A STUDY ON THE EFFECTS OF SEA WEED LIQUID FERTILIZER (CAULERPA TAXIFOLIA) ON THE GERMINATION AND GROWTH OF PHASEOLUS VULGARIS

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Abstract: In the developing world, the use of seaweed liquid fertilizer should be urged to avoid environmental pollution by heavy doses of chemical fertilizer in the soil. In the present day world, the seaweed fertilizers are often found to be more successful than the chemical fertilizers.
The major findings of this study are the treatment with specific concentrations of SLF can increase the germination percentage of the *Phaseolus vulgaris.* The treatment with 5 % concentrations of *Caulerpa taxifolia* SLF on *Phaseolus vulgaris* resulted maximum seedling length, growth index and vigour index. 2%, 4% and 5 % SLF treatments were obtained 100 % germination for *Phaseolus vulgaris.* So such treatment could achieve the farmer's maximum germination.
Phaseolus vulgaris seeds soaked with low concentration of *C.taxifolia* showed lower rates of germination, while increasing concentrations of extract promoted the germination.

Key words: Seaweed Liquid Fertilizer, *Phaseolus vulgaris, Caulerpa taxifolia*

I. INTRODUCTION

Chemical fertilizers are very common in agriculture. Chemicals may pollute water bodies, air, soil etc. The effluents from chemical fertilizer industries release substantial quantities of nutrients into water causing eutrophication. Chemical fertilizers are highly toxic and lethal to all types of living organisms including animals and plants. These problems can be overcome by increasing the production of organic bio-fertilizers

Sea weed represent an alternative to conventional chemical fertilizers. Sea weed contains large traces of potassium and natural hormones making it a hearty fertilizer that strengthens root and plants overall system. Sea weed extract is used as liquid organic biofertilizer because of its organic micro nutrient, nitrogen, phosphorous, potassium and natural growth hormone contents such as auxin, cytokinins etc. The plant growth hormone effect of seaweed has advantageous to stimulate germination and growth, thereby increasing the yield and resistance ability of many crops (Moller and Smith, in 1998).

Sea weeds are marine macro algae which form an important component of marine living resources of the world. Liquid extract obtained from sea weeds are successfully used as foliar sprays for several crops (Bokil *et al*.,1974).

There are many under-utilized crops such as *Phaseolus vulgaris* which can be used to alleviate nutritional deficiencies in the third world countries like India especially child mal nutrition. *Phaseolus vulgaris* commonly called Bush bean is a semi tropical legume plant native to South America, probably from Mexico (Damián-Huato et al., 2013). Beans are especially rich in vitamin C. Eating 100g of this food provides 20% daily needs. If maximum productivity is achieved for this plant it would be easily and cheaply available in the country .So it can be a potential source for compacting nutrient deficiencies in the country. So an attempt is made to increase the productivity of *Phaseolus vulgaris* using seaweed fertilizers.

II. MATERIALS AND METHODS

The seaweed used in this study were *Caulerpa taxifolia* . It was collected from the coastal area of Thikkodi in Kozhikode district. Samples were washed thoroughly using tap water to remove surface salt and spread on blotting paper to remove excess water

SLF was prepared by following the method of Thirumaran *et al.,* (2009). One kilogram of seaweed was cut in to small pieces powdered well and autoclaved for one hour. The hot extract filtered through a double layered cloth and allowed to cool at room temperature. The filtrate was then centrifuged for 30 minutes. The resulting supernatant was taken as 100% seaweed extract. By using this extract different solutions with concentrations of 1%, 2%,3%,4% and 5 % are prepared .

The crop selected for the present day study was bush bean (*Phaseolus vulgaris*). The seed for this study were collected from home gardens. Seeds with uniform size, colour and weight were taken for experiment.

A total of 120 seeds were selected to conduct the experiment. Seeds were placed in various petridishes, each with 10 seeds. Each treatment was given triplicate as a standard procedure to minimize error. One sample is watered regularly with distilled water and considered it as control (T_0).Other samples were treated with 1%(T1),2%(T2),3% (T3),4%(T4) and 5% (T5) concentrations of seaweed liquid fertilizer prepared from *Caulerpa taxifolia.* Germination percentage were recorded on 5thday,10thday and 15thday of the experiment other growth parameters such as vigor index, growth index, phytotoxicity and productivity are calculated based on Erulan *et al.* (2009).

III. RESULTS AND DISCUSSION

Table -1. Effect of LSF(*C.taxifolia*) on *Phaseolus vulgaris*- 15th DAY

	Radicle length (cm)	**Hypocotyle length (cm)**	**Seedling (cm)**	**Germination %**	**Phyto toxicity**	**Growth index**	**Vigour index**
T0	**1.2**	0.7	1.9	50%	-	-	0.95
T1	**1.8**	0.5	2.3	90%	-50	1.21	2.07
T2	**2.1**	0.5	2.6	100%	-75	1.37	2.6
T3	**-**	-	-	-	100	-	-
T4	**6.5**	1.45	7.95	100%	-441.7	4.18	7.95
T5	**4.5**	3.7	8.2	100%	-275	4.32	8.2

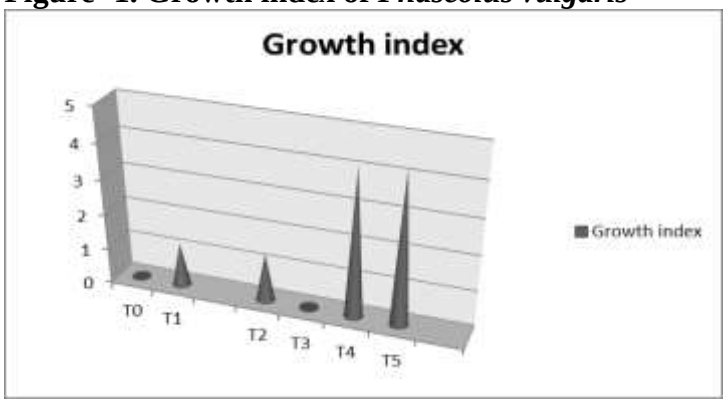
The high concentration (5%) of aqueous extracts of *C.taxifolia* promoted the seedling growth including the parameter of hypocotyl length (3.7cm), growth index(4.32)(Figure-1) and vigor index(8.2) and germination percentage(100%) (Table-1).

The radicle length (1.2cm), seedling length(1.9cm) germination percentage(50%),vigor index(0.95) were lowest at control. Hypocotyl length (0.5cm) of T1 and T2 were found to be same. For T1,Growth index(1.21cm) is minimum.

From this we conclude that *Phaseolus vulgaris* seeds soaked with low concentrations of seaweed extracts showed lower rates of germination, while increasing concentrations of extract promoted the germination.

The highest phytotoxicity was recorded with application of 3% seaweed extract .This could be the reason for the negative response of T3 in growth variables.T2, T4 and T5 show maximum germination percentage ie,100%.

Figure- 1. Growth index of *Phaseolus vulgaris*



As far as phytomass is concerned,1% SLF treated *Phaseolus vulgaris* yielded phytomass of 0.421.But it is seen that the treatments T4 and T5 have not show much difference in the phytomass value. It can also be known that phytomass values of T3 is very less compared to other treatments (Table-3).

Table-3.Phytomass and Productivity of *Phaseolus vulgaris*

	Phytomass (gm)	**Productivity**
T_0	0.266	0.0008
T_1	0.421	0.028
T_2	0.251	0.0167
T_3	0.189	0.0126
T_4	0.386	0.0257
T_5	0.37	0.0247

The maximum productivity was observed for the T1.The productivity of non SLF treated *Phaseolus vulgaris* control seedlings showed least productivity. The treatments T4 and T5 have been more or less similar in their productivity.

The low concentration of aqueous extracts of *S. wightii* and *C. chemnitzia* promoted the seedling growth, fresh weight and dry weight, chlorophyll, carotenoids , protein content of shoot etc. (Sivasankari et al., 2006); 1% & 2% SLF of *Caulerpa racemosa* increased seedling length, vigour index and growth index of *Vigna mungo*(Abhilash *et al*.,2013); Paddy, and Chilli got a significant increase in the same growth parameters with 2% *Kappaphycus alvarezii* SLF treatment (Babu and Rengasamy,2012); 2% *Hypnea musciformis* SLF treated *Arachis hypogea* showed maximum germination percentage, fresh weight, dry weight, root and shoot length, number of branches, leaf area etc. (Selvam and Kathiresan, 2014).

In this study 5% SLF treatment with has resulted maximum seedling length, growth index, vigour index, growth index etc. Similar observations were reported by Rathore *et al.*, (2009), the concentrations of (SLF -*Kappaphycus alvarezii*) 2.5 % and 5 % , the latter concentration was significant on soya bean for plant height, number of plants, number of branches etc.; 5 % SLF treatment with *Sargassum wightii* showed maximum shoot length, root length, fresh weight and dry weight on brinjal (Divya *et al*., 2005)

SUMMARY AND CONCLUSION

In the developing world, the use of seaweed liquid fertilizer should be urged to avoid environmental pollution by heavy doses of chemical fertilizer in the soil. In the present day world, the seaweed fertilizers are often found to be more successful than the chemical fertilizers. The treatment with 5 % concentrations of *Caulerpa taxifolia* SLF on *Phaseolus vulgaris* resulted maximum seedling length, growth index and vigour index.

The major findings of this study are the treatment with specific concentrations of SLF can increase the germination percentage of the *Phaseolus vulgaris.* 2%, 4% and 5 % SLF treatments were obtained 100 % germination for *Phaseolus vulgaris.* So such treatment could achieve the farmers maximum germination. *Phaseolus vulgaris* seeds soaked with low concentration of *C.taxifolia* showed lower rates of germination, while increasing concentrations of extract promoted the germination.

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