International Journal of Research in Engineering, Science and Management
Volume-2, Issue-12, December-2019
www.ijresm.com | ISSN (Online): 2581-5792

Commercial Bio-fertilizers - An Efficiency Assessment

Dipti Lalit Patil

Assistant Professor, Department of Biotechnology, Shri D. D. Vispute College of Science, Commerce and Management, New Panvel, India

***Abstract*: This paper presents an overview on commercial bio-fertilizers.**

***Keywords*: Bio-fertilizers**

1. Introduction

Biofertilizer or microbial or more appropriately "microbial inoculants" are preparations containing live or latent cells of the efficient strain of nitrogen-fixing microorganisms used for seed or soil application to increase the number of microorganisms in soil or rhizosphere and consequently improve the extent of microbiologically fixed N_2 for plant growth.

The biofertilizers are different from chemical fertilizer i.e.

- Biofertilizers on application remain in soil multiple and keep benefiting the growing crop.
- Whereas in the case of chemical biofertilizer in the long term effect they deteriorate the soil health.

A. Rhizobium as a biofertilizer

As we know that nitrogen is abundantly present in the atmosphere but plants cannot able to use this complex form of nitrogen, thus it is necessary to convert this atmospheric free nitrogen into a simpler form. Therefore, "conversion of atmospheric free nitrogen into a simple form which can be utilized by the plant is called nitrogen fixation" and this nitrogen can be fixed either symbiotically e.g. Rhizobium or a symbiotically e.g. Nostoc, Anabaena. According to Hellriegel in Germany in 1886 and of Beijerinick, a Dutch scientist in 1888 who discovered that bacteria in root nodules of legume now called Rhizobium are causative agents in fixation of atmospheric nitrogen.

The efficiency of nitrogen fixation by Rhizobium is affected by host, microsymbiont and various ecological factors like nutrition, pH, moisture, temperature, salinity, etc. The adverse effect sodicity and acidity on symbiotic nitrogen fixation could be mitigated by pelleting the seeds with lime powder after inoculants with Rhizobium.

B. HUMOL – G as a Biofertilizer

It is a mixed form of humic acid and humic acid is prepared from natural organic liquid, which increases the water-holding capacity of the soil and ultimately it beneficially affects the fertility of the soil. Its good effects are seen in the soil as well as on plant and this humic acid is now available in liquid form, as HUMOL–G from the Patil Biotech Pvt. Ltd., Jalgaon.

2. Materials and methods

A. Soil analysis

1) Measurement of pH

- Soil sample
- pH meter
- Mechanical shaker
- Buffer (pH- 9)
- Distilled water

Soil sample
⇩
Add water and stir mechanically.
⇩
pH measurement

Observation: pH of soil sample was found to be 7.9

2) Water holding capacity of the soil

Materials:

1. Soil sample
2. Distilled water

Oven dry soil for overnight
⇩
Add water to wet soil
⇩
Kept in the oven at 1050C for 24 hrs.
⇩
Weight the soil sample.

Calculation:

$$\text{Water holding capacity} = \frac{w2 - w3 - w4}{w3 - w1} \times 100$$

where,

W1 = wt. of precipitates + filter paper = 35.404 gm
W2 = wt. of saturated soil = 67 gm
W3 = wt. of oven dry soil = 54.67 gm
W4 = wt. of wet filter paper - wt. of dry filter paper
= 1.794 gm - 0.558 gm
= 1.236 gm

$$\therefore \quad \text{Water holding capacity} = \frac{w2 - w3 - w4}{w3 - w1} \times 100$$

$$\text{Water holding capacity} = \frac{67 - 54.65 - 1.236}{54.65 - 35.404} \times 100$$

$$\text{Water holding capacity} = \frac{11.114}{19.246} \times 100$$

$$\text{Water holding capacity} = 57.75\ \%$$

Observation: Water holding capacity was found to be 57.75 %.

3) *Estimation of phosphate from a given soil sample*

Material:

1. Ammonium molybdate solution.
2. Stannous chloride solution.
3. Standard phosphate solution.
4. Soil sample.
5. Distilled water.

Soil sample
⇩
Add ammonium molybdate solution and stannous chloride solution.
⇩
The blue color was observed.
⇩
Optical Density at 690 nm on a spectrophotometer.

Observation: Phosphate estimated from soil was found to be 1.08 mg/ml.

B. Pelleting of seed

To protect Rhizobia from the effect of acidic fertilizer, dry and acid soil, pelleting the seed is the commonly used practice. The pelleting agent use is lime.

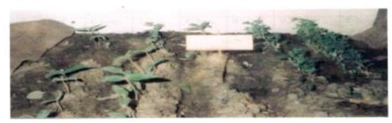
Water in container
⇩
- Sugar/ jaggery (50 gm)
- Boil for 15 min
- Gum arabic (200 gm)
- Cool it

Shaker solution
⇩
- Rhizobial culture
- Mix properly

Inoculum slurry
⇩
- Add seeds and mix well
- Add pelleting agent
- Dry the seeds in the shade

Seed coated with Rhizobial cells.
⇩
Sow in the field.

Field appliciation of Vigna radiata and Trigonella foenum greecum in the soil inoculated with Humol-G as a biofertilizer



Field appliciation of Vigna radiata and Trigonella foenum greecum in the soil inoculated with Rhizobium as a biofertilizer

C. Germination percentage

Sr. no.	Plant species	Germination % of control mean of 60	Germination % of HUMOL-G mean of 60	Germination % of Rhizobium mean of 60
1	*Vigna radiate*	20.3	75.6	55.0
2	*Trigonella foenumgraecum*	25.7	78.9	60.4
3	*Cicer arietinum*	23.1	45.0	60.6

	Vigna radiata		*Cicer arietinum*		*Trigonella foenumgraecum*	
Date	6/1/2012	16/2/12	6/1/2012	16/2/2012	6/1/2012	16/2/12
Length of leaf	2.0 cm	3.5 cm	-	1 cm	0.7 cm	1.1 cm
Diameter of leaf	0.6 cm	1.8 cm	-	0.6 cm	0.6 cm	0.8 cm
Diameter of stem	0.2 cm	0.2 cm	-	0.2 cm	0.1 cm	0.15 cm
Length of plant	3.1 cm	10.5 cm	0.25 cm	14 cm	3.2 cm	14.5 cm

Morphological Peculiarities of different crop plant uninoculated soil. (Control)

	Vigna radiata		*Cicer arietinum*		*Trigonella foenumgraecum*	
Date	6/1/2012	16/2/12	6/1/2012	16/2/12	6/1/2012	16/2/12
Length of leaf	2.0 cm	2.5 cm	0.5 cm	1 cm	1.2 cm	1.5 cm
Diameter of leaf	0.4 cm	1.7 cm	o.3 cm	0.9 cm	0.35 cm	1.2 cm
Diameter of stem	0.2 cm	0.2 cm	0.2 cm	0.3 cm	0.1 cm	0.1 cm
Length of plant	6.2 cm	12 cm	5.9 cm	32cm	3.7 cm	14 cm

Morphological Peculiarities of different crop plants inoculated with Rhizobium as a biofertilizer.

	Vigna radiata		*Cicer arietinum*		*Trigonella foenumgraecum*	
Date	6/1/2012	16/2/12	6/1/2012	16/2/12	6/1/2012	16/2/12
Length of leaf	2.0 cm	2.5 cm	0.5 cm	1 cm	1.2 cm	1.5 cm
Diameter of leaf	0.4 cm	1.7 cm	o.3 cm	0.9 cm	0.35 cm	1.2 cm
Diameter of stem	0.2 cm	0.2 cm	0.2 cm	0.3 cm	0.1 cm	0.1 cm
Length of plant	6.2 cm	12 cm	5.9 cm	32cm	3.7 cm	14 cm

International Journal of Research in Engineering, Science and Management
Volume-2, Issue-12, December-2019
www.ijresm.com | ISSN (Online): 2581-5792

Morphological Peculiarities of different crop plants inoculated with Humol-G as a biofertilizer

	Vigna radiata		*Cicer arietinum*		*Trigonella foenumgraecum*	
Date	6/1/2012	16/2/12	6/1/2012	16/2/12	6/1/2012	16/2/12
Length of leaf	1.6 cm	4.9 cm	0.8 cm	1.14 cm	1.6 cm	1.8 cm
Diameter of leaf	0.8 cm	2.5 cm	o.6 cm	0.8 cm	0.4 cm	1.6 cm
Diameter of stem	0.2 cm	0.2 cm	0.25 cm	0.25 cm	0.15 cm	0.2 cm
Length of plant	9.6 cm	23 cm	10.2 cm	31 cm	5.4 cm	24.5 cm

Phytochemical analysis of *Vigna radiata* using different biofertilizers with control

Test	*Vigna radiata*		
	Control	Rhizobium	HUMOL-G
Chlorophyll estimation	0.03	0.05	0.08
Protein content (Lowry's method) μg/ml	0.9	1.61	1.62

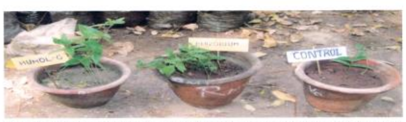
Phytochemical analysis of *Trigonella foenumgraecum* using different biofertilizers with control

Test	*Trigonella foenumgraecum*		
	Control	Rhizobium	HUMOL-G
Chlorophyll estimation	0.09	0.18	0.27
Protein content (Lowry's method) μg/ml	1.0	1.78	1.77
Carbohydrate content (Anthrone method)	-	-	0.88

Phytochemical analysis of *Cicer arietinum* using different biofertilizer with control

Test	*Cicer arietinum*		
	Control	Rhizobium	HUMOL-G
Chlorophyll estimation	0.01	0.04	0.12
Protein content (Lowry's method) μg/ml	1.1	1.98	1.93

Pot application of Cicer arietinum with Rhizobium, Humol-G as a biofertilizer with control.



Pot application of Vigna radiata with Rhizobium, Humol-G as a biofertilizer with control.

3. Result and discussion

Various biofertilizers such as Rhizobium sp., Humol-G were explored for optimum yield of different plants and maximum frequency. After few days the growth initiation Humol-G as a biofertilizer was found to be good as a comparison to the control, but the plant inoculated with the Rhizobium as a biofertilizer shows less growth as compared to control, then to overcome this problem we have done the pelleting of seed by using light to protect Rhizobium from the effect of acidity/alkalinity of soil. After that, the result obtains with Rhizobium are very good with that of the control. Then proceeding to the morphological as well as photochemical analysis of different crop plants will give as effective results compared to their control.

4. Conclusion

Forgoing discussion led us to conclude that Rhizobium inoculation of legume is very effective in harnessing atmospheric nitrogen for improving the status of the soil. Symbiotic nitrogen fixation can take place only within the cross inoculation group. The symbiotic nitrogen fixation is adversely affected by adverse soil condition seed against adverse conditions like acidity and sodicity and pesticide.

Whereas Humol-G increases soil fertility by improving physical properties, plant growth-promoting substance and vitamins liberated by biofertilizer help to maintain soil health. It positively affects the enzyme system of plants and thus increases the quality and yield of the plant. Thus both these commercial i.e. Rhizobium sp. and Humol–G (Patil Biotech Pvt. Ltd., Jalgaon) were found to be very efficient as compared to their control.

References

[1] N. S. Subba Rao, 1986. Biofertilizers in Agriculture. Oxford and IBH Publishing Co. Pvt. Ltd., 2nd Edition, pp. 1-7, 46-49, 65-69, 89-185.
[2] A. L. Singh, Nitrogen fixation in Indian rice field (Azolla and Blue green algae). Agro Botanical Publisher, Indian, 1st Edition, pp. 90-96, 112-143.
[3] Firman E. Bear, 1965. Chemistry of Soil in: Chemical Composition of Soil. Oxford and IBH Publishing Co. Pvt. Ltd., 2nd Edition, pp. 129-133, 264-270, 292-299.
[4] Samuel L. Tisdale and Werner L. Nelson. Soil Fertility and fertilizer in: Soil and Fertilizer. Collier, Macmillan Publisher, 3rd Edition, pp. 122-188, 439-549.
[5] S. P. Palaniappan and K. Annadurai, Organic Farming Theory and Practices in: Biological Nitrogen Fixation Scientific Publisher (I), Jodhpur, 1st Edition, pp. 56, 57, 68, 69, 72, 73.
[6] L. L. Somani, S. C. Bhandari, S. N. Saxena, K. K. Vyas, 1990. Biofertilizer In Rhizobium, Scientific Publisher, Jodhpur, India, pp. 155-167.
[7] Natural Product Radiance in Vigna Aconitifolia (Jacg), Vol. 2(3), May-June 2003.
[8] Natural Product Radiance in Liquid Seaweed Fertilizer, Sept.-Oct. 2003. Vol. 2, pp. 233-288.
[9] Biochemical methods 2nd edition, S. Sadasivam, A. Manickam.
[10] http://www.biotech_monitor.nl/3009.htm
[11] http://www.iiblio.org/Pfaf/cgibin/arr_htm/trigonella+foenum_graecum_and_CAN=LATIND
[12] http://eathnotes.tripod.com/adzuki.htm