBE Green UP-Green DOWN – Tree and Shrub Green-UP protocol in Biosphere Protocol.

Experimental Model

After acclimatization for 2weeks, the maize plants and beans seeds were divided randomly into 2 groups (A and B), and each group subdivided into 3 groups i.e., Group A (sub groups A1, A2, A3), Group B (sub groups B1, B2, B3). Treatment and observation of maize plants lasted for 60days, while the subgroups containing beans seeds were observed, administered and treated for 30 days.

Table 1: Test carried out on both beans seeds and maize plants, using powder and extracts from both dried orange peels and fresh oranges

GROUPS	SUB-GROUPS	DOSAGE Mg/Kg/Cl/l	SUBSTANCES ADMINISTERED	DURATION
A	A1 (Viable Beans seeds)	Nil	Nil	30 Days
	A2(Viable Beans seeds)	50mg/kg	Orange peel Powder (Biopesticide)	30 Days
	A3(Weevil Infested Beans seeds)	100mg/ kg	Weevils + Biopesticide	30 Days
B	B1 (Normal maizeplant)	Nil	Water	60 Days
	B2(Normal Maizeplant)	100 cl/l	Orange extract (fertilizer)	60 Days
	B3(Stunted maize plant)	200 cl/l	Orange extract(fertilizer)	60 Days

Table 2: Effect of dried powder extract on bean weevils

DAYS	Concentration of extract(mg/kg)			Control Mortality (%)
	50 Mortality (%)	100 Mortality (%)	150 Mortality (%)	
1 -5	20-40	30-40	50	00
6-10	40-50	50-60	60	00
11-15	50-70	60-70	80	00
16-20	70-80	80	90-100	00
21-25	80-90	90-100		00
26-30	100			00

Figure 1: Discolored Maize Plant during treatment (Sub group B3, treatment with extract after discoloration, stunted growth had occurred)

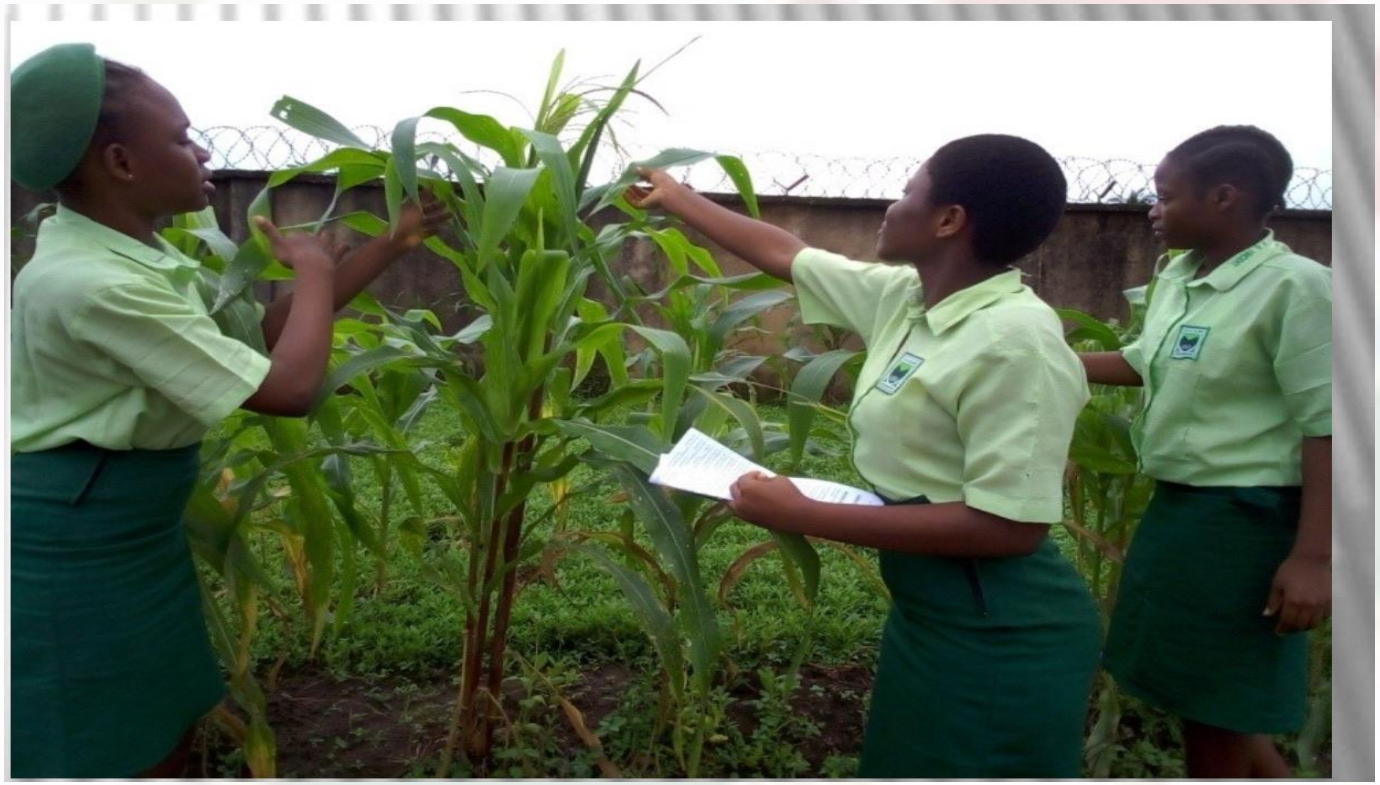

Figure 2: Recovered discolored maize plant after treatment

Figure 3: Healthy maize plant (Sub group B2 started with initial treatment)

DISCUSION, CONCULSION AND RECOMMENDATION

A preliminary study into the biopesticidal effects of sweet (Citrus sinesis) peel on bean weevil and fertilizer potency on maize plant was carried out. The phytochemical analysis of both fresh peels extracts and dried peels powder revealed that some vital ingredients in the peel as Tannins, Anthraquinones, Steroids, Resins, Glycoside Flavonoids, Cardiac glycoside and Terpenes These conform to the list of phytochemicals of Zimmerman (2005). The mortalities observed in both beans and maize weevils when treated with extracts from fresh and dried peels could be an indication of the systemic and contact actions of the active ingredients of the phytochemicals identified on the weevils. This agrees with the report of Zimmerman (2005) who stated that the actions of some of these phytochemicals could be physiological thereby protecting against various human diseases including cancer and heart diseases, could disrupt microbial membrane, inhibit respiratory virus. Although their work seemed to be more on the control of human diseases, it is possible however that these phytochemicals may have adverse effect on the lives of the weevils with resultant deaths of the weevils. This study also recognizes the importance of high concentrations of these phytochemicals on the mortality rates of the weevils. However, it was observed that it took only few days for a 100% mortality to occur at high concentrations as compared to the more days taken at lower concentrations. This study noted also that when dried extract from Citrus sinensis (Orange fruit), there was a progressive mortality rate from first day of application. The various maize plants including those that started reviving with the application of our fresh extracts confirms its fertilizer potency especially when fresh Citrus sinensis(Orange fruit) peels were diluted in distilled water at 200mg concentration. This further confirms the work of Okogun (2000) who reported that the type ofsolvent used for the extraction plays vital role on the effect of active ingredient.

CONCULSION

It could be concluded here that sweet orange peels have some vital active ingredients which actively affected the lives of both beans and maize weevils. We further conclude that the concentrations of the extracts as well as the diluents plays important an role in the killing actions of the active ingredients on the weevils. Conclusion is made also that since some phytochemicals from other plants extracts can be used to control certain human diseases, having identified similar phytochemicals in the sweet orange peels, same may be deleterious to the pests, hence, may be applied in the control of storage grain pests.

RECOMMENDATION

It is recommended that further studies need to be carried out to investigate the effect of Citrus sinensis (Orange fruit), extract following its long-term administration. The biopesticidical effect of Citrus sinensis (Orange fruit), should be carried out on other plant species with more attention at the dosage administered. Other methods of extraction of Citrus sinensis (Orange fruit), extract should also be investigated as this could lead to finding of other useful phytochemicals. Also, further studies need to be carried out to investigate the presence of receptors in the brain and its specific interaction with certain phytochemicals, as the lack of this knowledge have led to unnecessary administration of multiple pesticides that have led to untargeted effects or adverse reaction.

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