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EFFICACY OF *PARTHENIUM HYSTEROPHORUS* AGAINST COCKROACHES IN AKSUM UNIVERSITY, TIGRAY REGION, NORTHERN ETHIOPIA

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ABSTRACT

Parthenium hysterophorus is a serious weed of pastures, wasteland and agricultural fields in the world. This study was aimed to assess the efficacy of *Parthenium hysterophorus* extraction against cockroaches in Aksum University, Department of Biology laboratory, Tigray, Ethiopia. *Parthenium hysterophorus* containing its flower, root, stem, bark and leaf and cockroaches were collected from the campus. The parts of *Parthenium hysterophorus* were allowed to dry separately and made as a powder. Equal amount (3g) of powdered part of the plant were taken, distilled with 25ml of tap water with 10 ml of acetone then filtered using filter papers in to the funnels. Petri dishes were also prepared by dividing in to two equal halves having a gap between them then the extractions were dropped in one half of the Petri dishes and cockroaches were placed in the gap of the two halves then covered by a mosquito nets. The second half of the Petri dishes was used as control. Repellence capacities of all the extraction against cockroaches were observed. Extractions of *Parthenium hysterophorus* from Leaf + Flower followed by root + bark was found to be the most effective resulting in maximum effective mortality of cockroaches and the least was the extraction of all. Although the efficacy of the extractions of the different parts of *Parthenium hystrophorus* against cockroaches was assessed with their variations, it is recommended to evaluate its efficacy at different doses.

Keywords: Acetone, Aksum University, Cockroach, Extraction and *Parthenium hysterophorus*

INTRODUCTION

Parthenium hysterophorus is a serious weed of pastures, wasteland and agricultural fields in the world. Various problems are posed by the weed to human health, agriculture, live stock production and biodiversity (Veena and Shivani, 2012). It is poisonous and problematic weed posing serious threat to crop cultivation and also to human and animal health. It is commonly known as santa Maria, bitter weed, carrot grass, false rag weed, fever few, *Parthenium* weed, raw weed *Parthenium* and white top (Charsadda *et al.*, 2004). It has naturalized in several tropics and sub tropical part of the world. The plant now widely distributed in India, china Vietnam pacific island, Mexico, Jamaica, Argentina and Australia. In India, it was first recorded in 1810 in a runachal Pradesh, Nagaland and in pune in 1972 (Gnanavel, 2013). It had spread in to the majority of the western states from Kashmir in the north to Kerala in the south (Gnanavel, 2013).

According to Gnanavel (2013), the devastating invasive weeds *Parthenium* (*Parthenium hysterophorus*) is making an unwelcome advance in the countries around world from its birth place in Central America. The scourge known in Ethiopia national language Amharic as "sign" year away has now spread to Africa, Asia and Australia in Africa extends from Ethiopian in the North to South Africa in the south (Pankaj, 2001). Where ever it goes it reduced crop yield adversely affected the livestock production by taking over pasture and

affects the test of cow Milk that damage human health (Veena and Shivani, 2012). This weed grows luxuriantly established gardens plantation and vegetable crops. Due to its high fecundity a single plant can produce 10,000 to 15,000 viable seed and these seeds can disperse and germinate to cover large area. This alien weed is believed to have been introduced to India as contaminates in 480 wheat (public low 480 passed in 1954 to give food grants to developing countries for eliminating starvation and malnutrition) (Patel, 2011).

Approximately two million hectares land in India has been infested with this herbaceous plant (Patel, 2001). *Parthenium hysterophorus* was first reported from Ethiopia at Dire Dwa Harergae and eastern Ethiopia in 1980 (Lisanework Nigatu *et al.*, 2010). *Parthenium hysterophorus* is distributed in eastern Ethiopia along the Dire Dawa, Addis Abeba rail way central Shoa and Wollo, North Ethiopia Sidamo along the main road from Moyale to Asella. Most are major food aid distribution center and there is a strong justification that *Parthenium hystrephorus* seed were imported from sub tropic North America as a contaminating of grain food aid during the 1980 famine and distributed with the grain. *Parthenium hysterophorus* has been causing serious damage in Ethiopia since its discovery in 1980s as exotic invasive species (Lisanework Nigatu *et al.*, 2010).

Cockroaches (insects) have a numerous impact on furniture's, woods, health of human beings (Teklay Meles *et al*. 2012) and other related organisms since they are reservoirs or carrier for medical importance parasites of human in houses as *Enterobius vermicularis* and *Ascaris lumbricoids*. They have an ability to carry disease causing microorganisms on the surface of their body and they transfer those microorganisms towards the food that we can eat and then the food become contaminate a result that infected by different kinds of disease. So, the study was conducted on the efficacy of *Parthenium hystrephorus* on cockroaches to decrease their impact on the health of human being and other related animal health.

Therefore, this study was aimed to assess the efficacy of *Parthenium hystrophorus* against cockroaches in Department of Biology laboratory, Aksum University, Tigray, Ethiopia.

MATERIALS AND METHODS:

Description of the study area

This study was conducted in Aksum University Department of Biology laboratory, Axum town, central zone of Tigray, Northern part of Ethiopia. Axum is located at 1024 km far from Addis Abeba and 241 km from Mekelle. It is surrounded with Adwa in the east, Tahtay Maichew in the west, Merebleke in the south and Nader Adete in the north direction. It is located with an elevation of 2130 meter above sea 1evel at 14°7′N 38°44′E coordinates. The total coverage area of the study area is measured about 107 hectare. It is composed of silt, sandy soil, and woody plants. The climatic condition of the study area varies greatly from month to month and from year to year. Its annual temperature is measured about 24 ^{o}c up to 30 ^{o}c throughout the year. Most of the time the place get rain fall once a year, that is from half of May up to August. The average rain fall of the study site is estimated about 763 mm throughout the year (Central Statistics Agency, 2011).

Data collection Methods

Materials

Nets, Petri dish, Funnels, Filter paper, Conical Flask, Spatula, Scissors, Electronic balance, Erliminer flask, Acetone, Mortal & pistle, Cockroaches, Sieve, Tap water and *Parthenium hystrophorus*.

Plant collection and application of plant powder

Parts of the *Parthenium hysterophorous* (stem, flower, bark, root and leaves) were collected from the campus and allowed to dry in the open air for as long as one month. After being dried well, all the dried parts of the plant were crushed using mortar and pestle (Tesfu and Emana, 2013) and then 3g of each part (stem, flower, bark, root and leaves) were weighted and allowed to dissolve with 25ml of tap water with 10ml of acetone (to facilitate the extraction process). Taking the combinations of two of the crushed parts becoming a total of 3g and allowed to mix then extracted. Taking the combinations of three of the crushed parts becoming a total of 3g was allowed to mix, extracted and filtered using filter papers in the funnels.

Cockroach collection

Cockroaches were collected from the cafeteria and student dormitories of the campus using mosquito nets then allowed staying in the laboratory having the food for their survivals. After plants and cockroaches were collected, dried and crushed, 3g/25ml of tap water with 10ml of acetone and their combinations were taken, extracted then filtered. The Petri dishes were prepared and divided in to two equal halves having a gap between them. Half of the Petri dishes were filled with 0.5ml of extraction of *Parthenium hysterophorus* parts and or combinations and the second half also filled with

water as a control group. Cockroaches were released in between the two halves of the Petri dishes and then covered by mosquito nets to prevent them from escaping.

Data Analysis
Tables that contain numbers were used to represent the data. Detail descriptions of each of the result parts were also added.

RESULTS AND DISCUSSION:

Effect of extraction of *Parthenium hysterophorus* parts on mortality of cockroaches

Repellence capacity of all the parts of the selected plant species against cockroaches were observed (all the released cockroaches were run away from the borderline between the treated zones to the untreated zone with plant parts) (Table1). This may be due to insecticidal activity of the *Parthenium hysterophorus* plant that makes the cockroaches to escape from half of the petri dishes containing the extractions. *Parthenium hysterophorus* leaf + flower extract followed by root + bark was found to be the most effective resulting in maximum effective mortality of cockroaches and the least was the extraction of all parts i.e. combinations of one with the other parts (More than two combinations). The leaf + flower extraction kills the cockroaches immediately within six minutes (Table 1). This could be due to the poisonous nature of this plant species highly accumulated in its leaf and flower parts. The current finding shows that the poisonous or acidic nature of the extraction reduces when it is mixed more than two extracted parts. This could be the reason why it takes time to kill the cockroaches. The current finding correlates with the findings of (Veena and Shivani, 2012) studied on Biological utilities of *Parthenium hysterophorus* in India that shows the insecticidal effect of plant powders may attribute repellence, stomach poisoning effect where insects feed on admixed grains and pick up lethal doses of treatment particles, and these powders might reduce insect movement and also cause death through occlusion of their spiracles, thereby, preventing respiration via trachea.

Table 1 Response of *Parthenium hysterophorus* extraction against cockroaches

SNo	Extraction	Response in time
1.	Root	26-30minutes
2.	Leaf	42-55minutes
3.	Flower	15-24hrs
4.	Stem	18-24hrs
5.	Bark	14hrs
6.	Leaf + Root	14hrs
7.	Flower + Leaf	6minutes
8.	Flower + Bark	21hrs
9.	Leaf + Bark	22hrs
10.	Root + Flower	23hrs
11.	Root + Bark	12minutes
12.	Bark + Stem	6hrs
13.	Root + Stem	20hrs
14.	Flower + Stem	14hrs
15.	Flower + Leaf + Stem	24hrs
16.	Flower + Stem + Bark	24hrs
17.	Stem + Root + Leaf	24hrs
18.	Flower + Stem + Root	24hrs
19.	All parts together	24hrs

RESEARCH HIGHLIGHTS

- Powders of methanolic extract from different parts of *Parthenium hysterophorus* (stem, flower, bark, root and leaves) were prepared in different combinations used as treatments.
- Efficacies of different parts of *Parthenium hysterophorus* against insects of different spp. of Blatta (Cockroach) were studied.
- Research findings of this study revealed that the solvent extracts of the plant exhibited both insect repellent and insecticidal activities which were dose dependent in nature.

LIMITATIONS

- Generally Herbs are not without disadvantages, and Phyto medicine is not appropriate in all situations but it is highly useful for domestic purposes
- The following limitations were identified by the researchers in the present experimental study: The insect repellent and insecticidal activity method was crude and consumes more time; this method was traditional method, so there was no real time monitoring regarding insect death over time; maintaining permanent record of data is difficult; collection and handling of test organisms during experimental study were difficult; Usually poison risk associated with wild herbs.

CONCLUSION AND RECOMMENDATIONS:

The present laboratory investigation of the efficacy of *Parthenium hysterophorus* parts showed insecticidal property against cockroaches. However, the distributions of the acidic nature of the extractions vary on its different parts. The time interval of the ability of the extractions varies and

reduces when the mixture of the extractions increased from two to three combinations. Chemical property of each of the *Parthenium hysterophorus* extractions at different doses should be investigated

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