

Full Length Research Paper

The influence of aqueous leaf and stem extracts of *Adenia lobata* (Jacq) on the flowering and fruiting of okra (*Abelmoschus esculenta*) and groundnut (*Arachis hypogea*)

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The influence of the aqueous leaf and stem extracts of *Adenia lobata* (Jacq) on the flowering and fruiting of okra (*Abelmoschus esculenta*) and groundnut (*Arachis hypogea*) was investigated. *A. lobata* extract 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 treatments. All treatments at ($P < 0.05$) significantly inhibited the flowering and fruiting of the plant species. This observation was consistent in all the plant species used in the research, as there was a significant reduction in the flowering and fruiting of the plants. The concentration of the extracts affected the rate of effects of the extracts on the flowering and fruiting of the plant species. The higher the concentration, the more the inhibitory effects of the extracts. This study reveals the presence of compounds capable of inhibiting the flowering and fruiting of plants in *A. lobata*.

Key words: *Adenia lobata*, okra, groundnut, flowering, fruiting aqueous leaf and stem extracts.

INTRODUCTION

The growth and development of plants which comprise germination, seedling growth, flowering and fruiting could be influenced positively or negatively by exogenous applied substance. These substances include growth hormones and other secondary metabolites (Bidwell, 1974; Pandey and Sinha, 1978; Erclisli and Turkal, 1998). Research reports indicate that the flowering and fruiting of plants have been influenced by application of exogenous growth substances (Nakayama and Hashimoto, 1973; Onofeghara, 1981a; Fojioka et al., 1983; Khurana and Maheshwari, 1983, 1986; Raskin et al., 1987; Omrana and Semiah, 2006).

The flowering and fruiting of plant have either been induced or suppressed by the application of plant extracts. The flowering of plants has been known to be induced by treatment of plant extracts (Agbagwa et al., 2003; Ishioka et al., 1990, 1991; Kalhara et al., 1989;

Onofeghara, 1981b). On the other hand, plant extracts also have been known to suppress flowering in plants (Ishioka et al., 1990; Lakmini et al., 2007).

Exogenously applied plants extracts tend to influence fruiting in plants. Norrie and Keathley (2006) reported that the fruiting of Thompson seedless grape plants was induced by treatment of the plants with the extracts of *Ascophyllum nodosum* marine plant. Chowdhury et al. (2007) also observed that application of some plant extracts on mango, improved the quality and yield of the fruits. However, Erclisli and Turkal (1998) observed that the rate of fruiting in strawberry cultivars was reduce when treated with Juglone and walnut (*Juglans regia*) leaf extract. The influence of these plants extracts on the flowering and fruiting of plants might be due to their chemical constituent. Studies should be carried out on these plant extract to identify the bioactive substances responsible for their actions.

Adenia lobata belongs to the family Passifloraceae which comprises of about 92 species which are found in the Tropical and South African regions including West

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Table 1. Effects of aqueous leaf and stem extracts of *Adenia lobata* and their dilutions on the number of flowers produced by okra (*Abelmoschus esculenta*) and groundnut (*Arachis hypogea*).

Treatment	Okra		Groundnut	
	Leaf extract	Stem extract	Leaf extract	Stem extract
Concentrated	4	3	2	3
1:1	5	5	2	4
1:2.5	10	6	4	6
1.5	10	9.	6	6
Control	11	11	11	11
LSD (P < 005)	1.040	0.887	0.483	0.796

Mean of five replicates.

Arabia, Indo-Malasia and Northern Australia (Wills, 1985). The aqueous leaf and stem extracts of *A. lobata* have been reported to cause inhibition of germination of seed and stimulate seedling growth of cowpea and maize (Osuagwu, 2007). The leaf and bark of *A. lobata* are used for the treatment of cough, respiratory disorder, syphilis and gonorrhoea. The root powder with red pepper and guinea corn is used for the treatment of cancer of the nose (Gill, 1992). The leaf and stem juice is also used as animal and fish poison.

This study aimed at determining the effects of the leaf and stem extracts of *A. lobata* on the flowering and fruiting of okra (*Abelmoschus esculenta*) and groundnut (*Arachis hypogea*). The result of the findings will be further developed and utilized in horticulture.

MATERIALS AND METHODS

Plant materials

Okra and groundnut seeds were obtained from the seed service centre of the National Root Crop Research Institute Umudike, Umuahia, Abia State. The varieties of seeds used are groundnut RMP 12 and okra V35 (LD88). The seeds were tested for viability (Agrawal, 1995) and found to be viable. *A. lobata* was obtained from the forest strips of the Forestry Department, Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State.

Preparation of plant extracts

The harvested *A. lobata* plants were separated into stem and leaves and cut into 0.5 cm segments as in the method of Hansen - Quartey et al. (1998). Aqueous extracts were made using the modified Katz et al. (1987) method. Approximately 10 g of plants material was mixed with 100 ml of distilled water and blended with Arkeys "mixer" blender model RK 301 BL. The blended materials were centrifuged for 30 min at 1800 rounds per minutes. 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, 1:2.5 and 1:5, v/v) of the original extracts were prepared by mixing the original extract with distilled water.

Flowering and fruiting tests

The research was carried out using 30 plastic planting bucket filled with sterilized soil. Six seeds of either okra or groundnut were planted in a bucket, and soon after emergence, seedlings were thinned to 3 plants per planting bucket. A complete randomized design in five replicates was used for the research.

20 ml of each extract was applied through foliar spray on each plant twice a week for a month. Treatment commenced 2 weeks after seedlings emergency. 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 Science, Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State. The number of flowers and fruits were obtained through manual count. The length of fruit was taken using 15 cm meter rule and the weight of fruits taken using a sensitive electric balance. The average of the plants in each planting bucket was used as means per each treatment. The research was carried out from April to September 2006.

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 analyses the data collected, and least significance difference (LSD) at the 0.05 probability level was used to determine the difference among treatments.

RESULTS AND DISCUSSION

Flowering test

Treatment with the leaf and stem extracts of *A. lobata* caused reduction in the number of flowers in okra and groundnut plants (Table 1). There was significant decrease at (P < 0.05) in the numbers of flowers in the two plants species used for the study. The concentration of the extracts also affected the rate of reduction in flowering of okra and groundnut plants. The higher the concentration of the extracts, the lower the numbers of flowers produced. This observed suppressions of flowering by the leaf and stem extracts of *A. lobata* was also reported in some other plants by other researchers (Ishioke et al., 1990; Lakmini et al., 2007). In contrast,

Table 2. Effects of aqueous leaf and stem extracts of *A. lobata* and their dilutions on the number of fruits produced by okra (*A. esculenta*) and groundnut (*A. hypogea*).

Treatment	Okra		Groundnut	
	Leaf extract	Stem extract	Leaf extract	Stem extract
Concentrated	2	4	3	2
1:1	4	4	4	2
1:2.5	4	6	5	3
1.5	6	7	5	3
Control	8	8	6	6
LSD (P < 005)	1.224	0.884	0.906	1.750

Mean of five replicates.

Table 3. Effects of aqueous leaf and stem extracts of *A. lobata* and their dilutions on the length (cm) of the fruit of okra (*A. esculenta*) and groundnut (*A. hypogea*).

Treatment	Okra		Groundnut	
	Leaf extract	Stem extract	Leaf extract	Stem extract
Concentrated	3.20	3.05	1.33	1.53
1:1	3.90	3.50	1.78	1.94
1:2.5	4.65	4.88	1.93	2.00
1.5	6.30	5.55	2.12	2.32
Control	6.95	6.95	2.40	2.40
LSD (P < 005)	0.649	0.282	0.067	0.026

Mean of five replicates.

Table 4. Effects of aqueous leaf and stem extracts of *A. lobata* and their dilution on the dry weight (g) of okra (*A. esculenta*) and groundnut (*A. hypogea*).

Treatment	Okra		Groundnut	
	Leaf extract	Stem extract	Leaf extract	Stem extract
Concentrated	1.04	1.40	0.96	0.63
1:1	1.37	1.75	1.00	0.96
1:2.5	1.45	1.97	1.12	1.18
1.5	1.73	2.14	1.50	1.40
Control	2.75	2.75	1.76	1.76
LSD (P < 005)	0.275	0.187	0.121	0.187

Mean of five replicates.

increased flowering of plant treated with plants extracts have also been reported (Agbagwa et al., 2003; Ishioka et al., 1991; Kaihara et al., 1989; Onofeghara, 1981b). This observed inhibition of flowering by *A. lobata* extracts, might have been due to the disruption of process of flowering caused by compounds such as phenolic compounds in them.

Fruiting test

Treatments with aqueous leaf and stem extracts of *A.*

lobata caused decreased number, length and weight of the fruits of okra and groundnut (Tables 2, 3 and 4). There was a significant reduction at (P < 0.05) in the number, length and weight of the fruits of okra and groundnut as a result of treatment. Thus *A. lobata* leaf and stem extracts have been discovered to cause suppression of fruiting of okra and groundnut plants. The observed reduction in the fruiting of the plant species was also affected by the concentration of the extracts used. Extracts of higher concentration had more reducing effects.

Aqueous extracts of other plants have been reported to

cause decrease rate of fruiting in plants (Erclisi and Turkar, 1998). On the other hand, Norrie and Keathley (2006) reported increased fruiting of "Thompson" seedless grape plants treated with *A. nodosum* (marine plant) extracts. Chowdhury et al. (2007) also showed that some plant extracts induced increased fruiting in mango. This study has revealed inhibiting substances in the extracts of *A. lobata* which influences the flowering and fruiting in okra and ground plants. It is in our opinion that more research should be carried out to identify the compounds that are responsible for the inhibition. The compounds could then be used in controlling flowering and fruiting in plants.

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