



## Influence of Seaweed Liquid Fertilizer (SLF) on Seed Germination and Seedling Growth of Some Crop Plants

### KEYWORDS

Seaweed liquid fertilizer, *Caulerpa taxifolia*, seed germination, seedling growth.

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**ABSTRACT** Investigations were made to find out the effect of seaweed liquid fertilizer (SLF) prepared from the green alga, *Caulerpa taxifolia* on seed germination and seedling growth pulses, cereals and oil crops. The crop seeds were germinated in different concentrations (5%, 15%, 30%, 50%, 70% and 100%) of SLF to record the effect after every 24 hrs up to 120 hrs. SLF of *C. taxifolia* was found effective in increasing germination percentage and seedling growth in seeds of many plants.

### Introduction:

Seaweeds are biodegradable, non-toxic, non-polluting, Non-Hazardous to humans, animals and birds (Dhargalkar and Pereria, 2005). Application of seaweed liquid fertilizer to crops has been found to increase seed germination, yield of crops, resistance to frost, fungal attack and uptake of the inorganic nutrients from the soil (Bhosale *et al.*, 1990; Venkataraman *et al.*, 1993; Mohan *et al.*, 1994 and Sekar *et al.*, 1995).

In the present investigation an attempt has been made to study the influence of seaweed liquid fertilizer prepared from green alga *C. taxifolia* on seed germination and seedling growth of different crop plants.

### Materials and methods:

#### Preparation of SLF:

Fresh and mature thalli of *C. taxifolia* were collected by hand picking from Kunakeshwar situated on west coast of Maharashtra (15.37°N to 16.40° , 73.10°E to 74.13°E). In laboratory the material was washed thoroughly using tap water to remove salts and epiphytes. The water was drained off and seaweed was spread on blotting paper to remove excess water.

The SLF was prepared using method of Bhosale *et al.*, (1975). One kg of seaweed was cut in to small pieces, boiled with 1 liter of distilled water for an hour and filtered through muslin cloth. The filtrate thus obtained was considered as 100% seaweed liquid fertilizer (SLF). It was diluted to obtain different concentrations (5%, 15%, 30%, 50%, 70% and 100%) with distilled water and used for germination of crop seeds.

#### Crop seeds-

The seeds of crop plants selected for present study were obtained from Shri Ram Krushiseva Kendra Islampur, She-takari sahakari sangh, Kolhapur and from local farmers. The crop plants selected for present investigation are as follows:

- Pulses: 1. *Vigna aconitifolia* (Jacq.) Marchal.  
 2. *V. radiata* (L.) R. Wilczek  
 3. *V. unguiculata* (L.) Walp  
 4. *Lens culinaris* Medik  
 5. *Pisum sativum* L.  
 6. *Phaseolus lunatus* L.  
 7. *Cicer arietinum* L.

8. *Cajanus cajan* (L.) Millsp.

#### Cereals:

9. *Sorghum bicolor* (L.) Moench  
 10. *Zea mays* L.  
 11. *Triticum aestivum* L.  
 12. *Pennisetum typhoides*(Burm.)Stapf and Hubb.

#### Oil crops:

13. *Helianthus annuus* L.  
 14. *Glycine max* (L.) Merr.  
 15. *Arachis hypogea* L.  
 16. *Carthamus tinctorius* L.

#### Germination studies:

Healthy seeds with uniform size, color and shape were segregated and surface sterilized with 0.1% HgCl<sub>2</sub>, washed thoroughly 3 -5 times in distilled water and then kept in petridishes. The plates were lined with filter paper and moisten with different concentrations of SLF. The seeds were arranged uniformly in petridish. Water soaked seeds were used as the control. Germinated seeds were counted and recorded after every 24 hr up to 120 hr. growth of seedling was recorded by measuring shoot and root length after 120 hrs.

#### Result and Discussion:

The effect of SLF of *C. taxifolia* on seed germination is shown in graphs (Figs.1 to 3). The effect of SLF on seedling growth is represented in tables, 1 to 4).

In the legume *V. aconitifolia* cent percent germination was seen using 5%, 15% and 30% SLF after 48 hour, where as in control 100% seed germination was seen after 72 hrs. High concentrations of SLF caused a delay in seed germination which was clearly observed in *P. sativum* and *L. culinaris*.

In cereal crops *T. aestivum*, *S. bicolor* and *P. typhoides* all the treatments of SLF promoted the germination however a slight production in percent germination was noticed at 70 and 100 % SLF. In *Z. mays* a delay in germination was seen up to 48 hrs at higher concentrations of SLF, but there after germination percentage improved. Maximum shoot length and root length were recorded at 50% SLF concentration in *S. bicolor* and *Z. mays* and 30% in *P. typhoides*

All the oil seeds responded well to SLF treatment up to

30% SLF. A delay and also a slight reduction was seen in percent germination at 120 hrs. In *H. annuus* and *C. tinctorius* maximum shoot length and root length were recorded at 30 % SLF. In *Arachis* and *Catharanthus* almost all levels of SLF had a positive effect on seedling growth.

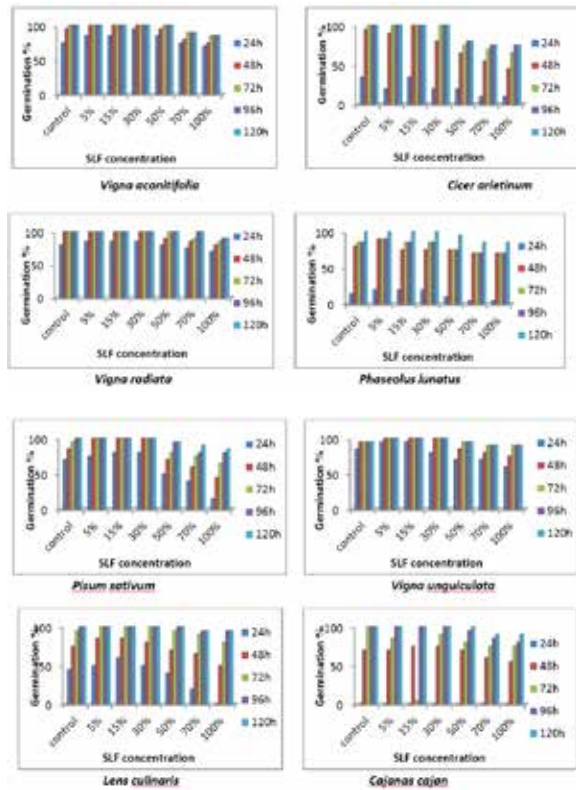


Fig.1. Effect of SLF of *Caulerpa taxifolia* on seed germination of pulses

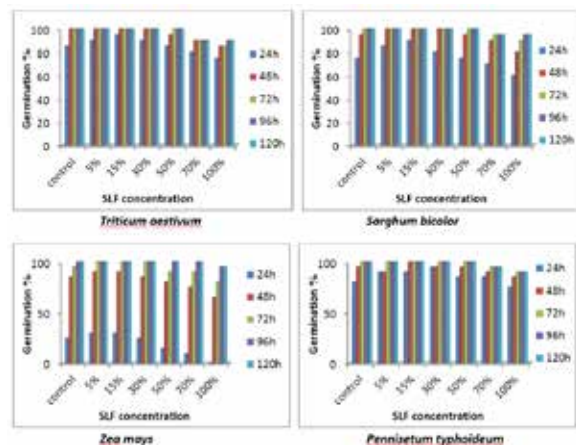


Fig.2. Effect of SLF of *Caulerpa taxifolia* on seed germination of cereal crops.

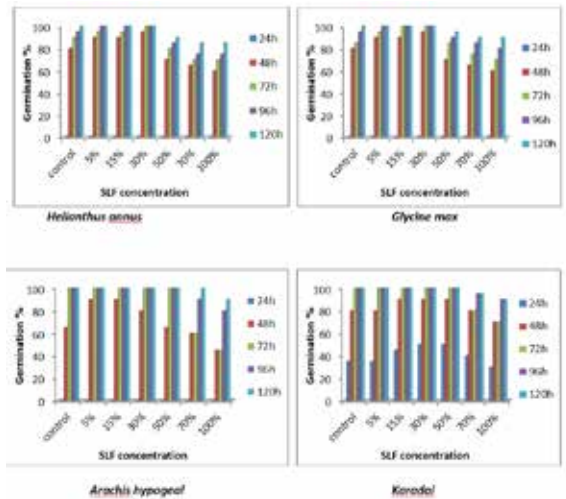


Fig.3. Effect of SLF of *Caulerpa taxifolia* on seed germination of oil crops.

Table 1. Effect of SLF of *Caulerpa taxifolia* on seedling growth of pulses

Name of the plant	Vigna aconitifolia		Vigna radiata		Vigna unguiculata		Lens culinaris	
	SL	RL	SL	RL	SL	RL	SL	RL
Conc. of SLF (%)								
C	3.65 ± 0.150	2.73 ± 0.153	5.00 ± 0.264	4.90 ± 0.360	6.18 ± 0.105	11.36 ± 0.225	2.63 ± 0.204	3.53 ± 0.153
5	6.20 ± 0.355	3.80 ± 0.400	5.38 ± 0.202	6.55 ± 0.150	6.53 ± 0.202	12.21 ± 0.276	2.56 ± 0.050	4.15 ± 0.180
15	5.52 ± 0.170	2.90 ± 0.160	3.90 ± 0.100	6.85 ± 0.350	7.94 ± 0.121	13.42 ± 0.288	3.84 ± 0.150	4.22 ± 0.158
30	3.87 ± 0.589	2.97 ± 0.153	3.70 ± 0.100	6.30 ± 0.100	7.28 ± 0.159	12.21 ± 0.270	4.00 ± 0.173	4.30 ± 0.152
50	3.91 ± 0.165	2.79 ± 0.182	3.50 ± 0.264	5.30 ± 0.404	6.68 ± 0.202	12.52 ± 0.452	3.08 ± 0.131	4.28 ± 0.158
70	3.66 ± 0.150	2.61 ± 0.165	3.05 ± 0.150	5.45 ± 0.150	6.36 ± 0.211	12.83 ± 0.206	2.78 ± 0.105	4.22 ± 0.170
100	3.58 ± 0.192	2.55 ± 0.150	2.65 ± 0.150	5.40 ± 0.264	6.06 ± 0.155	13.10 ± 0.265	2.49 ± 0.150	3.91 ± 0.165

Table 2. Effect of SLF of *Caulerpa taxifolia* on seedling growth of pulses

Name of the plant	Pisum sativum		Phaseolus lunatus		Cicer arietinum		Cajanus cajan	
	SL	RL	SL	RL	SL	RL	SL	RL
Conc. of SLF (%)								
C	2.36 ± 0.035	6.79 ± 0.330	5.91 ± 0.200	6.41 ± 0.165	4.76 ± 0.433	8.67 ± 0.635	4.42 ± 0.819	2.97 ± 0.555
5	2.56 ± 0.200	8.24 ± 0.233	5.84 ± 0.150	7.34 ± 0.264	4.21 ± 0.441	9.84 ± 0.810	4.35 ± 0.601	4.13 ± 0.300
15	2.49 ± 0.165	8.52 ± 0.330	6.13 ± 0.153	7.53 ± 0.252	4.82 ± 0.371	11.72 ± 0.605	4.85 ± 0.291	3.96 ± 0.222

30	2.25 ± 0.150	7.72 ± 0.270	6.60 ± 0.173	7.43 ± 0.214	5.11 ± 0.514	12.41 ± 0.628	4.23 ± 0.249	4.75 ± 0.417
50	2.05 ± 0.280	7.05 ± 0.396	5.52 ± 0.202	7.81 ± 0.441	5.01 ± 0.434	11.44 ± 0.504	4.70 ± 0.270	4.56 ± 0.210
70	2.02 ± 0.247	5.27 ± 0.153	5.76 ± 0.314	3.76 ± 0.262	3.90 ± 0.606	10.26 ± 0.720	4.42 ± 0.482	4.93 ± 0.240
100	1.52 ± 0.100	3.80 ± 0.255	4.47 ± 0.150	3.72 ± 0.158	3.07 ± 0.374	8.52 ± 0.720	4.05 ± 0.385	4.32 ± 0.897

100	6.79 ± 0.045	5.91 ± 0.195	4.11 ± 0.461	5.70 ± 0.220	2.01 ± 0.115	7.45 ± 0.340	2.33 ± 0.132	6.91 ± 0.253
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SL- Shoot length, RL-Root length, C-control, SLF-Seeweed Liquid Fertilizer.

**Discussion:**

In present investigation it was observed that in most of the crops maximum germination percentage and seedling growth were recorded at 5, 15 and 30 % SLF concentrations. On the contrary a higher concentrations showed an inhibitory effect.

The results obtained in pulses are agreement with previous studies made by many workers. Sathya *et al.* (2010) recorded that 30% SLF of *Chaetomorpha linum* is most effective in promoting growth parameters like root length, shoot length, fresh and dry weight in *C. cajan*. Chitra and Sreeja (2013) studied the effect of SLF of *Gracillaria corticata* and *C. peltata* on *V.radiata* and reported that maximum seed germination was observed at the lowest concentration of both the algae. Similar observations were made by number of workers for *V. catjang* and *Dolichos biflorus* (Anandraj and venkatesalu, 2002), Green gram and Black gram (Venkataraman *et al.*, 1993), *Vigna sinensis* (Sivasankari *et al.*, 2006 and Deniz Caparkaya *et al.*, 2009), *Vigna mungo* (Selvan *et al.*, 2013), *Cajanus cajan* (Mohan *et al.*, 1994 and Kamaladhasan and Subramanian, 2009).

The results obtained for oil crops in the present study coincided with those of earlier studies, Selvam and Sivakumar (2014) found that SLF of *Hypnea musciformis* at 2% concentration is effective in promoting germination, seedling growth, fresh and dry weight in *Arachis hypogea*. Kalidass *et al.*(2010) have studied the effect of SLF of *Ulva lactuca*, *Caulerpa scalpelliformis*, *Padina tetrastromatica* and *Sargassum linearifolium* on *Brassica nigra*. There study revealed that the SLF has significant effect on various growth parameters like root length, shoot length and leaf area. Sridhar and Rengasamy (2011) found that SLF from *Ulva lactuca* had a promotive effect on seedling growth at lower concentrations used in groundnut Similar results were obtained in *Sesamum indicum* L. (Gandhiyappan and Perumal, 2001) *Glycine max* (Rathore, 2009), groundnut (Bukhari and Untwale, 1978; Susseelama and Venkatragu, 1994 and Selvam and Sivakumar, 2014).

Results obtained in cereals are also supported by previous studies made by different workers, Mahadevi and Paul J (2014) noticed that SLF of *Caulerpa peltata* is effective in promoting seed germination, shoot length and root length in *Pennisetum glaucum* at 10% concentration of SLF. Similar results were obtained in *Sorghum* (Ashok *et al.*, 2004, Lingakumar *et al.*, 2004), *Zea mays* (Stephansan, 1974, Lingakumar *et al.*, 2004, Kumar and Sarvan, 2004, Rajkumar and Subramanian, 1999), *Pennisetum typhoides* (Balkrishnan, 2007), *Pennisetum glaucum* (Paul J and Shridevi, 2014 and Paul J, 2014).

**Conclusion:**

From the present study it can be concluded that SLF of *Caulerpa taxifolia* possesses fertilizer activity to enhance the germination and seedling growth in different crops. SLF are economical and ecofriendly alternatives to chemical fertilizers so this simple practise of application of SLF to different crops is recommended to the groers for attaining better germination and growth.

**Table 3. Effect of SLF of *Caulerpa taxifolia* on seedling growth of cereals**

Name of the plant	Sorghum vulgare		Triticum aestivum		Zea mays		Pennisetum typhoideum	
	SL	RL	SL	RL	SL	RL	SL	RL
C	6.77 ± 0.206	6.50 ± 0.264	5.72 ± 0.202	9.42 ± 0.432	3.38 ± 0.152	8.40 ± 0.252	6.62 ± 0.301	13.01 ± 0.252
5	7.58 ± 0.555	8.53 ± 0.233	4.41 ± 0.253	7.80 ± 0.608	3.40 ± 0.589	8.42 ± 0.704	6.90 ± 0.350	12.75 ± 0.822
15	7.60 ± 0.264	10.50 ± 0.435	6.38 ± 0.287	10.55 ± 0.633	3.75 ± 0.583	8.67 ± 0.254	8.19 ± 0.219	16.63 ± 0.571
30	7.22 ± 0.533	9.35 ± 0.480	6.50 ± 0.435	10.40 ± 0.529	3.00 ± 0.367	7.87 ± 0.331	8.59 ± 0.145	17.29 ± 0.159
50	6.20 ± 0.229	8.00 ± 0.458	6.20 ± 0.264	9.17 ± 0.345	2.84 ± 0.209	7.70 ± 0.349	8.12 ± 0.122	15.65 ± 0.572
70	5.35 ± 0.238	7.80 ± 0.264	4.50 ± 0.435	6.95 ± 0.538	2.67 ± 0.469	7.21 ± 0.268	8.10 ± 0.314	14.84 ± 0.461
100	3.47 ± 0.153	5.26 ± 0.150	3.90 ± 0.200	5.90 ± 0.264	2.01 ± 0.201	6.96 ± 0.328	7.52 ± 0.191	12.88 ± 0.113

**Table 4. Effect of SLF of *Caulerpa taxifolia* on seedling growth of oil crops**

Name of the plant	Helianthus annus		Glycine max		Arachis hypogea		Carthamus tinctorius	
	SL	RL	SL	RL	SL	RL	SL	RL
C	5.97 ± 0.252	6.95 ± 0.235	4.41 ± 0.236	5.64 ± 0.913	2.46 ± 0.344	5.28 ± 0.411	1.84 ± 0.150	2.16 ± 0.125
5	7.61 ± 0.151	7.29 ± 0.175	5.28 ± 0.450	4.82 ± 0.207	2.23 ± 0.165	6.32 ± 0.525	2.78 ± 0.121	5.65 ± 0.145
15	7.42 ± 0.267	8.34 ± 0.155	5.02 ± 0.417	7.10 ± 0.919	2.48 ± 0.143	9.04 ± 0.152	2.75 ± 0.204	4.13 ± 0.168
30	8.02 ± 0.129	9.27 ± 0.174	4.92 ± 0.197	6.86 ± 0.308	2.50 ± 0.265	9.64 ± 0.421	3.65 ± 0.157	8.46 ± 0.210
50	7.24 ± 0.221	6.25 ± 0.213	4.05 ± 0.225	6.18 ± 0.545	2.61 ± 0.216	8.75 ± 0.453	3.13 ± 0.217	5.05 ± 0.278
70	6.15 ± 0.057	7.33 ± 0.294	3.48 ± 0.207	6.46 ± 0.4360	2.11 ± 0.191	8.62 ± 0.600	2.77 ± 0.275	4.38 ± 0.121

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