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Research Article

SIGNIFICANCE OF GREEN AND BROWN SEAWEED LIQUID FERTILIZER ON SEED GERMINATION OF *SOLANUM MELONGENA*, *SOLANUM LYCOPERSICUM* AND *CAPSICUM ANNUM* BY PAPER TOWEL AND POT METHOD

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ABSTRACT

Today, the challenges faced for higher yield of crop, require implementing modern agricultural practices including use of variety of fertilizers. The commercially available inorganic fertilizer has many environmental hazardous issues that have been supplement by Seaweed Liquid Fertilizer. Seaweeds contains considerable amount of micronutrients and plant growth hormones which helps in seed germination. The Seaweed Liquid Fertilizer prepared from *Ulva lactuca*, *Ulva reticulata*, *Padina pavonica*, *Sargassum johnstonii*. The effect of Seaweed Liquid Fertilizer by different concentrations like 1%, 2%, 3%, 4%, 5% and control (without treatment) were studied for electrical conductivity, seed germination, shoot height, root height, seedling length and seed vigour index content of *Solanum melongena*, *Solanum lycopersicum* and *Capsicum annum* baby plant. The aim of our study was to evaluate effect of different concentration of Seaweed Liquid Fertilizer on vegetables seeds by the paper towel method and pot method maintained under natural conditions. The finding of the present study showed that the brown Seaweed Liquid Fertilizer gave better result as compared to green Seaweed Liquid Fertilizer at 4% concentration.

INTRODUCTION

In agricultural systems, the extensive application of chemical fertilizers to increase crop productivity has caused considerable damage to the ecology and has even depressed the nutritional quality of crops. A focus on organic farming for health considerations and also to meet the stringent consumer standards, agricultural practices are increasingly being modified (Kramer *et al*., 2006). The quantity of many factors among which is the most important one is technique of fertilization. The use of biofertilizer and organic fertilizer are healthy practices for economical production in place of synthetic fertilizer. Organic farming is a system of ecological soil management that relies, in part or in full, the rotation of crop, organic waste amendments, balanced mineral nutrient management, and mechanical and biological controls on building organic matter with minimum adverse effects on soil health.

In agriculture and horticulture, there is a scope for intensive use of seaweeds resources to improve harvest quantity and quality. Many reports were available on plant seedling development, seed germination and tolerance concentration of plants through environmental stress carried out using various seaweed products implementing on different cultured plants in many reports available (Zhang and Ervin, 2004; 2008), and increased plant growth and yield (Hong *et al*., 2007; Zodape *et al*., 2008; Khan *et al*., 2009; Kumari *et al*., 2011). In agriculture and horticulture, a number of commercial seaweed extract products are available for use as liquid extracts applied in different application foliar spray, in granular/powder or soil drench form as soil conditioners and manure (Blunden *et al*. 1997; Lingakumar *et al*. 2004; Thirumaran *et al*. 2009).

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Seaweed extracts contains major and minor nutrients, amino acids, vitamins, auxin, cytokinins and abscisic acid like growth promoting substances (Mooney and Van Staden, 1986) and have been reported to increase nutrient uptake from soil (Verkleij, 1992; Turan and Köse, 2004) and to stimulate the growth and yield of plants (Rama Rao, 1991) and enhance antioxidant properties (Verkleij, 1992). The marine algae fertilizer was affected on growth promoting efficiency on several plants in cereals, pulses and vegetable crops (Hernandez-Herrera *et al*., 2014; Parthiban *et al*., 2013; Bai *et al*., 2013; Kalaivanan *et al*., 2012, Zodape *et al*., 2011; Sasikumar *et al*., 2011; Kalidass *et al*., 2010). Crop yield can increase in two ways related to vigourous seeds: (1) maximum density made by higher seedling percentage even under abiotic stress conditions and (2) higher emergence rate and increased growth (Ghasemi- Golezani *et al*., 2010).

Solanum melongena, *Solanum lycopersicum* and *Capsicum annum* are one of the most important vegetable crops around the world in terms of human consumption, and they are also the most popular garden vegetable. The present study aims to investigate the effect of Seaweed Liquid Fertilizer prepared from *Ulva lactuca*, *Ulva reticulata*, *Padina pavonica* and *Sargassum johnstonii* on electrical conductivity, percentage germination, root length, shoot length, seedling length and vigour index of *Solanum melongena*, *Solanum lycopersicum* and *Capsicum annum.*

MATERIALS AND METHOD

Preparation of Seaweed Liquid Fertilizer

Seaweeds of *Ulva lactuca* (A1), *Ulva reticulata* (A2), *Padina pavonica* (A3), *Sargassum johnstonii* (A4) were collected from Sundervan at Bety- Dwarka located in Northwest to Southeast in 13 km (8m) with an average 4 km (2m) in east-west direction of coast of Okha, Gujarat (22° 26' 58" N 69° 72" E). At first, seaweeds were washed with sea water for 3 to 4 times to remove all epiphytes and sand particles, after brought in the laboratory again washed thoroughly with tap water for 3 to 4 times to remove salinity of seaweeds. The wet seaweed samples were dried in sunlight. After sun drying, seaweed was cut into small pieces and powdered. The 1kg powder of each seaweed sample was mixed with water (20 L) in the proportion of 1:20. Then it was boiled for 1 h. The mixture was cooled and filtered with muslin cloth (Bhosle *et al*. 1975). The obtained liquid extract was designated as standard solution and was used to prepare various concentrations of 1%, 2%, 3%, 4% and 5% of extract by mixing appropriate proportion of Seaweed Liquid Fertilizer with sterilized distilled water.

Healthy seeds of *Solanum melongena*, *Solanum lycopersicum* and *Capsicum annum* were collected from Vegetable scientific research center, Anand Agriculture University, Anand, Gujarat. The seeds surface were sterilized with 0.1% $HgCl_2$ up to 1-2 minutes and washed with distilled water immediately then used for different germination methods. The seeds were socked in different concentrations of different Seaweed Liquid Fertilizers up to 24-48 hours and then used for germination by two different methods: (1) Paper Towel and (2) Pot method.

Physico- chemical parameters of Seaweed Liquid Fertilizer

The pH and electrical conductivity (EC) of the Seaweed Liquid Fertilizers were measured using a pH meter and conductivity meter, respectively, and the colour of the seaweed extracts were observed visually.

Electrical Conductivity test of selected vegetables seed

1 g of selected seed of *Solanum melongena*, *Solanum lycopersicum* and *Capsicum annum* vegetable were weighed, the seed surface sterilized with 0.1% $HgCl_2$ for 1-2 minutes and washed thoroughly in distilled water. The clean seeds were immersed in 10 mL of different concentration of selected seaweed liquid fertilizers for 10-12 h at 25±1°C temperature. After removing the seed of EC was measured in mmhos/cm/2g seed (Rinku *et al*., 2017).

Paper Towel Method

In paper towel method, different concentrations of 1%, 2%, 3%, 4%, and 5% of Seaweed Liquid Fertilizer of two green seaweeds as *Ulva lactuca* and *Ulva reticulata* and two brown seaweeds as *Padina pavonica* and *Sargassum johnstonii* and control (without treatment) were used as base for the treatment of seeds of *Solanum melongena*, *Solanum lycopersicum* and *Capsicum annum*. In paper towel method, 50 treated seeds were placed in tissue paper by maintaining appropriate distance, fold the paper at four sites properly and spray the water to maintaining moisture content and put into zip locked bag carefully. After 12 days, % germination, shoot length, root length, seedling length and seed vigour index was measured under room temperature in natural condition.

Pot Method

After paper towel method screening of all treatment, the most potential concentration apply on pot method under natural condition. In pot method, pots filled with soil have sufficient quantity of NPK. The 50 treated seeds were sowed at appropriate distance and watered regularly. After 20 days, % germination, shoot length, root length, seedling length and seed vigour index was determined.

Vigour index

Seed vigour is an important quality parameter which needs to be determining to addition germination. Vigour index of seeds calculated by using Abdul Baki and Anderson (1973) formula was:

Vigour index = Germination (%) x seedling length (cm).

Statistical analysis

Statistical data of standard deviation were analyzed using SPSS13.0. All experiments are run in triplicates and the mean± standard error mean values were presented.

RESULTS

Physico-chemical analysis of Seaweed Liquid Fertilizer

The physico-chemical parameters like colour, pH and EC was measured and shown in Table-1. All four Seaweeds Liquid Fertilizers were found in the range of basic pH. The maximum and minimum EC of Seaweed Liquid Fertilizer have been

found in *Sargassum johnstonii* and *Padina pavonica* that was 7.30 mhos/cm and 4.41 mhos/cm respectively.

Table 1 Physico- chemical parameters of different Seaweed Liquid Fertilizer

Name of Seaweed Liquid Fertilizer	Colour	pH	EC (mhos/cm)
Ulva lactuca	Green	8.84	6.05
Ulva reticulata	Green	8.81	5.05
Padina pavonica	Brown	8.89	4.41
Sargassum johnstonii	Brown	8.79	7.30

Conductivity of vegetable seed

The lower value of EC greater is the seed vigour. Table-2 represents the electrical conductivity of vegetables seed. The minimum EC was found 3.02 mhos/cm/2g, 2.35 mhos/cm/2g and 3.05 mhos/cm/2g found by the treatment of *Ulva lactuca* at 4% concentration in *Solanum melongena, Solanum lycopersicum* and *Capsicum annum* seeds, respectively. The maximum EC was determined 3.82mhos/cm/2g at 2% concentration and 4.86mhos/cm/2g at 4% concentration of *Sargassum johnstonii* in *Solanum melongena* and *Solanum lycopersicum* seeds respectively. In *Capsicum annum*, the maximum value was found 4.11mhos/cm/2g at 3% concentration treatment of *Ulva lactuca*. In control (without treatment) EC was observed 3.68 mhos/cm/2g, 3.55 mhos/cm/2 and 4.26 mhos/cm/2g in *Solanum melongena, Solanum lycopersicum* and *Capsicum annum* seed respectively.

Table 2 Electrical conductivity of different concentration of different Seaweed Liquid Fertilizer on treated vegetables seed

Seaweed Liquid Fertilizer	Different Concentration	*Solanum melongena*	*Solanum lycopersicum*	*Capsicum annum*
	1%	3.74	3.21	3.92
	2%	3.23	3.37	3.66
Ulva lactuca	3%	3.65	3.43	4.11
	4%	3.02	2.35	3.05
	5%	3.53	2.86	3.38
	1%	3.54	3.64	3.24
	2%	3.81	3.45	3.43
Ulva reticulata	3%	3.69	3.82	3.75
	4%	2.93	2.87	2.97
	5%	3.33	3.13	3.96
	1%	3.29	3.37	3.12
	2%	3.62	3.53	3.52
Padina pavonica	3%	3.41	3.04	2.74
	4%	2.98	2.56	2.24
	5%	3.08	3.78	3.43
	1%	3.42	3.55	2.65
	2%	3.82	4.86	3.53
Sargassum johnstonii	3%	3.21	4.25	3.17
	4%	2.56	2.78	2.72
	5%	2.88	3.93	3.31
Control		3.68	3.55	4.26

Paper towel method

Seed germination

The seed germination were recorded maximum (100%) of 4% concentration of Seaweed Liquid Fertilizer treatment in treated plants as compare to control (80%, 20%, 80%) of *Solanum melongena*, *Solanum lycopersicum* and *Capsicum annum* (Table-3). The 100% germination was reported by giving treatment at all concentrations prepared from *Ulva lactuca*, *Ulva reticulata*, *Padina pavonica* and *Sargassum johnstonii* in *Solanum melongena* and *Capsicum annum* seed. The lowest percentage germination recorded was 40% at 3% concentration prepared from *Ulva lactuca* and at 1% and 3% concentration prepared from *Padina pavonica*.

Growth parameters

In Solanum melongena

The effect of different concentration of Seaweed Liquid Fertilizer on growth parameters such as root length, shoot length, seedling length was measured. The graph-1 represented the root length, shoot length and seedling length of *Solanum melongena* plant. The maximum root length was observed 4±0.27cm in 4% concentration of *Ulva reticulata* and minimum root length was 0.8±0.29cm in plant that received from 2% of *Padina pavonica*. The maximum shoot length recorded was 4.44±0.45cm in 4% concentration of *Padina pavonica* Seaweed Liquid Fertilizer. The minimum shoot length was 1.82±0.52cm in plant received from 1% *Ulva lactuca* (graph-1). 3.86±0.41cm seedling length was found in control. In all treatment of Seaweed Liquid Fertilizer concentration maximum seedling length observed at 4% concentration was 6.32±0.07cm, 7.62±0.15cm, 7.42±0.03cm and 8±0.01cm that were received from *Ulva lactuca*, *Ulva reticulata*, *Padina pavonica* and *Sargassum johnstonii*, respectively (graph-1).

In Solanum lycopersicum

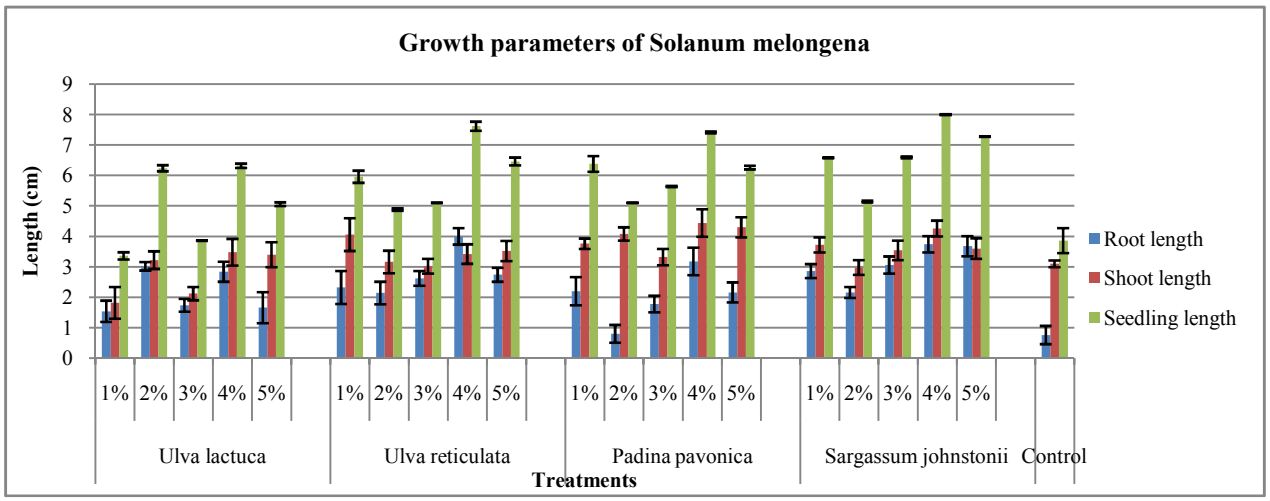
At 2% concentration, the result was found lowest length of root and shoot that was 0.2±0.07cm and 0.58±0.39cm from the Seaweed Liquid Fertilizer prepared from *Sargassum johnstonii* and *Ulva lactuca* respectively. The highest length of shoot was recorded 5.16±0.21cm in 4% concentration of *Padina pavonica* (graph-2). The lower seedling length was recorded 0.88±0.27cm that was received at 2% concentration prepared from *Sargassum johnstonii*. The highest seedling length was recorded in all treatment of Seaweed Liquid Fertilizer at 4% concentration, but in all treatment of Seaweed Liquid Fertilizer the highest value observed was 10.42±0.08cm that was received from *Padina pavonica* and in control that was found 6.4± 1.92cm (graph-2).

In Capsicum annum

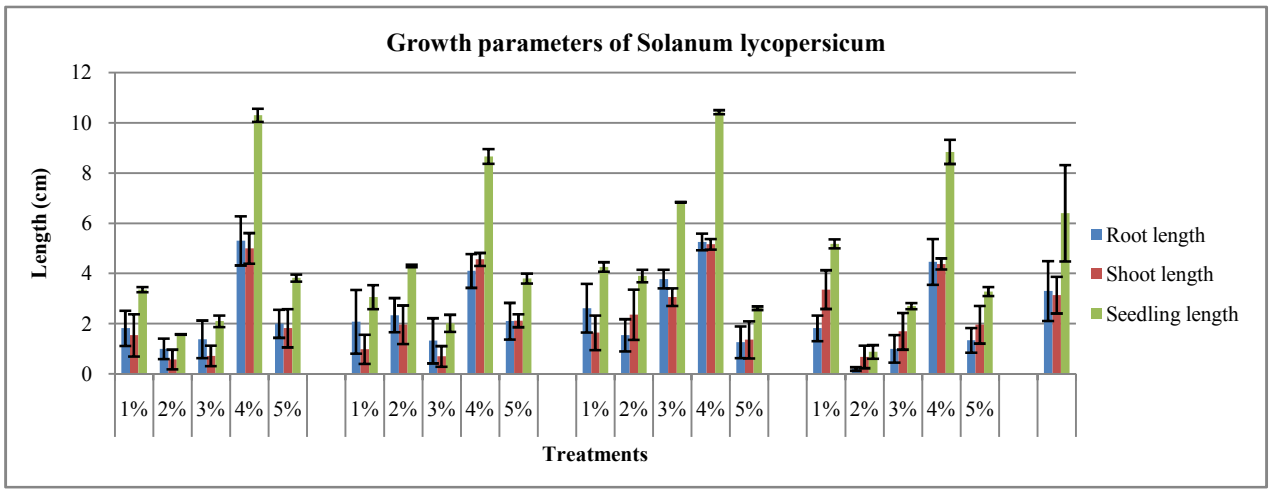
Higher concentration of Seaweed Liquid Fertilizer, above 4% was found to show retarding effect on shoot & root length (graph-3). In both green Seaweed Liquid Fertilizer most affected is *Ulva lactuca* in root length and *Ulva reticulata* in shoot length in 4% concentration of experiment. In this experiment, in 2% concentration from *Ulva lactuca*, *Ulva reticulata*, *Padina pavonica* & *Sargassum johnstonii* the root and shoot length recorded were 3.90±0.59cm, 3.94±0.66cm, 2.38±0.35cm & 4.44±0.27cm and 3.26±0.55cm, 3.04±0.2cm, 3.56±0.27cm & 3.32±0.11cm, respectively. In both green Seaweed Liquid Fertilizer most potential seaweed liquid fertilizer was *Ulva lactuca* as compare to *Ulva reticulata*. In control, seedling length was observed 2.6±0.84cm. In green and brown seaweed liquid fertilizer most potential Seaweed Liquid Fertilizer was *Ulva lactuca* and *Padina pavonica* gives highest seedling length was observed 11.98±0.09cm and 10.94±0.11cm respectively (graph-3).

Table 3 Effect of treatments on vegetables seed percentage germination and seed vigour index by paper towel method

Seaweed Liquid Fertilizer	Treatments	*Solanum melongena*		*Solanum lycopersicum*		*Capsicum annum*	
		% Germination	Seed Vigour Index	% Germination	Seed Vigour Index	% Germination	Seed Vigour Index
Ulva lactuca	1%	100%	336	80%	268.8	100%	576
	2%	100%	624	60%	94.8	100%	716
	3%	100%	386	40%	84	100%	484
	4%	100%	632	100%	1030	100%	1198
	5%	100%	506	80%	305.6	100%	788
Ulva reticulata	1%	100%	596	80%	122.4	100%	670
	2%	100%	488	60%	344	100%	698
	3%	100%	510	100%	80.8	100%	812
	4%	100%	762	100%	866	100%	948
	5%	100%	646	60%	253.2	100%	560
Padina pavonica	1%	100%	638	40%	170.4	100%	748
	2%	100%	510	80%	312	100%	594
	3%	100%	564	40%	273.6	100%	758
	4%	100%	742	100%	1042	100%	1094
	5%	100%	626	100%	262	100%	668
Sargassum johnstonii	1%	100%	658	80%	414.4	100%	1028
	2%	100%	514	60%	52.8	100%	776
	3%	100%	660	60%	162	100%	828
	4%	100%	800	100%	884	100%	940
	5%	100%	728	60%	198	100%	782
Control		80%	308.8	20%	128	80%	208



Graph 1 Effect of treatment on root, shoot and seedling length of *Solanum melongena* in paper towel method



Graph 2 Effect of treatments on root, shoot and seedling length of *Solanum lycopersicum* in paper towel method

Vigour index

The vigour index showed in table-3 a highly significant factor for growth of plant. The result in target plant of *Solanum melongena*, seed treated with 4% concentration of *Sargassum johnstonii* is the most vigourous and 1% concentration of *Ulva lactuca* the least vigourous. In *Solanum lycopersicum* seeds, 4% concentration of *Padina pavonica* Seaweed Liquid Fertilizer was most vigourous as compare to other Seaweed Liquid Fertilizer treatment. The result in *Capsicum annum*, both green and brown Seaweed Liquid Fertilizer the maximum vigour index value received at 4% concentration of Seaweed Liquid Fertilizer from *Ulva lactuca* as compare to *Ulva reticulata* and *Padina pavonica* as compare to *Sargassum johnstonii* that the highest value was found 1198 (*Ulva lactuca*) and 1094 (*Padina pavonica*).

Pot study

The most potential concentration of Seaweed Liquid Fertilizers was found by 4% by paper towel method, the same applied for the pot study. After 20 days, 100% germination observed in all treatments in all vegetable seed plant. In control, 90% and 80% germination was found in *Solanum melongena* & *Capsicum annum* and *Solanum lycopersicum,* respectively. In *Solanum melongena*, maximum root length and shoot length was observed in *Sargassum johnstonii* and *Padina pavonica* that was 5.86±0.18cm & 9.64±0.37cm, respectively. The maximum and minimum root length was recorded in *Ulva lactuca* and *Padina pavonica* that was 5.98±0.27cm & 5.8±0.28cm in experiment of *Solanum lycopersicum* seeds. In *Capsicum annum*, treatment of green Seaweed Liquid Fertilizer of *Ulva lactuca* and *Ulva reticulata* root length and shoot length was recorded 6.0±0.17cm and 9.88±0.23cm, respectively. In *Solanum melongena*, highest seedling length recorded was 15.46±0.02cm that was received from *Padina pavonica*. Maximum seedling length was observed in 15.68±0.08cm and 17.18±0.19cm in *Solanum lycopersicum* and *Capsicum annum* respectively that was received from *Sargassum johnstonii*. In this study, *Solanum melongena* and *Solanum lycopersicum* seeds vigour index shown most vigourous in Seaweed Liquid Fertilizer of *Padina pavonica* and in *Capsicum annum* most vigour index shown in *Sargassum johnstonii* as compare to control (table-4).

DISCUSSION

In the developing world, to use of Seaweed Liquid Fertilizer may be the solution of environmental pollution by heavy dose of chemical fertilizer. The effect of Seaweed Liquid Fertilizer on plant growth, yield and the ability sustained environmental conditions. The treatment with different Seaweed Liquid Fertilizer increased the seed germination. However, different concentration of Seaweed Liquid Fertilizer plays an important role to impact desired effects. The higher concentration of Seaweed Liquid Fertilizer affects on respiratory activity was higher and percentage germination was less. The conductivity of seed has been positively correlated with the percentage of germination of peas and broad beans (Mathews and Bradnock, 1968). Many researchers have reported that seed aging caused increased electrical conductivity of leachates (Seiadat *et al*., 2012; Ghassemi- Golezani *et al*., 2010; Sedghi *et al*., 2010). The decrease in germination and seed vigour has been found correlated with the increase in conductivity in several crop species (Delouche and Baskin, 1973; Rudrapal and B. asu, 1979; Gelmond *et al*., 1979; Powell and Matthews, 1981; Ghosh and Nandi, 1981; Waters and Blanchette, 1983; Wann, 1986; Prasad and Prasad, 1986; Dey and Mukherjee, 1988). The germination percentage was found decreasing from 94.4 to 41.6 the electrical conductivity increased from 128 to 287 of musk melon (Pesis and Timothy, 1983).

In the present study, the seeds treated with 4% concentration of all Seaweed Liquid Fertilizer showed better results in growth parameters as compare to other concentration of Seaweed Liquid Fertilizer treatment. A number of reviews have been well documented that different seaweed extracts exhibited wide range of responses on treated plant. Seaweed extract different concentrations were evaluated to be more effective in different plant such as *Solanum lycopersicum* (Hernandez-Herrera *et al*., 2014), *Vigna radiata* (Bai *et al*., 2013; Parthiban *et al*., 2013), *Mangifera indica* (Ahmed *et al*., 2013), *Fagopyrum esculentum* (Anisimov *et al*., 2013), *Vigna mungo* (Kalaivanan *et al*., 2012), *Lycopersicum esculentum* (Zodape *et al*., 2011), *Abelmoschus esculentus* (Sasikumar *et al*., 2011), *Brassica nigra* (Kalidass *et al*., 2010).

Table 4 Effect of different Seaweed Liquid Fertilizer on germination, seedling length and vigour index of treated vegetables seed in pot study

Seaweed Liquid Fertilizer	Vegetables	% Germination	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Vigour index
Ulva lactuca	*Solanum melongena*	100%	5.54±0.35	9.12±0.35	14.66±0.003	1466
	Solanum lycopersicum	100%	5.98±0.27	9.42±0.27	15.4±0.004	1540
	Capsicum annum	100%	6.0±0.17	9.88±0.23	15.88±0.04	1588
Ulva reticulata	*Solanum melongena*	100%	5.54±0.52	8.66±0.33	14.2±0.12	1420
	Solanum lycopersicum	100%	5.94±0.24	9.12±0.36	15.06±0.08	1506
	Capsicum annum	100%	5.78±0.20	9.64±0.29	15.42±0.05	1542
Padina pavonica	*Solanum melongena*	100%	5.82±0.33	9.64±0.37	15.46±0.02	1546
	Solanum lycopersicum	100%	5.8±0.28	9.62±0.35	15.42±0.05	1542
	Capsicum annum	100%	5.58±0.25	9.12±0.21	14.7±0.03	1470
Sargassum johnstonii	*Solanum melongena*	100%	5.86±0.18	9.36±0.50	15.22±0.22	1522
	Solanum lycopersicum	100%	5.8±0.31	9.88±0.19	15.68±0.08	1568
	Capsicum annum	100%	6.12±0.19	11.06±0.46	17.18±0.19	1718
Control	*Solanum melongena*	90%	5.02±0.18	8.9±0.22	13.92±0.35	1392
	Solanum lycopersicum	80%	5.7±0.27	9.08±0.39	14.78±0.66	1478
	Capsicum annum	90%	5.78±0.25	8.72±0.21	14.5±0.32	1450

(Results are mean± standard error mean)

Dhargalkar and Untawale (1980) was carried out that different concentration of *Hypnea musciformis, Spatoglossum asperum, Stoechospernum marginatum* and *Sargassum* Liquid Fertilizer treatment on seed germination of green chilies and turnip and result was found lower concentrations of Seaweed Liquid Fertilizer increase the germination percentage than the higher concentration. Similar observation was made in maize, ragi and Kambu (Rajkumar and Subramanian, 1999), Sesmum (Gandhiyappan and Perumal, 2001), *Oryza sativa* (Asirselvin *et al*., 2004) and Cowpea (Sivasankari *et al*., 2006).

Venkataraman Kumar *et al*. (1993) and Anantharaj and Venkatesalu (2002) reported same results that was highest seed germination observed at lowest concentration of Seaweed Liquid Fertilizer in black gram and *Dolichos biflorus* respectively. Mohan *et al*. (1994) studied on the effect of five different seaweeds namely *Padina, Sargassum, Turbinaria, Champia* and *Helminthocladia* extracts on seed germination and seedling growth in *Cajanus cajan* and they found that extract obtained from brown seaweeds especially *Sargassum* and *Padina* were more effective when the seeds were soaked in extract for 24 h. Seed vigour is an important component of physiological seed quality (viability and germination) during harvest and satisfactory levels are necessary in addition to traditional quality of moisture, purity and seed health to obtain optimum plant stand and high production of crops. Higher the number of normal seedlings greater is the seed vigour. The seed lot showing the higher seed vigour index is considered to be more vigourous (Abdul-Baki and Anderson, 1973). Seedling vigour has been shown to correlate with electrical conductivity in barley seed (Abdul-Baki and Anderson, 1970), wheat (Ram and Wiesner, 1988), corn (Woodstock and Feeley, 1965) and barley, wheat and maize (Tajbakhsh Shishvan, 1990).

In crop production seedling stage is a critical stage depends on physiological and biochemical structures of seed. To obtain good and fast seedling, high seed vigour is depended to provide essential nutrients for seedling until it can photosynthesize independently. The *Stoechospernum marginatum* at low concentration exhibited the growth of brinjal (Vijayanand *et al*., 2004). Stephenson (1974) reported same results of low concentration of Seaweed Liquid Fertilizer from *Ascophyllum* and *Laminaria* induced the maximum growth in maize. Taylor and Wilkinson (1977) observed to increase seedling growth may be due to the presence of Phenyl Acetic Acid (PAA) and other closely related compounds. Lingakumar *et al*. (2002) were recorded the higher seedling growth of green gram at 1.5% concentration of *Enteromorpha clathrata*. Venkataraman Kumar *et al*. (1993) reported to promote early seedling growth in black gram up to 0.75% and in green gram 1.5% with the prepared extract from *Sargassum plagiophyllum* and commercial seaweed extract (SM3). Jothinayagi and Anbazhagan (2009) has been reported that at 20% concentration of brown alga of *Sargassum wightii* and red alga *Rosenvingea intricata* (Thirumaran *et al*., 2009) increased shoot length, root length, fresh and dry weight of *Abelmoschus esculentus* and *Cyamopsis tetragonolaba*, respectively.

CONCLUSION

The present investigation conclude that, by using the paper towel and pot method i.e. use of green and brown seaweeds liquid biofertilizer has exhibited on germination percentage, vigour index and physical parameter of growth with better results as compare to control.

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