

LIQUID BIOFERTILIZERS BOON FOR FARMERS

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India is an agrarian country where 60-70% population depends on agriculture. As all know that agriculture is the index of economic growth of any country. Therefore, good and healthy agriculture is necessary for each country. There are many hurdles in front of good agriculture practices but, one which influences agriculture more is consistently reducing land holding. According to a rural survey carried out by NABARD, the average landholding size of a household shrunk marginally to 1.1 hectare (ha) in 2015-16 from 1.16 ha three years ago (The Hindu, 2018). The main reason behind decreasing land holding is the ever-increasing population.

India is the 2nd largest country after China in population. Indian population increasing very fast, it is estimated that the population of India reached at 1.412 billion in 2025 and to 1.475 billion in 2030 (Rani *et al.*, 2018). To feed ever-growing populations, it is necessary to increase production efficiency. If farmers want to increase production, then they have to increase productivity because productivity is the basis of higher production. Many components contribute to increasing productivity, one of which is nutrient management. Among various nutrient management components, liquid biofertilizer is one of the important components which influence productivity. It is also inexpensive than other nutrient sources.

Liquid Biofertilizers

Liquid biofertilizers are the microbial formulation containing beneficial microorganisms which are capable of fixing, mobilizing or solubilizing the important plant nutrients by their biological activity. Liquid biofertilizers are classified in 3 broad groups-

1. Nitrogen fixers

Microbes which fix nitrogen symbiotically and non-symbiotically. Ex-*Rhizobium*, *Azotobacter*, *Azospirillum*.

2. Phosphorus solubilizers or mobilizers

Microbes which solubilize or mobilize important plant nutrients such as P, Zn, Cu, Mo etc. examples of some important solubilizers or mobilizers are *Pseudomonas striata*, *Bacillus polymyxa*, *Aspergillus niger*, *Penicillium digitatum*, *Glomus*, *Gigaspora* and *AM*.

3. Potash mobilizer

Microbes which mobilize elementarily or a mixture of potassium in the soil. Use of potash mobilizing bacteria (KMB) would not only reduce the high cost of manufacturing potassium fertilizers but would also mobilize insoluble potassium in soils and fertilizer to which they are applied. Ex. *Fraturia aurentia*

Basic concept of liquid Biofertilizers

The basic concept of liquid biofertilizers as follows-

1. **Stabilization-** Stabilize the microbes during production, distribution and storage.
2. **Application-** Prepared formulation should be delivered easily to the field in the most effective manner.
3. **Persistence-** High persistence, to protect the microbes from harmful environmental factors at the field.
4. **Activity-** Increase the activity, reproduction, contact and interaction with target crops, to enhance the microbial activity at the field.

Roles of liquid Biofertilizers

1. Minimize the use of nitrogen, phosphorus and potassium fertilizers.
2. Increases the seed quality of the crops.
3. Improve soil health and enhance soil fertility.
4. Economically profitable.
5. Crop yield increased.
6. Reduced pest and disease occurrence.
7. Produce growth hormones which help to increase productivity.
8. It provides benefits to subsequent crop due to residual effect.
9. Improve nutrient use efficiency.

Benefits of Liquid Biofertilizers

1. Easy to use.
2. Require minimum dose for application.
3. Shelf life 12-24 months.
4. Resistant to high temperature.
5. Storage quality is good.
6. Microbe's population can be maintained more than 10^9 cells ml^{-1} up to 12 -24 months.
7. Cost effective.
8. Better survival on seeds and soil.
9. Very high enzymatic activity.
10. Contamination is nil.

Impact of liquid biofertilizers on Crop Yield and Soil Health

S.No.	Findings	References
1.	Application of 75% RDK along with soil application of KMB(<i>Fraturiaaurentia</i>) @ 1 litre in 80 kg FYM ha^{-1} resulted higher potato tuber yield.	Chaudhary <i>et al.</i> , 2019
2.	In green gram crop combined inoculation of liquid biofertilizers such as Rhizobium & PSB could increase the morphological characters such as height of the plant, Root length, number of nodules plant^{-1} , nodule dry weight g plant^{-1} , and Dry matter production.	Shravani <i>et al.</i> , 2019
3.	Combined inoculation of liquid biofertilizers such as Rhizobium, Azospirillum and Azotobacter could enhance the morphological parameters as well as biochemical constituents such as Chlorophyll, Carbohydrate, Protein Carotenoids in <i>Vigna mungo</i> .	Maheswari and Elakkiya, 2014

Application Methodology

There are 3 ways of using liquid biofertilizers

1. Seed treatment

- i. Use plastic bag having size 21"X10" for small quantity seed treatment.
- ii. Put 2 kg seed in a bag and shut the mouth of the bag in such a way to trap the air as much as possible.
- iii. Twist the bag until all the seed were uniformly wetted.

- iv. When a uniform layer of culture coated on each and every seed shaking should be stopped.
- v. Open the bag and spread the seed under shade for 20-30 minutes.
- vi. The seed treatment can be done with any of two or more bacteria.
- vii. The important things have to be kept in mind that the seeds must be coated first with *Rhizobium* or *Azotobacter* or *Azospirillum* than use phosphorus solubilizing bacteria and potassium mobilizing bacteria.
- viii. This method is very effective.

2. Root Dipping

- i. This method is used for paddy transplanting/ vegetable crops.
- ii. The required quantity of inoculums has to be mixed with 5-10 ltr of water.
- iii. Dip the plant roots for a minimum ½ an hour before sowing.

3. Soil Application

- i. Phosphorus solubilizing bacteria and potassium mobilizing bacteria used in this method.
- ii. Mix PSM and KMB inoculants with 400 to 600 kg of cow dung FYM.
- iii. Kept the mixture under the shade for overnight and maintained 50% moisture.
- iv. Use the mixture as a soil application in rows or during levelling of soil.

Dosage of liquid biofertilizers

Crop	Recommended Biofertilizer	Quantity to be applied (approx.)
Pulses	<i>Rhizobium</i>	500ml/ha
Wheat, Oat, Barley	<i>Azotobacter/Azospirillum</i>	500ml/ha
Rice	<i>Azospirillum</i>	500ml/ha
Oilseed crops	<i>Azotobacter</i>	500ml/ha
Pearl millets, Finger millets	<i>Azotobacter</i>	500ml/ha
Maize and Sorghum	<i>Azospirillum</i>	500ml/ha
Fruit and Flowers	<i>Azotobacter</i>	1-2ml/plant

Precautions

1. Store liquid biofertilizer bottle in a cool and dry place.
2. Do not mix biofertilizer with any agrochemicals.

3. Keep agrochemicals away from biofertilizers bottle.
4. Do not use biofertilizer after the expiry period.

Conclusion

It can be concluded that liquid biofertilizer is the key component of nutrient management. It has a long shelf life and very effective rather than solid base biofertilizer. It enhances soil fertility as well as crop productivity. It is environment friendly because it reduces pollution which is caused by chemical fertilizers. It is very cost-effective and easy to use for farmers.

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