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Germination, shoot length and root length of yard long bean influenced by aqueous extract of few ornamental plants

M. M. Rahman[*1], M. R. Islam[2], M. M. A. Islam[2], M. J. Rahman[3], M. K. Hasan[3]

[1]*Department of Agroforestry and Environment, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh*

[2]*Department of Agricultural Chemistry, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh*

[3]*Department of Soil Science, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh*

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Abstract

An experiment was conducted to study the effects of aqueous extracts of few ornamental plants viz. China box *(Murraya exotica),* Indian Medlar *(Mimusops elengi),* Parrot tree *(Butea monosperma)* Mussaenda *(Mussaenda erythrephytta),* Mast tree *(Polyalthia longifolia)* and Swamp tree (*Thuja occidentalis*) on the germination and growth of Yard long bean (*Vigna unguiculata*). Aqueous extract of Parrot tree plant extract showed the highest percentage of germination, shoot length and root length of yard long bean and lowest performance was found on aqueous extract of Indian Medllar. So, it may be concluded that aqueous extract of Parrot tree is good for germination, growth and development of yard long bean.

* **Corresponding Author:** M. M. Rahman ✉ mijanurag@gmail.com

Introduction

Food legumes provide low fat protein in the human diet and hence are considered as "meat for the poor" (Heiser, 1990). They are also important as high quality livestock fodder and residual nitrigen suppliers in soil, fixing atmospheric nitrogen (Leikam *et al*. 2007). Among the food legumes, Yard long beans which originated in west africa is now extensively grow throughout Southeast Asia, Europe, Oceania and North America (Annonymus, 2014). It is often consumed as immature pods as source of protein (24-27%) (Ano and Ubochi, 2008), vitamins, minerals and fibres (Messina, 1999; Singh, 2005).

The nutritional quality of food raised by organic farming in comparison to conventional farming is a current issue that continues to attract interest and generate discussion. Consumers regard organic foods not only as better, but also a safe, more hygienic, and free of chemical residues and artificial ingredients (Winter and Davis, 2006). Organic fertilizers not only increase physica (porosity, structure and water-holding capacity) and chemical properties of soil but also increase mineral deposition, which is essential for proper development of plants (Galbiattia *et al.,* 2007). Therefore, application of organic fertilizer has received great attention especially among the farmers (Chang *et al*., 2007). In fact, nutrient management through organic resources is very essential for crops (Kannaiyan, 2000).

Certain plant extracts have been found to affect the germination as well as growth of different crop plants. Today farmers are well aware about the application of organic fertilizer to improve their crop production as well as farming land (Galbiattia *et al.,* 2007). In order to fill the demand of organic fertilizer, one of such option is use of *Moringa oleifera* leaf extracts (MOLEs) as fertilizer (Davis, 2000). In agriculture and horticulture, use of MOLEs has proved beneficial for the growth and yield (Chang *et al*., 2007), deeper root development and better seed germination (Kannaiyan, 2000), delay of fruit senescence, and improved plant vigour and yield quality/quantity (Phiri and Mbewe 2010; Hossain *et al*., 2012).

MOLEs also impart the crops the ability to withstand adverse environmental conditions (Chang *et al*., 2007). Tripathi *et al.,* (1981) showed that the aqueous extract of *Terminalia chebula* and *Eupatorium adenophorum* strongly inhibited the germination, radical and plumule growth on wheat. Banana plant extract found to inhibit the germination of lettuce (*Roy et al.,* 2006). Certain reports also indicated the growth regulatory effects of different plant extracts. The aqueous extract of *Terminalia belirica* found to increase the germination, shoot and root growth in okra and swamp cabbage (*Roy et al.,* 2012).

For better production of crops, higher germination as well as seedling growth is very important factor and various efforts are being applied to achieve this. Use of plant extracts for improved crop growth might be an effective way to reduce the chemical pollution. Though here are a lot of studies indicating the positive effects of various herbal plants extracts on germination and seedling growth, but reports on extracts of ornamental plants is very limited. Therefore, the present study was conducted to investigate the effect of aqueous extracts of six ornamental plants on germination shoot length and root length growth of Yard long bean (*Vigna unguiculata*).

Materials and method

The experiment was conducted at research laboratory, Department of Agricultural Chemistry, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh. Six ornamental plants namely China box *(Murraya exotica),* Indian Medlar *(Mimusops elengi),* Parrot tree *(Butea monosperma)* Mussaenda *(Mussaenda erythrephytta),* Mast tree *(Polyalthia longifolia)* and Swamp tree (*Thuja occidentalis*) were selected to study the effects on the growth of Yard long bean *(Vigna unguiculata)*

Preparation of aqueous extracts

200 gm of fresh and clean leaves were taken and cut into smaller pieces, it was then blended by using blender and was taken in a 1000 ml reagent bottle and 800ml of water was added to it. It was then kept for 72 hours at room temperature of 18±2°C and relative humidity of 75±5% with regular interval of stirring.

After 72 hours the aqueous slurry was filtered through Whatman filter paper No.1 and was taken in another 500 ml bottle. The filtrates of individual plant extract were stored and used for treating the seeds of vegetable crops along with water as a control and other comprehensive study.

Treatments

There were seven treatments. These are;

T_1 = Aqueous extract of china box

T_2 = Aqueous extract of Indian Medlar

T_3 = Aqueous extract of Parrot tree

T_4 = Aqueous extract of Mussaenda

T_5 = Aqueous extract of Mast tree

T_6 = Aqueous extract of Swamp cedar

T_c = Water or control

Set up for the investigation of Pea Seed

For the investigation of germination percentage, growth and development of vegetable seeds, fifteen ml of each aqueous extract was put in each pot. In control, only distilled water was used and amount of distilled water was also same. Then twenty five seeds of each vegetable crop were kept in each pot and each treatment was replicated into three times. The pot were kept in natural diffused light under laboratory conditions at 18±2°C temperature and relative humidity of 75±5% after placing. 5 ml of water was used per day per pot to keep constant moisture (Dubey, 1973). In control, only water was added if necessary per day per pot.

Data collection and analysis

After setting the experiment, the germination percentages, shoot length, root length and completion of germination were recorded. Effects of different treatments on morphology of seedlings were also recorded. The data were subjected to analyze statistically using analysis of variance (ANOVA) technique by MSTST-C (Gomez and Gomez, 1984) and means were compared by the DMRT method.

Germination test:

$$\text{Germination (\%)} = \frac{\text{No of seeds germinated}}{\text{Noof sedds placed}} \times 100$$

Results and discussion

Germination percentage (%)

A significant effect (P ≤5) of aqueous extracts of ornamental plant leaves was found on germination of yard long bean.

The percent germination was counted in 4th, 5th and 6th days presented in Table 1. The highest germination (55.00, 61.00 and 62.00% at 4th, 5th and 6th days respectively) was found in T_3 (Aqueous extract of Parrot tree) (Table 1).

The extracts of other plants performed moderately but the lowest germination (48.00, 53.00 and 57.00% at 4th, 5th and 6th days respectively) was recorded in T_2 (Aqueous extract of Indian Medllar). Increased germination of long yard bean might be due to the presence of some growth regulatory substances present in the extract. These results were partially similar with Sona (2007).

Table 1. Effects of leaves extracts of ornamental plants on germination percentage of Yard long bean.

Treatments	% Germination at		
	4 DAS	5 DAS	6 DAS
T_1	53 b	59 b	60 a
T_2	48 c	53 d	57 b
T_3	55 a	61 a	62 a
T_4	53 b	59 b	61 a
T_5	53 b	59 b	60 a
T_6	53 b	57 b	59 b
T_c	50 bc	55 c	57 c
CV%	3.10	2.44	3.98

In a column, Fig.s having the similar letter (s) or without letter (s) do not differ significantly by DMRT at P ≤ 5% level.

Shoot length (cm)

Shoot length of pea was significant at different Days After Sowing influenced by aqueous leaf extract of different ornamental plants (Table 2).

The highest shoot length (14.01cm and 19.31cm at 17DAS and 27DAS) of yard long bean seedling was found in T_3 (Aqueous extract of Parrot tree) and the lowest shoot length (12.54cm and 16.84cm at 17DAS and 27DAS) was found in T_2 (Aqueous extract of Indian Medllar). These results were partially similar with Sona (2007).

Table 2. Effects of leaves extracts of ornamental plants on shoot length (cm) of Yard long bean.

Treatments	Shoot length (cm) at	
	17 DAS	27 DAS
T_1	12.78 c	18.14 b
T_2	12.54 c	16.84 d
T_3	14.01 a	19.32 a
T_4	13.18 b	17.73 c
T_5	12.96 c	19.31 a
T_6	13.68 ab	19.29 a
T_c	13.83 ab	19.23 a
CV%	4.01	3.09

In a column, Fig.s having the similar letter (s) or without letter (s) do not differ significantly by DMRT at P ≤ 5% level.

Root Length (cm)

The effect of ornamental plants leaf extract on the root length of yard long bean was significant throughout the growth period (Table 3). At 17 (DAS) highest root length (8.34cm) was observed in the treatment T_3 (Aqueous extract of Parrot tree) and the shortest (7.51 cm) was recorded in T_2 (Aqueous extract of Indian Medllar). Again at 27 DAS, the highest root length (8.64cm) was observed in the treatment T_3 (Aqueous extract of Parrot tree) and the shortest roots length (7.24cm) was recorded in the treatment (Aqueous extract of Indian Medllar). The lowest root length of yard long bean seedlings was found in seeds treated with Indian Medllar due to the presence of some toxic compounds or other inhibitory materials. These results were partially similar with Sona (2007).

Table 3. Effects of leaves extracts of ornamental plants on root length (cm) of Yard long bean.

Treatments	Root length (cm) at	
	17 DAS	27 DAS
T_1	7.87 c	8.23 a
T_2	7.51 d	7.24 c
T_3	8.34 a	8.64 a
T_4	7.59 d	7.61 bc
T_5	7.52 d	7.57 bc
T_6	8.32 a	8.15 ab
T_c	8.08 bc	8.36 a
CV%	5.18	3.96

In a column, Fig.s having the similar letter (s) or without letter (s) do not differ significantly by DMRT at P ≤ 5% level.

Conclusion

The experiment was carried out to investigate the effects of aqueous extracts of few ornamental plants on germination, shoot length and root length of yard long bean. Aqueous extract of Parrot tree (T_3) plant extract showed the highest percentage of germination, shoot length and root length of yard long bean and lowest performance was found on Aqueous extract of Indian Medllar (T_2). Further research might isolate and investigate the allelochemicals for determining their potential and farm application.

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