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**UTILIZATION OF SEAWEED EXTRACTS FOR GROWTH AND YIELD OF  
FLOWERING PLANT: *TAGETES ERECTA***

**NAIK K & PADHI SB\***

Centre for Environmental Studies (CES), Forest & Environment Department, Government of  
Odisha

\*Corresponding Author: [sailabalapadhi@gmail.com](mailto:sailabalapadhi@gmail.com); Mobile-+91-9937095353; Fax: 0674-  
2553182

**ABSTRACT**

The present study was carried out for studying the effect of liquid seaweed extracted on the Impact of *Gracilaria verrucosa*, *Enteromorpha intestinalis*, *Chaetomorpha linum* and *Kappaphycus alvarezii* (Doty) on the germination percentage, shoot weight and root weight, and chlorophyll content of leaf on *Tagetes erecta*. The study revealed that the pretreated seeds with different concentrations of *G. verrucosa*, *E. Intestinalis*, *C. Linum* and *K-alvarezii* extract showed enhanced growth in comparison with control. The growth increased with increases in the concentration of sea weed extract from 1% to 10% and positive result was obtained in all employed concentration of sea weed extracts.

**Keywords- Chilika lake, Seaweeds, Tagetes erecta, Germination**

**INTRODUCTION**

Seaweed liquid fertilizers were found superior than chemical one because of the presence of high levels of organic matter, thus accounting a reduction of 50% cost for chemical fertilizers Aitken and Senn (1965). The importance due to the presence of minerals, trace elements and

plant growth regulators which occur in water soluble form and enhances the disease resistance in field crops. Seaweed is also high in polysaccharides but yet very low in N. P. K content seaweed is well known for its trace mineral content and the presence of a

range of biologically active, growth promoting substances (Crouch and Van Staden 1993). Seaweed concentrates are known to cause many beneficial effects on plants as they contain growth promoting hormones (IAA and IBA, Cytokinins), trace elements (Fe, Cu, Zn, Co, Mo, Mn, and Ni), vitamins and amino acids. Several investigators have been made a lot of researches to know how seaweed works including morphological and chemical development in plants since 1965 till now. Seaweed extract is a new generation of natural organic fertilizers containing highly effective nutritious and promotes faster germination of seeds and increase yield and resistant ability of many crops, unlike the chemical fertilizers, extracts derived from seaweeds are biodegradable, non-toxic, non-polluting and non-hazardous to humans, animals and birds. Seaweed treatment of crops has grown in popularity and led to develop large numbers of processed seaweed products. These can be placed into three groups, meals for supplementing soil in large volumes or for blending into defend rooting media for glasshouse crops, powdered or liquid extracts, and concentrates employed as root dips, soil drenches and foliar sprays Booth (1969)

.Seaweed extracts are known to enhance seed germination and plant growth Bhosle et al (1975). All the crude extracts of seaweed increased protein content in root and shoot systems; total soluble sugars and chlorophyll content in leaves. As for application of seaweed to the soil show that organic matter improves physical and chemical properties of soil (porosity, structure, and water- holding capacity). Among organic sources as supplemental fertilizer, seaweed extract has been used.

The potential of floriculture as an industry has not been exploited properly. Floriculture is an extensive type of agriculture and the income per unit area from floriculture is much higher than any other branch of agriculture. In Odisha floriculture is not getting the priority it deserves though it has a great role to play in future. In the present investigation the seaweed extracts of four seaweeds *Gracilaria verrucosa*, *Enteromorpha intestinalis*, *Chaetomorpha linum* and *Kappaphycus alvarezii* (Doty) have been studied on seed germination and development of flowering plant *Tagetes erecta*.

## MATERIALS AND METHODS

Fresh thalli of the experimental seaweed (*Gracilaria verrucosa*,

*Enteromorpha intestinalis*, *Chaetomorpha linum* and *Kappaphycus alvarezii* (Doty), were collected, washed several times with Chilika and Gopalpur-sea water to remove dust and attached epiphytes. Then the thalli were washed with tap water and then they were shade dried for six days. 500 gm. of dried sample of each alga was extracted with water (1:2 w/v) by boiling for an hour. The extract was allowed to cool, filtered and the filtrate was taken as 100% concentration of liquid fertilizer. From this 1%, 5.0%, and 10% concentrations of Liquid Fertilizers was prepared by serial dilutions with sterile distilled water.

#### Collection and Selection of flowers

Ornamental flowering plant *Tagetes erecta* was obtained from Regional Plant Resource Centre (RPRC) Bhubaneswar. The flowers were selected taking uniform size, colour, annual and commercial and disease free flowers.

#### Flower socking treatment

Healthy seeds of experimental flower *Tagetes erecta* was selected, surface sterilized with 1% acidified  $HgCl_2$  for 1 minute and repeatedly washed with distilled water. The seeds were then soaked in different concentrations (1.0%, 5.0% and 10.0%)

of the Liquid Fertilizer preparations for six hours and allowed to germinate in plastic pots (15 cm high and 10 cm diameter). Seeds soaked in distilled water were used as control.

#### Germination percentage and seedling growth parameters

Germination percentage was studied 3 days after planting the seeds in pots. After 15 days the seedling were determined by recording shoot weight and root weight and the chlorophyll content of leaf in both treated and untreated conditions.

#### RESULT & DISCUSSION

Fig .1. represents the effect of seaweed extracts on percentage of germination of seed of seed of *Tagetes erecta*. The value was taken as an average of five individuals and the result was obtained after 15<sup>th</sup> days of observation. For six hour pre-treatment of seed in 1% *Gracilaria verrucosa*, the percentage of germination was  $93 \pm 1.6\%$  in 5% extract the percentage of germination was  $96 \pm 2.6\%$  and in 10% extract the percentage of germination was 99%. However in control condition, the percentage of germination of seed was  $90 \pm 3.4\%$ . With six hour pretreatment of seed in 1% *Enteromorpha intestinalis*

extract. The percentage of germination of seed was  $92 \pm 2.1\%$ , in 5% extract. The percentage of germination of was  $95 \pm 2.7\%$  and in 10% extract, the percentage of germination of seed was  $97 \pm 2.4\%$  with six hour pretreatment of seed in 1% *Chaetomorpha linum* the percentage of germination of seed was  $91 \pm 2.2\%$ , in 5% extract the percentage of germination of

seed was  $94 \pm 2.9\%$  and in 10% extract the percentage of germination of seed was  $96 \pm 2.6\%$  with six hour pre-treatment of seed in 1% of *Kappaphycus alvarezii* (Doty), the percentage of germination of seed was  $91 \pm 2.2\%$ , in 5% extract the percentage of germination of seed was  $93 \pm 3.1\%$  and in 10% extract the percentage of germination of was  $95 \pm 2.7\%$ .

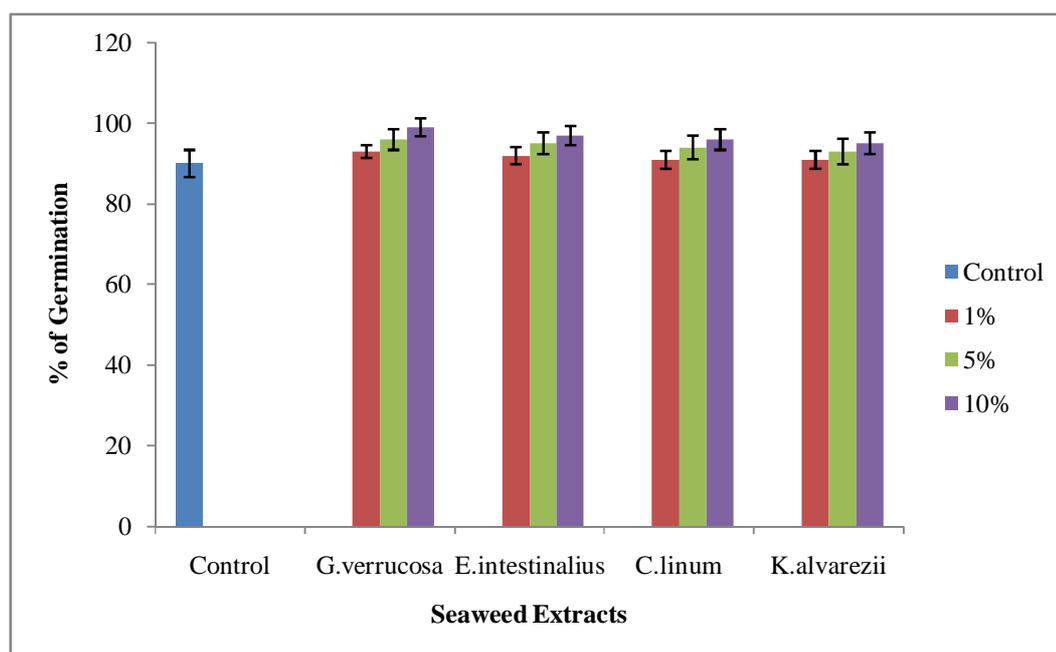


Fig-1.Effect of seaweed extract on percentage of germination of seed of *T.erecta*(15 days observation).

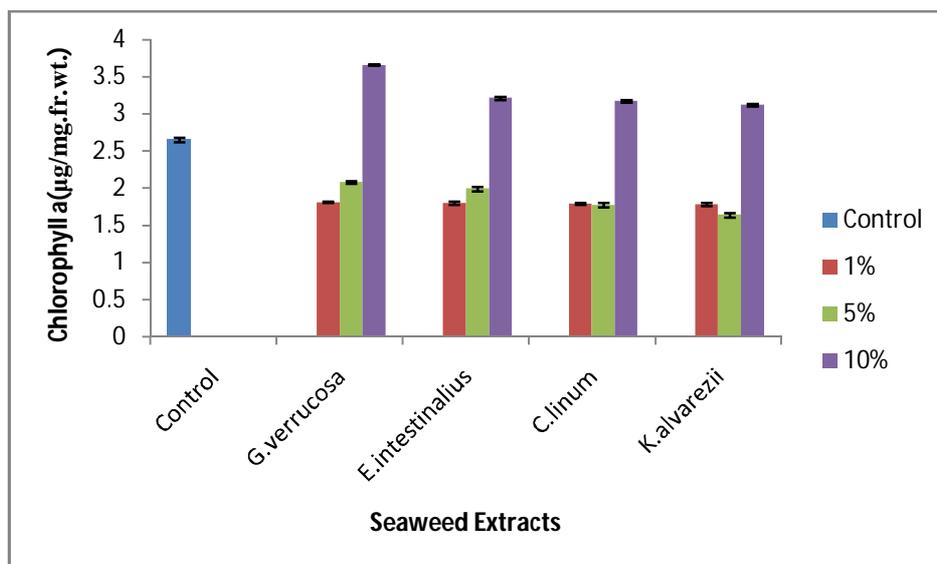


Fig-2.a.Effect of seaweed extract on chlorophyll a content of leaf of *T. erecta* (15 days observation)

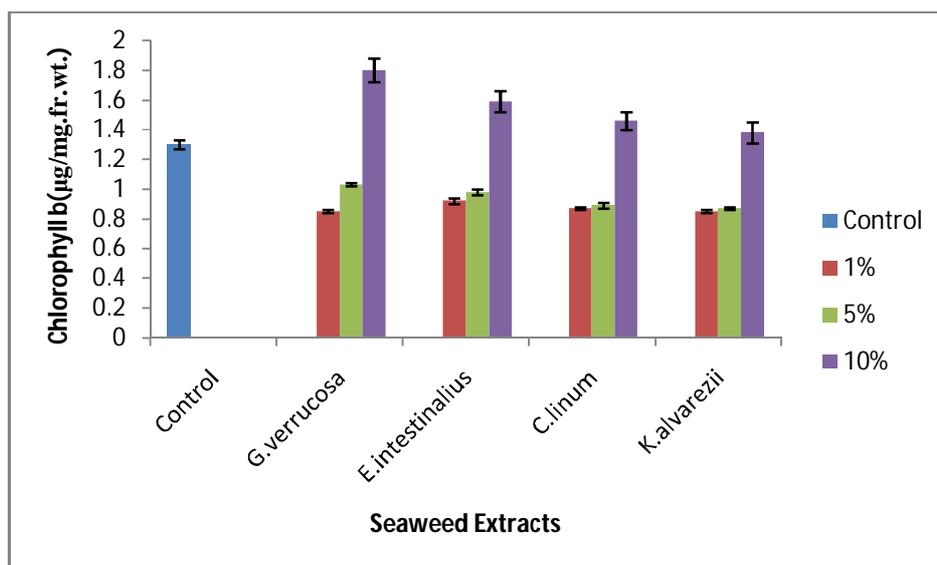


Fig-2.b.Effect of seaweed extract on chlorophyll b content of leaf of *T. erecta* (15 days observation)

Fig 2. A & b represent the effect of seaweed extracts on the chlorophyll content in ( $\mu\text{g /mg. fresh weight}$ ) of *Tagetes erecta*. The values were taken as an average of five individuals and the result was taken after 15<sup>th</sup> days of observation. In 1% *Gracilaria verrucosa*, extracts, the chlorophyll-a content

of the leaf was  $1.81 \pm 0.01$  ( $\mu\text{g /mg. fresh weight}$ ) and the chlorophyll-b content of the leaf was  $0.85 \pm 0.01$  ( $\mu\text{g /mg. fresh weight}$ ). In 5% extract, the chlorophyll-a content of the leaf was  $2.08 \pm 0.02$  ( $\mu\text{g /mg. fresh weight}$ ) and the chlorophyll-b content of the leaf was  $1.03 \pm 0.01$  ( $\mu\text{g /mg. fresh$

weight). In 10% extract, the chlorophyll-a content of the leaf was  $3.66 \pm 0.01$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $1.8 \pm 0.08$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In control condition, the chlorophyll-a content of the leaf was  $2.65 \pm 0.03$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $1.30 \pm 0.03$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In 1% *Enteromorpha intestinalis*, extract the chlorophyll-a content of the leaf was  $1.80 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $0.92 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In 5% extract, the chlorophyll-a content of the leaf was  $1.99 \pm 0.03$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $0.98 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In 10% extract, chlorophyll-a content of the leaf was  $3.21 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $1.59 \pm 0.07$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In 1% *Chaetomorpha linum*, extract the chlorophyll-a content of the leaf was  $1.79 \pm 0.01$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $0.87 \pm 0.01$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In 5% extract of the chlorophyll-a content of the leaf was  $1.77 \pm 0.03$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $0.89 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In 10% extract of the chlorophyll-a content of the leaf was  $3.17 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $1.46 \pm 0.06$  ( $\mu\text{g} / \text{mg}$ . fresh

weight). In 1% *Kappaphycus alvarezii* (Doty), extract the chlorophyll-a content of the leaf was  $1.78 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $0.85 \pm 0.01$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In 5% extract the chlorophyll-a content of the leaf was  $1.64 \pm 0.03$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $0.87 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight). In 10% extract, chlorophyll-a content of the leaf was  $3.12 \pm 0.02$  ( $\mu\text{g} / \text{mg}$ . fresh weight) and the chlorophyll-b content of the leaf was  $1.38 \pm 0.07$  ( $\mu\text{g} / \text{mg}$ . fresh weight).

Table .1. represent the effect of seaweed extracts on shoot weight and root weight of *Tagetes erecta*. The values were taken as an average of five individuals and the result was obtained after 15<sup>th</sup> days of observation. In 1% *Gracilaria verrucosa*, extracts, the weight of the root was  $68 \pm 2.1$  mg. and weight of shoot was  $280 \pm 5.8$  mg. In 5% extract, the weight of the root was  $85 \pm 3.9$  mg. and weight of shoot was  $305 \pm 4.9$  in mg. In 10% extract, the weight of root was  $95 \pm 3.1$  mg. and the weight of the shoot was  $315 \pm 5.9$  mg. However, in control condition the weight of the root was  $60 \pm 1.5$  mg. and the weight of the shoot was  $211 \pm 5.6$  mg. In 1% *Enteromorpha intestinalis*

extract the weight of root was  $66 \pm 2.2$  in mg. and the weight of the shoot was  $240 \pm 6.0$  mg. In 5% extract, the weight of the root was  $78 \pm 4.2$  mg and weight of the shoot was  $265 \pm 5.2$  in mg. In 10% extract the weight of the root was  $98 \pm 2.9$  mg. and weight of the shoot was  $290 \pm 6.1$  in mg. In 1% *Chaetomorpha linum* extract the weight of root was  $64 \pm 2.3$  in mg and weight of the shoot was  $220 \pm 6.2$  in mg. In 5% extract the weight of the root was  $76 \pm 4.3$  mg. and weight of

the shoot was  $245 \pm 5.4$  mg. In 10% extract, the weight of the root was  $96 \pm 3.2$  mg. and weight of the shoot was  $270 \pm 6.2$  mg. In 1% *Kappaphycus alvarezii* (Doty) extract the weight of the root was  $62 \pm 2.4$  mg. and weight of the shoot was  $210 \pm 6.4$  mg. In 5% extract, the weight of the root was  $74 \pm 4.4$  mg. and weight of the shoot was  $235 \pm 5.6$  mg. In 10% extract, the weight of the root was  $94 \pm 3.4$  mg. and weight of the shoot was  $260 \pm 6.3$  mg.

Table-1. Effect of seaweed extracts on the shoot weight and root weight of *Tagetes erecta* (15 days observation)

Pretreatment of seed in hours	Seaweed extract used	Control			1%			5%			10%		
		Wt. of root (mg)	Wt. of shoot (mg)	Total wt. (mg.)	Wt. of root (mg)	Wt. of shoot (mg)	Total wt. (mg.)	Wt. of root (mg)	Wt. of shoot (mg)	Total wt. (mg.)	Wt. of root (mg)	Wt. of shoot (mg)	Total wt. (mg.)
6 hours	Control	60±1.5	211±5.6	271±7.2	-	-	-	-	-	-	-	-	-
	<i>G.verrucosa</i>	-	-	-	68±2.1	280±5.8	348±7.9	85±3.9	305±7.9	395±11.8	95±3.1	315±5.9	410±9.0
	<i>E.intestinalis</i>	-	-	-	66±2.2	240±6.0	360±8.2	78±4.2	265±6.2	343±10.4	98±2.9	290±6.2	388±9.1
	<i>C.linum</i>	-	-	--	64±2.3	220±6.2	284±8.5	76±4.3	245±6.4	321±10.7	96±3.2	270±6.2	366±9.4
	<i>K.alvarezii</i>	-	-	--	62±2.4	210±6.4	272±8.8	74±4.4	235±5.6	309±10.0	94±3.4	260±6.3	354±9.7

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**CONCLUSION**

The present study indicate that the effect of liquid seaweed fertilizer obtained from four different seaweed have beneficial effect on all the parameters studied in *t. erecta*. It is evident from the above investigation that the employed experimental seaweeds grown in Chilika lake of Odisha state can be effectively utilized for extracting liquid seaweed fertilizers and utilized for sustainable horticulture.

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