



## APPLICATION OF DUCKWEED ON GROWTH AND DEVELOPMENT OF LENTIL SEEDLINGS

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### ABSTRACT

*Wolffia arrhiza* an aquatic weed found in 77 Districts of India. The effect of growth promoting substances of *Wolffia arrhiza* on lentil variety D.P.L-15 seedlings has been studied by presoaking seed treatment. The observations show that germination and growth of both root and shoot development is stimulated in seeds treated with 5% extract. Results are significant statistically.

**KEYWORDS:** *Wolffia arrhiza*, Lentil Seedlings, D.P.L-15

Out of variety of aquatic plants, duckweeds comprise simplest and smallest of flowering plants relegated as botanical curiosities. They have been described as plants without known economic significance in the beginning but now their relevance as fish and duckfood has attracted attention. Nowinska and Rzesza (1972) pointed out the importance of *Wolffia arrhiza* as a poor man's food for Polish, Burmese and Thai people. Costanza *et al.*, (2014) pointed changes in the global value of ecosystem services. They reported on estimated yield of 265 tones of green matter per hectare and 2080 kg. of protein per hectare. There are also reports of endogenous gibberellins in floating plants and turions of *Wolffia arrhiza* (Pieterse *et al.*, 1971). It is known that gibberellins have an effect on dormancy and as such duckweeds may prove useful as experimental material for studying dormancy and also serve towards extraction of growth substances for utilization in agriculture, Duckweeds have been found to be unusually suited for biochemical studies and plant nutrition. Extracts of *W. arrhiza* on vegetative growth (Tiwari, 2003) and on yield of lentil studied earlier by Tiwari and Shukla (2007). The overwhelming usage of lemons as experimental organisms in morphogenetic, physiological, biochemical and genetically research has opened up wide vistas for exploration and enquiry.

### MATERIALS AND METHODS

The experimental material was collected from nature in healthy condition and plants of equal size and shape were carefully selected. Selected plants were

vigorously washed in tap water to remove adhering debris and algae. Finally, the material was washed with distilled water. The extractions of *W. arrhiza* were made in water or ether. As ether is injurious to plant growth, it was allowed to evaporate and growth-promoting substances were suspended in water. Five milliliter of *Wolffia arrhiza* by volume was taken and ground in a clean porcelain mortar with water or ether. In case of water extract sufficient water was added to make it 100 ml. to have a five percent extract. In case of ether extract, ether was first allowed to evaporate and the suspension was then made to 100 ml. in distilled water. 1, 2 and 5 percent extracts were made by further dilutions with distilled water. Fifty seeds were soaked in sterilized petridishes in different concentrations (1, 2 and 5 percent) of water and ether extract of *W. arrhiza* and distilled water (control) and 12 hours. Immediately after the soaking period seedlings were grown in test tubes filled with distilled water on equal sized filter papers following Garrard's (1954) technique. The experiments were carried out at a temperature of 30-35°C, the normal temperature range of crop in nature. Observations were made every twenty-four hours with in experimental duration of hrs. on length of root, number of lateral roots and length of shoot, fresh weight of seedlings and dry weight of seedlings.

The data was analyzed statistically following analysis of variance method at 5 percent error probability for testing the significance of the effect of treatments. Results of statistical analysis are entered in respective observation tables.

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**RESULTS**

**RESPONSE OF JUVENILE SEEDLING GROWTH OF LENTIL TO *W. arrhiza* EXTRACT**

**Observations on Effect of Ether Extract for 12 Hours**

**Length of Root**

Results given in table 1 clearly indicate that various concentration of ether extract exercise a beneficial effect on length of Primary roots with gradual increase in concentration of extract applied the stimulatory declines. The increase in length of root is observed throughout the observation up to 144 hrs. Statistical analysis of results suggests that the effect is significant at 5 percent error probability.

**Number of Lateral Roots**

Observation recorded in table 1 indicate that various concentration (1,2 and 5 percent) exhibit a tendency to throughout observation up to 144 hrs. However 2 percent extract maximum promotion and gradual increase in concentration declines stimulatory effect. The results were statistically analysis of variance method and beneficial effect of 2 percent extract has been found be significant 5 percent error probability.

**Length of Shoot**

Results given in table 1 are indicative that treatment with different concentration (1,2 and 5 percent)

implements and increase in length of shoot throughout observation up to 144 hrs. 5 percent extract is maximum in effectiveness and increase in concentration of extract gradually decline stimulatory effect of treatment. The statistical analysis of variance shows that observe increase 5 percent treatment is significant at 5 percent error probability.

**Fresh Weight of Seedlings**

Results given in table 1 are indicative that treatment with different concentration (1,2 and 5 percent) implement and increase in fresh weight throughout observation after 144 hrs. 5 percent extract is maximum in effectiveness and increase in concentration of extract gradually decline stimulatory effect of treatment. Results of statistical analysis of variance show that observe increase 5 percent treatment is significant at 5 percent error probability.

**Dry Weight of Seedlings**

Results given in table 1 are indicative that are treatment with different concentration (1, 2 and 5 percent) implement and increase in dry matter productivity throughout observation after 144 hrs. 5 percent extract is maximum in effectiveness and increase in concentration of extract gradually decline stimulatory effect of treatment. Results of statistical analysis of variance show that observe increase 5 percent treatment is significant at 5 percent error probability.

**Table 1: Effect of 12 hours pre-soaking seed treatment with *Wolffia arrhiza* (Extract of Juvenile Seedling Growth)**

		ETHER-EXTRACT						
Age of Seedlings		24	48	72	96	120	144	
Length of Root (cm.)	C	2.5	5.2	3.8	8.0	9.6	10.6	C.D. = 0.23695 DIFFERENCE 5% ETHER EXTRACT CONTROL = 3.2
	1%	2.7	5.9	6.8	8.0	10.4	12.1	
	2%	3.4	6.1	7.4	8.3	10.9	12.4	
	5%	3.7	6.8	8.0	9.6	11.1	13.8	
Number of Lateral Roots	C	3	5	5	5	5	5	C.D. = 0.23695 DIFFERENCE 2% ETHER EXTRACT CONTROL = 2.0
	1%	2	2	3	3	3	3	
	2%	3	5	6	6	7	7	
	5%	1	2	3	3	3	4	
Length of Shoot in (cm.)	C	1.5	2.3	3.2	4.2	5.1	6.8	C.D. = 0.18808 DIFFERENCE 5% ETHER EXTRACT CONTROL = 2.4
	1%	1.8	2.9	4.3	5.4	6.1	6.9	
	2%	2.1	3.6	5.0	5.7	6.8	7.6	
	5%	3.9	4.4	5.1	7.0	8.0	9.2	
Fresh Weight g/10 Seedlings	C	0.114	0.232	0.502	0.978	0.998	1.162	C.D. = 0.04743 DIFFERENCE 5% ETHER EXTRACT CONTROL = 0.818
	1%	0.156	0.326	0.581	1.024	1.127	1.264	
	2%	0.267	0.478	0.648	1.271	1.483	1.910	
	5%	0.259	0.510	0.791	1.381	1.600	1.981	
Dry Weight z/10 Seedlings	C	6.8	12.2	13.2	18.6	20.8	24.0	C.D. = 0.047391 DIFFERENCE 5% ETHER EXTRACT CONTROL = 4.2
	1%	9.1	15.6	17.2	20.4	22.8	25.1	
	2%	9.4	18.2	19.5	20.9	22.0	25.9	
	5%	10.0	20.1	21.1	22.8	25.8	28.2	

**Table 2: Effect of 12 Hours Pre-soaking Seed Treatment with *Wolffia arrhiza* (Extract of Juvenile Seedling Growth)**

WATER-EXTRACT								
Age of Seedlings		24	48	72	96	120	144	
Length of Root (cm.)	C	2.5	5.2	3.8	8.0	9.6	10.6	C.D. = 0.33510 DIFFERENCE 5% WATER EXTRACT CONTROL = 3.4
	1%	3.0	6.0	6.9	8.0	11.2	12.4	
	2%	3.4	6.2	7.6	8.5	11.4	12.8	
	5%	3.8	7.0	8.1	9.6	11.9	14.0	
Number of Lateral Roots	C	3	5	5	5	5	5	C.D. = 0.23695 DIFFERENCE 5% WATER EXTRACT CONTROL = 4.0
	1%	2	3	3	3	3	3	
	2%	4	6	7	8	9	9	
	5%	1	2	4	4	5	5	
Length of Shoot in (cm.)	C	1.5	2.3	3.2	4.2	5.1	6.8	C.D. = 0.18046 DIFFERENCE 5% WATER EXTRACT CONTROL = 2.6
	1%	1.7	3.1	4.1	5.2	5.9	6.8	
	2%	2.1	3.9	5.1	6.1	6.9	7.7	
	5%	4.1	4.7	5.8	7.6	8.2	9.4	
Fresh Weight g/10 Seedlings	C	0.114	0.232	0.502	0.978	0.998	1.162	C.D. = 0.04606 DIFFERENCE 5% WATER EXTRACT CONTROL = 0.8
	1%	0.156	0.321	0.567	1.012	1.118	1.256	
	2%	0.264	0.465	0.642	1.265	1.476	1.865	
	5%	0.256	0.505	0.789	1.364	1.526	1.962	
Dry Weight z/10 Seedlings	C	6.8	12.2	13.2	18.6	20.8	24.0	C.D. = 0.049326 DIFFERENCE 5% WATER EXTRACT CONTROL = 5.2
	1%	9.2	16.6	17.4	20.2	22.9	25.4	
	2%	9.6	19.4	20.0	21.4	22.4	26.7	
	5%	10.4	20.9	21.0	23.7	26.1	29.2	

## DISCUSSION

Based on information scattered in the literature (Hillman, 1961) and preliminary observations made (Shukla *et al.*, 1973) perimeters of study set up as described earlier for present investigation, bore fruits and revealed interesting results. They provided a new dimension of importance to lemonades. Security of wetlands and its agricultural and socio-economic significance reported by Tiwari *et al.*, (2009). Nutritive value of Indian foods studied by (Gopalan *et al.*, 2004) Present investigation has brought to knowledge facts of both academic and applied significance. The utility of duckweeds in obtaining extracts to be employed in agriculture has further multiplied their importance. A correlative discussion of observations made during present investigation and facts recorded elsewhere in the literature would provide a conceptual synthesis of subject matter. Observations on juvenile seedling growth of lentil plants show that out of various concentrations (1,2 and 5 percent) of extracts tried, 5 percent extract exhibits all round maximum beneficial growth. Length of root, number of lateral roots and length of shoot, fresh weight of seedling, dry weight of seedlings exhibit marked increase with 5 percent extract (except 12 hrs. soaking with ether and water extract where 2 percent extract is more effective in number of lateral roots). Improved seedling growth is proven with prospects of

better crop. Increase under 12 hrs. treatments in length of root, number of lateral roots and length of shoot, fresh weight of seedlings, dry weight of seedlings increased 30.18, 40, 35.29, 70.48 and 17.5 percent with 5 percent ether extract respectively. Increases in length of shoot, fresh weight of seedling, dry weight of seedlings were found to be 32.07 80.0, 38.23, 68.8 and 21.66 percent with 5 percent water extract respectively during present investigation on expiry of experiments after 144 hrs.

## CONCLUSION

Large infestation of *W. arrhiza* plants with its known noxious importance is also endowed with great potential to multiply yield and alter quality of lentil crop. The findings are of paramount academic and applied significance, and are proven with promising possibilities for utilization of *W. arrhiza* extracts by growers of commercial crop of lentil for higher and better quality lentil production.

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