AN INVESTIGATION OF ALLELOPATHIC EFFECT OF *Anogeissus leiocapus* LEAF EXTRACT ON MAIZE, COWPEA AND SORGHUM.

***GARBA, A., ** ABUBAKAR I. A. **Y. HARUNA, ***S. ADAMU**

**Department of Forestry Technology, Federal Polytechnic Bauchi.*
***Department of Agricultural technology, Federal Polytechnic Bauchi.*
****Department of Animal Health and Production technology, Federal Polytechnic Bauchi*

Abstract

Extracts from leaves of Anogeissus leiocapus was used to test the inhibitory effect on stimulation of hypogeal development and epigeal growth of maize, cowpea and sorghum. The study was conducted under laboratory conditions. The aqueous extract of the tree species was prepared by chopping 50g fresh leaves and soaked in 120ml of distilled water and kept overnight. The effects of extracts from these tree species was compared with distilled water. The extract shows remarkable inhibitory effect on the hypogeal growth on the three receptor plant.

Keywords: Allelopathy, Allelochemicals, Inhibition, Receptor, Hypogeal

INTRODUCTION.

The ecological term Allelopathy has been defined as an adverse influence of one plant or microorganism on another (Rice,1984). In agricultural practice, allelopathy is exploited for weed control (Kohli et al., 1998). Association and dissociation pattern between certain plant species are widely known. Such phenomenon may be governed by direct competition for necessary growth factors or through addition of allelopathic chemicals into the soil environment (Einhelling, 1996; Ashrafi et al., 2007). It has been documented that allelopathy may play an important role in plant-plant interference by those chemical compounds (Inderjit and Dakshini, 1992). These biochemicals or allelochemicals can be beneficial (positive allelopaty) or detrimental (negative allelopaty) on the target organisms. Allelopaty, may also play an eminent role in the intraspecific and interspecific competition and may determine the type of interspecific association.

The allelochemicals are present in virtually all plants viz, roots, stem, leaves and fruits (Rice, 1984). Allelochemical are produce by plants as end products, byproducts and metabolites. Most of the allelochemicals are secondary metabolites and produced as byproducts of primary metabolic pathway. Allelochemical can be released into the environment by process like weathering, volatilization, root exudation, leaching and decomposition of plant residues (Gross and Parthier, 1994; Seligler, 1996). Under specific conditions these chemicals are released into the environment in ample quantities and long persistence to affect a neighboring or succession plant (Chou, 1990).

The need to reduce harmful environmental effects from the overuse of herbicides has encouraged the development of weed management systems which are dependent on ecological manipulations rather than agrochemicals (Liebman and Ohno, 1997; Zoheir et al., 2008; Zoheir et al., 2009). Studies on the allelopathic influence of trees on cropped lands of the semi-arid tropics on crops are rare. El Atta and Bashir (1999) reported the adverse effects of oil extracted from *Eucalyptus camaldulensis* on germination of wheat.

There is a need to screen the inhibitory influence of a wide range of water extracts, from some promising indigenous agroforestry trees in the drought prone region of Nigeria, on germination and seedling growth. Therefore, this study was intended to evaluate the possible effect of, *Anogeissus leiocapus*, on the growth and germination of *Sorghum vulgare, Zea mays and Cowpea* with which they are usually grown in close proximity in various communities of Bauchi state.

MATERIALS AND METHODS

Leaves were obtained from a matured tree of *Anogeissus leiocapus* which was identified using Hutchinson

Materials used

Distilled water

Plastic container with lid

Marker for labeling

Chopping knife and cutting board

Strainer

Petri dishes (1 per replicate. One replicate = one Petri dish with 10 seeds)

Filter paper disks, same size as Petri dishes (1 per replicate)

Droppers

Seeds { *Zea mays* L (Poaceae), cow pea (Fabaceae), and *Sorghum vulgare* pers (Graminaceae)}10 per replicate

Plant material**:** leaves of *Azadiracta indica, Eucalyptus camaldulences, Anogeissus leiocapus*

Preparation of Extract.

Deena Singh *et al.*,(1999) method was used for the preparation of extract. 50g of Fresh leaves of *Anogeissus leiocapus* was chopped and soaked in 120m distilled water overnight in plastic containers. The content was then strained solute removed and the extracts obtained sealed and kept in a refrigerator. Clean filter paper disk were placed in the bottom of two sets of five clean and numbered (1-5) Petri dish. The set was marked extracts A, and the other was marked control. 10 seeds of *Zea mays* and Cow pea and 20 seeds of sorghum were placed in each of the Petri dish.

Dropper was used to wet the filter paper with 10ml of extract A set of the Petri dish and 10ml of water for the other set which is the control. This continued for ten days.

Germination percentage

The number of germinated seeds were counted on the tenth day and germination percentage was calculated by using the following formula.

$$\text{Germination percentage} = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds sown}} \times 100$$

Shoot length

The young shoots of seedlings were measured using centimeter scale and recorded

Statistical analysis

Statistical mean was used to analyzed the results

Calculation of inhibitory effect

The formula described by Sundra and Pote (1978) was used to calculate the inhibitory percentage of the leaves extracts in relation to the control.

Thus : $I = 100 – (E2 \times 100/E1)$.

Where,

I = % Inhibition

E1 = Response of control plant

E2 = Response of treated plant.

Result and Discussion

Table 1. Showing effect of fresh leave extract of *A. leiocapus* Germination percentage of Maize, Cow pea and Sorghum.

Treatments	maize	Cowpea	sorghum
control	76	72	50
Trt	96 (-26.3)	86(-19.4)	50(-0.0)

Values in parenthesis represent inhibitory effect in comparison to the control

Table 1 show the germination percentage of the treatments for the three receptor seeds. Under treatment A sorghum shows the lowest inhibitory value of 0.0 , then followed by cow pea with the value of -19.4 and lastly maize with value of -26.3. This corresponded with 50, 86 and 96 germination percentage respectively. Comparing

Within the column, in the maize column, treatment A (Neem extract) was observed to have the lowest value with 18.4 then followed by treatment B with 21,1 then treatment C which has lowest value of 26.3. The germination percentage of treatment B and C are higher than the germination percentage of the control. This implies that these extract (Eucalyptus and Anogeissus) at that concentration level have positive allelopathic effect on the germination of maize. For the cowpea, Neem has highest inhibition with 16.7 then followed by Anogeissus with 19.4 and lastly Eucalyptus with 30.6. A reverse trend was observed in the case of Sorghum, seed germination percentage was highest in seeds grown under the Neem extract (70) and -40 inhibitions. And germination percentage has the lowest value under treatment C (Anogeissus extract) 50 and -0.0 inhibition.

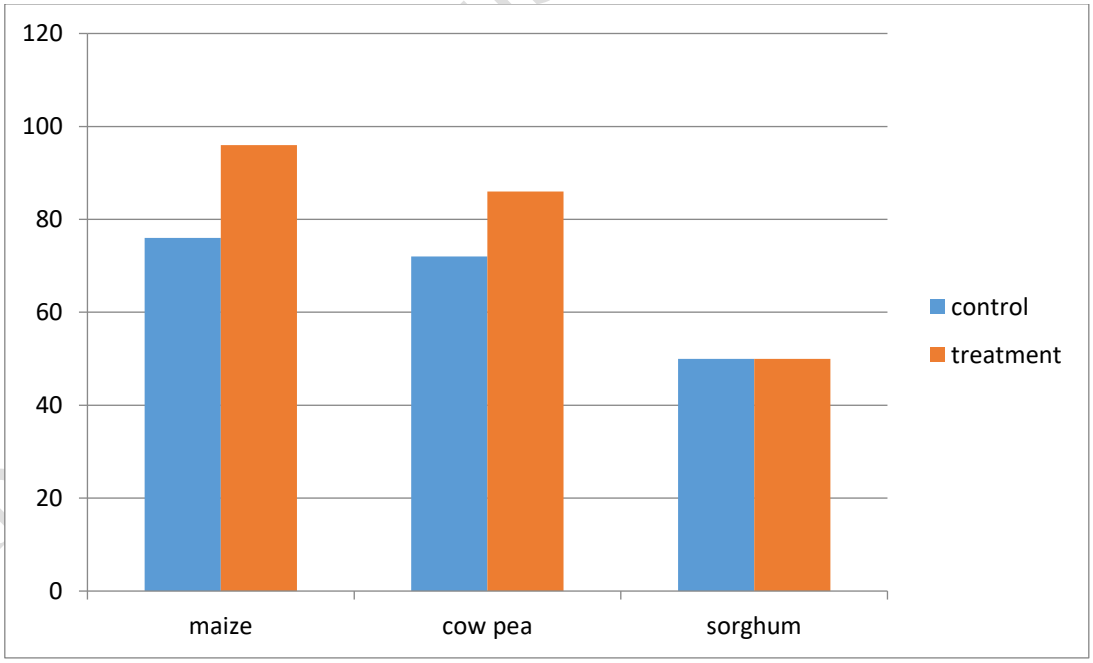

Figure 1: showing effects of fresh leaves extract of ***A. leiocapus*** on germination percentage of maize cowpea and sorghum.

Table 2: Showing the effect of fresh leaves extract of ***A. leiocapus*** on hypogeal development of maize, cowpea and sorghum

Treatment	Maize(cm)	Cow pea(cm)	Sorghum(cm)
Control	3.08	3.11	1.48
Trt	1.13 (-36.69)	1.87(-39.87)	1.40(-5.40)

Values in parenthesis represent inhibitory effect in comparison to the control

Table 2 shows the average shoot length of all the receptors under the treatments and the control. Under treatment lowest value was observed with sorghum (-5.40) followed by maize with -36.69 and cowpea with the highest inhibition of -39.87.

Within the column, in the maize column treatment shows high inhibitory effect than the control with-36.69. In the cow pea column the high inhibition was observed with treatment (-39.87). In the sorghum column treatment has slightly higher inhibition as compared with the control

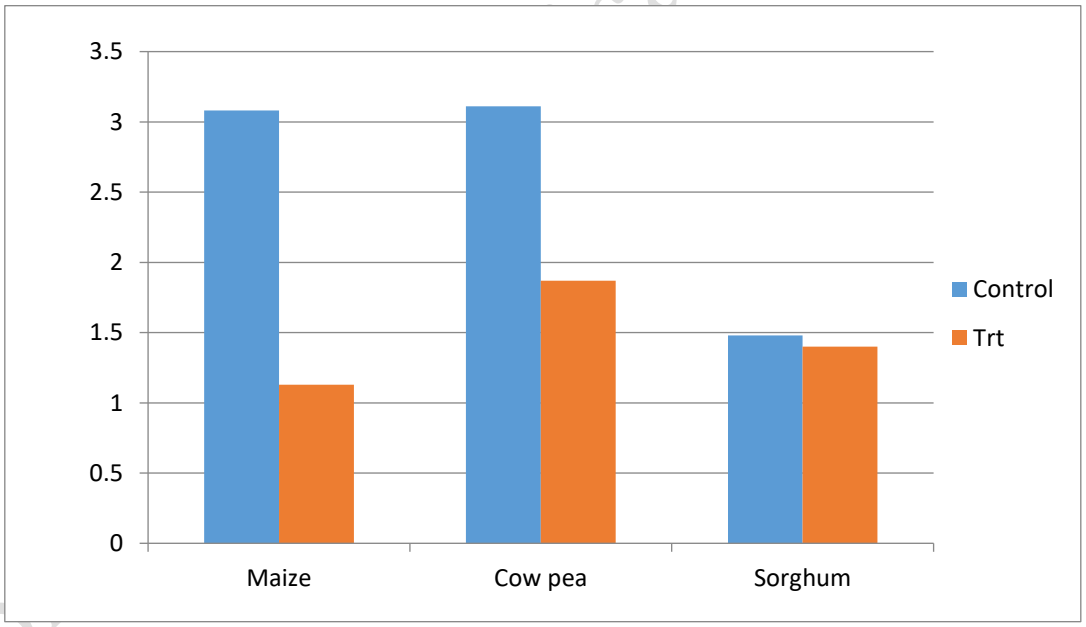

Figure 2: Inhibitory Effects of *A. leiocapus* on hypogeal development of maize, cow pea and sorghum.

The results of this study indicated that extracts from fresh leaves of *A. leiocapus* have allelochemicals with positive effect on seed germination and negative effect on the hypogeal growth of seedlings of maize and cow pea but with no effect on germination of sorghum and slightly retard the hypogeal development

sorghum.. This result showed that *A. leiocarpus,* reduces the germination of sorghum but positive allelopathy on maize and cow pea when compared with the control. The differences in the tolerance levels between maize, cow pea and sorghum could possibly be due to the selective permeability of the seed coat to the inhibitory substances (Zakaria & Razak, 1990). Allelochemicals might be inactivated in the soil by different factors such as chelating with ions, complication with soil colloids (both organic & inorganic), and decomposition by micro-organisms or mechanical forces. On the other hand, they might accumulate to toxic levels when environmental conditions favored the retention of allelochemicals in the soil (Purvis, 1990).

Conclusion

It could be concluded that extracts from fresh *A. leiocapus* litter are toxic to germination of maize ,sorghum and cowpea depending on the permeability of their seed coat. The hypogeal growth is more negatively affected by the extracts from This study therefore recommends further investigation on compatibility of these Phanerophyte species with the receptors

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