# Effect of sea weed (*Caulerpa racemosa*) extract on biochemical variations, growth and yield of *Vigna mungo.*

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## Original Article

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## Abstract

The present investigations revealed that seaweed species were observed to be the potential sources of fertilizer. In the case of vigor index, at first 3 concentrations 100% was noticed and it reduced at last 2 concentrations. The phytotoxicity was increased with increased SLF concentration and it was at maximum at 3% concentration. Present findings encourage the application of such seaweeds as natural fertilizer in agriculture sector. It was also understood that the too much or too less concentrations of SLF has reduced effect on the selected plant. 1% concentration of *Caulerpa racemosa* SLF has proved increase in yield, growth and biochemical content in *Vigna mungo.*

**Key Words:** Vigour Index, Phytomass, Productivity, Growth Index, Seaweed Liquid Fertilizer.

## Introduction

In India agriculture is the major source of occupation. More than 70 per cent of working population derives their livelihood by cultivation. More over in India agriculture is the basis of economic structure of India. But due to pollution and other anthropogenic activities the unpredictable nature of climate has resulted much damage to agriculture. Modern agronomy, plant breeding, pesticides, fertilizers and technological improvements have sharply increased yield from cultivation but at the same time have caused wide-spread ecological damage and negative human health effects. Nationwide the need for nitrogen, phosphorus, potassium fertilizers increased from 96,116 tons in 2006 to 739,271 tons in 2007. The increase tends to be caused by the dosage increase of fertilizer used in per unit area. The fact shows that the farmers used about 300-350kg of urea and other chemical fertilizers for crop plants and rice per hectare. This condition not only increases production cost but also reduces soil fertility, and causes environmental pollution (Pusri 2008). The importance of seaweeds as manure has been recognized for a long time in other countries. However, in India very little information is available on the beneficial effects of seaweeds to improve crop growth Bhosle *et al* (1975), Vijayalakshmi and Lakshmanan (1988). Newton (1951) reviewed the use of seaweeds as manure by ancient Romans and the method of seaweed application from whole and chapped seaweeds as well as liquid supplement and extracted preparations. The responses of plants to seaweed application are many and varied. These include higher yield, increased nutrient uptake, changes in plant tissue composition, increased resistance to frost, fungal disease and insect attack, longer shelf of fruit and better seed germination. The present study was undertaken to investigate the effect of seaweed liquid fertilizers (SLF) of *Caulerpa recemosa* on the growth and biochemical characteristics of *Vigna mungo*

## Material and Methods

### PREPARATION OF SEAWEED EXTRACT

The collected seaweed (*Caulerpa recemosa*) are thoroughly washed and dried at 45° c in oven and ground to a fine powder. For preparation of fertilizer, 50g of each sea weed powder were weighed and 50ml distilled water added to it and filtered through muslin cloth to obtain 100% SWC. This concentrated solution is made into five different proportions (1%,2%,3%,4% and 5%).

### SELECTION OF CROP PLANT

The crop plant selected for the present study was *Vigna mungo L*. belonging to the family Fabaceae. It's life-cycle will completed in 2-3 months. It is a rich source of protein, carbohydrates and certain minerals. The seeds were collected from healthy looking plants growing in the house-hold region. The seeds with uniform size, colour, and weight were chosen for this experimental purpose.

The parameters has been used for the study are enlisted below

I. Germination studies (Based on Chou and Muller (1972); Vilasini. G. (1975); Sharma and Saran (1992).

1)Germination percentage 2)Radicle and hypocotyl lengh 3)Vigour index 4)Phytotoxicity 5)Growth index 6)Phytomass and productivity

II. Morphological studies are conducted based on (Erulan et al., 2009)

1) Height of the plant 2)Length of the roots 3) Number of leaves 4)Number of flowers and fruits 5)Phytomass and productivity

III. Biochemical studies are carried out based on Arnon, 1949; Lowry et al., 1951; Shirlaw et al., 1967.

1) Protein 2)Carbohydrate 3)Chlorophyll Pigments

## Results:

I. GERMINATION STUDIES

In Caulerpa treated seeds, the germination percentage was decreased with increasing concentration; in the first three concentrations 100% seeds were germinated.

But in 4% and 5% the germination percentage was 96.66 and 93.33 respectively.

The hypocotyl and radical length of control was 7.96 and 3.75 c.m. The radical length ranges from 3.71c.m. (3%) to 3.21 c.m. (5%). It is also seen that the hypocotyl length and radicle length were decreased with increased concentration. Here the hypocotyl length varies from 10.38 c.m. (1%) to 7.33 c.m. (5%). In this case, the seedling length of 5% SWC was lesser than those of control. Table - 1.

**Table-1. Germination studies of *Vigna mungo***

| | Radicle (Cm) | Hypo-cotyl(Cm) | Seedling (Cm) | Germin-ation% | Vigour Index | Growth Index | Phyto-toxicity |
|---|---|---|---|---|---|---|---|
| Control | 3.75± 0.18 | 7.96± 0.44 | 11.71± 0.65 | 100 ± 1 | 11.71 | - | - |
| 1% | 4.87± 0.19 | 10.38± 0.47 | 15.25± 0.68 | 100 ± 1 | 15.25 | 1.3025 | -29.86 |
| 2% | 4.61± 0.19 | 10.11± 0.47 | 14.72± 0.68 | 100 ± 1 | 14.72 | 1.2570 | -22.93 |
| 3% | 3.71± 0.18 | 9.96± 0.46 | 13.67± 0.67 | 100 ± 1 | 13.67 | 1.1673 | 1.066 |
| 4% | 4.33± 0.18 | 9.86± 0.46 | 14.19± 0.67 | 96.66± 0.96 | 13.70 | 1.2117 | -15.46 |
| 5% | 3.21± 0.17 | 7.33± 0.44 | 10.56± 0.64 | 93.33± 0.93 | 9.85 | 0.9017 | 13.86 |

As in the case of vigor index, at first 3 concentrations 100% was noticed and it reduced at last 2 concentrations. The phytotoxicity was increased with increased SLF concentration and it was at maximum at 3% concentration.

The root length of the plants varied from 33.83 to 51.75 cm. The maximum root length was recorded in the plants that received 1% SLF of Caulerpa. The values of root length of the plants were presented in the Table-2.

**Table-2.Phytomass and Productivity**

| | Fresh Weight | Dry Weight | Phytomass | Productivity |
|---|---|---|---|---|
| Control | 0.193 | 0.028 | 0.165 | 0.041 |
| 1% | 0.220 | 0.030 | 0.189 | 0.047 |
| 2% | 0.209 | 0.029 | 0.179 | 0.044 |
| 3% | 0.200 | 0.027 | 0.172 | 0.043 |
| 4% | 0.205 | 0.028 | 0.177 | 0.044 |
| 5% | 0.183 | 0.025 | 0.157 | 0.039 |

The shoot length of the plants varied from 98.113 to 149.71cm. The maximum shoot length was noted in the plants that received 1% SLF of Padina. The values of shoot length of the plants were depicted in Table-2.

Fresh weight of the black gram was varied from 32.5 to 39.86 mg g-1.fr.wt.The results of fresh weight of the plants were depicted in the Table-2.

The dry weight of black gram was ranged from 9.85 to 15.25 mg g-1 .fr.wt. The results of the dry weight of the plants were depicted in the Table-2.

The protein content ranged from 0.430 to 0.996 mg g-1 f. wt. The minimum protein content was observed in the plants that received 5% seaweed liquid fertilizer of *Caulerpa*.

The total carbohydrate content ranged from 0.117 to 0.609 mg g-1 f. wt. The minimum content was noted in the plants that were treated with 5% SLF of *Caulerpa*.

## Discussion:

In the present study, SLF treated plants showed better activity than controlled plants. These findings can be correlated with earlier studies, Gandhiappan and Perumal (2001); Sivasankari *et al.,*(2006). The seeds treated with *Caulerpa racemosa* show the maximum seedling growth at 1%. These recordings supported by Bukhari and Untawale (1978) reported that the lowest concentration of *Enteromorpha intestinalis* treatment showed 100 % seed germination. Venkataraman Kumar *et al.,* (1993) obtained 100 % seed germination at lowest concentration in Black gram. Anatharaj and Venkatesalu (2001) reported that higher concentration of *Gracilaria edulis* reduced the seed germination in *Dolichos biflorus.*

In the present investigation, the seeds treated with lower concentration of seaweed liquid fertilizer (SLF) increased the vegetative growth. The fresh weight , dry weight, Phytomass, productivity etc were at maximum for *Vigna mungo* when treated with 1% of SLF. The vigour index and growth index were also showed maximum value at 1% concentration, the former two indices decreased with increase in SLF



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concentration. Erulan *et al.,* (2009) reported that SLF at low concentrations enhanced the growth parameters such as shoot length, root length, leaf area, fresh weight, dry weight and moisture content. Biochemical parameters like chlorophyll 'a' and 'b', protein, sugars, starch, ascorbic acid were also found higher at 1.5%.

**Conclusion**:

Sea weed fertilizer can absorb by the plant within several hours and safe to humans, animals and the environment. The present investigations revealed that seaweed species were observed to be the potential sources of fertilizer. Present findings encourage the application of such seaweeds as natural fertilizer in agriculture sector. It was also understood that the too much or too less concentrations of SLF has reduced effect on the selected plant. 1% concentration of *Caulerpa racemosa* SLF has proved increase in yield, growth and biochemical content in *Vigna mungo.* Thus the SLF was found to be the cheapest source of fertilizer in coastal areas of Malabar for plant growth but further more research is needed to strongly establish the mechanism of action of the seaweed extract on the plant growth.

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