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Research Article

PROMOTE GROWTH AND PHOTOSYNTHETIC PIGMENTS OF *LYCOPERSICON ESCUENTUM L.* USING FOLIAR SPRAY EXTRACT OF *SARGASSUM ILICIFOLIUM* (BROWN SEAWEED)

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ABSTRACT

The seaweeds play a vital function in marine environment and renewable assets of marine surroundings. Many of the seaweeds used as food, fooder and fertilizer. The present investigation focused on the brown seaweed *Sargassum ilicifolium* used as fertilizer in the *Lycopersicum esculentum L* . The effect of foliar extract and different concentration (10%, 25%, 50%, 75%, 100%) control distilled water. And the effect of above thought foliar application on the growth and photosynthetic pigments of 45 days old seedlings of *Lycopersicum esculentum* L parameters were analyzed. Among the five methods of treatments 25% of *Sargassum ilicifolium* (turner) C. Agardh extract is very effective compare to control and other concentration.

Keywords: *S. ilicifolium, Lycopersicun esculentum,* Foliar application, Photosynthetic pigment, Growth pigment.

INTRODUCTION

The most valuable resource on earth is marine algae, which are also a common source of food, feed, and untreated materials a number of industries. Marine algae together along with green vegetables, salads, as well as jellies, marmalade, chocolates, and pickles, are utilized as sustenance for humans (Kılınç *et al.,* 2013). In recent years, seaweed used as a biofertilizer (Dhargalkar and Pereira, 2005). Alginic acid, vitamins, antibiotics, nutrients, and all trace elements are present in seaweed (Hong *et al.,* 2007). The growth hormones (auxins, gibberellins, and vitamins) in seaweed extracts increase crop production, seed germination, and resistance against fungal infections, insect assaults. An alternative to traditional chemical fertilizers is seaweed. Commercial liquid seaweed extracts have very effectively utilized as foliar sprays on several crops Rao and Chatterjee, (2014). The care of soil has been negatively impacted by chemical agriculture. Chemical fertilizers have reduced soil fertility, making the soil acidic and killing crop plants. The steady loss of soil fertility is brought on by nutrient losses, salt buildup, other element accumulation, and uneven nutrient compensations (Ramya *et al.,* 2010).

Since the extract of seaweeds includes growth promoting hormones (IAA, IBB), they are significant as foliar sprays for many groups. The higher degree of organic matter in seaweed fertilizer makes it superior to chemical fertilizer because it helps plants maintain moisture and minerals at the topsoil layer where they can grow (Kumareswari and Rani, 2015). Crops get foliar sprays of seaweed concentrations as root dips, and soil drenches. Seaweeds are also now used as soil supplements, promising uses for plant bio-stimulants (Jayaraj *et al.,* 2008). Recent studies have shown that bioactive chemicals in ultra-low levels have positive effects on a variety of species, especially those that generate seedlings for agricultural plants (El-Din, 2015; Al-Shakankery *et al.,* 2014).

In addition to requiring micronutrients for growth and development, tomatoes are a heavy feeder of plant nutrients such as nitrogen, phosphorus, and potassium (Pramanick *et al.,* 2016). One of India's most widely grown vegetables is

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the tomato *(Lycopersicon esculentum L).* In India, agriculture accounts for more than 70% of all employment (Krishna *et al.,* 2019). This work designed to look into the impact of foliar function of *S. ilicifolium* on the activity of *L. esculentum L.*

MATERIALS AND METHODS

Collection of Samples

Sargassum ilicifolium (C. Agardh), seaweed used in the current study, is a member of the Phaeophyceae family (plate 1). The seaweed *(S.ilicifolium*) collected by C. Agarth was found along the shore of the Gulf of Mannar Biosphere Reserve in Tamil Nadu. To any unwanted contaminants, epiphytes, and clinging sand particles, the samples are washed with seawater. Algae with morphologically different thallus were packed in polythene bags, preserved in an ice chest filled with slush ice, and brought to the lab. Seaweeds were broadening out on the paper to absorb surplus H2O, when the water dried up. The dried seaweed was broken up into little fragments using the mixer. The powder was sieved, and liquid seaweed fertilizer was made from this powder and kept in vials (Jha *et al.,* 2009).

Collection of crop plant

The agricultural crop used for the current study *L. esculentum* (L) mill, a member of the Solanaceae family and seeds produced from TACRI, Coimbatore, Tamil Nadu. The Seed be cleaned three times in distilled water after being sterilized for one minute with0.1 % mercuric chloride.

Preparation of seaweed extract

The experiment conducted in a greenhouse environment with a temperature of around 28°C (85%) humidity; the treatments were organized in a random block design. Five treatments at different extract strengths made up the experiment (DI). Three replicates of one seedling were used for each treatment. Two foliar sprays were made for each plant: the 50 ml of seaweeds sprayed at transplant time, and then 100 ml was administered four weeks later (Zodape *et al.,* 2011). As a result of water pressure, the stomata were open when the sprays were done in the morning, allowing for greater foliar penetration. Throughout the experiment, all plants received water as needed, except for foliar applications, which went without water for 24 hours.

Preparation of pot study

They were steamed with 0.1% mercuric chloride before being seeded in clay pots with a soil mixture containing NPK. In each container, ten seeds were planted. Regular watering was done in the pots and the seed to pot distance was kept at 3-5 cm. 10 days later, Various SLF levels were used as foliar sprays to potted plants for treatment. At three-day intervals, around 50 ml of various extract concentrations were sprayed.

Details of treatments

Sargassum ilicifolium (10%,25%,50%,75%100%) and Control (Dis.H2O)

Germination percentage

Germination refers to the initial appearance of the radical by visual observation.

% Germination = No. of seeds germinated/total no. of seeds sown* 100

Fresh and dry weight

Each seedling was divided into a root and a branch. They were dried at 800C for 24 hours while being blotted in paper, weighed, and dried. By using a balance, the dry weight was measured.

Estimation of chlorophyll

The amount of chlorophyll method followed by Arnon (1949).

RESULTS AND DISCUSSION

The effect of foliar application *Sargassum ilicifolium* Seaweed extract (10% ,25%, 50%, 75%, 100%) different concentration on *Lycopersicon esculentum* of growth parameters (% of germination , Shoot length, Root length, Fresh weight , Dry weight) has been depicted in the form (Table 1 and Plate 2,3) and photosynthetic pigments (chlorophyll a, b, and total chlorophyll) in (Figure. 1).

Seaweeds constitute a vital part of the world's marine biological resources. To improve production in many commercial crops, it is regular procedure to foliar spray seaweed extract (Khan *et al.,* 2009). The *S. ilicifolium* extract was Prepared different concentrations of foliar spray (10, 25, 50, 75, 100%) used in *L. esculentum*. The growth parameters like Shoot length, root length, Fresh weight, and dry weight were observed in 45 days old plants. A minimum 100% of germination was observed at 25 % of *S. ilicifolium.* The result of maximum shoot length (39.082 ± 2.083) and root length (16.473 ± 2.083) were found in 25% of *S. ilicifolium*. The maximum fresh and dry wg (0.832 ± 0.912, 0.0004 ± 0.205) was showed in 25% of *S. ilicifoium* extract of foliar spray. Similar research indicates that a 20 % *Sargassum wightii* concentration improved the fresh and dry weight, fresh shoot length, and root length of *Abelmoschus eschulanthes* and *Cyamopsis tetragonolaba*, respectively (Jothinayagi and Anbazhagan, 2009).

In comparison to methods that involve applying nutrients to the soil, foliar spray of mineral nutrients offers a simple way to provide nutrients to higher plants. Application of Algal extract at 25 to 100% resulted in significantly greater stimulation of growth characteristics such as leaf area, shoot length, and number of leaves/shoot

than the control treatment (Abdel-Aziz and Ragab, 2017). Similar investigations found that applying seaweed (*S. crassifolium*) to tomato plants improved the amount of dry matter that branches accumulated, although larger concentrations had an inhibitory impact (Stephenson, 1974). Featonby-Smith BC, van Staden J, (1983 a) Observed Owing to macro and micro elements as well as growth-promoting compounds including cytokinin, the growth of tomato root and shoot improved when a seaweed extract was applied either as foliar spray or combined with the soil.

Early vegetative, tassel initiation, and maturity have all contributed to the crop producing more grain and staves than the control in hybrid maize plants (Basavaraja *et al.*, 2018). At 15% seaweed extract, which was significantly more than all other treatments, the highest number of pods per plant, test weight, and grains per pod were observed. Foliar treatment had no discernible impact on plant height, number of pods per plant, number of grains per plant, number of branches per plant, or test weight. seaweed extract with a concentration of up to 5% (Rathore *et al.*, 2009, Zodape *et al.*, 2008).

Plate I. Brown Seaweed of *S.ilicifolium C.Agarth*.

Plate II. Effect of *S.ilicifolium* extract on growth of *Lycopersicon esculentum* using foliar spray method.

Plate III. Effect of *S.ilicifolium* extract on growth of *Lycopersicon esculentum* using foliar spray method.

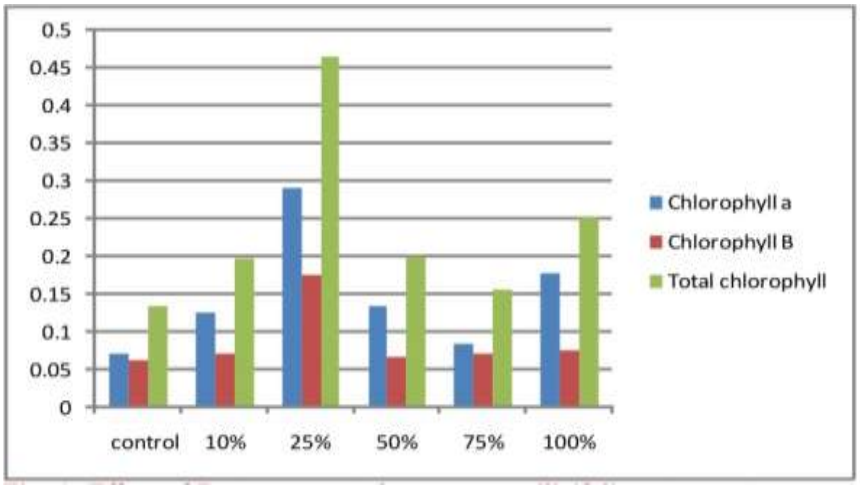

Figure 1. Effect of Brown seaweed *Sargassum ilicifolium* extract on chlorophyll pigments of *L. esculentum* using foliar sparay methods.

Table 1. Shoot length, Root length, Fresh weight, Dry weight of *L.esculentum.*

Parameters	Control	Treatments (Mean ± SD)				
		10%	25%	50%	75%	100%
% of germination	100%	90%	100%	100%	100%	100%
Shoot length (cm)	6.978±0.880	5.277±0.765	39.082±2.083	7.591±0.918	17.555±1.396	5.452±0.778
Root length (cm)	21.141±1.532	13.497±1.224	16.473±2.083	7.160±0.891	7.120±.889	12.548±1.180
Fresh weight (g)	0.819±0.905	0.192±.438	0.832±0.912	0.064±0.254	0.605±0.777	0.072±0.268
Dry weight (g)	0.306±0.553	0.004±0.063	0.0004±0.205	0.00018±0.0134	0.008±0.091	0.0005±0.024

The photosynthetic pigment like chlorophyll a, b, and total chlorophyll was observed in *L. esculentum* 45 days old plants. The maximum level of chlorophyll 'a' (0.2905) 25% and Chlorophyll b. The effects of foliar application of seaweed extract up to 5% concentration on plant height, number of pods per plant, number of grains per plant, number of branches per plant, and test weight were not significant. (25%) and total chlorophyll (0.4662) was showed in *S. ilicifolium* (Fig: 1). Yao *et al.,* (2020) examined the Auxins, betaines, and cytokinins found in certain seaweeds increase the chlorophyll content of leaves. Numerous studies showed that applying seaweed extract to leaves caused the quantity of chlorophyll to rise (Krajnc *et al.,* 2012). Tomato and cucumber seedlings' chlorophyll content increased as a result of the seaweed treatment in *Ascophyllum nodosum* (Whapham *et al.,* 1993). Spraying plants with seaweed extract improves their chlorophyll levels (Blunden et al., 1996). *Cyamopsis tetragonoloba* exhibits an increase in photosynthetic pigment in response to the seaweed extract. The highest pigment levels were often seen in photosynthetic seaweed (Thirumaran *et al.,* 2009, Sheheta *et al.,* 2011).

CONCLUSION

A cheap and sustainable source of bio-fertilizer and bio-stimulants is seaweed. In the development of crops, marine macroalgae extracts are frequently employed as liquid bio-fertilizers. SLF treatment of agricultural plants had great outcomes in all respects. As a result, SLF of *S. ilicifolium* is a potent and affordable fertilizer that may be advertised as an environmentally benign bio-fertilizer.

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