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Influence of seaweed extract organic and inorganic fertilizers on growth and yield of cauliflower (*Brassica oleracea* var *botrytis*) cv Pant sugra

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Abstract
A field experiment was conducted during 2018-2019 at Horticulture farm, Department of Horticulture, SHUATS, Prayagraj in Randomized Block Design with three replications and 9 treatments. The treatment consist of T_1(10%SLF+100%NPK), T_2(20%SLF+100%NPK), T_3(30%SLF+100%NPK), T_4(10%SLF+75%NPK), T_5(20%SLF+75%NPK), T_6(30%SLF+75%NPK), T_7(10%SLF+50%NPK), T_8(20% SLF+50%NPK), T_9(30% SLF +50%NPK) and T_0(Control). The results reveals that treatment T_8 (20% Seaweed liquid fertilizer +50% NPK) emerged as superior over all other treatment combinations in terms of plant height (53.90 cm), No. of leaves (18.40), plant spread (63.63 cm), diameter of the curd (54.83 cm), weight of the curd (0.80 g), yield per plot (4.40 kg) and yield (110.77 qha^{-1}). The increased in the growth and yield parameters is due to the concentration of 20% seaweed liquid fertilizer. The experimental results obtained during soil analayis showed treatment T_1 (10% seaweed liquid fertilizer + 100% NPK) have higher availability of Organic Carbon (0.23 %), EC (0.24 dSm^{-1}), Nitrogen (145.10 kg/ha), Phosphorous (13.67 kg/ha) and Potassium (225.83 kg/ha). Treatment T_8 (20% seaweed liquid fertilizer + 50% NPK) showed higher B:C ratio (2.47) compared with the other treatments under Allahabad Agro- Climatic conditions. However, since this is based on one season experiment, further trials may be needed to substantiate the results.

Keywords: Seaweed liquid extract, NPK, growth, yield and cauliflower

Introduction
Cauliflower (*Brassica oleracea* var. *botrytis* L.*)* the varieties of *Brasssica oleracea* have same chromosome number (n=9). a cool season vegetable belongs to the family *Brassicaceae*. In India this popular vegetable covers an area of 433.9 thousand ha with a production of 8573.3 thousand ton (Anonymous, 2014). India is having low productivity of cauliflower (19.8 t/ha) compared to the other parts of the world. Varietal sensitivity to fluctuating temperature and following faulty management practices by the vegetable growers are some of the reasons for low productivity. Among the various nutrients i.e. Major and micronutrients, nitrogen is one of the most important elements. Nitrogenous fertilizers and biological nitrogen fixation represents the major inputs of nitrogen for crops. Although synthetic chemical nitrogenous compound can be used to increase the availability of nitrogen for the crop but there are alternate technologies that can be used to reduce the dependency of plants on chemical compounds.

Nowadays, application of bio stimulants has become an alternative approach to minimize the use of chemical fertilizers. Seaweeds are the macroscopic marine algae found attached to the bottom in relatively shallow coastal waters. They grow in the intertidal, shallow and deep sea areas up to 180 meter depth and also in estuaries and backwaters on the solid substrate such as rocks, dead corals and pebbles.

Seaweed liquid extract (SLE) which contains macro nutrients, trace elements, organic substances like amino acids and plant growth regulators such as auxin, cytokinin and gibberellins are applied to improve nutritional status, vegetative growth, yield and fruit quality in some plants. At present, the use of natural seaweed products as substitutes to conventional inorganic fertilizers has gained importance. Moreover, application of algal extracts in modern agriculture has been reported in some plants.

In view of the above facts, the present investigation was undertaken to study on the Influence of seaweed extract organic and inorganic fertilizers on the growth and yield of cauliflower (*Brassica oleracea* var. *botrytis* L.) cv Pant sugra.

Materials and methods

The present study entitled "Influence of Seaweed extract organic and inorganic fertilizer on the growth and yield of cauliflower" was carried out from October 2018-Feburary 2019 at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj (Allahabad).The plants are transplanted in an open field with the experiment consisting of 9 treatments with different combination viz., T_1(10%SLF+100%NPK),T_2(20%SLF+100%NPK),T_3(30%SLF+100%NPK),T_4(10%SLF+75%NPK),T_5(20%SLF+75%NPK),T_6(30%SLF+75%NPK),T_7(10%SLF+50%NPK),T_8(20% SLF+50%NPK),T_9(30% SLF +50%NPK) and T_0(Control). The experiment was laid out under Randomized Block Design (RBD) replicated thrice. The data was analyzed by method suggested by Fisher and Yates (1949).

Results and Discussion

Influence of seaweed liquid extract and NPK on the growth and yield parameter under different treatment is described in Table 1 and fig 1 its shows the plant height(cm), number of leaves, plant spread (cm),diameter of the curds (cm) and weight of the curds(g)on cauliflower which is significantly influenced by seaweed and NPK.

A. Growth Parameter

The maximum plant height per plant (53.90 cm) was observed in T_8 (20% seaweed liquid fertilizer + 50% NPK), the maximum number of leaves per plant (18.40) was observed in T_8 (20% seaweed liquid fertilizer + 50% NPK) and the maximum plant spread per plant (63.63 cm) was observed in T_8 (20% seaweed liquid fertilizer + 50% NPK) where as in T_0 shown very little growth compared to T_8. The effects of foliar applications of different concentrations of seaweed extract on nutrient uptake, growth and yield. Foliar applications of seaweed extract significantly enhanced the growth and yield parameters (Rathore *et al*., 2008), (Nedumaran *et al*., 2009) [9]. The organic and inorganic fertilizers combinations significantly increase the growth such as yield and post harvest life of cauliflower *(Brassies oleracea* L) (Kodithuwakku *et al.*, 2009) [6] (Kamble *et al*., 2014). The nitrogen application increased the yield of fooder (stem and leaves) (Bjelic *et al.*, 2005) [2] it was also recorded maximum plant height, number of branches, number of leaves (Kamble *et al*., 2014). The maximum growth parameter was recorded with different concentration of seaweed (Nedumaran *et al*., 2009) [9]

B. Yield Parameter

The maximum diameter of the curd is (54.83 cm) and maximum weight of the curd is (0.80 g) was both observed in T_8 (20% seaweed liquid fertilizer + 50% NPK) .The other treatment yield little less compared to T_8 where as in T_0 is very low in all the parameter.

Table 1: influence of seaweed extract organic and inorganic fertilizers on growth and yield in cauliflower

Treatment	Plant height(cm)	No. of leaves	Plant spreads (cm)	Diameter of the curds (cm)	Weight of the curds (g)
T_0:Control	40.43	14	47.77	45.70	0.44
T_1:10%SLF+100%NPK	47.08	17.49	61.51	52.27	0.67
T_2:20%SLF+100%NPK	41.06	15.38	54.17	46.63	0.49
T_3:30%SLF+100%NPK	40.06	14.34	48.32	46.08	0.45
T_4:10%SLF+75%NPK	42.07	15.50	54.57	47.23	0.50
T_5:20%SLF+75%NPK	41	15.21	52.14	46.33	0.47
T_6:30%SLF+75NPK	42.27	15.61	58.88	47.93	0.51
T_7:10%SLF+50%NPK	42.94	15.76	60.74	48.93	0.56
T_8:20%SLF+50%NPK	53.90	18.40	63.63	54.83	0.80
T_9:30%SLF+50NPK	42.27	15.64	59.45	47.97	0.52
F Test	S	S	S	S	S
SE.d±	1.00	0.60	1.23	2.10	0.07
CD(P=0.05%)	2.11	1.26	2.58	4.42	0.14

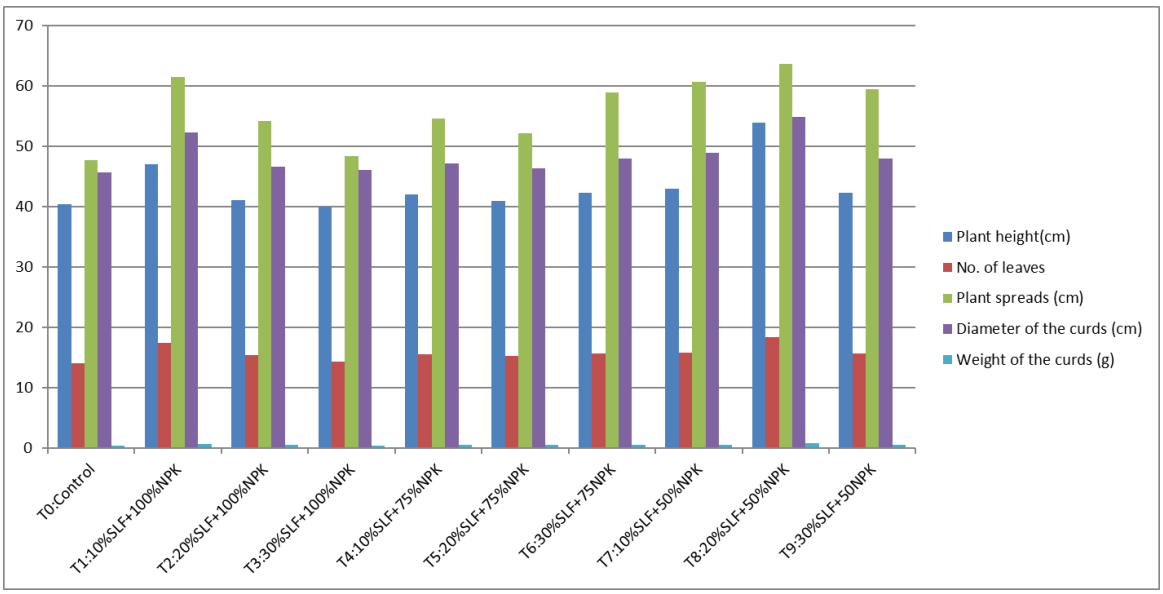

Fig 1: Influence of seaweed extract organic and inorganic fertilizers on growth and yield in cauliflower

Conclusion

In view of the experimental results obtained during the investigation, treatment T_8 (20% Seaweed liquid fertilizer + 50% NPK) emerged as superior over all other treatment combinations in terms of plant height (53.90 cm), No. of leaves (18.40), plant spread (63.63 cm), diameter of the curd (54.83 cm), weight of the curd (0.80 g). The increased in the growth and yield parameters is due to the concentration of 20% seaweed liquid fertilizer.

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