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Study on the Extracts of some Ornamental Plants on Germination and Seedling Growth of Pea

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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 erythrophylla*), Mast tree (*Polyalthia longifolia*) and Swamp tree (*Swamp tree occidentalis*) on the germination and growth of Pea (*Pisum sativum*). Mussaenda (*Mussaenda erythrophylla*) plant extract showed the highest percentage of germination and shoot length of pea and lowest percentage was found from aqueous extract of Indian Medlar (*Mimusops elengi*). The longest root length was found on control condition (water) and shortest found on Mussaenda (*Mussaenda erythrophylla*). The highest chlorophyll contents was found on Parrot tree (*Butea monosperma*) and lowest was found on Mussaenda (*Mussaenda erythrophylla*). So, it may be concluded that aqueous extract of Mussaenda (*Mussaenda erythrophylla*) is good for germination, growth and developments of pea (*Pisum sativum*).

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Study on the Extracts of some Ornamental Plants on Germination and Seedling Growth of Pea

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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 erythrophylla*), Mast tree (*Polyalthia longifolia*) and Swamp tree (*Swamp tree occidentalis*) on the germination and growth of Pea (*Pisum sativum*). Mussaenda (*Mussaenda erythrophylla*) plant extract showed the highest percentage of germination and shoot length of pea and lowest percentage was found from aqueous extract of Indian Medlar (*Mimusops elengi*). The longest root length was found on control condition (water) and shortest found on Mussaenda (*Mussaenda erythrophylla*). The highest chlorophyll contents was found on Parrot tree (*Butea monosperma*) and lowest was found on Mussaenda (*Mussaenda erythrophylla*). So, it may be concluded that aqueous extract of Mussaenda (*Mussaenda erythrophylla*) is good for germination, growth and developments of pea (*Pisum sativum*).

Keywords: aqueous extract, germination, seedling growth, pea.

I. INTRODUCTION

Pea (*Pisum sativum*) is an annual plant with a life cycle of one year. It is a cool season crop grown in many parts of the world; it is used as a vegetable, fresh, frozen or canned. The nutritional value of pea is amazing. Pea contains protein, potassium, phosphorus, Magnesium, calcium, sodium, selenium, iron, zinc, manganese, and iron, niacin, vitamins A, C, B1, B6 and other vitamins in small amounts.

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 (Galbiatti *et al.*, 2007). In order to fill the demand of organic fertilizer, one of such option is use of *Moringa oleifera* leaf extracts as fertilizer (Davis, K. 2000). In agriculture and horticulture, use of these extract has proved beneficial for the growth

and yield (Kannaiyan 2000), deeper root development and better seed germination (Chang Ed-Harun *et al.*, 2007), delay of fruit senescence, and improved plant vigour and yield quality/quantity (Hossain, *et al.*, 2012, Phiri, *et al.*, 2010). MOLEs also impart the crops the ability to withstand adverse environmental conditions. Again (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, seedling growth and Chemical Investigation of Pea (*Pisum sativum*).

II. MATERIALS AND METHODS

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 erythrophylla*), Mast tree (*Polyalthia longifolia*) and Swamp cedar (*Swamp tree occidentalis*) were selected to study the effects on the growth of Pea (*Pisum sativum*)

a) Preparation of aqueous extracts

200 gm of fresh and clean leaves were taken and cut into smaller pieces, it was then blended by

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using blender and was taken in a 1000 ml reagent bottle and 800 ml of water was added to it. It was then kept for 72 hours at room temperature of $18\pm 2^{\circ}\text{C}$ and relative humidity of $75\pm 5\%$ 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.

b) *Treatments:* There were seven treatments. These are;

- T₁ = Aqueous extract of china box
- T₂ = Aqueous extract of Indian Medlar
- T₃ = Aqueous extract of Parrot tree
- T₄ = Aqueous extract of Mussaenda
- T₅ = Aqueous extract of Mast tree
- T₆ = Aqueous extract of Swamp cedar
- T_c = Water or control

c) *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 $18\pm 2^{\circ}\text{C}$ temperature and relative humidity of $75\pm 5\%$ after placing. 5 ml of water was used per day per pot to keep constant moisture. In control, only water was added if necessary per day per pot.

Table 1: Effects of leaves extracts of ornamental plants on germination percentage of Pea

Treatments	7 DAS	8 DAS	9 DAS	% Germination at 10 DAS	11 DAS	12 DAS	13 DAS
T ₁	73.00 b	89.00 ab	89.00ab	93.00 a	93.00 a	93.00 a	94.00 a
T ₂	67.00 c	76.00 c	84.00 b	88.00 c	89.00 c	89.00 d	91.00 b
T ₃	69.00 c	80.00 bc	82.00 b	86.00 d	86.00 d	86.00 c	86.00 c
T ₄	77.00 a	89.00 a	90.00 a	93.00 a	94.00 a	94.00 a	95.00 a
T ₅	68.00 c	81.00 bc	88.00 ab	85.00 d	92.00b	92.00 b	94.00 a
T ₆	74.00ab	88.00 ab	87.00 ab	91.00ab	92.00 b	92.00 b	91.00 b
T _c	70.00bc	84.00abc	89.00 ab	90.00 bc	92.00 b	92.00b	92.00b
CV %	2.21	2.56	3.27	3.49	3.78	3.13	3.21

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

b) *Shoot length (cm)*

Shoot length of pea was significant at 27 DAS and 37 DAS but insignificant at 17 DAS and 47 DAS influenced by different types of extracts (Table 2). However numerically, the highest shoot length (6.80cm and 9.79cm at 17DAS and 47DAS) of pea seedling was found in T₄ and the lowest shoot length (6.26cm and 9.37cm at 17DAS and 47DAS) was found in T₂. Again, at 27DAS and 37DAS, it was significant where the

d) *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.

III. RESULTS AND DISCUSSION

a) *Germination percentage (%)*

The percent germination was counted in 7th, 8th, 9th, 10th, 11th, 12th and 13th days presented in Table 1. In the, the highest germination (77.00, 89.00, 90.00, 93.00, 94.00, 94.00 and 95.00 at 7th, 8th, 9th, 10th, 11th, 12th and 13th days respectively) was found in T₄ (Aqueous extract of Mussaenda) followed by T₆. The extracts of other plants performed moderately but the lowest germination (67.00, 76.00, 84.00, 88.00, 89.00, 89.00 and 91.00 at 7th, 8th, 9th, 10th, 11th, 12th and 13th days respectively) was recorded in T₂ (Aqueous extract of Indian Medlar). Increased germination of pea might be due to the presence of some growth regulatory substances present in the extract. These results were partially similar with (Sona, R. R. 2007) who stated that the highest germination of country bean was found in seeds treated with aqueous extract of Parrot tree and the second highest germination was found with aqueous extract of mouchanda.

highest shoot length (8.58cm and 9.52cm at 27DAS and 37DAS) of pea seedling was found in T₄ and the lowest shoot length (7.98cm and 8.40cm at 27DAS and 37DAS) was found in T₂. These results were partially similar with (Sona, R. R. 2007).

Table 2: Effects of leaves extracts of ornamental plants on shoot length (cm) of pea

Treatments	17 DAS	Shoot length (cm) at		47 DAS
		27 DAS	37 DAS	
T ₁	6.67 a	8.54 a	9.76 a	9.68 a
T ₂	6.26 a	7.98 c	8.40 c	9.37 a
T ₃	6.60 a	8.32 b	9.46 b	9.51 a
T ₄	6.80 a	8.58 a	9.52 a	9.79 a
T ₅	6.46 a	8.00 c	8.72 c	8.77 a
T ₆	6.77 a	8.55 a	9.47 b	9.57 a
T _c	6.47 a	8.34 b	9.33 b	9.62 a
CV %	2.03	2.09	2.99	2.87

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

c) Root length (cm)

The effect of ornamental plants leaf extract on the root length of Pea was significant throughout the growth period (Table 3). Root length of Pea at 17 and 37 Day's After Sowing (DAS) was statistically similar. At 27 (DAS) highest root length (7.95 cm) was observed in the treatment T_c(water). While, the shortest (6.30 cm) was recorded in T₆ (Swamp tree) treatment. However, at 47 DAS, the highest root length (8.40 cm) was observed in

the treatment applied with no leaf extract (control) and the shortest root length (7.71 cm) was recorded in the treatment T₆ with application of Swamp tree leaf extract which was statistically different from others. The lowest root length of pea seedlings was found in seeds treated with Swamp tree due to the presence of some toxic compounds or other inhibitory materials. These results were partially similar with (Sona, R. R. 2007).

Table 3: Effects of leaves extracts of ornamental plants on root length (cm) of Pea

Treatments	17 DAS	Root length (cm) at		47 DAS
		27 DAS	37 DAS	
T ₁	7.36 a	7.22 ab	8.25 a	8.32 ab
T ₂	7.05 a	7.29 ab	8.30 a	8.36 ab
T ₃	7.13 a	7.74 a	8.22 a	8.27 b
T ₄	7.23 a	7.47 ab	8.00 a	8.06 b
T ₅	7.06 a	7.64 ab	8.14 a	8.16 b
T ₆	6.85 a	6.30 b	8.06 a	7.71 c
T _c	7.36 a	7.95 a	8.37 a	8.40 a
CV %	1.98	1.88	1.06	1.21

In a column, figures having the similar letter (s) or without letter (s) do not differ significantly by DMRT at $P \leq 5\%$

d) Calcium and Magnesium content in plant sample

The effect of ornamental plants leaf extract on the Calcium and Magnesium content in Pea was significant throughout the growth period (Table 4). The highest calcium content in plant (106.1 mg/kg) was recorded in T₆ treatment which was statistically identical with T₁. However, the lowest (87.62 mg/kg) calcium content was recorded in T₃ (Parrot tree) which was statistically different from other treatments. Magnesium

content of various treatments was observed statistically similar.



Table 4: Effects of leaves extracts of ornamental plants on Calcium and Magnesium (mg/kg) content of Pea

Treatments	Ca (mg/kg)	Mg (mg/kg)
T ₁	104.7 a	5.94 a
T ₂	94.32 abc	5.50 a
T ₃	87.62 c	5.39 a
T ₄	88.29 bc	5.78 a
T ₅	100.2 ab	5.76 a
T ₆	106.1 a	5.61 a
T _c	95.88 abc	5.45 a
CV %	2.50	2.9

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

e) Chlorophyll content of Pea plants leaf

The effect of ornamental plants leaf extract on the Chlorophyll content of pea was significant throughout the growth period (Table 5). Different Chlorophyll content of pea was observed which was statistically varied at different treatments. Highest (0.91mg/gm) content of chlo. a was observed in the treatment T₆ (Swamp tree) and the lowest (0.81mg/gm) was recorded in T₄ (Mouchanda) treatment, which was statistically different from other treatments. On the other hand, the highest (0.43mg/gm) Chlo.b was observed in the treatment applied with Parrot tree leaf extract (T₃), which was statistically similar with treatment T₄ and the lowest Chlo. b (0.16mg/gm) was recorded in the

treatment T₆ with application of Swamp tree leaf extract which was statistically different from others. Whereas, highest total Chlorophyll content was observed in the treatment T₃ which was statistically similar with treatment T₁, T₂ and T₄ respectively. And the lowest (1.08mg/gm) total Chlo. Was observed in the treatment T₆ (Swamp tree) which was statistically similar with treatment T₅. Maximum carotenoide (4.12mg/gm) content was observed in the treatment T₆ applying Swamp tree leaf extract, which was statistically similar with treatment T₄ and T₅ respectively and the minimum carotenoide (3.49mg/gm) content, was observed in the treatment T_c(control).

Table 5: Effects of leaves extracts of ornamental plants on chlorophyll content of Pea

Treatments	Chlo. a (mg/gm)	Chlo. b (mg/gm)	Total Chlo. (mg/gm)	Carotenoide (mg/gm)
T ₁	0.85 ab	0.36 b	1.22 a	3.94 b
T ₂	0.87 b	0.34 b	1.22 ab	3.70 bc
T ₃	0.84 bc	0.43 a	1.27 a	3.63 bc
T ₄	0.81 c	0.40 a	1.22 ab	4.23 a
T ₅	0.87 b	0.21 c	1.08 c	4.00 ab
T ₆	0.91 a	0.16 d	1.08 c	4.12 a
T _c	0.86 b	0.29 c	1.15 b	3.49 c
CV %	1.02	0.98	1.21	1.51

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

IV. CONCLUSION

The exteriment was carried out to investigate the effects of aqueous extracts of few ornamental plants on germination, shoot length, root length, calcium content, magnesium content and chlorophyll contents of pea. Mussaenda (*Mussaendaerythrephytta*) plant extract showed the highest percentage of germination and

shoot length of pea and Aqueous extract of Indian Medllar (T₂) lowest. The longest root length was found on control condition and shortest found on T₆. The highest chlorophyll contents were found on T₃ and lowest was found on T₆. Further research might isolate and investigate the allelochemicals for determining their potential and farm application.

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