Effect of seaweed extracts on the growth, flower yield and quality of Dahlia(*Dahlia variabilis*) c.v. Aditya Birla

ABSTRACT:-

An experiment entitled "Effect of seaweed extracts on the growth, flower yield and quality of Dahlia (Dahlia variabilis) c.v. Aditya Birla" was conducted to evaluate the response of dahlia to different growth regulators, Kelp @ 2 and 4ml and Biovita @ 2 and 4 ml. Thirteen different treatment combinations were replicated thrice in a Randomized Completely Block Design. The investigation revealed that Biovita was very effective and recorded maximum days to seed germination, plant height, number of leaves, stem diameter, secondary branch number. Leaf area Significant influence of growth regulators was observed on various vegetative parameters. Flower diameter, flower number, diameter and fresh weight increased Significant influence of growth regulators was observed on various foral parameters. Highest flower numbers per plant and flower yield per ha was recorded treatment T_{11} (4 ml L-1Biovita, 5 days interval). Treatment T11 recorded higher net realization Rs. 506700 which was followed by treatment cost of cultivation with of Rs.170500.. Furthermore, highest Cost benefit ratio was recorded under treatment T11 (1:2.97).

Keywords:- Aditya Birla, Kelp , Biovita, Vegetative parameter and Cost benefit ratio.

1. INTRODUCTION:-

Dahlia (*Dahlia variabilisL.*) is one of the most popular tuberous, rooted perennial, herbaceous blooming plant, esteemed for their spectacular attractive flowers, commonly known as "water cane", "water pipe" and "hollow stem flower" because of hollowness of itsstems. Dahlia being known for its dignity and royalty, it has no rival as a bedding plant forversatile beauty, even commercially and they regularly stay fresh for more than half a monthrelying upon cultivars **(Bose et al., 2003).** Dahlia is well known bulbous flowering plant developed different parts of the world for its wonderful fancy sprouts of changing shades ofhues for the beautification of beds, borders and cut blooms. The chromosome number of DahliavariabilisL. is 2n = 64. It belongs to the family Asteraceae, originated in Mexico and was declared the national flower of this country 1963, which got its name by Cavanilles in the year1791, to commemorate

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the work of Swedish Botanist Dr. Andreas Dahl, a pupil of Linneaus.Being a well-known flower florists blossom, dahlia tubers were sold each year in millions inNorth America and Europe **(Singh *et al.*, 1994).**

Dahlia occupies a place of pride in any garden. Dahlias are easy to grow both in fieldand in pot and are extensively used for exhibition, garden display and home decoration. Dwarfgrowing types are suitable for beds and borders (pure / mixed borders). Large flowering dahliasin pots are popular for terrace garden or verandah display. Cut flowers of pompon and miniaturetypes stay fresh flower vases for many days and also better to make moderately good garlands.The long, clean and stiff stalks, are very suitable for both cut flower and decoration purpose**(Mishra *et al.*, 1990).**

Evaluation is a necessary pre-requisite for crop improvement and it will provide a rapid, reliable and efficient means of information to augment the utilization of germplasm. It is thestepping stone in order to utilize any crop to its full potential. Since, the performance of eachgenotype varies with regions, season and growing environment, therefore testing the performance of the available genotypes for suitability and adaptability take prime importance,as the research work on this line is marge in Himachal Pradesh. Keeping all these points inview, an investigation will be carried out to assess the performance of different cultivars fortheir growth and flowering characteristics under sub-montane, sub-tropical low hill zone ofHP.

Dahlia is a half hardy annual and one of the most popular of all garden annuals grownthroughout the world. It can easily be grown in the open fields and poly houses for theproduction of cut flowers; cut-asters last long and are used in vases and floral decorations. It isan important commercial ornamental annual grown in many parts of the world for cut flowers.Plant bio-stimulants refer to the natural or synthetic substances which are applied to seeds,plants and/or soil to cause changes in structural and vital processes in plant growth.**(Kumarand Chaudhary, 2018).**

The use of bio-stimulants generally increases nutrient uptake as well as nutrient useefficiency, thereby reducing the consumption of artificial fertilizers, which affect soil healthtremendously. Plant bio stimulants (PBs) such as protein hydrolysates and seaweed extracts areattracting the increasing interest of scientists and vegetable growers for their potential

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toenhance yield and nutritional quality. Bio stimulants applied in plant production have beenwidely considered as environmental friendly agricultural practice and so are now among toolsused in sustainable agriculture. Seaweed extracts have been used in organic agriculture toencourage the development and strengthen the quality performance of floricultural crops. Theeffectiveness of the seaweed extract is built entirely on hormone levels of plants or otherwisemicronutrients in the crude extract. Dried or fresh seaweeds and liquid extracts have beenincreasingly employed by horticulturists, gardeners, farmers, and orchadists as a fertilizer. Sea.The effect of seaweed extract is due to the microelements and plant growth regulators such ascytokine present in it. Seaweed extract is used as a foliar spray, application to soil and forsoaking of seeds before sowing. It enhances the germination of seeds, increases uptake of plantnutrients, and gives resistance to frost and fungal diseases. Seaweed extract is effective forincreasing shelf-life of the produce, improves the quality of produce, and serves as an excellentsoil conditioner.**Pandey *et al.*,(2017).**

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2- Add modern references
3- Here is the written review about the second factor, Biovita

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For example Kelp large brown algae or seaweeds
Biovita Is it a growth regulator or a vitamin and purity ratio

2. MATERIALSANDMETHODS:-

2.1 Experimental Site and Location

The experiment was conducted during kharif season of the year 2022 at Horticulture Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj.

Table 1. Details of Dahlia under experiment

Notation	Treatments	Frequency of application
T_1	Control	-
T_2	2 ml L^{-1}Kelp	5 days interval
T_3	2 ml L^{-1}Kelp	10 days interval
T_4	2 ml L^{-1}Kelp	15 days interval

T_5	4 ml L^{-1}Kelp	5 days interval
T_6	4 ml L^{-1}Kelp	10 days interval
T_7	4 ml L^{-1}Kelp	15 days interval
T_8	2 ml L^{-1}Biovita	5 days interval
T_9	2 ml L^{-1}Biovita	10 days interval
T_{10}	2 ml L^{-1}Biovita	15 days interval
T_{11}	4 ml L^{-1}Biovita	5 days interval
T_{12}	4 ml L^{-1}Biovita	10 days interval
T_{13}	4 ml L^{-1}Biovita	15 days interval

3. RESULTSANDDISCUSSION:-

3.1 Vegetativegrowthparametersin dahlia plantof various plant growth regulators

Days taken to germination of seeds of dahlia are one of the most important parameter of plant. The plots of treatment T_{11}were observed with mean maximum plant height(24.57)followed by 24.10 cm in T_{12} and the minimum germination of seed was observed in treatmentT_1(23.24).

Plant height of treatment T_{11}were observed with mean maximum plant height(83.13cm)followed by 80.02 cm in T_8 and the minimum plant height was observed in treatmentT_1(61.17cm). The resulting in better availability and nutrient uptake by the plants which in turn helped in producing better growth. These results regarding he plant height were well-supported by Similar results are obtained by **Pandey *et al.*,(2017), Younis*etal.*, (2014) and Kumar and Saravanan (2019).**

The highest grand mean of the stem girth of the treatment T_{11} plant was 24.25 cm and minimum stem girth of the treatment was found the control (18.45 cm). Presence of macro and micro nutrients also are of key importance because of its catalytic and stimulatory affecting various metabolic and physiological processes of the plant. Similar data was also observed by **Vikas *et al.* (2015)** in dahlia **and Yadav *et al.* (2007)** in chrysanthemum cultivars.

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The maximum number of secondary branches per plant i.e., 9.02 was recorded in treatment T_{11} followed by T_{12} (8.15) were at par with each other,whereas minimum number of secondary branches were observed with control i.e. treatment T_1(2.53).In the present study, it was observed that due to the minimum availability of macro nutrients in control treatment resulted in minimum branch production. These results are in the conformity with the findings of **Ahmed *et al.*, (2004), Younis *et al.*, (2014) and Singh *et al.*, (1996).**

The maximum number of leaves were recorded in the treatment T_{11} (150.78) whereas minimum number of leaves were recorded in the Treatment control (60.33) which was statistically significant. Similar variations in number of leaves were also reported by **Singh and Mishra (2005)** found in Tuberose and **Damke*et al.* (2006)** found in chrysanthemum.

The data pertaining to leaf area revealed that the highest grand mean of the treatment was 82.88 cm² and the lowest value found of leaf area of the treatment 64.50 cm². Similar variations in the leaf area were also observed by **Shruti *et al.* (2004) and Anope*t al.* (2010)** in gerbera.

The minimum number of days taken to first bud appearance (80.73days) was recorded under treatment control which was supplemented with Biovita followed by treatment T_2 (69.06 days), which were at par with each other. The maximum time to appearance of first bud (82.88 days) was recorded with treatmentT_{11}.The earliness in first bud appearance by the use of plant growth regulators in combination may be due to the availability of proper nutrients to the plants. As a result, plants completed their vegetative growth earlier resulted in taking the less number of days for bud appearance .While in other treatments only organic fertilizer is applied in which macronutrients are available in lesser quantities comparatively and here, the nutrients take more time to be available to the plants. These findings are similar to the **Kumar and Saravanan (2019), Kumar (2014) and Meena *et al*,(2014).**

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Table 2 Vegetativegrowthparameters in dahlia plant of various plant growth regulators

Treatments	Days taken for germination of seeds	Plant Height (cm)	Stem girth(cm)	Number of secondary branches	Number of leaves per plant	Leaf Area	Days taken for floral bud formation
Control	23.24	61.17	18.45	2.53	123.76	64.50	80.73
2 ml L^{-1}Kelp, 5 days interval	23.76	66.23	22.66	6.52	128.91	77.77	91.53
2 ml L^{-1}Kelp, 10 days interval	23.33	64.11	20.11	5.78	126.73	73.76	88.00

2 ml L^{-1}Kelp, 15 days interval	22.77	63.13	19.35	4.58	124.27	69.12	82.07
4 ml L^{-1}Kelp, 5 days interval	23.90	74.12	23.08	7.11	135.65	78.97	94.20
4 ml L^{-1}Kelp, 10 days interval	23.37	72.67	20.21	6.03	130.14	75.86	86.47
4 ml L^{-1}Kelp, 15 days interval	22.71	69.15	19.52	5.67	125.89	70.48	82.87
2 ml L^{-1}Biovita, 5 days interval	24.32	80.03	24.20	8.23	141.28	78.97	96.20
2 ml L^{-1}Biovita, 10 days interval	23.47	70.23	20.43	6.95	137.70	77.31	88.47
2 ml L^{-1}Biovita, 15 days interval	23.33	69.09	19.17	6.04	128.10	69.06	84.33
4 ml L^{-1}Biovita, 5 days interval	24.57	83.13	24.25	9.02	150.78	82.88	97.13
4 ml L^{-1}Biovita, 10 days interval	24.10	80.20	21.63	8.15	141.64	77.58	90.26
4 ml L^{-1}Biovita, 15 days interval	23.87	79.45	19.94	7.04	136.17	71.87	88.67
F test	S	F	S	S	S	S	S
Sem	0.14	1.58	0.53	0.43	1.66	1.39	25.08
C D At 5 %	0.09	1.02	0.35	0.28	1.08	0.91	16.30
CV	2.08	7.92	9.12	24.06	4.62	6.75	5.90

3.2 Floweringgrowthparametersin dahlia plantof various plant growth regulators

The largest flower diameter (11.78 cm) was recorded under treatment T_{11} which was supplemented with biovita followed by treatment T_{12} (11.06 cm), which were at par with each other whereas smallest flowers (9.95 cm) were noticed with treatment T_1 (control).**Kumar and Saravanan (2019)** found the increase in flower diameter due to the solubilizing effect on the fixed form of the nutrients increasing the flower diameter and stimulating and enhancing the flower size. Cell division, cell enlargement and availability of metabolites as amino acids, proteins and nucleo proteins led to increase in flower diameter.

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The flower duration ranged from 79.17 (T1) to 96.42 (T11) days. Plant growth regulators supplemented had presented the longest duration of flowering. This may be attributed to the reason that flowering duration potential of dahlia is under control of its genetic makeup rather than any cultural practice. These results are in line with the findings of **Farhad *et al.*, (2009).**

Among the treatments, treatment T_{11} (Biovita) was found most effective in reporting the maximum vase life (5.79 days). However, minimum vase life (4.13 days) was reported under the treatment T1 (control).

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The analysis of data, on number of flowers per plant clearly indicated that the maximum number of flowers (84.71/plant) were observed from the treatment T_{11} (Biovita) which was significantly superior over all other treatments. It was followed by treatment T_8 (84.71). The

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minimum flower number was recorded under control (74.11/plant). Similar results are reported by **Ahmed *et al* ,(2004), Khasa*et al.*, (2005)and Carlile (2008).**

The yield flower per plants of treatmentT_{11}, with Biovita were observed with mean maximum weight of flowers/plant (418.72 g) which was observed statistically significant from T1 (control)and minimum flowers yield in all the treatment was found in control (213.65 g). Weight of flowers/plant was significantly increased with the combined application.

The flower yield per tonneof treatment T_{11},with Biovita were observed with mean maximum weight of flowers/plant(16.26 t)which was observed statistically significant fromT1(control)and minimum flowers yield in all the treatment was found in control (8.50 t).Weight of flowers/plant was significantly increased with the combined application. This could be due to the maintenance of proper supply of all the essential nutrients at scheduled timing. This integration shows a positive effect on the growth of various flower crops and also increases the soil fertility status. These findings are in the conformity to the results of **Kumar and Chaudhary (2018).**

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Table 3. Flowering growth parameters in dahlia plant of various plant growth regulators

Treatments	Flower Diameter	Duration of flowering (days)	Vase life (days)	No. of flowers plant^{-1}	Flower yield /plant (g)	Flower yield/ha (t)
Control	9.95	79.17	4.13	74.11	213.65	8.50
2 ml L^{-1}Kelp, 5 days interval	10.78	93.17	5.18	82.53	299.08	12.78
2 ml L^{-1}Kelp, 10 days interval	10.55	86.43	4.52	77.67	262.45	10.45
2 ml L^{-1}Kelp, 15 days interval	10.08	80.89	4.23	74.76	252.92	9.70
4 ml L^{-1}Kelp, 5 days interval	10.9	93.6	5.23	82.86	344.73	13.35
4 ml L^{-1}Kelp, 10 days interval	10.63	86.7	5.02	77.57	323.13	11.38
4 ml L^{-1}Kelp, 15 days interval	10.11	78.93	4.65	75.24	289.14	11.09
2 ml L^{-1}Biovita, 5 days interval	11.06	94.3	5.4	84.71	361.87	16.93
2 ml L^{-1}Biovita, 10 days interval	10.77	84.7	5.02	78.29	298.76	14.35
2 ml L^{-1}Biovita, 15 days interval	10.09	80.52	4.67	75.63	272.58	12.69
4 ml L^{-1}Biovita, 5 days interval	11.78	96.42	5.79	84.9	418.72	16.25
4 ml L^{-1}Biovita, 10 days interval	11.06	89.82	5.04	79.43	372.12	15.23

4 ml L^{-1}Biovita, 15 days interval	10.45	81.87	4.79	76.27	305.34	13.89
F test	S	**S**	S	S	F	F
Sem	0.11	**1.69**	0.12	1.04	25.08	0.92
C D At 5 %	0.07	**1.1**	0.08	0.68	16.30	0.60
CV	3.77	**7.02**	8.81	4.77	15.10	19.70

3.3:Economicsofdahlia plant of various plant growth regulators

The data presented in table depicts the B:Cratio in response to the application of applied plant growth regulators. The B:C ratio was found to be1:2.81in response to treatmentT_{11}, indicating that after spending 1 rupee, one can earn profit of 2.81 rupee. For treatment T_1, the B:C ratio was least i.e. 0.99, signifying that for 1 rupee spent, one can earn profit of Rs. 0.99. The Cost of production (Rs/ ha) 17500 Rs. Maximum gross return were found in treatment T_{11} and also found net return.

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Benefit- cost ratio

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Table 4. Economicsofdahlia plant of various plant growth regulators

Treatments	Cost of cultivation (Rs/ha)	Total yield (t/ha)	Selling Rate (Rs/q)	Gross return (Rs/ha)	Net return (Rs./ha)	Benefit-cost ratio
T1	170500	8.5	4000	340000	169500	0.99
T2	170500	12.78	4000	511200	340700	2.00
T3	170500	10.45	4000	418000	247500	1.45
T4	170500	9.7	4000	388000	217500	1.28
T5	170500	13.35	4000	534000	363500	2.13
T6	170500	11.38	4000	455200	284700	1.67
T7	170500	11.09	4000	443600	273100	1.60
T8	170500	16.93	4000	677200	506700	2.97
T9	170500	14.35	4000	574000	403500	2.37
T10	170500	12.69	4000	507600	337100	1.98
T11	170500	16.25	4000	650000	479500	2.81
T12	170500	15.23	4000	609200	438700	2.57
T13	170500	13.89	4000	555600	385100	2.26

Conclusion:-

Seaweed extract had a significant effect on the growth, flowering yield and quality of branch, number of leaves and stem diameter and other floral parameter and estimate the economics of the various treatments. The highest growth and floral quality parameter was found in the treatment T_{11}, (4 ml L-1Biovita, 5 days interval) and also found highest cost benefit is 2.97.

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