

## PREPARATION OF BIO-FERTILIZER BY USING KITCHEN WASTE AND BIOMASS AND EFFECT OF THEIR APPLICATION ON CROPS

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### ABSTRACT

Bio-fertilizer is low cost, renewable sources of plant nutrients which can supplement of chemical fertilizers. Excessive use of chemical fertilizers and pesticides has either reduces or eliminated such essential microbial populations from the agriculture soils. It has thus become necessary to produce such bio-fertilizers at commercial scale and add to the soil. In the present work the author has prepared three types of bio-fertilizers by using different waste materials. Firstly prepared bio-fertilizer by using kitchen waste, secondly by using biomass (such as rice husk, rice straw, bamboo leaves, soil, and water) and other types of bio-fertilizer is liquid, prepared by using biomass and Molasses. After preparation of above bio-fertilizers, they were used in different field crops such as ladies finger and study the growth and production of crops after an interval of every five day. Performance of crops under there biofertilizers was also studied.

**KEY WORDS :** Bio-fertilizer, Kkitchen waste, Biomass, crops

### INTRODUCTION

A Bio-fertilizer can be defined a substance which contains living microorganisms which, when applied to seed, plant surfaces, or soil, colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. Bio-fertilizers add nutrients through the natural processes of nitrogen fixation, solubilizing phosphorus, and stimulating plant growth through the synthesis of growth-promoting substances. Bio-fertilizer can be expected to reduce the use of chemical fertilizers and pesticides. Since they play several roles, a preferred scientific term for such beneficial bacteria is “plant-growth promoting rhizobacteria” (PGPR). The term bio-fertilizer or more appropriately a microbial inoculate can generally be defined as preparation containing live or latent cells of efficient strains of nitrogen fixing, phosphate solubilizing or cellulolytic microorganism used for application to accelerate those microbial processes which augment the availability of nutrients that can be easily to seed

or composting areas with the objective of increasing the number of such microorganisms and assimilated by plants. The biofertilizer increase physico-chemical properties of soils such as structure, texture, water holding capacity, cation exchange capacity and pH by providing several nutrients and sufficient organic matter. Bio-fertilizer is a good tool to improve the crop yield, productivity and quantity, reduce the rate of chemical fertilizers and the cost of crop production and allow for better environment. Abdel-Aal, (1990) studied Effect of nitrogen, phosphorus and potassium fertilization on the productivity of fodder beet (*Beta vulgaris*, L.), Effect of planting distance and nitrogen fertilization rates on growth and yield of fodder beet plants have also reported (Abdrabou, 1995). Abo-Salama and *et al.* (2000) Studies on some sugar beet cultivars under Middle Egypt conditions: I- Response to planting and harvesting dates. Researchers (Abu EL-Fotoh, *et al.*, 2000) reported effect of bio-fertilization on sugar beet yield, quality and optimization of the chemical fertilizers. Barbanti *et al.* (1998) response of fodder beet time and rate of potassium fertilizer application

in newly cultivated sandy soil. EL-Hawar (1999) studied Influence of nitrogen, potassium and boron fertilizer levels on sugar beet under saline soil conditions. Some researchers (Shabaev, *et al.*, 1996) reported Nitrogen fixation in rhizosphere, yield of beet root and nitrogen balance flood plain and soil using nitrogen fixing bacteria of the genus *Pseudomonas*.

### MATERIALS AND METHODS

We have prepared three types of bio-fertilizers by using different waste materials.

Preparation of bio-fertilizer by using Kitchen waste

#### Material required

Bucket, Garden soil, Water, Kitchen waste, Stirring rod

#### Method

- i. By using garden soil and the kitchen waste separate edible kitchen waste (Amaranth leaves, Coriander leaves, Bottle Gourd peels, Potato peels, Onion peels, Pumpkin peels, Banana peels, small amounts of wasted cooked food ) in a container.
- ii. Take a large earthen pot or a bucket and drill 4-5 holes around the container at different levels to let air inside. line the bottom with a layer of soil now start adding kitchen waste or garden soil cover this container with a plastic sheet or a plank of wood to help retain moisture and heat .
- iii. Every few days, use a rake to give the pile a quick turn to provide aeration.
- iv. We think the pile is too dry, so we sprinkle some water So that the compost should be moist.
- v. Within 20 days piles should start forming compost that is dry dark brown and crumbly and smelling of earth.
- vi. Now we have used the compost in okra, crops.

#### Preparation of bio-fertilizer by using biomass

#### Material required

Rice husk, Rice straw, Bamboo leaves, Soil, Water

Methodology for preparation

- i. Soil containing the useful microorganisms must be gathered. This micro-organism increase microbial diversities in the soil and plants storing nutrients which significantly improves soil quality. Together micro-organisms take a 5 cm hole and understood patent ground next to tree. It is important to collect soil from this layer because this is where the micro-organisms are

most active.

- ii. Carefully weigh 0.5 kg of bamboo leaves, 4 kg of rice husk, 2 kg of rice straw and 1 kg of soil that was just collected.
- iii. These ingredients should be combined thoroughly making sure that mixture is consistent and too large for a micro-organisms to cover as much area as possible.
- iv. While mixing pour some water over the plant to add moisture. When the mixture is both consistence and moist transfer into a 50 cm diameter bucket. Spread the plant evenly on the bottom and create a depression in a centre. This provides ventilation and prevents beneficial micro-organisms from overheating.
- v. Cover the bucket and let it stay in shade, mix the contents in every 4 days. Spreading it out evenly once again in the depression. This process should be repeated for a month. The mixture is ready to be used when a layer of white fungus has formed.

#### Preparation of bio-fertilizer by using biomass and Molasses

Material required for cultivating micro-organisms 0.5 kg dried sample, 10 l molasses, Net bag of 50 l and water.

#### Methodology for preparation

- i. Place a 0.5 kg of above prepared dried sample in the net bag and tie it.
- ii. Using a beaker measure a 10 l of molasses and pour it into a 100 l capacity of container and now mix 15 l of water.
- iii. Soak the net bag in the above solution. Always stir the solution in one direction to avoid the striving of micro-organisms. Once it is well mixed when the molasses is no longer sticky.
- iv. Once the mixture is stired sufficiently seal the barrel and let it stand for 30 days barrel cap. After 30 days the solution should be fermented and a white layer should be visible

### RESULTS AND DISCUSSION

We have prepared total three types of bio-fertilizers by using different waste materials. At first we have prepared kitchen waste bio-fertilizers by using different types of kitchen waste such as Potato Peels, Onion Peels, Bottle Gourd peels, Pumpkin peels, Amaranth leaves, Coriander Leaves, Banana peels. Now we have prepared biomass and liquid bio-

fertilizers by using bamboo leaves, rice husk and rice straw and molasses. After preparation of above bio-fertilizer we have applied it in to different crops in the College field and studied different parameter of crops.

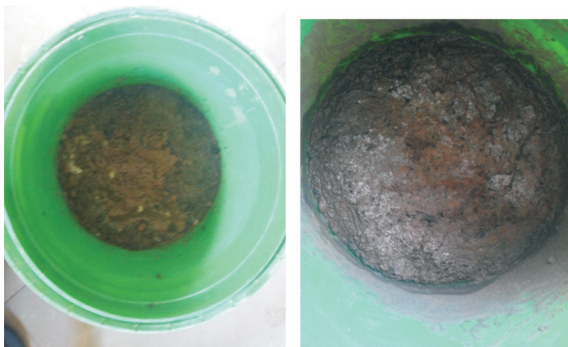


Fig. 1. Prepared bio-fertilizers after 15 and 20 days respectively from kitchen waste.



Fig. 2. Prepared bio-fertilizers after 15 and 20 days respectively from dried biomass.

### Effect of prepared kitchen waste bio-fertilizers on ladies fingers crops

After preparation of bio-fertilizers we have used on okra crops in college field and taken reading or observation of different parameters after every five day intervals and found that there is excessive growth in height of crops. Before using bio-fertilizer the height of crop is 15cm.

After using bio-fertilizer we have measured the height of the crop after 5 days the height of crop was



Fig. 3. Showing prepared liquid bio-fertilizers.

20 cm, after 10 days the height is 26 cm, after 15 days the height is 30.4 cm, after 20 days the height is 35.6 cm, after 25 days the height is 40 cm. Before using bio-fertilizer the stem diameter is 0.8 cm after using bio-fertilizer we have measured the stem dia. after 5 days the stem dia. is 1.5 cm, after 10 days the stem dia. is 2 cm, after 15 days the stem dia. is 2.2 cm, after 20 days the stem dia. is 2.5 cm, after 25 days the stem dia. is 2.8 cm. Before using bio-fertilizer No. of Leaves is 5 and Flower is nil, No of fruits is also nil. After using bio-fertilizer we observed that in every five days interval, the number of Leaves are 5,8,9,11,12 and 15. No of flowers are 0,2, 2,3,4, and 4. and the number of fruits are 0,2,3,3 and 4.



Fig. 4. Showing effect of kitchen waste bio-fertilizer after ten days on ladyfinger crop.

Table 1: Effect of kitchen waste bio-fertilizers on growth and production of Ladies fingers crops:

Parameter	Before using bio-fertilizers	After 5 days	After 10 days	After 15 days	After 20 days	After 25 days
Height, cm	15	20	26	30.4	35.6	40
Stem Diam., cm	0.8	1.5	2	2.2	2.5	2.8
No. of Leaves	5	8	9	11	12	15
No. of Flowers	-	2	2	3	4	4
No. of Fruits	-	-	2	3	3	4

**Effect of prepared dried biomass bio-fertilizers on Ladies fingers crops**

After preparation of bio-fertilizers we have used on ladies fingers crops in the College field and taken readings or observations of different parameters after every five day intervals and found that there is excessive growth in height of crops. Before using bio-fertilizer the height of crop is 11cm. After using bio-fertilizer we have measured the height of crop after 5 days the height of crop was 17 cm, after 10 days the height is 23 cm, after 15 days the height is 27.5 cm, after 20 days the height is 30 cm, after 25 days the height is 35 cm. Before using bio-fertilizer the stem diameter is 1.2 cm. After using bio-fertilizer we have measured the stem dia. after 5 days the stem dia. is 1.7cm, after 10 days the stem dia. is 1.8 cm, after 15 days the stem dia. is 2.0 cm, after 20 days the stem dia. is 2.3 cm, after 25 days the stem dia. is 2.5cm. Before using bio-fertilizer No. of Leaves is 3 and Flower is nil, No of fruits also nil. After using bio-fertilizer we observed that in every five days interval, the number of Leaves is 7, 9,9,10 and 12. the number of flowers is 0,1,2,2, and 3. and no. of fruits is 0,1,1,2 and 3.

**Effect of prepared liquid biomass bio-fertilizers on Ladies fingers crops**

After preparation of bio-fertilizers we have used on ladies fingers crops in college field and taken reading or observation of different parameter after every five day intervals and found that there is excessive growth in height of crops. Before using

bio-fertilizer the height of crop is 10 cm. After using bio-fertilizer we have measured the height of crop after 5 days the height of crop is 12 cm, after 10 days the height is 15cm, after 15 days the height is 18.2 cm, after 20 days the height is 23 cm, after 25 days the height is 29 cm. Before using bio-fertilizer the stem diameter is 1.2 cm. After using bio-fertilizer we have measured the stem dia. after 5 days the stem dia. is 1.7 cm, after 10 days the stem dia. is 1.8 cm, after 15 days the stem dia. is 2.0 cm, after 20 days the stem dia. is 2.1 cm, after 25 days the stem dia. is 2.3 cm. Before using bio-fertilizer No. of Leaves is 3 and Flower is nil, No of fruits also nil. After using bio-fertilizer we observed that in every five days interval, the number of Leaves are 7, 9, 9, 10 and 12. No of flowers are 0, 1, 2, 2 And 3 and no of fruits are 0,1,1,2 and 3.

**Comparative Study of all prepared bio-fertilizers on Okra crops**

Now we have compared the effect of all prepared bio-fertilizers on the ladies fingers crops development and production and observed after 15 day that the height of crop became 30.4 cm in case of kitchen waste fertilizers, 27.5 cm and 18.2 cm in case of dried biomass and liquid biomass bio-fertilizers respectively. Similarly the stem diameter of crop became after 15 days 2.2 cm in case of kitchen waste fertilizers, 2 cm and 2 cm in case of dried biomass and liquid biomass bio-fertilizers respectively. Similarly the no of leaves became after 15 days 11 in case of kitchen waste fertilizers, 9 and 9 in case of dried biomass and liquid biomass bio-fertilizers

**Table 2.** Effect of dried biomass bio-fertilizers on growth and production of Ladyfingers crops:

Parameter	Before using bio-fertilizers	After 5 days	After 10 days	After 15 days	After 20 days	After 25 days
Height, cm	11	17	23	27.5	30	35
Stem Diam., cm	1.2	1.7	1.8	2.0	2.3	2.5
No. of Leaves	3	7	9	9	10	12
No. of Flowers	-	-	1	2	2	3
No. of Fruits	-	-	1	1	2	3

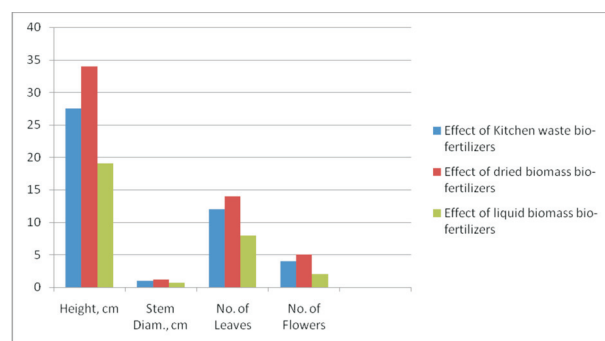
**Table 3** Effect of liquid biomass bio-fertilizers on growth and production of Ladyfingers crops:

Parameter	Before using bio-fertilizers	After 5 days	After 10 days	After 15 days	After 20 days	After 25 days
Height, cm	10	12	15	18.2	23	29
Stem Diam., cm	1.2	1.7	1.8	2.0	2.1	2.3
No. of Leaves	3	7	9	9	10	12
No. of Flowers	-	-	1	2	2	3
No. of Fruits	-	-	1	1	2	3

**Table 4** Effect of Different prepared bio-fertilizers on growth and production of Ladyfingers crops

Parameter	Effect of Kitchen waste bio-fertilizers	Effect of dried biomass bio-fertilizers	Effect of liquid biomass bio-fertilizers
Height, cm	30.4	27.5	18.2
Stem Diam., cm	2.2	2.0	2.0
No. of Leaves	11	9	9
No. of Flowers	3	2	2
No. of Fruits	3	1	1

respectively. Similarly the number of flowers became after 15 days, 3 in case of kitchen waste fertilizers, 2 and 2 in case of dried biomass and liquid biomass bio-fertilizers respectively. Similarly the number of fruits became after 15 days 3 in case of kitchen waste fertilizers, 1 and 1 in case of dried biomass and liquid biomass bio-fertilizers respectively.

**Fig. 5.** Showing effect of different prepared bio-fertilizers on growth and production of Ladyfingers crops:

## CONCLUSION

In the present work we have prepared three different types of bio-fertilizer by using kitchen waste like (Amaranth leaves, coriander leaves, Bottle gourd peels, potato peels, onion peels, pumpkin peels, Banana peels small amounts of wasted cooked food) and biomass like (Bamboo leaves, rice husk, and rice straw, garden soil) and Molasses. Out of three prepared bio-fertilizers two are in solid and one is in liquid state. After preparation of above bio-fertilizers we have used in three different crops and studied their growth and production by measuring different parameters such as height, width, number of flowers, numbers of fruits and numbers of leaves after intervals of every five days. After studies we conclude that:

**Height:** The greatest average height of okra crops is achieved by using kitchen waste which is 30.4 cm as compared to 27.5 cm height in dried biomass bio-

fertilizer and 18.2 cm in liquid biomass bio-fertilizer. **Diameter:** The greatest average diameter of okra crops is achieved by using kitchen waste which is 2.2 cm as compared to 2.0 cm diameter in dried biomass bio-fertilizer and 2.0 cm in liquid biomass bio-fertilizer

**No. of leaves:** The greatest average number of leaves of okra crops is achieved by using kitchen waste which is 11 as compared to 9 number of leaves in dried biomass bio-fertilizer and 9 in liquid biomass bio-fertilizer.

**Number of flower:** The greatest average number of flowers of okra crops is achieved by using kitchen waste which is 3 as compared to 2 number of flowers in dried biomass bio-fertilizer and 2 in liquid biomass bio-fertilizer.

**Number of fruits:** The greatest average number of fruits of ladyfinger crops is achieved by using kitchen waste which is 3 as compared to 1 number of fruits in dried biomass bio-fertilizer and 1 in liquid biomass bio-fertilizer.

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