*International Journal of Plant & Soil Science*
*4(5): 494-498, 2015; Article no.IJPSS.2015.048*
*ISSN: 2320-7035*

**SCIENCEDOMAIN** *international*
www.sciencedomain.org

# Effect of Cashew Leaves and Stem-Bark Extracts on the Germaination of Maize

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***Authors' contributions***

*This work was carried out in collaboration between both authors. OWN designed the study, wrote the protocol, managed the experimental process and wrote the first draft of the manuscript. BSE managed the literature searches, analyses of the study, and identified the species of plant. Both authors read and approved the final manuscript.*

***Article Information***

DOI: 10.9734/IJPSS/2015/14409
Editor(s):
(1) Francisco Cruz-Sosa, Biotechnology Department, Metropolitan Autonomous University Iztapalapa Campus Av. San Rafael Atlixco 186 México City 09340 México.
Reviewers:
(1) Anonymous, South Dakota State University, USA.
(2) Onofre S. Corpuz, Research and Development, Cotabato Foundation College of Science and Technology, Philippines.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=777&id=24&aid=7067

***Original Research Article***

***Received 29th September 2014***
***Accepted 11th November 2014***
***Published 22nd November 2014***

## ABSTRACT

A study was carried out on *Anacardium occidentale* Linn. (cashew) from Uturu community of Isukwuato local government in Abia state Nigeria to determine the effect of its leaves and stem-barks extracts on the sprouting of maize seeds. The seeds were allowed to sprout having met all the necessary conditions required for sprouting. While the seeds were placed for sprouting, concentrations of the extracts were prepared and administered to the seeds while the control which is distilled water was applied on the seeds used as control of the experiment. The rate of inhibition of the extracts gotten from the leaves and stem-barks increased with the increase in the concentration of the extracts. 75% concentration showed the highest inhibitory effect followed by 50% and then 25% likewise that of the stem-bark extracts. Results from this study, revealed that the leaves and stem-bark of the cashew plant contained substances that could inhibit the sprouting of seeds like that of maize.

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*Keywords: Anacardium occidentale; cashew; leaves and stem-bark extracts; sprouting; maize; allelopahthy.*

## 1. INTRODUCTION

*Anacardim occidentale* or well known as cashew plant, is a hardy drought-resistant tropical and subtropical tree. This species belongs to the genus *Anacardium*, a member of a family of *Anacardiacece*, which comprises about 60 genera and 400 species. This may grow up to as much as 15 meters [1]. The tree possesses a system of latex tubes that oozes a milky juice which comes out when injured. [2] Reported that the milky juice of the latex tubes of the stem yields a gum that is the basics of a special varnish used to protect books and wood from insect damage. Cashew fruits can be almost round, and sometimes elongated. The very young apples are green or purple, and later turns green. When ripe, the apple becomes red or yellow, or a mixture of these. Cashew apples contain about four times the vitamin C in other fruits [3]. The nut shell contains 90% anacardic acid and 10% cardol, which is used as lubricants, insecticides and in the production of plastics [4]. The cashew tree has an intensive lateral root system and a tap-root which penetrates deeply into the soil. After its emergence, the radicle rapidly develops into a tap-root which starts producing lateral roots four days later [5]. There is an increasing interest in allelopathic studies and recently many researchers have focused on the exploration of plant allelopathy [6]. Allelopathy is a mechanism to achieve a competitive edge among plant species growing in close proximity to another. The type of compound involved in allelopathy includes phenolic compounds, tannins, toxins and terpenes that reduce competition for nutrients' space and light. Allelochemicals may be released from plant tissues in a variety of ways, including volatilization, root exudation, leaching, and decomposition of plant residues [7]. Allelochemicals with negative allelopathic effects are an important part of plant defense against herbivory (i.e., animals eating plants as their primary food) [8,9,10] Studied the allelopathic effects of cashew on the growth of maize and cucumber. [11] Suggests that aqueous extracts of allelopathic trees especially those of A. indica and M. indica can be used to treat the wheat grains for 10 minutes before sowing or storage to reduce the fungal incidence. [12] Showed that aqueous extracts of plants viz., *Allium sativum, Cymbopogon proxims, Carum carvi, Azadirachta indica* and *Eugenia caryophyllus* had strong antifungal activity against fungi viz., *Fusarium oxysporum, Botrytis cinerea* and *Rhizoctonia solani*. This work is aimed at studying the allelopathic effect of cashew leaf and stem-bark extracts on the sprouting of maize.

## 2. MATERIALS AND METHODS

The maize seeds BR9928DMR (Stem-borer resistant maize varieties) used for the work was collected from the national agricultural seed council at National Root Crop Research Institute, Umudike, Abia state, Nigeria. The samples, cashew leaves and stem-barks were collected from cashew plantation located at the premises of the National Root Crops Research Institute (N.R.C.R.I) in Abia state.

The samples were oven-dried at 55 c at their central services laboratory for 12 hours and ground into fine powder after which it was stored for later use. Cold water extraction was used in getting the extracts. 20 grams of each sample was weighed and soaked overnight in 150 mls of water in a beaker and allowed to stand. During the extraction of the filtrate, muslin cloth was spread over another beaker and the extract was poured through. The filtrate was collected to be used for the experiment while the chaff was discarded. The stock solution (100%) of both extracts was diluted into concentrations of 25%, 50%, and 75%.

### 2.1 Sprouting Studies

21 sterile Petri-dishes stuffed with cotton wool was soaked with three of extract concentration and distilled water was used for three Petri-dishes to serve as the control. Ten seeds each were planted on them and allowed to germinate with twice a day wetting of the dishes to avoid dry out. After sprouting, the number of the germinated seeds was taken note of and the percentage sprouting calculated using the formular :

$$\text{Percentage germination} = \frac{\text{Number germinated}}{\text{Total planted}} \times 100$$

## 3. RESULTS

Tables 1a and 1b show the effect of cashew leave and stem-bark extracts on the sprouting of maize seeds. 75% concentration of the extracts had the highest inhibitory effect followed by 50% and then 25%. The leaves extracts showed very significant inhibitory effect than the stem-bark extracts. According to Duncan multiple range test at = 0.05, these effects had significant difference when compared to the control.

Fig. 1 shows the percentage sprouting of the maize seeds when treated with various concentrations of both extracts compared to the control. At 75% concentration, the leave extract greatly reduced the sprouting of maize seeds which confirmed that the leave extracts had serious inhibitory effects.

**Table 1a. Effects of various concentrations of leaf extracts on the sprouting of maize seeds**

| Treatment | Total number planted | Number sprouted | Percentage sprouting |
|---|---|---|---|
| Control | 30 | 29 | 96.7% |
| 25% | 30 | 23 | 76.7% |
| 50% | 30 | 19 | 63.3% |
| 75% | 30 | 14 | 46.7% |

**Table 1b. Effects of various concentrations of stem-bark extracts on the sprouting of maize seeds**

| Treatment | Total number planted | Number sprouted | Percentage sprouting |
|---|---|---|---|
| Control | 30 | 29 | 96.7% |
| 25% | 30 | 24 | 80.0% |
| 50% | 30 | 20 | 66.7% |
| 75% | 30 | 18 | 60.0% |

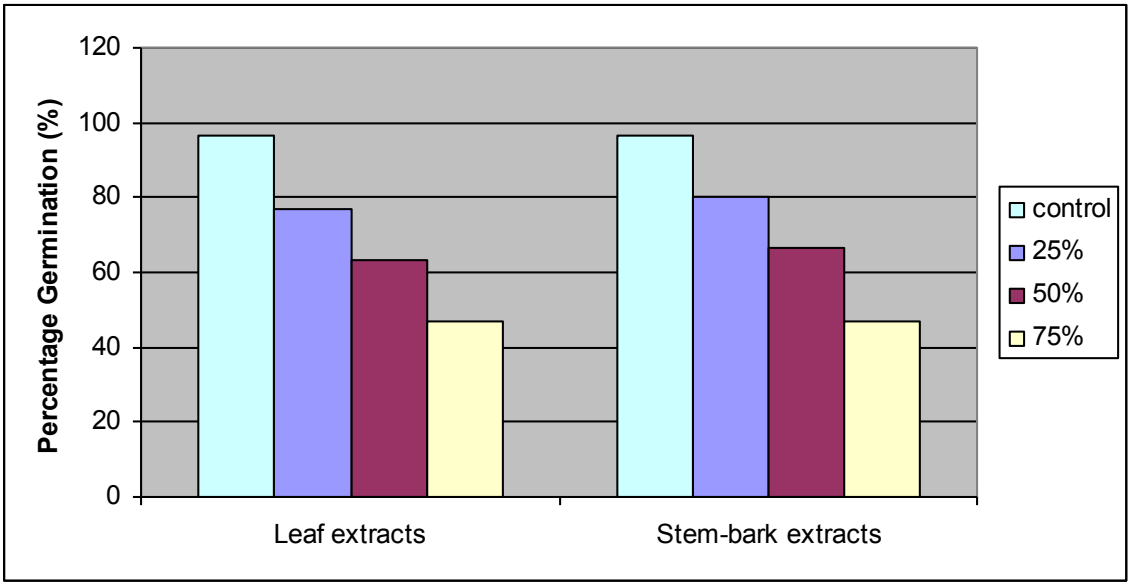


**Fig. 1. Showing the effect of cashew leaf and stem-bark extract on the percentage germination of maize**

## 4. DISCUSSION

The findings from this study showed that there were some phytochemicals in the tissues of *Anacardium occidentale* which showed significant phyotoxic effects on agricultural crop seeds of *Zea mays.* [13] Reported that both living and herbicidal killed guackgrass *Agropryon*

*repens* significantly reduced the growth of crops like groundnut. Since residues and water extracts were used in this experiment, chemical compounds (inhibitors) involved should be water soluble. It is likely that these compounds leach from the plant during the season and add to the rhizosphere zone [14]. Cashew retarded the crops' growth, which could happen due to inhibition of cell division because allelopathic chemicals have been found to inhibit gibberellins and indoleacetic acid function [15]. In addition, the allelopathic interaction depended on the chemical stability of bioactive compounds and the concentration of extracts used in the experiment [16]. According to [15], plants also appear to vary in their production of allelopathic chemicals depending upon the environment in which they are grown due to their response to various stresses that they encountered. [17] Reported that high concentrations of *A. occidentale* leaf-extract reduced the percentage germination of *Vigna unguiculata*. [18] Observed that inhibitory effect was proportional to the concentration of the extract in *Lantana camara* leaf extract.

## 5. CONCLUSION

The results of this study that provided enough evidence to conclude that *Anacardium occidentale* has shown a significant levels of allelopathy (inhibition) which has effectively decreased sprouting of *Zea mays*.. Various allelochemicals are present in the plant. These chemicals enter into the crops environment and adversely affect the growth of crop and reduce their yield. For the successful cultivation of maize, the seeds should be grown away from this plant.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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