GLOBAL JOURNAL OF BIOLOGY, AGRICULTURE & HEALTH SCIENCES
(**Published By**: Global Institute for Research & Education)
www.gifre.org

ALLELOPATHIC EFFECTS OF *MORINGA OLIFERA* ON THE GERMINATION AND SEEDLING SURVIVAL OF *EUPHORBIA HETEROPHYLLA* L.

Ademiluyi Benson Oluwafemi (PhD)
Department of Plant Science, Ekiti State University, *P.M.B. 5363,* Ado-Ekiti,Nigeria

Abstract

Laboratory studies were carried out to test the allelopathic effect of fresh leaf aqueous extract (FLE) of *Moringa olifera* on the germination and early growth of *Euphorbia heterophylla* in the Department of Plant Science of Ekiti State University Ado Ekiti. Harvested fresh leaves of *Moringa olifera* were blended and 5 g, 10 g, 15 g and 20 g each of the material separately soaked in 100ml of distilled water for 24 hours and later filtered to make the FLE. 5ml from each filtrate was used to moisten the double laid filter paper in the Petri dishes and 20 seeds sowed in each. Speed of germination and germination percentage including other seedling growths were observed. The results showed that higher FLE concentration of *Moringa olifera* slowed down germination speed and also reduced total germination percentage of *E. heterophylla* than the lower concentrations and the control. No germination of *Moringa olifera* was observed at the highest concentration of 20 g *Moringa olifera*. All the growth parameters observed were reduced by higher concentrations of FLE of *Moringa olifera* more than the lower and the control. Seedling survival of *E. heterophylla* got reduced as the concentration of the fresh leaf extract of *M. olifera* increased. The result from this trial suggests that *Moringa olifera* possesses some bio-herbicidal properties that may be used to help suppress *Euphorbia heterophylla*.

Keyword: *Moringa olifera, Euphorbia heterophylla, fresh leave extracts, germination.*

1. Introduction

Euphorbia heterophylla known as Wild poinsettia originated in tropical America but now distributed in most of the tropical and sub-tropical areas of the world where it occurs as weeds of cultivated crops (Barreto and Evans, 1998; Berrecke, 1995; Bridges *et al*., 1992). *E. heterophylla* had been reported to be a major weed in Soyabean in the United States and Brazil; a major weed of Peanut and cotton in Georgia and Florida; it is also a major weed of cowpea (Moore *et al*., 1990; Willard and Griffin, 1993; Winkler *et al*., 2003). The plant becomes resistant to herbicides when it grows wild as weed (Falodun and Agbakwuru, 2003). Reports have shown that weeds do develop resistance to herbicides thus making herbicides less effective (Tranel and Wright, 2000; Deprado and franco, 2004). This development has led to attention being focused on the use of biosynthesized herbicides that are easily biodegraded. Among these is allelopathic chemicals which are believed to be safer than the synthetic herbicides (Dayan et al., 1999; Duke *et al*.,2000).

Moringa olifera has been reported to serve immense benefits as food, Vitamins and in folk medicine. *M. olifera* contains a complete food as it contains all the essential Amino acids required for healthy living (Vanisha et al., 2003). It possesses all the vitamins needed to keep the body healthy (Subadra and Vanisha, 2003). Leaf extracts can be used against bacterial or fungal skin complaints. Flower juice of *M. olifera* can also be used to improve the quality and flow of mother's milk when breast feeding (Fahey, 2005).

In addition to the numerous reported uses of *M. olifera*, its allelopathic effects had been studied and reported (Fuglie, 2000, Phiri and Mbewe, 2009, Phiri, 2010). The present work was therefore designed to investigate the allelopathic potential of *Moringa olifera* on the germination and seedling growth of *Euphorbia heterophylla* which had constituted a major weed problem in arable and plantation fields in the southern part of Nigeria.

2. Materials and Methods

The experiment was carried out in the Laboratory of the Department of plant Science of Ekiti State University, Ado Ekiti of Nigeria between July and October 2013. Two trials were made to ascertain the validity of the experiment. Matured seeds of *Euphorbia heterophylla* as well as fresh leaves of *Moringa olifera* were collected from within the University community. Collected fresh leaves of *M. olifera* were blended using pestle and mortar. The ground plant material was weighed separately into 5g, 10g, 15g and 20g and each soaked in 100ml of distilled water for 24 hours and then filtered. The filtrate served as the fresh leaf aqueous extract (FLE).

Twenty seeds of *E. heterophylla* were placed in each Petri dishes double laid with Whatman No1 filter paper. 5ml of FLE from the weighed 5, 10, 15 and 20g *T. diversifolia* was used to moisten the double laid filter paper where the seeds of *E. heterophylla* were sowed. A control experiment with distilled water used to moisten the Petri dish was also set up. The experiment was replicated 5times. The seeds were observed daily for germination count. Opening of the seeds with radicle appearance served as criterion for germination. Data were taken on germination percentage, speed of germination, radicle and plumule length measurement number of secondary roots and seedling survival at two weeks after sowing the seeds of *E. heterophylla*. All data collected were statistically analysed using the analysis of variance and means separated using the Fisher's least significant difference (LSD).

3. Results and Discussion

Table 1 shows the allelopathic effect of *Moringa olifera* on the germination percentage of *Euphorbia heterophylla*. The highest germination of *E. heterophylla* was recorded in the control dishes while the no germination was recorded in the Petri dishes containing 20 g per 100ml of *M. olifera* in Trial I and in both 15 g and 20 g in Trial II. The total germination percentage of *E. heterophylla* reduced as the concentration of *M. olifera* increased. Also the speed of germination of *E. heterophylla* was concentration dependent as the speed of germination decreased with increased concentration of *M. olifera* (Table 2).

The effects of FLE of *M. olifera* on the radicle and plumule lengths of *E. heterophylla* are presented in Tables 3 and 4. While the highest radicle and plumule lengths of *E. heterophylla* were recorded in the control dishes, the least was recorded in the 20 g dishes. The plumule length of *E. heterophylla* was completely retarded in the dishes that received 15 g and 20 g per 100 ml *M. olifera*. The inhibition of plumule length and plumule lengths of *E. heterophylla* by *Moringa olifera* in this study may be due to possible allelopathic compounds contained in the leaves of *M. olifera* which became phytotoxic to the growth of *E. heterophylla*. Similar compounds have been reported by Jabrane *et al*., (2008) and Cheema *et al*., (2000) in Eucalyptus and Sorghum plants respectively.

Table 5 shows the effect of FLE of *M. olifera* on the number of secondary roots produced by *E. heterophylla*. The control experiment produced the highest number of roots while no secondary roots were produced in concentrations of FLE of *M. olifera* above 10 g. Seedlings of *E. heterophylla* could not survive at concentrations of FLE of *M. olifera* above 10 g but the highest survival percentage was observed in the control. The reduction in number of secondary roots and subsequent reduction in survival percentage of *E. heterophylla* by higher concentration of FLE of *M. olifera* could be as a result of allelochemicals produced by *M. olifera* which might have retarded these growth parameters. It had been reported that allelochemicals can affect all ecological factors including growth, plant survival, canopy succession, extension and crop production (Ferguson and Rathinasabapathi, 2003).

The present study had been able to reveal the potential of *Moringa olifera* as bio-herbicide for the control of *Euphorbia heterophylla* as weed. Reports have shown that plant extracts have also been used in combination with synthetic herbicide to reduce the dose of herbicides used for effective weed control (Razzaq, *et al.*, 2010; Cheema, *et al.*, 2002; Cheema, *et al.*, 2003).

5. Conclusion

It is concluded that the application of extracts from *Moringa olifera* can serve herbicidal purpose in suppressing the germination and early growth of *Euphorbia heterophylla*. Further combination of this extract with herbicides can be researched into to increase the effectiveness of the extracts and reduce the dose of the synthetic herbicide.

Table 1: Effect of *M. olifera* on the germination percentage of *E. heterophylla*

Treatments	Germination percentage	
	Trial I	Trial II
0 g	85.0a	100.0a
5 g	45.5b	35.5b
10 g	15.0c	20.0c
15 g	5.0d	0.0d
20 g	0.0d	0.0d
LSD	8.40	7.74

Means followed by the same letter(s) within columns are not significantly different (P=0.05)

Table 2: Effect of *M. olifera* on the speed of germination of *E. heterophylla*

Treatments	Speed of germination	
	Trial I	Trial II
0 g	48.4a	33.6a
5 g	21.7b	19.2b
10 g	10.2c	7.8c
15 g	2.6d	0.0d
20 g	0.0d	0.0d
LSD	3.45	2.36

Means followed by the same letter(s) within columns are not significantly different (P=0.05)

Table 3: Effect of *M. olifera* on the radicle length of *E. heterophylla*

Treatments	Radicle length (mm)	
	Trial I	Trial II
0 g	28.a	34.2a
5 g	13.8b	16.0b
10 g	12.6c	11.6c
15 g	11.3d	0.0d
20 g	0.0e	0.0d
LSD	1.02	1.34

Means followed by the same letter(s) within columns are not significantly different (P=0.05)

Table 4: Effect of *M. olifera* on the of plumule length of *E. heterophylla*

Treatments	Plumule length (mm)	
	Trial I	Trial II
0 g	24.5a	26.3a
5 g	12.6b	11.8b
10 g	4.8c	3.5c
15 g	0.0d	0.0d
20 g	0.0d	0.0d
LSD	6.34	7.06

Means followed by the same letter(s) within columns are not significantly different (P=0.05)

Table 5: Effect of *M. olifera* on the number of secondary roots of *E. heterophylla*

Treatments	Number of secondary roots	
	Trial I	Trial II
0 g	10.3a	11.8a
5 g	8.1b	7.6b
10 g	5.6c	3.3c
15 g	0.0d	0.0d
20 g	0.0d	0.0d
LSD	1.21	1.06

Means followed by the same letter(s) within columns are not significantly different (P=0.05)

Table 6: Effect of *M. olifera* on the seedling survival of *E. heterophylla*

Treatments	Seedling survival (%)	
	Trial I	Trial II
0 g	85.0a	97.5a
5 g	16.5b	11.5b
10 g	6.4.0bc	4.0bc
15 g	0.0c	0.0c
20 g	0.0c	0.0dc
LSD	10.60	11.04

Means followed by the same letter(s) within columns are not significantly different (P=0.05)

References

Barreto, R.W. and Evans, H.C. (1998). Fungal pathogens of *Euphorbia heterophylla* in Brazil and their potential as weed bio-control agents. *Mycopathologia 141:21-36.*

Berecke, B.J. (1995). Wild poinsettia (*Euphorbia heterophylla*) germination and emergence. *Weed science, 43:103-106.*

Bridges, D.C., Berecke, B.J. and Barbour, J.C. (1992). Wild poinsettia interference with peanut (*Arachis hypogea*). *Weed Science 40: 37-42.*

Cheema, Z.A., Asim, M. and Khaliq, A. (2000). Sorghum allelopathy for weed control in cotton (*Gossypium arboreum*). *International Journal of Agric. Biology. 2:37-41.*

Cheema, Z.A., Iqbaj, J. and Khaliq, A. (2003). Reducing isoprotron dose in combination with sorgaab for weed control in wheat. *Pak. J. Weed Sci. Res. 9: 153–160.*

Cheema, Z.A., Khaliq, A. and Tariq, M. (2002). Evaluation of concentrated sorgaab alone and in combination with reduced rates of 3 pre-emergence herbicides for weed control in cotton (*Gossypium hirsutum* L.). *Intl. J. Agric. Biol. 4: 549-552.*

Dayan, F.E., Romagni, J.G.,Tellez, M., Rimando, A. And Duke, S.O., (1999). Managing weeds with biosynthesized products. *Pestic. Outl. 10: 185-188.*

De-prado, R.A., and franco, A.R. (2004). Cross –resistance and herbicides metabolism in grass weeds in Europe. Biochemical and Physiological aspects. *Weed Sci. 52: 441-447.*

Duke. S.O., Dayan, F.E., Romagni, J.G. and Rimando, A.M. (2000). Biosynthesized products as sources of herbicides. Current Status and Future Trends. *Weed Res. 40:99-111.*

Fahey, J.W. (2005). *Moringa olifera*: A Review of the Medical Evidence for its Nutritional Therapeutic and Propphylactic properties. *Tree for life Journals 1:5.*

Falodun, A. and Agbakwuru, E.O.P. (2003). Phytochemical Analysis and Laxative Activities of *Euphorbia heterophylla* L. (Euphorbiacea). *Pak. J. Science Res. 47(5): 345-348.*

Ferguson, J.J. and Rathinasabapathi, B. (2003). Allelopathy how plants suppress other plants. University of Florida. *Institute of food and Agriculture Science, UF/IFAS, Florida*.

Fugile, L.J. (2000). The Miracle Tree: *Moringa olifera*; Natural Nutrition for the Tropics, The Multiple attributes of *Moringa*. *Training Manual, Church World service, Darkar, Senegal. 172pp.*

Jabran, K., Z.A. Cheema, M. Farooq, S.M.A. Basra, M. Hussain and H. Rehman. (2008). Tank mixing of allelopathic crop water extracts with pendimethalin helps in the management of weeds in canola (*Brassica napus*) field. *Int. J. Agric. Biol. 10: 293-296.*

Moore, J.D., Banks, P.A. and Pimellalison, C.L. (1990). Wild poinsettia (*Euphorbia heterophylla* L) control in peanut (*Arachis hypogeal*). *weed Science, 38: 536-540.*

Phiri, C. (2010). Influence of *Moringa olifera* Leave extracts on germination and early seedling development on major cereals. *Agricultural Biology Journal 1: 774-777.*

Phiri, C. Mbewe, D.N. (2009). Influence of *Moringa oleifera* leaf extracts on germination and early seedling survival of three common legumes. *International journal Agricultural Biology 12: 315-317.*

Razzaq, A., Cheema, Z.A., Jabran, K., Farooq, M., Khaliq, A., Haider, G. and Basra, S.M.A. (2010). Weed Management in Wheat through Combination of Allelopathic Water Extracts With Reduced Doses of Herbicides. *Pak. J. Weed Sci. Res. 16 (3): 247-256.*

Subadra Seshadri and Vanisha S Nambiar (2003). Kanjero (*Digera arvensis*) and Drumstick leaves (*Moringa olifera*):Nutrient profile and potential for Human consumption. In: plants in Human Health and Nutrition policy. *World Review of Nutrition and Dietetics. Basel, Karger. 91:41-56.*

Tranel, P.J. and Wright, T.R. (2000). Resistance of weed to ALS-inhibiting herbicides. What have we learned? *Weed Science. 50:700-712*

Vanisha, S. Nambbiar, Meghna Daxini, Kalyani Bhadalkar (2003). Nutritional and sensory evaluation of shade dried beta-carotene rich drumstick leaf (*Moringa olifera*) recipes. *Indian Food Packer. 57 (6):156-161*.

Willard, T.S. and Griffin, J.L. (1993). Growth responses of Wild Poinsettia (*Euphorbia heterophylla* L.) following folia herbicide applications. *Weed Technology, 7: 190-195.*

Winkler, L.M., Vidal, R.A. and Neto, J.F.B. (2003). Caracterizaco genetic de *Euphorbia heterophylla* resistente a herbicidas inidores de acetolactoat sintase. *Pesqu. Agropeca. Bras. 38: 1067-1072.*