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Traditional Botanical: *Platostoma africanum* as A Botanical for the Control of Pests of Medical and Veterinary Relevance

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ABSTRACT
Insects that once served a vital role in medicine and veterinary care have evolved into dangerous pests. There are insects that are significant clinically. With their feeding habits, they spread infections to man and his domestic animals by contaminating various bodily parts, such as their mouths, wings, and appendages. Effective biodegradable pesticides with higher selectivity are required to avoid these issues related to the application of broad spectrum synthetic pesticides. Pesticides called botanicals are made from plant ingredients. In this study, *Platostoma africanum* was evaluated as a potential botanical for the management of pests with potential medical and veterinary importance. The researchers extracted the various plant parts into aqueous and organic solutions, evaluated the effectiveness of the extracts based on the extraction process, and examined how the extracts affected some insect pests of medicinal and veterinary value. Working with such botanicals is advised to be done in an enclosed space at room temperature because the active components of *P. africanum* are unstable when exposed to direct sunlight. Future research should take into account the fact that *P. africanum* can benefit from the combination of two or more botanicals.

Keywords: Platostoma africanum, Botanical, Repellents, Toxicants, Antifeedants

Pesticides made from plant-based components are known as botanicals [1]. As they are less dangerous, biodegradable, and preserve a balanced variety of insect pests, they are particularly successful at preventing and controlling insect infestations [2]. The use of botanicals dates back into the centuries where humans would either burn an entire plant or use preparations from certain plant components to control insects [3].

African native plant *Plastostoma africanum,* also known as *"Mani"* in Liberia, *"Manding - Bambara"* in Senegal, in Ghana, *"Akan - Osante"* in Ghana, *"Akan - Brong," "Guere," "KruGuere," and "Kyama"* in Ivory Coast, *and "MkpriIbok - ukpong" in (Efik – Nigeria),* is usually observed in landfill areas and moist locations sub-Saharan African countries, with a distinct minty odor. The leaves are oblong, sharp or sharply cordate, and have whole or crescent edges at the base. They are terminated with 2 – 4 cm long leaf stalk [4]. The seeds and leaves of *Plastostomaafricanum* are used to treat infant's allergies, sore

throats, headaches and fever in Ghana. In Liberia, it is used as a stomachache medication [5]. The leaf is utilized as a local homeostatic pharmacological agent, an anesthetic, and an anti-abortifacient. Individuals with fungus on the lips are given an ash of *Plastostoma africanum* formed from burning its shoots as a therapy and painful throat reliever. Its roots have sexual properties [6]

The usage of pest control methods has economic and ecological repercussions, which must now be addressed. The persistent use of synthetic and oil-derived chemicals in the fight against hazardous insects for the past 50 years has had unfavorable indirect consequences [7]. The use of native plants as insecticide is widespread in developing nations. As these plants produce phytochemicals to protect themselves from insects, manufactured pesticides could be replaced with active compounds obtained from these plants that are effective insecticides. It is therefore appropriate direction for Ghana because this study will access and develop a traditional unsophisticated botanical from *P. africanum*to control these deadly insects.

The researchers acquired the Platostoma africanum plant in Navrongo, Ghana. The biological science department identified the plant at the University for Development Studies' Department of Applied Biology. The leaves, stem, and root of the plant were separated. The plant was properly washed under running water, rinsed with distilled water, and then chopped into little pieces for each component. In an open space with active ventilation, the leaves, stems, and roots were sun dried until they reached a steady weight. Using an electric blender, the individual components were minced and ground into a fine texture.

Anopheles larvae were collected from Navrongo. The larvae were put in a plastic container that had some water in it and were given fish meal mash as food. Some of the larvae turned into pupa after about 4 days, which were then relocated into another plastic container and put in a cage made of wire gauze.

The plant material from *P. africanum* was soaked for two weeks in either a powder form or a decoction form, during which time it underwent fermentation and produced alcohol on-site, making it easier to extract the plant's active ingredients. Water was used as the solvent to remove the ground-up plant matter from the *P. africanum*. The aqueous *P. africanum* solution was made by both squeezing juice and dissolving in water, as done by N'Guessan [8]. According to N'Guessan [8] soaking plant extracts in water for a longer time boosts their toxic effects. As was done by [9], 330ml of ethanol was added with *P. africanum*powder and stirred each day for approximately a week.

In accordance with [10] methodology, the plant materials were sun-dried, crushed into a powder form using an electrical mill, and then samples were filtered with a fine mesh (0.25 mm diameter sieve) .

Two pieces of meat were utilized in the test of *P. africanum as a* deterrent, one as experimental (A) and the other as a control (B). Meat in bowl (A) was covered with *Platostoma africanum* powder while B was placed in a box without having the plant's powder applied to it. To test *P. africanum's* ability to repel, the meats were left out for a number of hours and the observations were recorded.

To test *P. africanum*as anti-feedant, ants from the Order Hymenoptera—one as a control (Cage B) and the other as experimental (Cage A)—were placed into insect cages. In Cage A, food items with *P. africanum* extract were introduced and observed to see whether the meal would make the insects turn away. The meal served to Cage B was untreated. Results from the experiments were obtained after two days of observation.

To test *P. africanum*as insects' growth and development inhibitors, 3 bowls were used to hold mosquito larvae. In each bowl, there were 50 to 100 larvae. The bowls were labeled A, B, and C. A and B were the standard and C as the control. Bowl A received 5 to 15 ml of *P. africanum* tincture. *P. africanum*(2g)

powder was put in a half-tablespoon portion to bowl B. In bowl C, no *P. africanum* extract is added. To determine which of the bowls housing the larvae mature into pupae and then into adults, the setups were left for 8 days.

To test *P africanum*as grain protectant, 30 bean grains were introduced into 2 bowls. Bowl A as the experimental and B as the control. While bowl B received no treatment, bowl A received a 15ml tincture of *P. africanum* that was left overnight to allow the alcohol to evaporate and the extract to concentrate on the grains. In both bowls, five bean weevils were placed and watched to see which grains would become infested.

Table 1: Results of *Platostoma africanum* as a botanical

***Platostoma africanum* as deterrent**						
Bowls		Time (hrs.)		Number of flies observed		
A		1 – 5 hrs.		None		
B		1 – 5 hrs.		5 – 10		
A		5 – 8 hrs.		1 – 3		
B		5 – 8 hrs.		9 – 15		
***P. africanum*as antifeedant**						
Setups	Time (day)					
	1 – 2 days	2 – 3 days	3 – 4 days	4 – 5 days	5 – 6 days	6 – 7 days
Cage A	1 – 5 active	1 – 3 active	1 – 3 active	1 active	1 active	None
Cage B	1 – 5 active	1 – 5 active	1 – 4 active	1 – 3 active	1 – 3 active	1 – 2 active
***P. africanum* as Insect Growth and Development Inhibitors**						
Set ups	Time (Day)					
	Day 1	2 – 3 days	6 – 7 days			
Bowl A	20 – 25 larvae	2 – 6 active pupa	None			
Bowl B	20 – 25 larvae	3 – 9 active pupa	None			
Bowl C	20 – 25 larvae	18 – 20 active pupa	8 – 15 adult mosquitoes			
***P. africanum* as natural grain protectants**						
Set ups	Time					
	1 – 3 days	3 – 7 days	5 – 15 days	19 days		
Bowl A	5 weevils	3 active weevils	0	0		
Bowl B	5 weevils	5 active weevils	10 active, 8 – 10 dead	15		

By activating olfactory or other receptors, the powdered *Platostoma africanum* deterred houseflies from the treated meat. This finding agrees with Singh and Agarwal [11] where they used Himalayan cedar wood oil (*Cedrus deodara: Pinaceae*) as a bioassay against house flies. Ocampo and Hsia [12] found that calamus oil, asarone, and its analogues dramatically decreased the fertility and hatchability of the kelp fly, *Coelopafrigida* (Diptera: Coelopidae), which is a member of the same Order as the house fly. The *P. africanum* prevented the houseflies from eating for around 5 hours while having toxic and

unpleasant effects on them, as shown in Table 1. Flies settlement on the treated meat after 5 hours indicates that the plants' repellent qualities have gone.

Due to the presence of allelochemicals that may impair digestion, *Platostoma africanum's* antifeedant properties may be employed to eradicate insects from the Order Hymenoptera, according to comparable research [13]. It reduced the ants' ability to feed. According to a related study by Alonso-Amelot [14] the phagodeterrency of the chemicals, post-consumption physiological stress, or a repellant effect may have an impact on an insect's decision not to feed on a plant. Table 1 shows that as the number of days went on, the number of ants in cage A, which contained treated *P. africanum* food material, significantly fell.

Platostoma africanum also had an impact on the stages of Anopheles mosquito development. According to Regnault-Roger and Hamraoui [15], botanicals have antifeedant effects against mosquito larvae and only cause a little amount of larval death. According to Konstantopoulou et al., [16] who conducted research along similar lines on the extraction of essential oils from Satureja, Origanum, and Mentha (Lamiaceae) against Drosophila auraria (Diptera: Drosophilidae), prevented the puparium of the flies from hatching.

The *Platostoma africanum* plant extract decreased the rate of oviposition as shown in Table 1, inhibited the adult emergence of stored product insects, and also decreased seed damage rates which is also in line with Tapondjou et al., [17]. Many of the treated grains germinated after the experiment, indicating that the treated grains retained their vitality. According to Rajasekaran and Kumaraswami [18], grains treated with plant extracts fully prevented insect growth. Moreover, the survival rates of larvae, pupae and adult emergence are decreased by plant derivatives [19]. Plant compounds also prevented the growth of eggs and immature stages inside grain kernels as observed by Boeke [20].

The botanical *Platostoma africanum* has the following qualities:

1. It is a repellent that promotes plant products security and pushes infestations away from treated materials by likely activating olfactory or other receptors.
2. An antifeedant which can prevent or disrupt insect feeding by distancing the treated materials from their natural appeal or flavor.
3. It serves as a natural pesticide for grains that are kept in storage by lowering the rate of oviposition, suppressing adult insect development and reducing seed damage rates.
4. Inhibition of insect maturation and development that had a negative impact on an insect's capacity to grow and mature, dramatically lowered larval, pupal and adult weight, prolonged the larval and pupal phase, and slowed pupal recuperation.

P. africanum efficiency is influenced by things like how long the extract is exposed to sunlight when drying and how long it is left out in the open at room temperature. *Platostoma africanum*active components are unstable in direct sunlight, hence conducting research on these botanicals should be in an enclosed space at room temperature. Future studies should mix *P. africanum* with a different plant that is known to keep insects away in order to test for any synergistic effects on insects of interest.

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Conflict of Interest

The authors declare that, they have no conflict of interest.

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