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Research Article

IMPROVING GREEN LEAFY VEGETABLES SEED GERMINATION USING BIO-PRIMING TREATMENT

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ABSTRACT

The experiment was conducted to evaluate the effect of seed priming on the percentage germination, root length, shoot length, seedling length, seed vigour index (SVI) and seed stamina index (SSI) of *Corinderum sativum, Trigonella foenum- graecum, Spinacia oleracea* seeds. Seeds were treated by bio-priming with different concentration of seaweed liquid fertilizer (SLF) of *Sargassum wightii & Sargassum johnstonii* such as 2%, 4%, 6%, 8% and 10%. The untreated seeds were taken as control. The results showed that the soaked seeds with different concentration of brown seaweed liquid fertilizer (SLF) as a primer was obviously inhibited the seed germination. The maximum seed vigour index and seed stamina index was obtained when treated with 6% concentration of *Sargassum wightii* in *Corinderum sativum , Trigonella foenum- graecum, Spinacia oleracea* seeds respectively.

INTRODUCTION

Many years ago crop lands were pure and highly productive but recent years crop land and agriculture field decreases fertility, crop productivity. So, recent study seaweed liquid fertilizers are used as a organic fertilizer of more useful to Human health and environment also. Seeds were socking into seaweed liquid fertilizer for a priming treatment it's more successfully technique for germination. Priming is a pre-sowing, seed priming technique is physiological method based in controlled hydration treatment to absorb water before radical swelling and improve plant growth under stress condition (Rinku *et al*., 2017). Seed priming has been successfully demonstrated to the growth parameters in seeds of many crop particularly seeds of vegetables and small seeded grasses (G. Thirumaran *et al*., 2009) and this technique has been used for better germination. Seed priming technique is a low cost, low risk and easily available than the other treatment and they do not contain other negatively affect for environment.

Seed priming has been proved to advanced germination for many agriculture and horticulture plants. Different priming technique such as hydro priming, halo priming, osmotic priming were using a different solution for greater germination than the untreated seeds. Hydro priming involves pre-sowing seed soaking in distilled water for 6-24 hours (Donaldson *et al*., 2001). Osmopriming is pre-sowing seed soaking osmotic reagent (Muhammad *et al*., 2015). The storage of such primed seeds can results in high germination and seedling emergence rates, vigorous early growth, early flowering, maturity and higher yields than unprimed seeds. Several methods have been used to precondition seeds as an attempt to improve germination and seedling establishment of many field crops, including wetting and drying, pre-germination and control hydration by means of an osmotic such as polyethylene glycol and this method of control hydration is called priming or osmo conditioning (Khan *et al*., 2005). Priming of seed has an important role to phytochrome induced dormancy and decrease the time necessary for germination and emergence (Bhim *et al*., 2016). In this study found that salinity stress during the early stages of spring of leafy vegetable cause's reduction of germination percentage and slow germination, poor establishment and decrease the rate of seedling length, root

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length, shoot length. Decline seedling emergence and establishment also have implication on early and efficient capture and use of sources like a light timing, development, nutrient uptake, weed control and yield at harvest (Ogbuehi *et al.,* 2013).

MATERIAL & METHOD

Collection and Identification of seaweed

Brown seaweeds of *Sargassum johnstonii & Sargassum wightii* were collected from okha, Gujarat, India during December 2017. They were collected handpicked and washed with water up to 3-4 times to remove all the adheving organism and sand particles etc and transferred in to the laboratory (Divya *et al.,* 2015). Identification of seaweeds by export and book (Untawale *et al*., 1983).

Preparation of seaweed liquid fertilizer

Fresh seaweeds were washed thoroughly with water to remove all unwanted particles, and then seaweed is dried for few days. The dry seaweeds were cut in to piece and then grind. The powder was mixed with D/w in ratio of 1:20 (w/v). Boiled for 45 minutes and filtered through of muslin cloth. The filtrate was collected and stored in to bottle. The extract was 100% concentration and in this experiment takes a five different concentration of solution such as 2%, 4%, 6%, 8%, 10% was used.

Priming treatment

Healthy seeds of *Corinderum sativum, Trigonella foenum-graecum, Spinacia oleracea* were collected from Gandhi agro, Anand, Gujarat. 50 *Corinderum sativum, Trigonella foenum-graecum, Spinacia oleracea* seeds were finally selected for each treatment in duplicated set. 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. The seeds were socked in different concentrations of different Seaweed Liquid Fertilizers up to 24-48 hours at room temperature. After the seeds from each solution were removed and dried on filter paper for few minutes for controlling moisture content. Soaking seeds were transferred on tissue paper and tissue paper fold two times and put in to zip lock bag carefully.

This experiment was run up to 12 days at room temperature and measured percentage germination formula (Bekendam and Grob, 1979).

$$\text{Germination percentage (GP)} = \frac{n}{N} \times 100 \quad (1)$$

Whereas, n=number of seeds that were germinated, N: total number of seed in each experiment.

Seed stamina Index was calculated as formula (Abdul-Baki A.A and Anderson J.D, 1970, 1979).

$$\text{SSI} = \frac{\{\text{GP (RL+SL)}\}}{100} \quad (2)$$

Whereas, GP= % germination, RL= root length and SL= shoot length

$$\text{Seedling vigour index} = \text{Seedling length (cm)} \times \text{\% germination} \quad (3)$$

Whereas, seedling length= root length+ shoot length (cm).

RESULTS AND DISCUSSION

The results was found to effect of priming treatment on *Corinderum sativum, Trigonella foenum- graecum, Spinacia oleracea* in Table- 1, 2, 3 and also represent in this figure:1&2 effect of seed germination on *Corinderum sativum,* figure- 3 & 4 effect of seed germination on *Trigonella foenum- graecum,* figure- 5 & 6 effect of seed germination on *Spinacia oleracea* respectively. The seaweed extract was found in effective of increasing the growth and yield at 6% concentration of seaweed liquid fertilizer (SLF). Maximum seed germination of was observed in 6% concentration *Corinderum sativum, Trigonella foenum- graecum, Spinacia oleracea* of Seaweed liquid fertilizer (SLF) and minimum growth was reported above 6% concentration. The fastest, earlier germination might be connected with metabolic activities increased in priming treatment of seed. The present study revealed that the SLF treatments from *Sargassum wightii* and *Sargassum johnstonii* exhibits more effect on growth. The effect of Seaweed liquid fertilizer (SLF) on leafy vegetable plants achieving the quality of the soil and increase the crop production yield. Increase of early germination by priming treatment compared to un-primed seeds (Rinku *et al*., 2017). In these experiment leafy vegetables greatest germination was found at 6% concentration of *Sargassum johnstonii* and *Sargassum wightii.*

Image 1 *Corinderum sativum*

Image 2 *Trigonella foenum- graecum*

Image 3 *Spinacia oleracea*

In this experiment priming treatment was improved the seedling growth of *Corinderum sativum, Trigonella foenum-graecum, Spinacia oleracea* as compare to control. In *Corinderum sativum,* highest root length, shoot length and seedling length was obtained at 6% concentration that was 6.36±0.07 cm, 4.56±0.66 cm and 11.25±0.84 cm in treatment of *Sargassum johnstonii*. In both seeds *Trigonella foenum-graecum, Spinacia oleracea* 6.66±0.02 cm and 6.29±0.54 cm seedling length was observed at 2% concentration in *Sargassum wightii* but it is also highest as compare to control that was 2.88±0.03 cm and 2.79±0.03 cm respectively. In *Corinderum sativum, Trigonella foenum- graecum, Spinacia oleracea* seed vigour index lowest value was show at 10% in priming treatment and highest seed vigour index value was show at 6% concentration in all selected seeds in this study.

Table 1 Effect of seaweed extract on growth of *Corinderum sativum*

Seaweed Liquid Fertilizer	Concentration	% germination	Root length (cm)	Shoot length (cm)	Seedling length (cm)	SVI	SSI
	2%	100%	3.38±1.36	2.43±0.14	7.67±1.71	767±171	7.67±1.71
	4%	100%	3.83±1.43	2.69±0.11	8.74±1.02	874.5±102.5	8.74±1.02
Sargassum johnstonii	6%	100%	6.36±0.07	4.56±0.66	11.25±0.84	1125±84	11.25±0.84
	8%	100%	3.73±1.57	2.95±0.41	9.13±2.06	913.5±206.5	9.13±2.06
	10%	100%	3.71±0.69	2.46±0.27	7.84±1.41	784.5±141.5	7.84±1.41
	2%	100%	2.99±1.29	2.86±1.10	8.24±3.19	824.5±1.256	8.24±3.19
	4%	100%	3.25±1.13	3.51±1.72	8.64±3.36	864.5±1.22	8.64±3.36
Sargassum wightii	6%	100%	5.63±0.49	4.74±1.22	12.73±0.31	1273±1.03	12.73±0.31
	8%	100%	3.29±1.50	3.64±1.00	9.09±3.09	909.5±0.88	9.09±3.09
	10%	100%	3.39±1.21	3.04±0.99	8.98±2.58	898.5±0.61	8.98±2.58
	Control	100%	2.13±0.46	2.42±1.51	4.55±1.97	455±197	4.55±1.97

(SVI- Seed Vigour Index, SSI- Seed Stamina Index; results= Mean±std)

Table 2 Effect of seaweed extract on growth of *Trigonella foenum –graecum*

Seaweed Liquid Fertilizer	Concentration	% germination	Root length (cm)	Shoot length (cm)	Seedling length (cm)	SVI	SSI
	2%	100%	2.11±0.35	3.97±0.43	6.53±0.91	653±91	6.53±0.91
	4%	100%	1.98±0.36	5.40±0.51	7.67±0.12	767±12	7.67±0.12
Sargassum johnstonii	6%	100%	2.96±0.35	6.67±0.5	9.49±0.60	949.5±60.5	9.49±0.60
	8%	100%	3.38±0.51	6.15±0.59	9.51±0.88	951±88	9.51±0.88
	10%	100%	2.96±0.30	6.15±0.77	9.29±0.92	929.5±92.5	9.29±0.92
	2%	100%	2.72±0.33	4.18±0.59	6.66±0.02	666.5±0.37	6.66±0.02
	4%	100%	2.56±0.32	4.29±0.61	6.86±0.94	686±0.31	6.86±0.94
Sargassum wightii	6%	100%	3.52±0.17	6.29±1.29	10.17±0.76	1017.5±0.25	10.17±0.76
	8%	100%	2.96±0.14	5.25±0.01	8.27±0.48	827±0.20	8.27±0.48
	10%	100%	2.87±0.24	4.73±0.33	7.66±0.62	766±0.19	7.66±0.62
	Control	100%	1.39±0.01	1.43±0.03	2.88±0.03	288.5±0.11	2.88±0.03

(SVI- Seed Vigour Index, SSI- Seed Stamina Index; results= Mean±std)

Seed vigour can be defined as the seed which determine the potential for faster, uniform emergence, and development of normal seed under a wide range of field condition. It is important to test the quality, vigour and performance ability of seeds compared to the untreated seeds know its true ability (Sangare, 2012). Seed vigour index is impact on germination and growth of seedling of brinjal, tomato and chilii seeds (Rinku *et al*., 2017).

Table 3 Effect of seaweed extract on growth of *Spinacia oleracea*

Seaweed Liquid Fertilizer	Concentration	% germination	Root length (cm)	Shoot length (cm)	Seedling length (cm)	SVI	SSI
	2%	100%	1.55±0.33	4.14±0.42	5.96±0.24	596±24	5.96±0.24
	4%	100%	1.62±0.11	4.69±0.23	6.66±0.1	666±10	6.66±0.1
Sargassum johnstonii	6%	100%	2.64±0.39	5.44±0.44	8.05±0.84	805.5±84.5	8.05±0.84
	8%	100%	2.02±0.17	5.04±0.45	7.09±0.38	709.5±38.5	7.09±0.38
	10%	100%	1.96±0.18	4.91±0.05	6.97±0.21	697.5±21.5	6.97±0.21
	2%	100%	1.73±0.02	4.36±0.36	6.29±0.54	629±54.5	6.29±0.54
	4%	100%	1.90±0.065	4.88±0.025	6.96±0.2	696±20	6.96±0.2
Sargassum wightii	6%	100%	2.21±0.17	6.42±0.065	8.47±0.4	847±40	8.47±0.4
	8%	100%	2.07±0.12	5.51±0.22	7.72±0.24	772±24	7.72±0.24
	10%	100%	1.88±0.17	5.44±0.3	7.45±0.26	745±26	7.45±0.26
	Control	100%	1.37±0.03	1.41±0.01	2.79±0.03	279±3	2.79±0.03

(SVI- Seed Vigour Index, SSI- Seed Stamina Index; results= Mean±std)

The germination and vigour is controlled by seed size, viability, soil moisture, oxygen concentration and temperature (Bewley *et al.*, 1982). Seed stamina Index (SSI) was significantly affected by seed bio-priming treatment as compared to untreated seeds and after 6% concentration seed stamina index was decreased in all selected seeds.

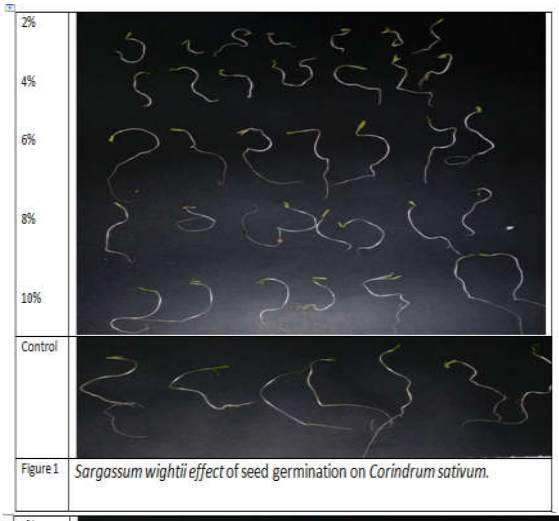

Figure 1 *Sargassum wightii effect* of seed germination on *Corindrum sativum.*

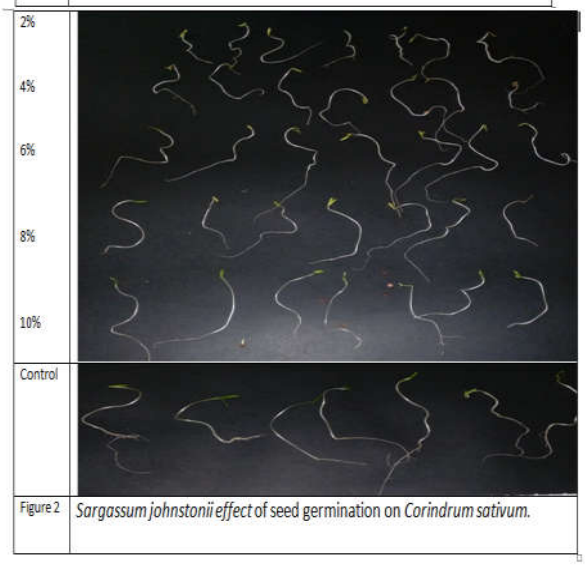

Figure 2 *Sargassum johnstonii effect* of seed germination on *Corindrum sativum.*

Figure 4 *Sargassum wightii effect* of seed germination on *Trigonella foenum.*

Figure 3 *Sargassum johnstonii effect* of seed germination on *Trigonella foenum.*

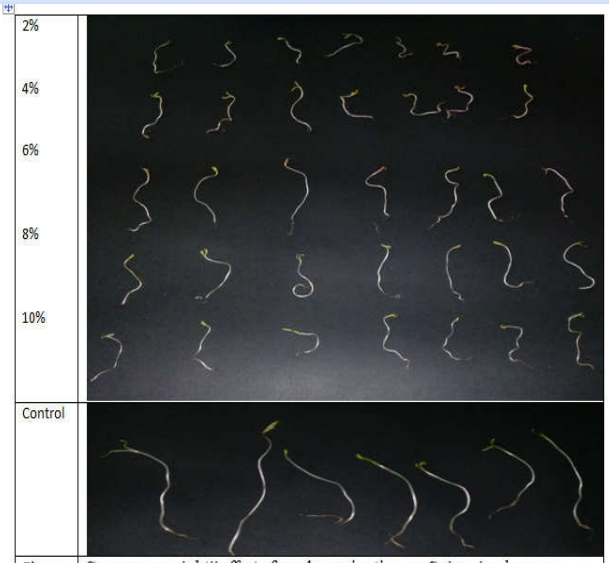

Figure 5 *Sargassum wightii effect* of seed germination on *Spinacia oleracea.*

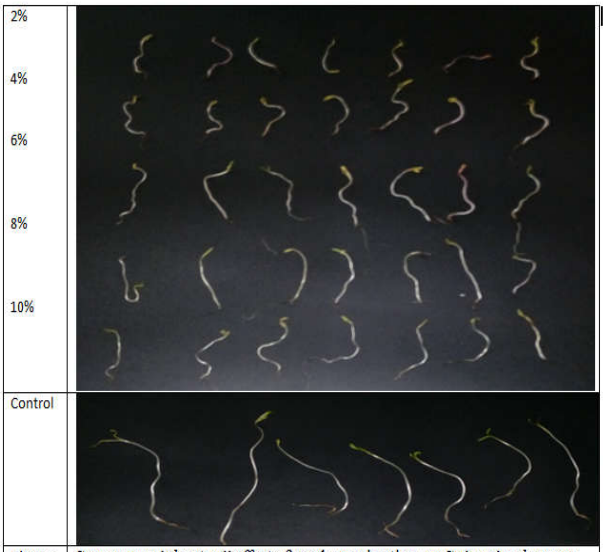

Figure 6 *Sargassum johnstonii effect* of seed germination on *Spinacia oleracea.*

CONCLUSION

In this experiment, concluded the highest germination percentage, seedling length, seed vigour index and seed stamina index was determined at 6% concentration of both brown seaweeds of *Sargassum johnstonii* & *Sargassum wightii* seaweed liquid fertilizer on the treatment of *Corinderum sativum, Trigonella foenum- graecum, Spinacia oleracea* seeds as compared to the untreated seeds. Bio-priming technique improving quality of seeds which was used in this study. Priming treatment is quite simple to use for agriculture, horticulture, gardening purpose as well as eco-friendly environment.

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