Nigerian Research Journal of Chemical Sciences **(ISSN: 2682-6054)**
Vol. 7, 2019

Herbicidal Properties of the Extract of Gliricidia Sepium, A *Fabaceae*

*I.A. Owokotomo and O.F. Afuye

Department of Chemistry, Federal University of Technology, Akure, Nigeria.

*Corresponding Author: adekunleowokotomo@gmail.com

ABSTRACT

The herbicidal efficacy of the aqueous suspension (5%) of the extract of *Gliricidia sepium* was investigated in petri dish assays. The constituent of *Gliricidia sepium* were extracted using ethyl alcohol and petroleum spirit solvent mixture (2: 1.5). The extract was tested on 3 monocots. Maize (zee mays), cowpea (*vignaunguiculata*) and okra (*okra spp*). The extracts acted as contact herbicide by inhibiting the seed germination and shoot growth of maize and cowpea, but no inhibitory effect on the germination and shoot growth of okra.

Key words: Cowpea, *Gliricidia sepium*, herbicides, maize, okra

INTRODUCTION

Gliricidia sepium, commonly known as 'Agunmaniye' in South-west, Nigeria, is a leguminous tree and belongs to the family fabaceae [1]. Gliricidia can be found in tropical and sub-tropical countries as a live fencing that is planted along the side of fields. The trees are usually medium size with composite leaves and has pink to lilac coloured flowers tingled with white. *Gliricidia sepium* contains many compounds, chief among them is tannin, which varies with the location of the tree [2]. Most of the research with *Gliricidia* and its compounds have focused on the nutritive quality. It is generally agreed that it is a high quality forage but of low palatability when first introduced to animals [3]. The smell of the leaves has been identified as the reason for the reluctance of animals to eat *Gliricidia* plant. However, some studies have focused on the ability of the plant and/or root to decrease soil nematodes populations and control insects or fungi [4].

Research has equally been conducted on the antifungal and the antimicrobial properties of *Gliricidia* extracts. Medicarpin, one of the compounds in the leaves and heart wood of *Gliricidia* is supposed to be anti-fungal and used in the treatment of dermatophytoses [5].

Indiscriminate use of chemical herbicides had given rise to many serious environmental problems as the chemicals find their way into the food chain [6].

In view of this, the present study was initiated to elucidate the herbicidal properties of the crude extract of *Gliricidia sepium* in order to make preliminary evaluation of its potential as agreen herbicide.

MATERIALS AND METHODS

The apparatus used was blending machine (Kenwood Major), 500 cm^3 separating funnel, measuring cylinder and funnel. Other materials include petroleum ether (40-60 $^{\circ}C$), 95% ethyl alcohol, petri dishes and cotton wool, which were all obtained from standard suppliers of laboratory materials.

The plant materials used were locally obtained. The *Gliricidia* leaves were harvested from a farm within the campus of the Federal University of Technology, Akure, Nigeria. Maize seeds variety Swam 1, Cowpea seeds and Okra seeds NH_4 (7-4) variety were obtained from Ondo State Agricultural Development Project, Horticulture Section, Akure, Nigeria.

Extraction

The constituent of *Gliricidia sepium* were extracted using the ethyl alcohol and petroleum spirit mixture [7]. About 15 g of *Gliricidia sepium* leaves was weighed into a blending machine containing 200 cm^3 of 95% ethyl alcohol and 150 $cm^3$of petroleum ether (40-60 $^{\circ}C$). The blender was run for 3 minutes to extract the constituents of the leaves. The residue was allowed to settle and the supernatant liquid was transferred into a separating funnel. Sufficient water was then added to make the alcohol concentration equal to about 80% after which the hypo-phase was separated from the epi-phase (at 80% concentration of alcohol, the alcohol becomes immiscible with petroleum ether). The residue was then washed four times with water (so as to remove the alcohol completely from the mixture) and was then concentrated to get the crude extract of *Gliricidia sepium*.

Seed germination and seedling growth bioassay

Five percent aqueous suspension of the oil extracted from the leaves of *Gliricidia sepium* was used for the screening for herbicidal activity in Petri dish bioassay using the modified method of Anason *et al* [8]. The petri dishes were lined with cotton wool and soaked with 2cm^3 of distilled water. The seeds were mixed separately with the prepared aqueous suspension of the *Gliricidia* extract and then spread evenly around the petri dishes (10 seeds per dish). Germinated seeds were counted after 7 days. The seedling growth was determined by measuring the length of shoot

for each seedling using a ruler. The controls were set up in like manner but without mixing with the *Gliricidia* extract.

RESULTS AND DISCUSSION

The data obtained from the effects of crude extract of *Gliricidia sepium* on the seed germination of maize, cowpea and okra (*okra spp*) seeds are shown on Table1-3 respectively. The result showed that the extract acted as contact herbicide by retarding the seed germination of maize and cowpea but had no effect on okra seeds. On the 7th day, only 30% of the maize seeds treated with *Gliricidia* extract germinated compared to the 100% germination recorded for the control. The same trend was recorded for cowpea, (Table 2) in which 20% germination was recorded in the case of seeds treated with *Gliricidia* extract whereas 70% was recorded for the control. Table 3 showed the result for the extract of *Gliricidia* on the germination of okra seeds, Okra seeds germination was not affected by the *Gliricidia* extract as 100% germination was recorded both for treated and control seeds by the 7th day of the experiment.

To further elucidate the potentials of the extract of *Gliricidia*, as contact herbicide, its effect on the seedling growth of the tested plant species were equally studied. Table 4, 5 and 6 show the inhibitory effect of the extract of *Gliricidia* on the shoot growth of maize, cowpea and Okra seedlings respectively.

Table 4-5 result show that the extracts of *Gliricidia sepium* affected the shoot growth of maize and cowpea since the shoot length of the seedling treated with *Gliricidia* extract were consistently shorter in length than the control throughout the duration of the experiment which is consistent with the previous study of the seed germination for both plants. Table 6 shows the shoots of okra were not affected by the extract, which is consistent with the other results because the okra seedlings were not inhibited by the extract.

Table 1: Effect of crude extract in Gliricidiasepium on the seed germination of Maize

Duration in days	% seed germination with G. sepium	%seed germination day(s) without G. sepium (control)
1	-	-
2	-	40
3	20	50
4	20	70
5	30	100
6	30	100
7	30	100

Table 2: Effect of crude extract in Gliricidia sepium on the seed germination of cowpea

Duration in days	% seed germination with G. sepium	%seed germination day(s) without G. sepium (control)
1	20	70
2	20	70
3	20	100
4	40	100
5	40	100
6	40	100
7	40	100

Table 3: Effect of extract in *Gliricidia sepium* on the seed germination of okra seeds

Duration in days	% seed germination with G. sepium	%seed germination day(s) without G.sepium (control)
1	0	0
2	0	0
3	0	0
4	90	100
5	100	100
6	100	100
7	100	100

Table 4: Effect of extract in *Gliricidia sepium* on the growth of the shoot of maize

Duration in day(s)	Shoot length with extract of *G.sepium* (mm)	Shooth length without extract of *G.sepium*(mm)	%growth of shoot
1	-	-	-
2	-	1.2	0
3	1.3	2.6	50.0
4	3.6	5.8	62.1
5	7.2	9.6	75.0
6	8.1	11.8	68.6
7	8.8	12.1	70.9

Table 5: Effect of extract in *G.sepium* on the growth of the shoot of cowpea

Duration in day(s)	Shoot length with extract of G.sepium (mm)	Shooth length without extract of G.sepium(mm)	%growth of shoot
1	-	-	-
2	0.8	1.8	44.4
3	1.3	2.6	50.0
4	5.1	6.2	82.3
5	12.3	14.5	84.8
6	14.6	18.4	79.0
7	15.8	20.6	76.7

Table 6: Effect of extract of *Gliricidia sepium* on the growth of the shoot of okra

Duration in day(s)	Shoot length with extract of *G.sepium* (mm)	Shoot length without extract of *G.sepium* (mm)	% growth of shoot
1	-	-	-
2	0.8	-	-
3	3.6	1.8	200.0
4	11.8	7.1	166.2
5	14.6	12.7	120.7
6	14.8	12.7	166.5
7	15.2	12.9	177.8

From the results obtained from the experiments, it is hereby inferred that *Gliricidia sepium* extract acted as contact herbicide because it affected the seed germination and shoot growth of maize and cowpea. Its lack of effect on the germination and seed growth of Okra may be indicative of species selectivity.

REFERENCES

1. Allien, O.N. & Allen, E.K. (1981). The leguminosae. The University of Wisconsin Press, pp: 812.
2. Jackson, F. S., Barry, T. N., Lascano, C. & Palmer, B. (1995). The extractable and bound condensed tannin content of leaves from tropical tree, shrub and forage legumes. *J. Sci. Food Agric.*, 71, 103 – 110.
3. Van Soese, P. J. (1982). Nutritional ecology of the ruminants, (2nd edn.), Cornell University Press, pp: 34-67.
4. Ganesan, T. (1994). Antifungal properties of wild plants. *Adv. Plant Sci*., 7, 185-187.
5. Caceres, A. H., Lopez, B. R., Giron, M. A. & Loyeman, H. (1991). Plant used in Guatemala for the treatment of dermatophytic infections. *J. Ethnophamcol*, 31, 263-276.
6. Ashton, F. N. & Crafts, A.S. (1981). Mode of antiobs of herbicides, (2nd edn.), Wiley and Sons, New York, pp: 525.
7. Alex Imodi (1978). Carotenoids – Properties and application. *Food Tech*., 5, 38-42.
8. Anason, T., Stein, J. R., Graham, E., Wat, C. K., Tower, G.H.N. & Lam, J. (1981). Phototoxicity to selected marine and freshwater algae of polyacetylenes from species in the asteraceae. *Can. J. Bot.*, 59: 54-58.