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INFLUENCE OF SEAWEED APPLICATION ON THE GROWTH AND FLOWERING PERFORMANCE OF POMPON DAHLIA

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ABSTRACT

This study examined the Influence of Seaweed Application on the Growth and flowering Performance of Pompon Dahlia. The experiment was conducted at Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal during winter season of the year 2021-22. It was laid out on Randomized Block Design with nine treatments replicated trice. On 2nd week of December healthy rooted cuttings were planted with a spacing of 30cm x40 cm. The treatments were of seaweed (*Caulerpa racemosa)*. The treatment was T1: Tap water, T2: 2.5ml/lit, T3: 5ml/lit, T4: 10ml/lit, T5: 15ml/lit, T6: 20ml/lit, T7: 25ml/lit, T8: 30ml/lit, T9: 35ml/lit. The observation was recorded over vegetative parameter like plant height, number of brunches, number of leaves; reproductive parameter including number of flowers, flower diameter, flower stalk length, flower weight with stalk, flower weight without stalk. The results were statistically analysed. Plant height, flower stalk length, vase life, Flower weight with stalk was highest in treatment T4 i.e. (*Caulerpa racemosa)* @ 10ml/lit**.** The number of brunch, number of flower, number of leaves, diameter of the flower, vase life and flower weight without stalk was highest in (*Caulerpa racemosa)* treatment T5 @ 15ml/lit. So, it may conclude that the treatment (*Caulerpa racemosa)* T5@ 15ml/lit gave the best result in both vegetative and reproductive parameters.

Keywords **:** Dahlia, Seaweed extract, *Caulerpa racemosa*, Growth and flowering, Randomized Block Design.

Introduction

One of the most significant and beautiful winter flowering bulbous plants in the Compositae family is the dahlia. It is a dicotyledonous, herbaceous, bushy plant. Mexico and Central America are its original habitats. This plant initially bloomed in Europe in 1791, and it was given the name "Dahlia" in honour of Dr. Andreas Dahl (1751–1799), a Swedish botanist and Linnaeus's student. According to Malik *et al.* (2017), the Agric. Horticultural Society of Calcutta, India was responsible for introducing dahlia to India as early as 1857. In 1963, Mexico named the dahlia its national flower. Although dahlias have tuberous roots and are a perennial plant, they are occasionally grown as annuals in areas with harsh winters. Dahlias belong to the Compositae family and have both ray florets and disc florets in the centre of the flower. In many parts of India, dahlias are widely utilised for exhibition, garden decorating, and other purposes. Dwarf varieties are employed for beds, borders, or even mixed borders. Dahlias with giant or huge flowers work well in veranda or terrace gardens. For flower arrangements, long-stemmed flowers of various shapes and hues are used. Pompon combination Dahlias make beautiful cut flowers and can be used to make garlands. Dahlias have also been used for dietary and medical purposes. In addition to being high in inulin and fructose, tubers also have trace amounts of beneficial substances including phytin and benzoic acid (Whitley, 1985). Many types of dahlias are grown from seed but commercially propagated through stem cutting or by division of the tuberous root (Larson, 1980). Seaweed forms an integral part of marine ecosystem. On the

basis of the pigmentation present, it has been estimated that there are roughly 9,000 species of macroalgae that can be divided into three main groups. They are Phaeophyta, Rhodophyta, Chlorophyta. The extract of seaweed contain element such as N, P, K, Ca, Mg, micronutrients, macronutrients, vitamin, cytokinin, auxin and abscisic acid. Seaweed extract is regarded as a crucial source of nourishment for sustainable agriculture because it is organic and biodegradable (Masoud and Abou-Zaid, 2017). According to Gawade *et al.* (2019), seaweed is a product that is extremely enriched with macro and micro-elements, amino acids, vitamins, cytokinin, auxins, and other growth factors that alter plants' metabolism and hence promote growth. They function as bio stimulants, promoting postharvest shelf life, biotic and abiotic stress tolerance, flower and fruit production, and postharvest shelf life (Kahkashan *et al.*, 2017). This study aimed to investigate the Influence of Seaweed Application on the Growth and flowering Performance of Pompon Dahlia.

Materials and Methods

The experiment on the effect of seaweed extract on growth and flowering of pompon dahlia was conducted during the winter season of 2021–22 at the Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal, located at 23.5° N latitude, 89° E longitude and 9.75 m above mean sea level, under a subtropical humid climate. The soil of the site was sandy loam, well drained and of medium fertility, with sand (35.93%), silt (36.00%) and clay (28.07%) determined by Robinson's pipette method, organic carbon (0.74%) by Walkley and Black method, available nitrogen (0.07%) by modified Kjeldahl method, available phosphorus (28.50 kg/ha) by Olsen's method, available K_2O (78 kg/ha) by flame photometer, and soil pH ranging from 6.5 to 6.7 (Table 2). Meteorological data during December 2021 to April 2022 showed moderate winter temperatures, gradually rising towards March–April, low rainfall and high relative humidity (Table 1). The experiment titled "Effect of Seaweed on Growth and Flowering of Pompon Dahlia" was laid out in a Randomized Block Design with nine treatments and three replications, comprising 27 plots of 1.5 m × 1 m each, accommodating 243 plants at 30 cm × 40 cm spacing, using rooted cuttings of cv. Duston Red planted in the second week of December 2021. Treatments consisted of foliar application of seaweed extract at T_1-0 (control), T_2- 2.5, T_3 -5, T_4-10, T_5-15, T_6-20, T_7-25, T_8-30 and T_9-35 ml L^{-1}. Standard horticultural practices including land preparation, irrigation, staking, pinching at the 4th node stage, hand weeding, earthing up, and plant protection using Blitox (0.25%) were followed. Seaweed extract derived from Caulerpa racemosa was sprayed one month after planting, while control plants received tap water. Flowers were harvested at the proper stage in the morning, pre-cooled, and evaluated for vase life under laboratory conditions. Observations recorded included plant height, number of branches and leaves during vegetative growth, and flowering parameters such as number of flowers per plant, flower diameter, stalk length, flower weight with and without stalk, field life and vase life. Data from three tagged plants per replication were statistically analysed using OPSTAT following RBD procedures to determine treatment effects.

Results

The results so recorded have been described in the succeeding pages of the ensuing chapter under appropriate heads of study. The result regarding vegetative parameter and flowering parameter discuss here.

Vegetative Parameter

Vegetative parameter was influenced by different seaweed treatment recorded during different stage of growth of the plant.

Plant height

Spraying of seaweed extract significantly increased the plant height as compare to tap water (control). The height of dahlia plant was significantly influenced by the seaweed treatments. The highest plant height (42.33cm) was recorded in foliar spray of *Caulerpa racemosa* @ 10ml/lit (T_4) followed by (41.77cm) with foliar spray of *Caulerpa racemosa* @ 15ml/lit (T_5) which was at par. The least plant height was observed in foliar spray of tap water (T_1) with a reading of 30.33 cm (Table 3 and Fig. 1).

Number of branches

The numbers of branches of dahlia increase with increasing the dose of seaweed foliar spray @20ml/lit over control. But with further increase with the dose @ 25ml/lit the number of brunches start decreasing. The maximum number of branches of dahlia was recorded in foliar spray of seaweed @20ml/lit (Table 3 and Fig. 1).

Number of leaves

Foliar spray of *Caulerpa racemosa* @ 20ml/lit (T_6) was recorded maximum with number of leaves (244.11) followed by foliar spray of *Caulerpa racemosa* @ 25ml/lit (T_7). The minimum number of leaves was recorded in foliar spray of water (T_1) and the reading is 78.78 (Table 3 and Fig. 1).

Flower parameter

Number of flowers

The number of flowers increases with increasing the dose of seaweed @ 20ml/lit over control. But with further increase with the dose @ 25ml/lit the number of flower decreases. The maximum number of flower was recorded with the foliar application of *Caulerpa racemosa* @ 20ml/lit (T_6) (Table 4 and Fig. 2).

Diameter of the flower

Application of seaweed significantly increases the diameter of the flower. Among the different application of seaweed, the maximum diameter of the flower diameter (6.13) was recorded in foliar spray of *Caulerpa racemosa* @ 15ml/lit (T_5) followed by foliar spray of *Caulerpa racemosa* @ 20ml/lit (T_6) which was at par. The minimum diameter of the flower was recorded in foliar spray of water (T_1) with a value of 5.27 cm (Table 4 and Fig. 2).

Flower stalks length

Caulerpa racemosa @ 10ml/lit (T_4) foliar spray was observed to increase stalk length over control. Among the different application of seaweed, the maximum flower stalk length (31.77 cm) was recorded in foliar spray of *Caulerpa racemosa* @ 10ml/lit (T_4) followed by foliar spray of *Caulerpa racemosa* @ 15ml/lit (T_5) which was at par. The minimum stalk length of the flower was recorded in foliar spray of water (T_1) with a value of 28.89 cm (Table 4 and Fig. 2).

Flower weight with stalk

Among the different application of seaweed treatment foliar spray of *Caulerpa racemosa* @ 10ml/lit (T_4) shows highest flower weight (14.78 gm) followed by foliar spray of *Caulerpa racemosa* @ 15ml/lit (T_5). The minimum vase life recorded in foliar spray of *Caulerpa racemosa* @ 35ml/lit (T_9) with a value of 10.22 gm (Table 4 and Fig. 2).

Flower weight without stalk

Flower weight without stalk varied significantly increased by the foliar spray of seaweed over control. Among the different application of seaweed treatment foliar spray of *Caulerpa racemosa* @ 10ml/lit (T_4) shows highest flower weight without stalk (8.33gm) and foliar spray of *Caulerpa racemosa* @ 15ml/lit (T_5) has same reading, followed by foliar spray of *Caulerpa racemosa* @ 5ml/lit (T_3). The minimum flower weight without stalk recorded in foliar spray of water (T_1) and *Caulerpa racemosa* @ 35ml/lit (T_9) has the same value of 5.93 gm and 5.93 gm in both (Table 4 and Fig. 2).

Field life

It indicates that the field life varied significantly increased by application of seaweed over control. Among the different application of seaweed treatment foliar spray of *Caulerpa racemosa* @ 10ml/lit (T_4) shows highest (4.30 days) field life followed by foliar spray of *Caulerpa racemosa* @ 15ml/lit (T_5). The minimum field life recorded in foliar spray of water (T_1) with a value of 2.63 days (Table 4 and Fig. 2).

Vase life

Among the different application of seaweed treatment foliar spray *Caulerpa racemosa* @ 15ml/lit (T_5) shows highest (5.07) day vase life followed by *Caulerpa racemosa* @ 5ml/lit (T_3). The minimum vase life recorded in foliar spray *Caulerpa racemosa* @ 30ml/lit (T_8) and 35ml/lit (T_9) respectively with a value of both at 4.33 days (Table 4 and Fig. 2).

Discussion

Under vegetative parameters, foliar spray of *Caulerpa racemosa* @ 10 ml/lit recorded the maximum plant height (42.33 cm) in dahlia. Similar findings were reported by Sridhar and Rengasamy *et al.* (2011) in African marigold, where the highest plant height was observed with 1.0% *S. wightii* SLF treatment. According to Shaaban (2011), Ordog *et al.* (2004), and Jensen (2004) in pot marigold (*Calendula officinalis* L.), seaweed extracts contain small amounts of plant growth hormones, regulators, promoters, macro and micro nutrients, carbohydrates, amino acids, antibiotics, auxins, gibberellins, cytokinins, natural enzymes, and vitamins, which enhance yield and quality. Regarding the number of branches, it increased with increasing seaweed foliar spray up to @ 20 ml/lit over control, but further increase to @ 25 ml/lit reduced the number of branches; the maximum number of branches was recorded at @ 20 ml/lit, which is in accordance with the findings of Sridhar and Rengasamy (2011). For number of leaves, foliar spray of *Caulerpa racemosa* @ 20 ml/lit (T_6) recorded the maximum number of leaves (244.11). Dirya *et al.* (2015) also reported that application of seaweed extract at 5% increased root and shoot biomass, number of leaves, flowers, and yield in *Solanum melongena*. Under flower parameters, the number of flowers per plant increased with seaweed application up to @ 20 ml/lit over control but decreased at @ 25 ml/lit; the maximum number of flowers was recorded with *Caulerpa racemosa* @ 20 ml/lit (T_6), which agrees with Sridhar and Rengasamy *et al.* (2011) and Dirya *et al.* (2015). Flower diameter was highest with foliar spray of *Caulerpa racemosa* @ 15 ml/lit, while the lowest was observed in control plants; similar

results were reported by Norrie and Keathley (2006), Delucia and Vecchietti (2012), and Nofal *et al.* (2015) in *Calendula*. Flower stalk length increased with *Caulerpa racemosa* @ 10 ml/lit (T_4), in agreement with Dirya *et al.* (2015), possibly due to growth-promoting substances such as auxins, gibberellins, and cytokinin's present in seaweed extract. Maximum flower weight with stalk (14.78 g) and without stalk (8.33 g) was recorded with *Caulerpa racemosa* @ 10 ml/lit (T_4), whereas the minimum flower weight with stalk (10.22 g) was observed at @ 35 ml/lit (T_9) and without stalk (5.93 g) in water spray (T_1). These findings are also supported by Dirya *et al.* (2015). The maximum field life (4.30 days) was recorded with *Caulerpa racemosa* @ 10 ml/lit (T_4), while the minimum (2.63 days) was observed in water spray (T_1), which may be attributed to better plant growth; Karim *et al.* (2017) reported that seaweed and vermicompost application significantly improved vegetative growth and flowering attributes in tuberose (*Polianthes tuberosa* L.) through increased nutrient availability in soil. Regarding vase life, foliar spraying of *Caulerpa racemosa* @ 10 ml/lit significantly increased the vase life of dahlia flowers compared to other treatments; Jones *et al.* (1998) reported that application of seaweed concentrate extended the vase life of Sturt's Desert Pea flowers by five days, and Karim *et al.* (2017) also observed improvement in post-harvest attributes of tuberose due to enhanced nutrient availability.

Conclusion

The present investigation entitled "Effect of seaweed on growth and flowering of pompon dahlia" was conducted at Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia and West Bengal, during December 2021 to April 2022.

The study was conducted with nine treatments (T_1: Tap water, T_2: 2.5ml/lit, T_3: 5ml/lit, T_4: 10ml/lit, T5: 15ml/lit, T_6: 20ml/lit, T_7: 25ml/lit, T_8: 30ml/lit, T_9: 35ml/lit) with foliar spraying of seaweed *Caulerpa racemosa* and application of tap water (control). The observation was recorded under growth parameter including plant height, number of brunches, numbers of leaves; flowering parameter including number of flowers, diameter of the flower, flower stalk length, field life, vase life, flower weight with stalk, flower weight without stalk. The result was statistically analysed. Among growth parameter plant height was highest in foliar spray of *Caulerpa racemosa* @ 10ml/lit and number of brunch and number of leaves was highest in foliar spray of *Caulerpa racemosa* @ 15ml/lit. All the flower characteristics varied significantly among treatments. Among all the treatments foliar spray of *Caulerpa racemosa* @ 15ml/lit was highest in number of flowers, diameter of the flower, vase life, flower weight without stalk. Foliar spray of *Caulerpa racemosa* @ 10ml/lit was highest in flower stalk length, field life, flower weight stalk and also in flower weight without stalk. It could hence be concluded from the present studies that application of seaweed extracts as foliar spray at 30 DAP resulted in improvement of most of the economical parameters of pompon dahlia in the plains of West Bengal.

Table 1: Month wise meteorological data at the experimental site during the experimental period (open field)

Months	Temperature °C		Relative humidity (%)		Rainfall (mm)
	Maximum	Minimum	Maximum	Minimum	
December (2021)	24.69	12.27	95.51	61.19	4.7
January (2022)	23.34	10.19	95.25	60.54	0.68
February (2022)	26.67	11.07	95.07	51.14	0.99
March (2022)	33.85	17.84	91.93	40.23	0
April (2022)	32.73	17.75	96	56	3.3

(Source: Department of Agricultural meteorology and physics, B.C.K.V)

Table 2: Physical and chemical properties of soil

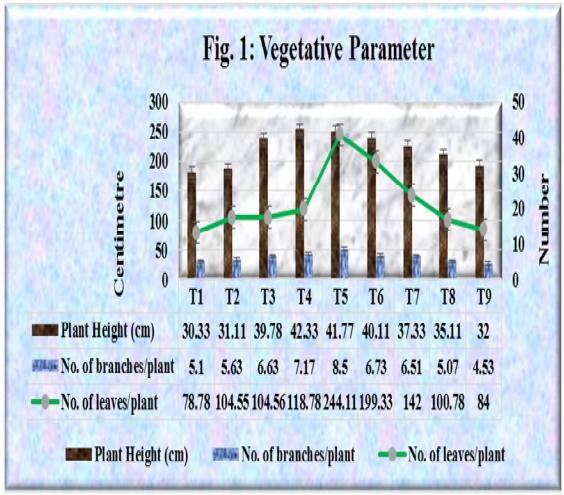
Physical properties of soil		
Sand (%)	35.93	Robinson's pipette method (Piper,1950)
Silt (%)	36.00	Robinson's pipette method (Piper,1950)
Clay (%)	28.07	Robinson's pipette method (Piper,1950)
Chemica properties of soil		
Organic Carbon (%)	0.74	Rapid titration Walkey and black method (Jackson,1973)
Total available Nitrogen (%)	0.07	Modified kjeldhal's technique (Jackson,1973)
Available Phosphorus (kg/ha)	28.50	Olsen method (Olsen *et.al*,1954) and stated by Jackson,1973
Available K_2O (kg/ha)	78	Flame photometer (Muhr et.al, 1965) as stated by Jackon, 1973
Soil pH	6.5 – 6.7	pH Meter method (Jackson,1973)

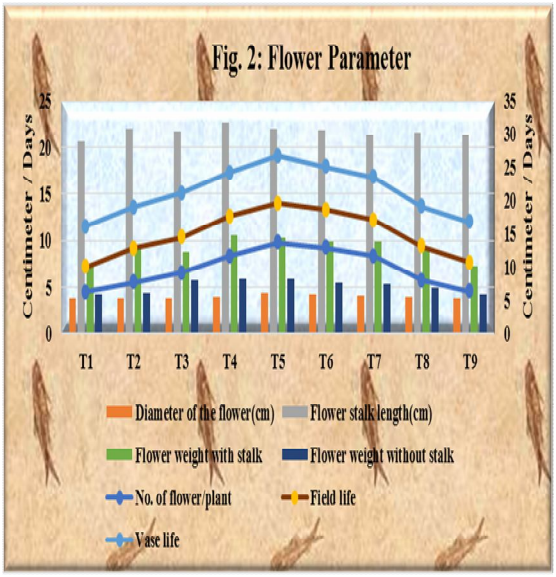
Table 3: Vegetative parameter

Treatments	Plant Height (cm)	No. of branches/plant	No. of leaves/plant
T1	30.33	5.1	78.78
T2	31.11	5.63	104.55
T3	39.78	6.63	104.56
T4	42.33	7.17	118.78
T5	41.77	8.5	244.11
T6	40.11	6.73	199.33
T7	37.33	6.51	142
T8	35.11	5.07	100.78
T9	32	4.53	84
C.D. (5%)	**4.47**	**1.36**	**11.01**
SE. M (±)	**1.48**	**0.45**	**3.64**

Table 4: Flower parameter

Treatments	No. of flower /plant	Diameter of the flower(cm)	Flower stalk length(cm)	Field life	Vase life	Flower weight with stalk	Flower weight without stalk
T1	4.5	5.27	28.89	2.63	4.4	10.22	5.93
T2	5.53	5.33	30.73	3.63	4.4	13	6.1
T3	6.53	5.35	30.43	3.77	4.8	12.22	8
T4	8.33	5.62	**31.77**	**4.3**	4.63	**14.78**	**8.33**
T5	**9.77**	**6.13**	30.75	4.23	**5.07**	14.43	**8.33**
T6	9.2	5.97	30.63	4.1	4.63	13.78	7.7
T7	8.33	5.71	29.89	3.87	4.6	13.75	7.47
T8	5.73	5.54	30.3	3.6	4.33	12.88	6.87
T9	4.53	5.41	29.77	3.1	4.33	10.25	5.93
C.D. (5%)	1.62	0.52	1.45	0.38	0.33	2.63	1.45
SE.m(±)	0.54	0.17	0.48	0.12	0.11	0.87	0.48





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