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Seaweeds as Biofertiliser

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ABSTRACT

Seaweeds were collected from Bhatye beach, Ratnagiri. Seaweed Enteromorpha was taken and different doses of it were given to Fenugreek plants in different tubs. The doses given were 0.1%,0.2%,1%,2%,5% and control of Liquid seaweed fertilizer. The plants with 1% Liquid Seaweed Fertilizer showed proper growth as compared with others with 1%as constant growth of Liquid Seaweed Fertilizer Enteromorpha, Ulva and Mixture of both were given to the Fenugreek plants. Here the plants with Liquid Seaweed Fertilizer Ulva showed nice growth with plants of size 6.7-6.9cms.Soil parameter like pH, Electrical Conductivity, carbon, Sulphur, Potassium was analyzed before and after addition of Liquid Seaweed Fertilizer. Soil parameters after addition of Liquid Seaweed Fertilizer were found to be increased.

Keywords: *Enteromorpha, Ulva, Biofertiliser, Seaweeds.*

1. INTRODUCTION

Seaweeds

Seaweeds are a group of Photoautotrophic multicellular algae occurring in marine environments.

Basically, they are simple organisms that can perform photosynthesis.

Algae have following characteristics:

- Algae are a non-vascular plant; they lack true root, stems or leaves.
- Algae are flowerless.
- Algae are seedless.
- Algae do not have embryos.
- All cells contain chlorophyll which performs photosynthesis for energy.
- The reproductive structures of algae are not protected by any tissue. Most algae have cells that serve to reproduce by means of gametes or spores.

Generally, Seaweeds can be divided into 2 categories:

- Microalgae-are unicellular algae not visible to naked eye. They are considered Phytoplankton's and can be found anywhere in oceans where there is light. The most common Microalgae are diatoms and dinoflagellates. Microalgae play an important role in food web in marine environments.
- Microalgae-refers to multicellular algae found in littoral zones. They have rhizoids to attach themselves to rocks. Their structures are more complex and they appear in a variety of colour and forms.

For sake of differentiation, microalgae are referred to as Phytoplankton while microalgae usually visible to naked eye along most coastal areas are referred to as seaweeds. They latter can be divided into four following types: Blue-green algae, red algae, brown algae and green algae.

2. REVIEW OF LITERATURE

1) By P.Abetz and C.L.Young
A commercially available seaweed extract was applied to cauliflower plant.
The result was the application of seaweed extract led to significant increase in the quality and diameter of cauliflower. (30 May

1983)
2) The effects of aqueous seaweed spray on the growth of maize. Jeannine J.C.Lescure and J.F.Marot
Seaweed extract applied as spray increased total fresh matter production of maize seedlings by 15-20% over the control. (4 July 1991)
3) The effect of aqueous seaweed extract on sugar beet. G.Blunden, F.E.Nicholson
Application of liquid seaweed extract to sugar beet produced a significant increase in root weight, root sugar content and in clarified juice purity. (6 Feb 1979)

3. MATERIAL AND METHODOLOGY

Study Area
Collection site: Bhatye beach in Ratnagiri.(Maharashtra)

Information about collection site
(Bhatye beach, Ratnagiri)

- Ratnagiri is a port city on the Arabian Sea coast in Ratnagiri district in the southwestern part of Maharashtra, India.
- .The district is a part of Konkan Located at 16.98 N-73.3 E Bhatye is a small village very close to Ratnagiri city (approximately 1Kms away), 12 Kms from Ratnagiri railway station, 2Kms from Ratnagiri bus stand.
- The length of the beach is approximately 1.5 Kms and is very flat and straight. The coconut research center of Kokan krishi vidyapeeth (an agricultural university of konkan) is situated exactly opposite to Bhatye beach.

Diversity of Seaweed

- Green seaweed such as *Ulva* and *Enteromorpha* are found in plenty on Bhatye beach.
- While a brown seaweed *Saragassum* is also found on Bhatye beach.
- Farmers living nearby Bhatye beach use dried seaweed as a fertilizer.

Enteromorpha

- *Enteromorpha* is a genus of green algae.
- *Enteromorpha* is common in intertidal zone, often near fresh water, although it can be found throughout intertidal and in areas with high salinity.

Distribution

- *Enteromorpha* is distributed throughout the world in a wide variety of environments.
- *Enteromorpha* can tolerate salinities varying from fresh water to seawater and it can also be able to survive in salt springs and salt mines.
- It can also grow on a wide variety of substrates growing on sand, mud, rock, wood, concrete or metal.

Classification

Kingdom: Protista
Phylum: Chlorophyta
Class: Chlorophyceae
Order : Ulotrichales
Family : Ulvacea
Genus : *Enteromorpha*

Ulva

Description

- *Ulvalactuca* is thin flat green algae. The margin is somewhat ruffled and torn.
- It may reach 18cm or more in length though generally much less and up to 30cm across.
- The membrane is two cells thick, soft and translucent and grows attached without a stripe to rock by a small disc shaped holdfast.

Distribution

- Distribution is worldwide: Europe, India, China, South Africa, and Central America.

Classification

Domain: Eukaryotes
Kingdom: Planate
Phylum : Chlorophyta
Class: Ulvophyceae
Order: Ulvale
Family: Ulvaceae
Genus : *Ulva*
Species : Ulvalactuca

- Seaweed *Ulva l*ong known and used by farmers for its rich value, seaweed feed plants with wide range of nutrients, growth bio-stimulants and conditioners.
- It stimulates natural development by increasing the level of plants chlorophyll production, growth.
- In effect SLF functions as a catalyst to let the plants use the sun rays more.

Extraction of Seaweed

- Collect the seaweed from the site (appx half kg)
- Clean it, wrap it a clean cotton cloth and dip it in water 3-4 times to remove the sand from the seaweed.
- Take out the seaweed from the cloth keep it in boiling water, boil the seaweed for some time.
- Blend it with blender to get thick extract of seaweed.
- Filter the extract and collect it in the bottle.
- Use this seaweed as a fertilizer.

Formulation

- For preparing 0.1%LSF 0.1 ml of seaweed extract is diluted with 9.9 ml of water.
- For 0.2%SLF 0.2ml of seaweed extract is diluted with 9.8ml water.
- For 1%SLF 1ml of seaweed extract is diluted with 9 ml of water
- For 2%SLF 2ml of seaweed extract is diluted with 8ml of water.
- For 5%SLF 5ml of seaweed extract is diluted with 5 ml of water

Seaweed Fertilizer

- Fenugreek seeds (5 Gms appx) were sowed in a round plastic tub of diameter 30cm, with soil in it.
- Seeds were sowed randomly on 4 October 2011, Thursday.

4. OBSERVATION AND RESULT

(To detect the proper dose of seaweed)

-Fenugreek seeds were sowed in the tub (circular)of diameter 30 cm.

-Seeds (appx 5 gm) were sowed in 6 tubs.
-One was "control",
-Second was given 0.1%dose of *Enteromorpha* extract.
-Third was given 0.2%dose of *Enteromorpha* extract.
-Fourth was given 1%dose of *Enteromorpha* extract.
-Fifth was given 2%dose of *Enteromorpha* extract.
-Sixth was given 5%dose of *Enteromorpha* extract.
-Seeds were sown on 4th October 2011 Thursday in the morning.
-In the evening extract was given to all the seeds.

Observation Table: 1

	0.1%	0.2%	1%	2%	5%	control
Seedlings	-	-	-	-	-	-
leaves	-	-	-	-	-	-

2nd Day

- Water +extract was given in the morning, small seedlings were seen in the tub which was given a dose of 0.1%, 0.2%, 1%.2%.
- Whereas tubs with 5% extract and control did not show any seedlings.
- The tub which 2% of extract showed a high amount of seedlings than other

.

Observation Table: 2

	0.1%	0.2%	1%	2%	5%	control
seedlings	yes	yes	yes	yes	-	-
leaves	-	-	-	-	-	-

3rd Day

In morning to small leaves were seen in the tub which was given 1% extract.5-6 seeds had got leaves.

-In the tubs with 0.1% and 0.2% extract large numbers of seedlings were seen.
-In the "control" small seedlings were seen.
-In the tub, with 5% extract, no seedlings were seen at all.
-In the evening the tub with 2% extract also had two small leaves and a large number of seedlings.

Seedlings were seen

Observation Table: 3

	0.1%	0.2%	1%	2%	5%	control
seedlings	yes	yes	yes	yes	-	yes
leaves	--	--	yes	yes	--	--

4th Day

- The tubs with 0.1% and 0.2% seaweed extract showed small leaves.
- A large number of small plants was seen in the tub which was given 1%seaweed extract.
  The size of the Fenugreek plant was 1.5cm.
- Large numbers of plants were seen in the tub which was given 2%seaweed extracts.
  The size of the Fenugreek plant was 1.2cm.
- The tubs with 5%seaweed extract and "control" showed seedlings.
- In the evening the tub with 5%seaweed extracts showed small leaves.

Observation Table: 4

	0.1%	0.2%	1%	2%	5%	control
seedlings	yes	yes	yes	yes	yes	yes
leaves	yes	yes	yes	yes	small	small
plant	--	--	yes	yes	--	--
Size of shoot	--	--	1.5 cm	1.2cm	--	--

5th DAY

- The seed which received 0.1%seaweed extract showed plants of height 2.2cm.
- The seeds which received 0.2%seaweed extracts showed plants of height 2.3 cm.
- The seeds receiving 1%seaweed extract showed very high and rich growth of plants.
  The size of the plants was 4.8 cms.
- The seeds receiving 2% seaweed extract showed plants of height 3.6 cm.
- In the "constant" height of plants was 2.3 cm.
  There was no proper growth as some seeds were not grown properly.
- In the seeds receiving 5% extract height of the plant was 1.6 to 1.7 cm.

Observation Table: 5

	0.1%	0.2%	1%	2%	5%	control
seedling	yes	yes	--	--	yes	yes
leaves	yes	yes	yes	yes	yes	yes
plant	yes	yes	yes	yes	yes	yes
Size of shoot	2.2cm	2.3cm	4.8cm	3.6cm	1.6cm	2.3cm

To compare the green seaweed as a fertilizer with 1% as a constant dose.

Three tubs were seeded with Fenugreek seeds on 6th Day.

1) The first tub was given 1%of *Enteromorpha* extract.
2) The second tub was given 1%*ulva* extract.
3) Third tub was given 1%mixture of both *Enteromorpha* and *Ulva*.

6th Day

- The seeds which were given *ulva* extract showed few seedlings.
- The seeds which were given *Enteromorpha* extract showed few seedlings.
- The seeds which received mixture showed few seedlings.
- In the evening all the three tubs showed nice seedlings

Observation Table: 6

	Ulva	*Enteromorpha*	mixture
seedlings	yes	yes	yes
leaves	--	--	--

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7th Day

- In the morning small leaves were seen in all three tubs. But the seed which received *Ulva* extract showed higher growth as compared to *Enteromorpha* and mixture.
- The seeds with *Enteromorpha* extract showed high growth but very small leaves as compared to *Ulva* and mixture.
- In the evening the seeds receiving *Ulva* extract showed higher and proper growth while the seeds receiving mixture showed growth but many seeds did not show seedlings.

Observation Table: 7

	Ulva	*Enteromorpha*	mixture
Seedlings	yes	yes	yes
leaves	yes	yes	yes

8th Day

- In the morning all the tubs which were given *Enteromorpha*, *Ulva*, and Mixture showed nice growth of Fenugreek plants with an approximate height of 3-3.5 cm.
- But still some seeds in the tub which was given mixture did not grow properly.
- Whereas all the seeds which were given *Ulva* and *Enteromorpha* extract were grown.

Observation Table: 8

	Ulva	*Enteromorpha*	mixture
Seedlings	--	--	yes
Leaves	yes	yes	yes
Plant	yes	yes	yes
Size of shoot	3cm	3cm	3cm

9th day

- The seeds which were given *Enteromorpha* extract showed the plants of height 4.2 to 4.5 cm.
- The seeds which were given Mixture extract showed plants of height 4.9 to 5cm.
- The seeds which were given *Ulva* extract showed plants of height 6.7 to 6.9cm.
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Observation Table: 9

	Ulva	Enteromorpha	Mixture
Seedling	--	--	--
Leaves	yes	yes	yes
Plant	yes	yes	yes
Size of shoot	6.7-6.9cm	4.2- 4.5cm	4.9-5cm

Fully Grown Plants

Plant of Size-4.9-5cm

Plant of Size-6.7-6.9cm

Plant of Size-4.9-5cm

- Soil parameters before seed sowing were analyzed

Ph	E.C mhos	Carbon %	Sulphur Hectre/kg	Potassium Hectre/kg
6.75	0.13	0.82	28.0	310.0

Soil parameters after addition of liquid seaweed fertilizer were analyzed.

Ph	E.C mhos	Carbon %	Sulphur Hectre/kg	Potassium Hectre/kg
7.08	0.15	0.90	30.0	392.0

5. DISCUSSION

Part 1

To detect the proper dose of seaweed for the growth of Fenugreek plant.

- As compared with control, 1% and 2%seaweed liquid fertilizer showed high and proper growth of plants.
- 0.1%, 0.2%, 5%of Seaweed liquid fertilizer did not show good results.
- After performing the experiments it is concluded that 1%is considered as a proper dose of seaweed liquid fertilizer for

Fenugreek plants.

Part 2

- *Ulva, Enteromorpha,* and Mixture were taken as liquid seaweed fertilizer.
- 1%dose was given to three different tubs with Fenugreek seeds.
- Both the seeds with *Enteromorpha* and mixture showed growth but the growth was high and of good quality in the seeds which received *Ulva* as a seaweed fertilizer.

Part 3

- The soil parameters like Ph, E.C, Carbon, Sulphur, pottash were analyzed before seed sowing which was 6.75, 0.13, 082%, 28.0, and 310.0 respectively.
- After addition of liquid seaweed fertilizer, the soil parameters were checked which were7.08, 0.15.0.90.30.0, 392.0 respectively.
- The soil parameters after addition of liquid seaweed fertilizers had increased so we can conclude that liquid seaweed fertilizers contain growth regulating harmones, and can be used as soil conditioners.

6. CONCLUSION

Seaweeds *Enteromorpha* and *Ulva* were collected from Bhatye beach, Ratnagiri.Extract of Seaweeds was taken and applied to Fenugreek plants with 0.1%, 0.2%, 1%, 2%, 5%and control as doses, after applying this doses it was concluded that 1% was the proper dose showing good results.

Soil parameters before applying LSF and after applying LSF were analyzed.All the parameters pH, Electrical Conductivity, Carbon, Sulphur, Pottash were increased after addition of Seaweed fertilizer.

- Seaweeds can be recommended as a fertilizer because:
- It does not have any harmful effects on the environment.
- It is cheap as compared to chemical fertilizers.
- Seaweeds are easily available.
- Seaweed fertilizers are easy to handle.
- Seaweeds are ecofriendly.
- Seaweed increases crop yield, nutrient uptake.
- Seaweeds can be used as soil conditioner.

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