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A RELATIVE STUDY ON THE EFFECT OF LIQUID FERTILIZER OF *CAULERPA SCALPELLIFORMIS* AND *HALOPHILA OVALIS* ON GROWTH AND BIOCHEMICAL COMPONENTS OF *ABELMOSCHUS ESCULENTUS* (L.)MOENCH

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I.ABSTRACT

The present study has been focus on the relative study on the effect of Caulerpa scalpelliformis and Halophila ovalis on the growth and Biochemical components of of Abelmoschus esculentus seedlings. Different concentrations (0.25%,0.50%,0.75%,1.00%,1.50%,2.00%) of SLF and SGLF were prepared using aqueous alcohol extraction method. Seaweed extracts exhibit growth stimulating property on crop plants. An adequate amount of growth promoting hormones and micronutrients present in seaweed and seagrass makes them an excellent fertilizer. Caulerpa SLF, was found to be the most effective promoting three of the six morphological parameters to the maximum extent than the Halophila SGLF. In the biochemical point of view again the Caulerpa SLF was found to be superior over the Halophila SGLF

KEYWORDS: *Concentration, Fertilizer, Growth, Seagrass, Seaweed.*

II.INTRODUCTION

The fast growing population is mounting tremendous pressure on food production in the country. To meet out this increasing demand farmers are using chemical fertilizers to enhance their crop production (Kumar and Dinabandhu, 2011). Applications of chemical fertilizers certainly compensate the deficiency of nutrients in the soil. Whereas, in excess it affect soil and plants due course (Sridhar and Rangasamy, 2010). In order to overcome this problem the use of organic fertilizers is recommended now a day. In India large quantities of macroscopic marine algae and sea grasses have been utilized directly as manures (Thivy, 1958 and 1960).In recent years liquid extracts of seaweeds known as seaweed liquid fertilizer (SLF) and that of sea grasses termed as sea grass liquid fertilizer (SGLF) are being used. The seaweed liquid is an excellent source of major elements such as N, P, K, Ca, Mg as well as many micronutrients required for normal growth of plants. Seagrasses are submerged marine angiosperms growing in the intertidal and sub tidal areas of all seas expect the polar Regions. Seagrasses are also involved in cycling of nutrients of their environment. Apart from these ecological services, seagrasses find use as human food (Kannan 2010). Nutraceuticals and antioxidant resources (Athipermualsami et al 2008, 2010) and in recent years as bio fertilizers (Venkataraman Kumar, 2011).

Sobitha bai *et al*., 2010 carried out studies on the impact of seagrass *Syringodium isoetifolium* extract on germination and linear growth of *Sorghum bicolor*. The impact of SGLF on photosynthetic pigments and chlorophyllase activity in *Sorghum* and *vigna* has been assessed by Asir selin kumar and Sobitha bai, 2010. The present study was aimed to focus the relative study on the effect of *Caulerpa* SLF and *Halophila* SGLF on growth and biochemical components of *Abelmoschus esculentus* (L.)Moench

III. MATERIALS AND METHODS

Preparation of SLF (Seaweed Liquid Fertilizer) and SGLF (Seagrass Liquid Fertilizer)

The seaweed *Caulerpa scalpelliformis* and seagrass *Halophila ovalis* were collected form Hare Island, Thoothukudi coast. The samples were hand-picked and washed thoroughly with seawater to remove all the impurities, sand particles and epiphytes. The extracts prepared by using aqueous alcoholic extraction method and then made into different concentrations (0.25%, 0.50%, 0.75%, 1.00%, 1.5%, 2.0%)

Aqueous- Alcohol extraction method: (Ramamoorthy and Sujatha, 2007)

In this method, the seaweed/seagrass after thorough washing was sun dried followed by oven drying at 40°C for 36 hours and then powdered. 500g of the dry powder was soaked in 200ml alcohol for 12 hours and shaken vigorously to dissolve the alcohol soluble constituents and the supernatant saved. The residue was boiled in 300ml of distilled water for 30 minutes, cooled and filtered. Alcohol and water soluble supernatants were mixed and the volume was made up to 500ml with distilled water to get 100% extract.

Test crop plant

The crop plant, selected for the present study was *Abelmoschus esculentus* (L.)Moench is an important plant cultivated throughout Indian subcontinent. Certified seeds of *Abelmoschus esculents* were procured from Tamil Nadu, Agricultural Research College, Killikulam. The healthy seeds free from visible infection, uniform size, colour, and weight were segregated and then the seeds were stored in metal tin container as suggested by (Rao. 1976).

Experimental Design for Study

7 batches of seeds of *Abelmoschus esculentus* were surface sterilized in 0.1% mercuric chloride for 1 minute followed by thorough washing to remove traces of mercuric chloride. Then each batch of seeds was soaked in the *Caulerpa scalpelliformis* SLF and *Halophila ovalis* SGLF obtained by aqueous-alcohol method were prepared; 100% SLF and SGLF obtained by aqueous-alcohol method was diluted to six different concentrations viz., 0.25, 0.50, 0.75, 1.00, 1.50 and 2.00% using appropriate amount of distilled water. Then each batch of seeds was soaked in the respective SLF / SGLF dilution of 12 hours while the control batches of seeds were soaked in distilled water. Then the sterilized soaked seeds were sown in earthen pots filled up with 500 g of red soil: clay soil: composite (1.00:0.80:0.20). The pots with sown seeds were treated on alternative days with respective diluted SLF as soil drench. The seedlings were allowed to grow from 21 days. On the 22nd day, the seedlings were harvested for estimation of morphological characters; shoot length, root length, number of lateral roots, and number of leaves, fresh weight and dry weight (Venkataraman Kumar *et al,* 1993). Biochemical parameters; expect for chlorophylls and carotenoid, rest of the biochemicals were estimated in oven dried powdered samples. The biochemical estimated; chlorophyll a, chlorophyll b, total chlorophyll, carotenoid, protein, amino acid, carbohydrate and lipid.

Estimation of chlorophyll a, b, Total chlorophyll and carotenoid [Arnon (1949) as modified by Harborne (1973)]

Sugar (Sheifter *et al,* 1950)

Amino acid (Rosen, 1957)

Protein (Lowry *et al,* 1951)

Table 1-Effect of *Caulerpa scalpelliformis* SLF on growth parameters of bhendi seedlings

parameters	Control	SLF concentration (%)					
		0.25	0.50	0.75	1.00	1.5	2.0
Root length (cm)	11.23±0.36	14.16±1.92	18.86±0.86	19.00±0.36	18.96±0.85	19.33±0.46	17.73±1.17
Shoot length (cm)	7.76±2.37	10.00±1.54	10.46±1.01	9.23±0.64	10.53±0.77	11.00±0.29	9.10±1.22
No of lateral roots	18.66±4.70	23.66±4.25	37.0±1.08	27.33±8.37	32.66±6.98	38.33±8.41	21.33±6.38
No of leaves	4.00±0	3.66±0.33	3.33±0.33	3.66±0.33	3.66±0.66	5.33±0.66	3.33±0.33
Fresh weight (g)	0.896±0.092	0.860±0.110	0.943±0.317	0.939±0.068	1.320±0.216	3.240±1.182	0.923±0.137
Dry weight (g)	0.080±0.005	0.126±0.038	0.193±0.003	0.153±0.023	0.206±0.026	0.468±0.115	0.156±0.049

N=15,Means±SE±

Table 2-Effect of *Halophila ovalis* SGLF on growth parameters of bhendi seedlings

parameters	Control	SLF concentration (%)					
		0.25	0.50	0.75	1.00	1.5	2.0
Root length (cm)	13.67±0.92	11.26±0.39	11.67±0.44	10.83±0.44	13.76±0.72	13.43±0.47	13.66±0.44
Shoot length (cm)	8.33±0.33	13.73±0.93	14.66±1.67	12.30±0.72	15.86±0.47	15.76±0.104	15.23±0.14
No of lateral roots	26.33±0.88	29.67±0.33	31.33±0.67	36.00±0.57	45.33±0	46.60±0.67	41.67±0.67
No of leaves	4.00±0	4.00±0	5.33±0.67	4.66±0	6.00±0	7.33±0.67	5.33±0.67
Fresh weight (g)	0.376±0.152	1.133±0.110	1.276±0.053	1.767±0.349	1.430±0.344	1.480±0.237	1.520±0.317
Dry weight (g)	0.010±0.001	0.110±0.005	0.133±0.024	0.200±0.035	0.150±0.028	0.190±0.029	0.180±0.025

N=15,Means±SE

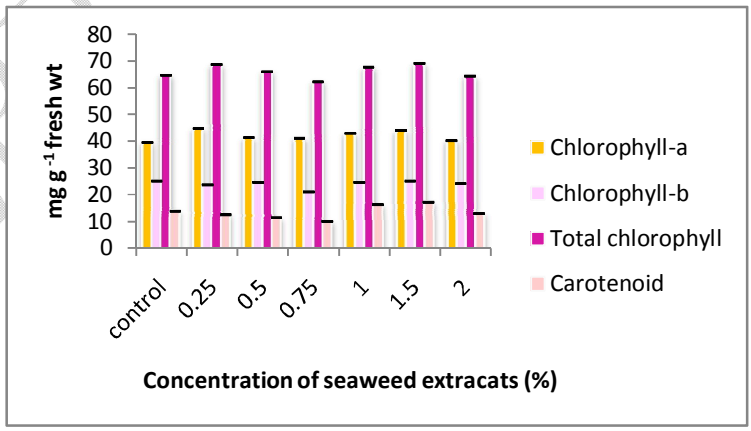

Fig- 1. Effect of *Caulerpa* SLF (alcohol) on photosynthetic pigments in Bhendi seedlings.

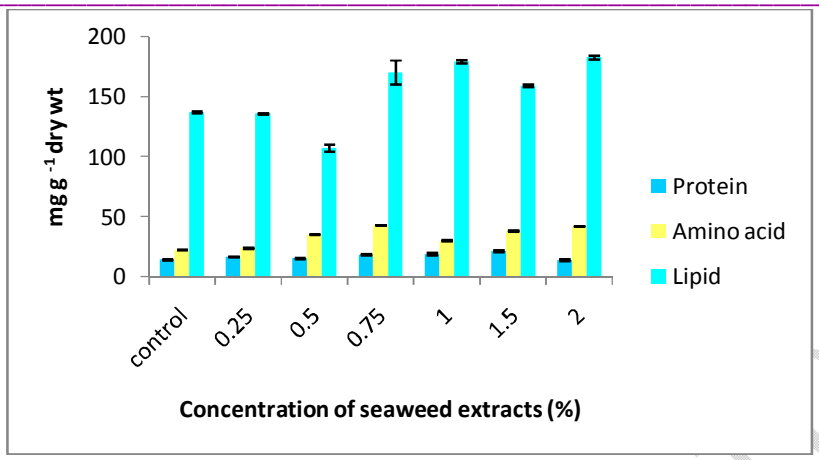

Fig- 2. Effect of *Caulerpa* SLF (alcohol) on certain biochemicals in Bhendi seedlings.

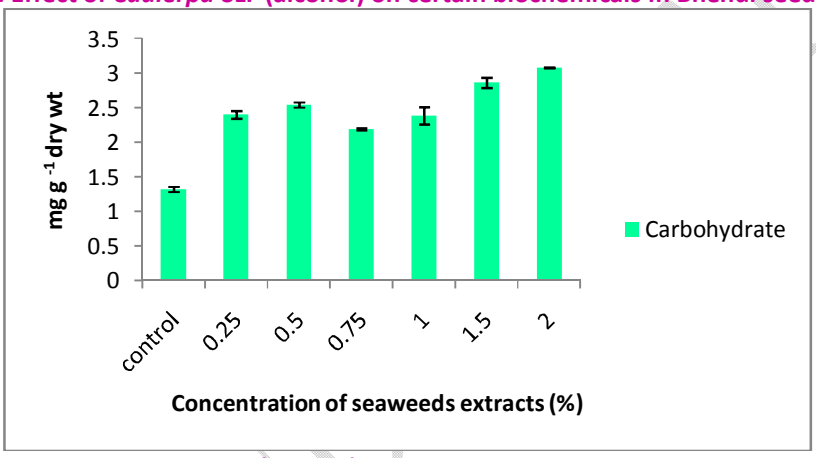

Fig- 3. Effect of *Caulerpa* SLF (alcohol) on carbohydrate content in Bhendi seedlings.

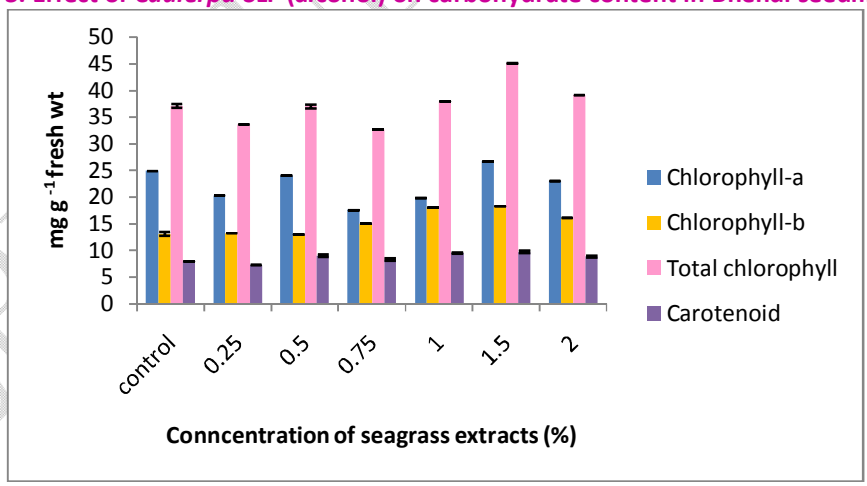

Fig- 4.Effect of *Halophila* SGLF (alcohol) on photosynthetic pigments in Bhendi seedlings.

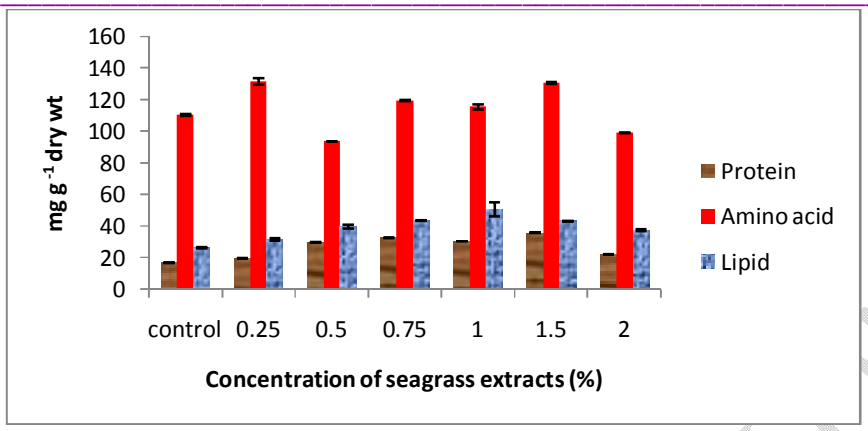

Fig- 5.Effect of *Halophila* SGLF (alcohol) on certain biochemicals in Bhendi seedlings..

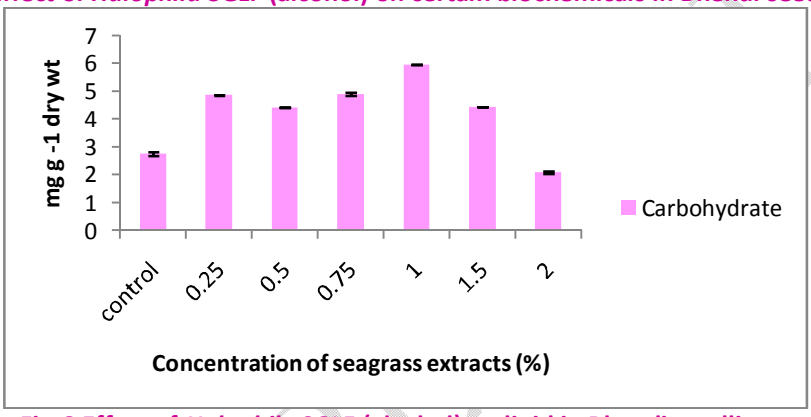

Fig-6.Effect of *Halophila* SGLF (alcohol) on lipid in Bhendi seedlings.

Result

Effect of *Caulerpa scalpelliformis* SLF (Table- 1; Fig- 1, 2, 3)

Shoot length, root length and number of lateral roots at all the concentrations of *Caulerpa* SLF exceeding over the control with the maximum effect at 1.5%). Number of leaves was more than the control only that at 1.5%) whereas fresh weight and dry weight of the bhendi seedlings exceeded over the control at almost all the concentration with peak values at 1.5% SLF (Table-1).

The amount of chlorophyll a and total chlorophyll was more than the control at all the concentrations with the maximum values at 1.5%) SLF. The carotenoid content exceeded over the control at 1.00 and 1.5% SLF (Fig- 1)..The amount of protein, amino acids and carbohydrates was more than the control at all the concentrations except 0.50%. Except for protein which showed peak value at 1.5% SLF rest of the biochemicals exhibited at 2.00% (Fig- 2,3).

Effect of *Halophila ovalis* SGLF (Table-2; Fig- 4, 5, 6)

As compared to control, shoot length was more at 1.00%) SGLF, root length and number of lateral roots at all the concentrations peaking at 1.00%), number of leaves at 0.50 to 2.00%) with maximum at 1.50%, fresh weight at all the concentrations and dry weight at 0.50 to 2.00%) with the highest values at 0.75% SGLF (Table-2).

The amount of chlorophyll a was more than the control at 1.50%), chlorophyll b at all the concentrations except 0.50%, total chlorophyll at 1.00, 1.50 and 2.00% and carotenoid at all the concentration except 0.25% SGLF (Fig- 2). The protein content exceeded over the control at all the concentration of SGLF with peak value at 1.50% while amino acid exceeded over the control at 0.25, 0.75,

1.00 and 1.50%. The amount of carbohydrate and lipid was more at all the concentrations of SGLF when compared the control with peak values at 1.00%) SGLF (Fig- 5, 6).

DISCUSSION

In bhendi seedling maximum root length of 11.0cm±0.288 was induced by1.5% *Caulerpa* SLF while 1.00% *Halophila* SGLF enhanced root length to the maximum of 15.86cm±0.470. Shoot length to the maximum of 19.33cm±0.436 was triggered by *Caulerpa* SLF at 1.50%.In earlier studies too, the green seaweed (Cladophora) SLF accelerated root length and shoot length to the maximum extent when compared to brown and red seaweed extracts in *Vicia faba* (Fabe beans) seedlings (EL-Sheek and El-Saied, 1999). Highest root and shoot length was observed in 10%) *Caulerpa racemosa* SLF treated *Vigna catajung* (Cow pea) seedlings compared to that of *Gracilaria* SLF (Anantharaj and Venkatesalu, 2001). These observations support the present findings in Bhendi vegetable-crop seedlings wherein the green seaweed (*Caulerpa*) SLF promoted the shoot length and root length to the maximum level. So *Caulerpa* SLF was found to be the most effective promoting three of the six morphological parameters to the maximum extent than the *Halophila* SGLF. Comparing, these two extents, *Caulerpa* SLF was dominant over *Halophila* SGLF. Caulerpa SLF (1.50%) enhanced chlorophyll a (44.028mg±0.003) chlorophyll b (25.107mg±0.001), total chlorophyll (69.135mg±0.004), carotenoid (17.243mg±0.025) and at 2.00% lipid (182.57mg±1.470) to the highest level. So from biochemical point of view once again the *Caulerpa* SLF was found to be superior over the *Halophila* SGLF in promoting many of the biochemical content to the highest level. Sobitha bai et al, 2007 have reported that impact of *Spyridia* (red seaweed) SLF was slightly lesser than that of *Syringodium* SGLF in promoting increased total chlorophyll and carotenoid content in *Abelmoschus esculentus* (Bhendi).Different concentrations of SLF (0.5%, 1%, 2.0%, 2.5%) when applied to soil bed, enhanced the chlorophyll a, b, protein, sugar, starch and nitrate reductive activity of *Sorghum* (Ashok *et al*., 2004).

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