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Effect of Spirulina Platensis as a Biofertilizer on Capsicum Annum L. (Chilly)

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Abstract: In the present investigation effect of *Spirullina platensis* as a biofertilizer was studiesd on growth characteristics od *Capsicum annum* L. most of the growth parameters like height of the plant, average size of the internodes, fresh weight and dry weight exhibited considerable increase over control. Soil analysis revealed higher consentration of Nitrogen Phospohores and Potassium in the pots enriched with the algae indicating diffused nutrients by *Spirulina platensis.*

Keywords: Capsicum annum, Biofertilizer, Spirullina platensis.

Introduction

The Indian coast is home to a rich diversity of seaweeds, with a total of 624 species of macroalgae documented along its shores. Seaweeds play a crucial role in the marine ecosystem and are significant sources of essential major and minor elements necessary for plant growth. These marine resources not only contribute to biodiversity but also serve various economic and ecological functions, making them vital to both local and global environments.

India is predominantly an agricultural country, with nearly 70% of its population engaged in various forms of agriculture, particularly in rural areas. To meet the tremendous food demand in the country, chemical fertilizers are widely utilized to enhance crop production. However, the adverse effects of these fertilizers—such as leaching into water bodies, pollution, destruction of beneficial microorganisms and insects, and reduction of soil fertility—are causing significant and often irreparable damage to ecosystems. This reliance on chemical inputs raises concerns about sustainability and environmental health.

Biofertilizers have emerged as an alternative approach to mitigate environmental pollution associated with chemical fertilizers. These natural fertilizers can conserve soil nutrients and mobilize them effectively, thus increasing agricultural yields without inflicting the same level of damage on the environment. Seaweed manure, in particular, is known to enrich the soil with nutrients and nitrogen compounds in ionic form. The minerals in seaweed diffuse rapidly from the thallus, enhancing nutrient availability.

In addition to nitrogen, seaweeds contribute essential elements such as potassium, sulfur, phosphorus, and calcium, which are vital for plant health. Furthermore, seaweed fertilizers help reduce the leaching of minerals from fields, thereby maintaining soil fertility. Due to their gelatinous properties, seaweeds improve the physical and chemical characteristics of soil, promoting better moisture retention and aeration (Kalidas et al., 2010).

Certain seaweeds, like *Ulva* and *Porphyra*, are recognized as excellent sources of proteins, offering both agricultural and nutritional benefits (Kallaperumal et al., 2003). Various forms of seaweed preparations, including Liquid Seaweed Fertilizers (LSF), Seaweed Liquid Fertilizer (SLF), Liquid Fertilizer (LF), and both whole and finely chopped algae manure, have been extensively used. Research indicates that these preparations produce beneficial effects on a wide range of crops, including cereals, pulses, and flowering plants (Yamaha et al., 1957; Dhargalkar and Untwale, 1983).

The integration of seaweed-based biofertilizers into agricultural practices represents a promising pathway towards sustainable farming, helping to reduce dependence on chemical fertilizers while enhancing soil health and crop productivity. Spirulina, a type of blue-green algae (cyanobacteria), is gaining attention as a biofertilizer due to its rich nutrient profile and various benefits for soil health and plant growth. Here are some key points about spirulina as a biofertilizer. Spirulina can enhance the levels of protein, sugars, amino acids, and chlorophyll in leaves, potentially boosting crop yield. Additionally, it serves as a protein supplement in livestock feed.

In the present investigation an attempt was made to study the effect of *Spirullina platensis* as biofertilizer on various growth parameters of Capsicum annum L. (chilly) which is one of t most economically and agriculturally important vegetable crops all over the world Soil analysis of control and treated soil was also carried out to study the extent to which nutrients are diffused in the soll by the alga

Material and Methods

Spirullina platensis belonging to order Oscillatoriales was collected from Vena river Hinganghat Dist. Wardha. Five Kg soil was filled in each pots. Fresh thallus of *Spirullina platensis* was grind to paste and added to the pots in varying concentration viz, 50 g , 100 g , 150 g and 200 g. Alga was not added to the control. Twenty seeds of chilly were sown in each pot.

Following growth parameters were selected for the study. For every parameter plants were selected randomly and standard deviation was calculated.

Height of plant

Table 1: Height of plant was noted after every week for 12 weeks (cm).

Spirullina platensis(g)/ 5 Kg soil	**7**	**14**	**21**	**28**	**35**	**42**	**49**	**56**	**63**	**70**	**77**	**84**
Control	-	1.6	2	3.1	4.2	5.7	5.8	6.3	8.5	9.2	11	12.2
50	-	1.6	2.2	3.5	3.8	6	6.4	7	8.6	9.6	11.4	13
100	-	2.1	3.2	3.8	4.2	5.2	5.8	6.2	8.8	9.9	11.6	13.2
150	-	2.2	3.5	4	4.3	5.4	5.9	6.5	9	10	11.8	13.5
200	-	2.4	4	4.2	4.3	5.9	6.2	6.9	9.8	10.5	12.2	14

Table 2: Internodal distance

Spirullina platensis(g)/ 5Kg soil	**No of Plants**	**No of Internodes**												**Avg**	**Avg Size of Internodes**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**		
Control	I	1.2	2.2	0.4	0.5	0.3	0.2	0.2	0.3					5.3	
	II	2.4	1.3	0.4	0.5	0.3	0.2	0.3	0.2					5.4	5.35
50	I	0.8	1.6	1.4	0.4	0.6	1.3	0.5	0.6					7.2	
	II	1.6	0.2	0.9	1.2	1.6	0.3	0.5	0.2					6.5	6.85
100	I	2.1	1.5	0.8	0.7	0.6	0.4	0.4	0.3	0.2				7	
	II	0.4	2.2	1.3	0.6	0.4	0.7	0.6	0.5	0.3	0.2			7.2	7.1
150	I	1.5	0.8	0.7	0.6	0.6	0.5	0.5	0.3	0.2	0.1			5.8	
	II	2.2	2.2	0.9	0.9	0.7	0.6	0.4	0.4	0.3	0.2			8.8	7.3
200	I	0.4	1.5	2.0	1.6	0.6	0.8	0.5	0.5	0.2	0.2			8.3	
	II	2.2	2.3	0.5	0.3	1.3	1.0	0.4	0.4	0.3	0.1			8.8	8.55

Table 3: Fresh Weight and dry weight after 90 days

Spirullina platensis(g)/5 Kg soil	**Fresh weight**	**Dry weight**
Control	0.512	0.048
50	0.639	0.052
100	1.200	0.086
150	1.250	0.090
200	1.566	0.098

Table 4: Soil Analysis.

Spirullina platensis(g)/5 Kg soil	**N Kg/hacter**	**P Kg/hacter**	**K Kg/hacter**	**Ph Kg/hacter**
Control	86	3.4	44	6.1
50	170	5.2	76	6.1
100	385	10.5	140	6.1
150	506	15.6	225	6.1
200	660	20	310	6.1

Internodal Distance: Internodal distance was measured by every week for 12 weeks.
Plant Biomass: Fresh weight and dry weight of the plants was noted after every month for 90 days.
Soil analysis: Soil was analyase for nitogen, phosphorus and potassium using standard laboratory methods (Trivedi and Goel 1986)

Result and Discussion

In the present investigation chilly plant exhibited marked increase over the control as algal dose was increase. Most of the growth parameters like height (Table 1)of the plant , average size of the internode(Table 2) increase considerably. This increase might be due to severale elements release in soil by *Spirullina platensis.* Fresh weight of the treated chilly plants also indicated definite increase over control as the dose was increased (table 3).

Spirullina platensis reported to have low energy high nitrogen content, seventeen amino acids besides other elements like potassium and phosphorus, all the soil samples were analyzed for three major elements l.e., nitrogen, phosphorus and potassium (Table 4). Control soil had 86 Kg. nitrogen per hectare however when 50 gm alga/5Kg soil was added to it nitrogen content increased noticeably i.e., 170 Kg/ hectare. Nitrogen content of the remaining treated soils also showed sharp increase Indicating diffused nitrogen from the alga. Various workers have reported increased growth parameters of crop plants when treated with seaweed fertilizers. Erulan et al. (2009) investigated the effects of Sargassum polycystum SLF extract on seed germination, growth, yield, and the biochemical and pigment profiles of Cajanus cajan, finding that a 0.5 concentration of both water and alcohol extracts produced superior results in these areas. Similarly, Naggar et al. (2005) reported that an aqueous extract of Ulva lactuca improved germination rates and various seedling growth metrics, including leaf area, pigment content, and the fresh and dry weights of roots and shoots in Vicia faba compared to the control.

Kalidas et al. (2010) examined the effects of 5%, 10%, and 100% seaweed liquid fertilizer derived from Ulva lactuca, Caulerpa scalpelliformis, Padina tetrastromatica, and Sargassum linearifolium on various growth parameters of Brassica nigra. The treated plants exhibited enhanced morphological traits, such as increased root and shoot lengths and leaf surface area, especially with 10% SLF from all the seaweeds.

Conclusion:

The investigation into the effects of **Spirulina platensis** as a biofertilizer on **Capsicum annuum L.** (chili) demonstrated significant positive impacts on various growth parameters, including plant height, internodal size, fresh weight, and dry weight, compared to the control group. The application of increasing concentrations of Spirulina resulted in enhanced soil nutrient profiles, particularly in nitrogen, phosphorus, and potassium levels, indicating the effective nutrient diffusion from the algae into the soil.The findings suggest that **Spirulina platensis** not only boosts the growth and biomass of chili plants but also improves soil fertility, positioning it as a viable alternative to chemical fertilizers. However, further field trials and dose standardization are necessary to optimize its application for different crops. Overall, **Spirulina platensis** presents a promising approach to sustainable agriculture, supporting both crop yields and environmental health.

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