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The effect of aqueous leaf and stem extracts of Senna alata (L) Roxb. on the flowering and fruiting of okra (*Abelmoschus esculentus* and groundnut (*Arachis hypogea*).

Osuagwu G. G. E and Anyanwu, M. I.
Department of Plant Science and Biotechnology, Michael Okpara University of Agriculture, Umudike. Umuahia Abia State Nigeria.

Abstract: *The effect of aqueous leaf and stem extracts of Senna alata (L) Roxb. on the flowering and fruiting of okra (Abelmoschis esculentus) and groundnut (Arachis hypogea) was investigated. S. alata extracts prepared in the following dilutions 1.1, 1:2.5 and 1:5 (v/v) from the original extracts and distilled water which served as control were used for treatment. There was significant reduction (P< 0.05) in the number of flowers, number of fruits, length of fruits and weight of fruits of the plant species as a result of treatment with aqueous extracts of S. alata. The concentration of the extracts affected the rate of the effects of the extracts on the flowering and fruiting of the plants species. The higher the concentration, the more the inhibitory effects of the extracts. This observation indicates the presence of compounds in S. alata that are capable of inhibiting the flowering and fruiting of plants.*

Key words: *fruiting flowering, inhibitory, Senna alata, Okra, groundnut.*

I. Introduction

The growth and development of plants which comprises germination, seedling growth, flowering and fruiting are positively or negatively influenced by various factors which include exogenously applied substances. These substances include growth hormones and other secondary metabolites [6; 11]. Flowering and fruiting of plants have been reported to have been influenced by the application of exogenous growth substances [4; 14; 19; 23].

The application of plant extracts is known to have either induced or suppressed the flowering and fruiting of plants. Treatment of plants with plant extracts has been reported to induce flowering in plants [2; 10; 12]. On the other hand, planted extracts also have been known to suppress flowering in plants [9; 15; 20].

The fruiting of plants has been reported by researchers to be influenced by exogenous application of plant extracts. The report of Norrie and Keathley [17], indicated that the fruiting of Thompson seedless grape plants was induced by treatment of the plants with extracts of Ascophyllum nodosum a marine plant. Norrie *et al*,[18], had early on showed that extracts of Ascophyllum nodosum caused increased berry size and weight of grape. Chowdhury *et al*,[5], also observed that he application of plant extracts on mango improved the quality and yield of the fruit. Furthermore, Agbagwa [1], reported that crude extracts of *Senna alata* (L) Roxb, induced fruiting and improved fruit yield of *Celosia argentea* L. Reports of inducement of fruit yield by plants as a result of application of plant extracts have been shown by other workers [4; 16]. On the other hand, Erclisli and Turkal [6], reported that the rate of fruiting in strawberry cultivars were reduced when treated with Juglone and walnut (*Juglans regia*) leaf extracts. Osuagwu and Ibeabuchi [20], also observed that leaf and stem extracts of *Adenia lobata* decreased the fruit yield of okra and groundnut.

The influence of these plant extracts on the flowering and fruiting of these plants might be due to their chemical components which either induced or inhibited flowering and fruiting of these plants. Attempts should be made to identify the bioactive substances in these plant extracts responsible for their activities.

Senna alata (Candle bush) belongs to the Caesalpinioideae sub family of the Fabaceae family. It is a native of Mexico and can be found in diverse habitats in the tropics. The shrub is about 3 – 4 m tall with leaves 50 – 80cm long. The inflorescence looks like yellow candle. The fruit shaped like a straight pod is up to 25cm long. The seeds are distributed by water or animals [7]. It has very effective fungicidal properties for treating ringworm and other fungal infections of the skin [7; 21]. Crude extracts of S. alata are reported to stimulate the growth and development of *Celosia argentea* [1; 2]. Its extracts are also observed to influence the reproductive growth of plants [1].

This investigation aimed at determing the effect of the leaf and stem crude extracts of S. alata on the flowering and fruiting of okra (*Abelmoschis esculentus*) and groundnut (*Arachis hypogea*). The result obtained from the study will be further developed and utilized in the controlling the flowering and fruiting of these and other plants.

II. Materials And Methods

Plant materials

The seeds of okra and groundnut were obtained from the Seed Service Centre, National Root Crop Research Institute Umudike, Umuahia, Abia State Nigeria. The variety of okra seeds used was V35 (IDE8) and that of groundnut was RMP 12. The seeds were tested for viability [3] and found to be viable. S. alata was obtained from the compound of Michael Okpara University of Agriculture, Umudike, Umuahia Abia State, Nigeria.

Preparation of Plant extracts.

The crude extracts of S. alata prepared using the modified methods of Hansen – Quartey *et al*,[8] and Katz *et al* [13]. The harvested *S. alata* plants were separated into 0.05cm segments [8]. Approximately, 10g of plant materials were mixed with 100ml distilled water and blended with Arkeys "mixer" blender model RK 301BL. The blended materials were centrifuged for 30minutes at 1800 rounds per minute. The supernatant was filtered through four layers of cheese cloth (0.25 µm pore size). The filtrates obtained were considered to be the original undiluted extracts. Three dilutions (1:1, 1:25 and 1:5 v/v) of the original extracts were prepared by mixing the original extracts with distilled water.

Flowering and fruiting test

The research was carried out using 30 plastic planting buckets filled with sterilized soil. Six seeds of either okra or groundnut were planted in each bucket and soon after emergence, seedling were thinned to 3 plants per planting bucket. A complete randomized design in five replicates was used for the research. 20ml of each extract was applied through foliar spray on each plant twice a week for a month. Treatment commenced 2 weeks after seedling emergence. Distilled water was used as control in all treatments. The research was carried out in the Green House of the College of Crops and Soil Sciences, Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State Nigeria. The number of flowers and fruits were obtained through manual count. The length of fruit was taken using 15cm meter rule and the weight of fruits taken using a sensitive electronic balance. The average of the plants in each planting bucket was used as mean per each treatment.

Statistical Analysis

The design for this study was the complete randomized design in five replicates of each treatment. Analysis of variance (ANOVA) was used to analyse the data collected and least significant difference (LSD) with the 0.05 probability level was used to determine the difference among treatments.

III. Results And Discussions

The results of the effects of leaf and stem extracts of *Senna alata* on the flowering and fruiting of okra (*Abelmoschis esculentus*) and groundnut (*Arachis hypogea*) are summarized in tables 1 – 4.

Flowering test

The number of flowers produced by okra and groundnut plants was greatly reduced by treatment with aqueous leaf and stem extracts of *S. alata* (Table 1). There was significant decrease at ($P < 0.05$) in the number of flowers produced by the two plant species. The concentration of the extracts played important role in the effects of the extracts on flowering of the plants. The higher the concentration of the extract the lower the number of flowers produced by the plants. Research reports also have indicated that aqueous extracts of other plants caused reduction in the number of flowers produced by plants [9; 15; 20]. On the other hand, increased flowering of plants due to treatment with plant extracts was reported by some worker [1; 2; 10; 12; 22; 24]. The observed inhibition of flowering by *S. alata* extracts might be as a result of disruption of physiological processes of flowering in these plants caused by compounds such as phenolic compounds in them.

Fruiting test

Aqueous leaf and stem extracts of *S. alata* treatment led to the decrease in number, length and weight of the fruits of okra and groundnut (Tables 2-4). There was significant reduction at ($P<0.05$) in the number, length and weight of the fruits of the plants used in the investigation due to treatment with the plant extracts. Thus leaf and stem extracts of S. alata have been discovered to inhibit fruiting in okra and groundnut. Concentration of extracts also affected the rates of suppression of fruiting by the extracts. Extracts of higher concentration had more inhibitory effects. Crude extracts of plants have been reported to cause reduction in fruiting of plants [6; 20]. In contrast, researchers have also observed that plant extracts increased fruiting of plants [4; 5; 17; 18]. The observed inhibition of fruiting of okra and groundnut by aqueous leaf and stem extracts of S. alata might be due to the presence in these extracts compounds that have inhibitory effect on fruiting of plants.

This study revealed that leaf and stem extracts of *S. alata* contain flower and fruiting inhibiting substances with influenced the flowering and fruiting in okra and groundnut plants. We suggest that more investigations should be carried out to a certain the bioactive compounds that are responsible for the inhibition. These compound could be utilized in regulating flowering and fruiting in plants.

Table 1: Effect of aqueous leaf and stem extracts of *Senna alata* and their dilutions on the number of flowers produced by okra (*Abelmoschis esculentus*) and groundnut (*Arachis hypogea*).

Treatment	Okra		Groundnut	
	Leaf extract	Stem extract	Leaf extract	Stem extract
Concentrated	3	3	3	3
1 : 1	5	5	4	4
1 : 2.5	11	9	6	5
1 : 5	12	12	7	6
Control	14	14	10	10
LSD (P<.0.05)	1.240	1.052	0.896	1.014

Means of five replicates.

Table 2: Effect of aqueous leaf and stem extracts of *S. alata* and their dilutions on the number of fruits produced by okra (*A. esculentus*) and groundnut (*A. hypogea*).

Treatment	Okra		Groundnut	
	Leaf extract	Stem extract	Leaf extract	Stem extract
Concentrated	2	3	3	3
1 : 1	3	3	4	4
1 : 2.5	3	3	5	4
1 : 5	4	5	5	5
Control	5	6	6	7
LSD (P<.0.05)	1.322	1.143	0.957	0.816

Means of five replicates

Table 3: Effect of aqueous leaf and stem extracts of *S. alata* and their dilutions on the length (cm) of the fruits of Okra (*A. esculentus*) and groundnut (*A. hypogea*).

Treatment	Okra		Groundnut	
	Leaf extract	Stem extract	Leaf extract	Stem extract
Concentrated	3.20±0.61	3.88±0.81	1.33±0.52	1.53±0.29
1 : 1	3.90±1.96	4.48±0.47	1.93±0.32	1.94±0.19
1 : 2.5	4.65±0.81	5.75±0.93	1.78±0.28	2.13±0.46
1 : 5	5.30±0.47	6.08±0.96	2.12±0.22	2.32±0.30
Control	6.45±0.93	6.95±0.82	2.42±0.18	2.63±0.28
LSD (P<.0.05)	1.159	0.861	0.792	1.057

Means of five replicates

Table 4: Effect of aqueous leaf and stem extract of *S. alata* and their dilutions on the dry weight (g) of Okra (*A. esculentus*) and groundnut (*A. hypogea*).

Treatment	Okra		Groundnut	
	Leaf extract	Stem extract	Leaf extract	Stem extract
Concentrated	0.91±0.52	1.01±0.32	0.96±1.57	1.18±0.67
1 : 1	1.37±0.84	1.75±0.65	1.81±0.48	1.97±0.38
1 : 2.5	1.89±0.76	1.97±0.76	1.89±0.36	2.05±0.36
1 : 5	2.75±0.62	2.68±0.83	2.15±0.79	2.25±0.52
Control	4.78±1.65	4.92±1.47	3.08±1.05	3.01±0.73
LSD (P<.0.05)	1.251	1.382	1.153	1.428

Means of five replicates

References

[1]. Agbagwa, I. O (2014). Crude extracts of Senna alata (L) Roxh. Mimics plant growth hormones in promotion of vegetative and reproductive growth in Celosia argentea L. American Journal of plant Sciences5:1918-1925.

[2]. Agbagwa, I. O, Onofeghara, F. A and Mensah, I. (2003). Stimulation of growth and development of Celosia argentea by crude extracts of Senna alata (L). Roxb. J. Appl. Sci. Environ Manage7(1): 9 – 13.

[3]. Agrawal, R. C. (1995). Seed technology. 2nd edition. Oxford and IBH publishing co PVT Ltd. New Delhi, Indian. Pp. 878.

[4]. Ahmed, Y. M and Shalaby, E. A (2012). Effect of different seaweed extracts and compost on vegetative growth, yield and fruit quality of cucumber. Journal of Horticultural science and ornamental plants,4(3):233 – 240.

[5]. Chowdhury, M. M. A, Rahim, M. A. , Khalequzzaman, K. M, Humavan, M. R. and Alam, M. M (2007). Effect of Plant extracts and time of application on incidence of anthracnose, yield and quality of Mango. Int. J. Sustain Crop Production, 2(5): 59 -68.

[6]. Erilisu, S. and Turkal, L. (1998). Allelopathic effects of juglone and walnut leaf extract on growth, fruit yield and plant tissues composition in strawberry cultivars. J. Hortic. Sci Biotechnol. 80: 39 – 42.

[7]. Hans, M. and Binadanda, M. (2008). Natural Medicine in the Tropics/foundation text anamed. Winnenden Germany.

[8]. Hanson - Quartey, J. A., Nyamapfene K. and materechera, S. A. (1998). Effects of aqueous extracts from Artemisia afra parts and soil on seed germination and early seedling development in selected plants species.S. Afr. J. Plant Soil, 15 (1):1 – 5.

[9]. Ishoka, N. Tanimoto, S and Harada, H (1990). Flower- inducing activity of phloem exudates in cultured apices from pharbitis seedlings. Plant Cell Physiol., 31 (5): 705 -709.
[10]. 10) Ishoka, N, Tanimoto, S. and Harada, H (1991). Flower – inducing activity of phloem exudates from pharbitis cotyledons exposed to various photoperiods. Plant cell physiol, 32 (7):921 - 924.
[11]. Jain, V. K. (2011). Fundamentals of plant physiology: 14th Edition: S. Chard and companyny. LTD., Ramnager, New Delhi – 110055 R. PP 663.
[12]. Kalhara S., Kozakl, A and Takimoto. A (1989). Flower inducing activity of water extract of various plant species in particular. Pharbitis nil. Plant cell Physiol. 30 (7): 1023 – 1028.
[13]. Katz, D. A,. Sneh B. and Friedman J. (1987). The allelopathic potentials of Coridothy capitalus L. (labiatae). Preliminary studies on the shrub in the inhibition of annuals germination and / or to promote allelopathically active actinomycetes. Plant soil, 98:53-66.
[14]. Khurana J. P. and Maheshwari, Sci. (1986). A comparison of the effect of chelates, salicylic acid and Benzoic acid on growth and flowering of Spirodela polyrrhiza. Plant cell physiol, 27 (5): 919 – 924.
[15]. Lakmini W. G. D. Rupika, S. T. J and kainadasa P. E. (2007). A preliminary study of the effects of gliricidia leaf extracts on growth performance of tomatoes Lycopersicum esculentum. Ruhuma J. Sci. 2: 111 - 114.
[16]. Muhamman, M. A. Auwalu, B. M., Momga, A. A. and Jibrin, J. M (2013). Effects of Aqueous extract of Moringa (Moringa oleifera Lam) and nitrogen rates on some physiological attributes and yield of tomatoes. International Journal of chemical Environmental and Biological sciences. 1 (1): 67 – 74.
[17]. Norrie, J. and Keathley, J. P (2006). Benefits of Ascophyllum nodosum marine plant extract application to Thompson seedless grape production. ISHS ACTA Horticulturea 71 (1): 22 – 28.
[18]. Norries, J., Branson, T. and Keathley, P. E. (2002). Marine plant extracts impact on Grape yield and quality. Acta Hort. (ISHS) 594: 313 – 319.
[19]. Omaran .H and Semiah, R (2006). Effects of Paclobutrazol application combined potassium nitrate and Bicomine spray on flowering and fruiting of mangosteen (Garcinia mangostana L). ISHS Acta Horticulturae 727: x International symposium on plant Bioregulators in fruit production Satilitio Mexico.
[20]. Osuagwu, G. G. E. and Ibeabuchi I. C. (2010). The influence of aqueous leaf and stem extracts of Adenia lobata (Jacq) on the flowering and fruiting of okra (Abelmoschus esculenta) and ground nut (Arachis hypogea). African Journal of Biotechnology 9(22): 3260 – 3263.
[21]. Owoyale, J.A, Olatundi, G. A and Oguntoye S. O. (2005). Antifungal and antibacterial activities of an alcoholic extract of Senna alata leaves. Journal of Applied Science and Environmental Management, 3(9):1105- 107.
[22]. Purse, J. G. (1984). Phloem Exudate of Perilla crispa and its effect on flowering of P. crispa shoot explant. Journal of experimental Botany 35: 227 – 238.
[23]. Raskin, I., Ehmann, A, Melander W. R and Mecuse, B. J. D. (1987). Salicylic acid. A natural Inducer or heat production in Arum lilies. Science 237 (4822): 1600 – 1602.
[24]. Wilmowicz, E., Frankowski, K., Glazinska, P. Kesy J. and Kopcewkz J. (2011). Involvement of ABA in flower induction of Pharbitis nil. Acta Societatis Botanicorum Poloniae, 80:1.