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RESEARCH ARTICLE

Studies on Effect of Natural Products of *Wolffia arrhiza* on Mass Production of Rajmasah (*Phaseolus vulgaris* L.)

Amit Tiwari[1], Archana Agnihotri[2] and Piyush Mishra[3]

Abstract

The modern agricultural sector faces the challenges of addressing the needs of the fast-growing global population. This process should be both high-yielding and sustainable without creating risks to the environment or human health. Therefore, natural products are gaining attention in the production of safe and nutritious food. In systematic efforts to develop affordable and effective biostimulants, we examined the impact of botanical extracts on the nutritional parameters of Rajmash seeds under field conditions. Rajmash is a highly nutritious legume with a good amount of protein. The effect of natural products of *Wolffia arrhiza*on Rajmash (*Phaseolus vulgaris L.*) has been studied by 12 hours of pre-soaking seed treatment at lab temperature. The observations show that length of pod, seed weight per plant and weight of 100 seeds of Rajmash plant showed maximum value in seed treated with 5% ether extract and these maximum value as compare to control showed significant at 5% probability (P = 0.01) increase.

Keywords: Mass Production, Pods, Rajmash, *Phaseolus vulgaris, Wolffia arrhiza*

Introduction

The duckweeds have been rated among ten major noxious weeds (Varshney and Singh 1973) causing major problems in forty-six districts, out of their total occurrence in 77 districts in India. Duckweed landscapes of Kanpur and mapping of wetlands Interalia significance reported by Tiwari (2000, 02) It is interesting to remark that estimated trends of duckweed infestations increased in 12 districts; a decline is marked only in one, while in 8 districts a constant growth manifest. Zhou et al. (2023) reported by duckweeds for phytoremediation of polluted water.It may thus be concluded that lemonades harbor increased distribution and are potentially useful for their multiple values. Appenroth *et al.* (2018) suggestednutritional value of the duckweed species of the genus *Wolffia* (Lemnaceae) as humanfood, Hu *et al*. (2022) studied determining the nutritional value and antioxidant capacity of duckweed under artificial conditions. Pascale *et al.* (2018) reported plant biostimulants enhancing plant nutrition in organicfarming. Rouphaeland G. Colla**.,** (2020) and Yakhin *et al.* (2017) suggested biostimulants in plant science. Costanza *et al.* (2014) pointed to changes in the global value of ecosystem services. The growth, distribution, and periodicity of duckweeds in Kanpur were studied with a view to emphasizing their significance by Shukla and Pandey (1979). Gibberellic acid influence on vegetative growth, nodulation, and yield of cowpea reported by Emonger (2007). Effect of 2, 4-D, and 4-CPA on yield and quality of tomato studied by Gemici and Tan (2006). Germination of Solo papaya seeds treated with plant hormones pointed out by Zanotti (2014).

Literature excels in excellent experimental work of eminent scientists dealing with aquatic plants, still, there are wide gaps in our knowledge to fully exploit *W. arrhiza* attributes likely to offer solutions on an array of botanical quizzes. *W. arrhiza*extracts on vegetative growth Tiwari (2003) and utilization of *W. arrhiza* extracts for improvement of dry weight and number of nodules in lentil crop reported

[1]Asst. Professor, Department of Botany, D.B.S. (PG) College, Kanpur

[2]Assistant Professor D.A-V. PG College Kanpur, Kanpur, Uttar Pradesh, India.

[3]Associate Professor D.A-V. PG College Kanpur, Kanpur, Uttar Pradesh, India.

***Corresponding Author:** Amit Tiwari, Asst. Professor, Department of Botany, D.B.S. (PG) College, Kanpur, E-Mail: amittiwari421@rediffmail.com

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by Tiwari (2017). Effect of ether deficit and micronutrient foliar application on the productivity of wheat plants studied (Kassab *et al.* 2004). This interesting perspective has met only a causal, arbitrary, and partial treatment during the works of various investigators in the past. Biosynthesis and signal transduction action of plant hormones studied by Davies (2004). Prosridee *et al.* (2023) studied optimum aquaculture and drying condition for *Wolffia arrhiza (L.).* Nothing is known towards the application of *W. arrhiza* extracts with special reference to the growth, development, and yield of Rajmash plants and how their metabolism and morpho-anatomical attributes could be altered for better adaptability of the crop to multiply growth and better-quality yield. Hillman (1961) rightly pointed out that "while adequate coverage by all work with a particular group of plants must perforce touch most fields of botanical research, it is impossible to consider each of the problems in their general context; to do so would be to write an Encyclopedia'. This brief synoptic background presented here sufficiently pinpoints the existing state of knowledge and suggests areas of research on *W. arrhiza,*forming the theme of the present investigation. The present investigation deals with the utilization of *W. arrhiza*plants with special reference to the mass production of Rajmash plants.

Material and Method

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 ether to remove adhering debris and algae. Finally, the material was washed with distilled ether and cultured in thoroughly acid- and distilled ether-washed rectangular glass containers. 2.5' long, 1'broad, and 1.5' deep, containing culture medium. Medium with organic nutrients like sugars, coconut milk, and soil extracts were found unsuitable as they either supplemented to the growth of contaminants or bore unknown composition. Culture medium as modified and suggested by Pandey (1979) was selected for bulk use for maintenance of stock cultures. Soil and plant analysis reported by Piper (1942). The medium was changed nightly to avoid exhaustion of nutrients in the medium.

The sides of glass containers were covered to the brim of medium with black paper to avoid and minimize algal contamination and curtail light availability to roots of *W. arrhiza*grown.

In stock cultures, fronds were acclimatized before their use as inoculums in experimental work. The stock cultures were maintained at a temperature of 25 to 30°C with a pH range of 6.5 to 7.5. The cultures were placed in a north-south direction near large glass windows of the laboratory and were grown under normal sunlight.

Studies on the utilization of *W. arrhiza* in agriculture were made with special reference to their use for obtaining extracts containing growth substances. Rajmash variety IPR 96-4 (amber) was selected to study the effect. Genetically tested seeds were obtained from the Indian Institute of Pulse Research (IIPR), Kanpur. Seeds of approximately the same size and weight were selected for the experiment.

Wolffia arrhiza was chosen as experimental material because of its quantitative abundance and growth in the district. Experimental material grown in stock cultures as described earlier was used for preparation of *W. arrhiza* extracts.

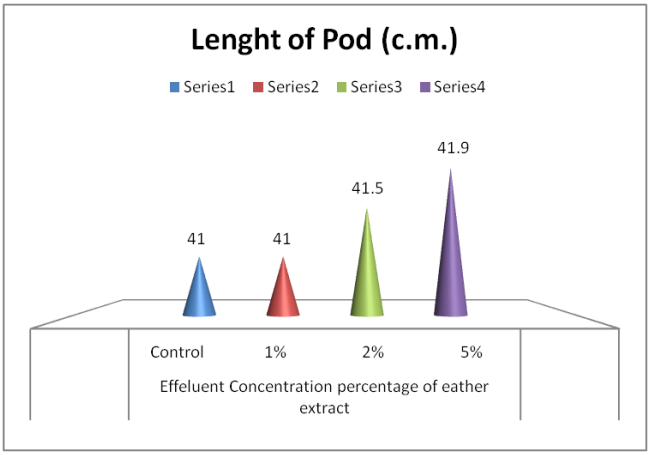
The extractions of *W. arrhiza*were made in ether. Five milliliters of *W. arrhiza* by volume were taken and ground in a clean porcelain mortar with ether. In the case of ether extract, sufficient ether was added to make it 100 ml to have a five percent extract. 1, 2, and 5 percent extracts were made by further dilutions with ether. Fifty seeds were soaked in sterilized Petri dishesin different concentrations (1,2, and 5 percent) of ether extracts of *W. arrhiza*and ether (control) for 12 hours.

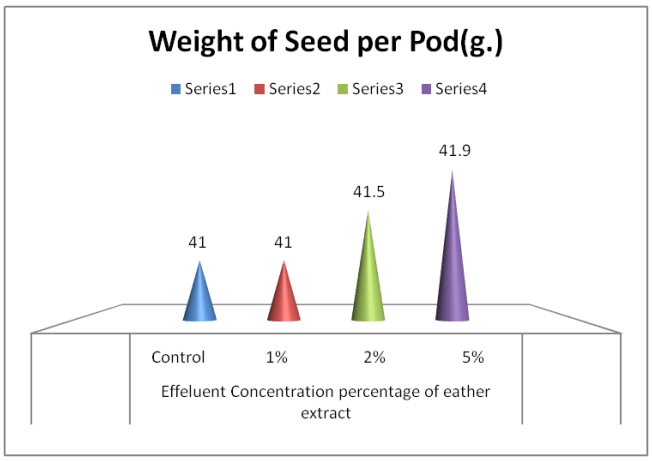
The effect of treatments was studied under field earthen pot conditions in the garden beds laid for specific purposes with dimensions of 8 feet in breadth and 10 feet in length. Each bed was sown with 3 rows containing 9 seeds spaced 25 cm in rows 60 cm apart. Thus, the total number of plants grown in each bed was 27 out of which 25 were selected for observations. Two beds of each treatment and a normal untreated control were laid to raise 50 replicates. Seeds of Rajmash variety IPR 96-4 (Amber) were soaked for 12 hours in various concentrations of extracts.

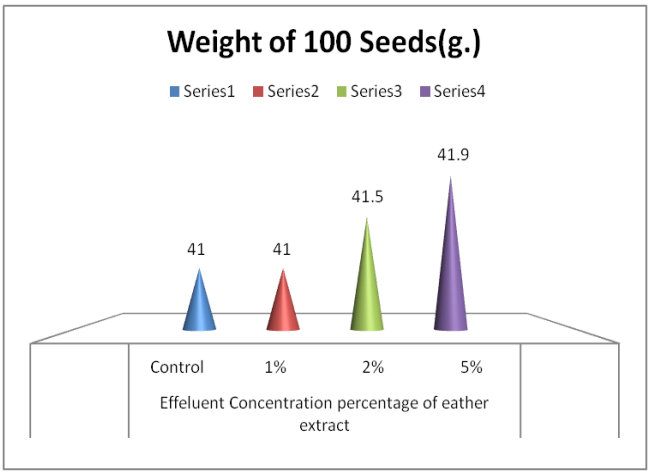
Results

Length of Pod (cm.)

Increase in level of ether extract of *W. arrhiza* up to 5% level of ether extract, over control, increases pod length of Rajmash plant. As compare to control, 2 and 5% etherextract level showed at 5% probability (P = 0.05) increase in pod length. Length of pod showed equal value at both 2% and 5% ether extract level. However, increase in pod length at 5% level of







ether extract face to reach the level of significance over 1% level of ether extract. Maximum increase in pod of Rajmash plant observed at 5% level of ether extract.

Weight of Seed per Pod (g.)

As compared to control increased in weight of seed per pod increases with the increase in level of ether extract up to 5% level. Increase in weight of seed per plant at 1% over control, and 5% over 2% level of ether extract was found to be significant at probability 5% (P = 0.01) Maximum weight of seed per pod was observed at 5% level of ether extract.

Weight of 100 Seeds (g.)

With the increase in level of ether extract treatment over control, increase in weight of 100 seed of Rajmash plant was observed 2% and 5% ether extract showed significant at 5% probability (P = 0.05) increasing weight of 100 seeds, over control, except 2% over 1% ether extract level, all other level over their proceeding. Level face to show any significant differences in weight of 100 seeds. Maximum weight of 100 seeds of Rajmash plant was observed at 5% ether extract level.

Discussion

Based on information scattered in the literature (Hillman, 1961) and preliminary observations made (Shukla *et al.* 1973), Seed priming with gibberellic acid in sponge-gourd modulated high salinity stress (Raheem, 2014), effect of gibberellic acid spray on growth nutrient uptake and yield attributes during various growth stages of black cumin (Shah et al. 2006), effect of various treatments on seed germination and seedling vigour of Anola (Singh and Kaur, 2020), bean seeds leading nutraceutical source of human health reported by Silvia *et al.* (2016). Perimeters of study set up as described earlier for the present investigation bore fruit 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). Moringa leaf extract improves biochemical attributes, yield and grain quality of rice (*Oryza sativa L.*) under drought stress concluded by Khan *et al.* (2021). Nutritive value of Indian foods studied by Gopalan *et al.* (2004); effect of gibberellic acid (GA3) on seed germination and growth of tomatoes reported by Lopez and Hernandez (2009). The results are in support of earlier findings of some other water extract on other crops. Such as moringa leaf extract improves growth, biochemical attributes, and productivity of late-sown quiona Rashid *et al.* (2021). Khan *et al.* (2017b) suggested growth promoting of fresh and stored *Moringa oleifera* leaf extract in improvingseedlingvigor, growth and productivity of wheat crop. Rashid *et al.* (2018) studied foliar applied moringa leaf extract induces terminal heat tolerance in Quinoa. Combined application of moringa leaf extract and chemical growth- promoters enhances the plant growth and productivity of wheat crop (*Triticum aestivum L.*) suggested by Khan *et al.* (2020).The 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

Table : Effect of 12 hours Pre-soaking seed treatment with *Wolffia arrhiza* extracts on Rajmash (*Phaseolus vulgaris* L.)

Phaseolus vulgaris L.	*Effeluent Concentration percentage of ether extract*				
	Control	*1%*	*2%*	*5%*	*C.D.*
Length of Pod (cm.)	9	9.1	9.3	9.3	0.2395
Weight of Seed per Pod (g.)	33	34	34.1	34.7	0.33282
Weight of 100 seeds(g.)	41	41	41.5	41.9	0.46005

made during the present investigation and facts recorded elsewhere in the literature would provide a conceptual synthesis of subject matter. However, on the basis of the increase in productivity of the Rajmash plant, 5 percent ether extract was found to be a to be a better result of *W. arrhiza*.

Conclusion-

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 Rajmash for higher and better quality Rajmash production.

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