VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI - 590 018

A Project Synopsis on:

"PRODUCTION OF HERMICOMPOST FERTILIZER BY FOOD WASTE USING BLACK SOLDIER FLY"

Project Report submitted in partial fulfilment of the requirement for the Award of the degree of

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING

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- **Project Reference Number:** 46S_BE_1362
- **Title of Project:** Production of Hermicompost fertilizer by Food waste using Black Soldier Fly.
- **Name of college:** KLE College of Engineering &Technology Chikodi Belagavi-591 201.
- **Name of Department:** Civil Engineering.
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- **Keywords:**

INTRODUCTION

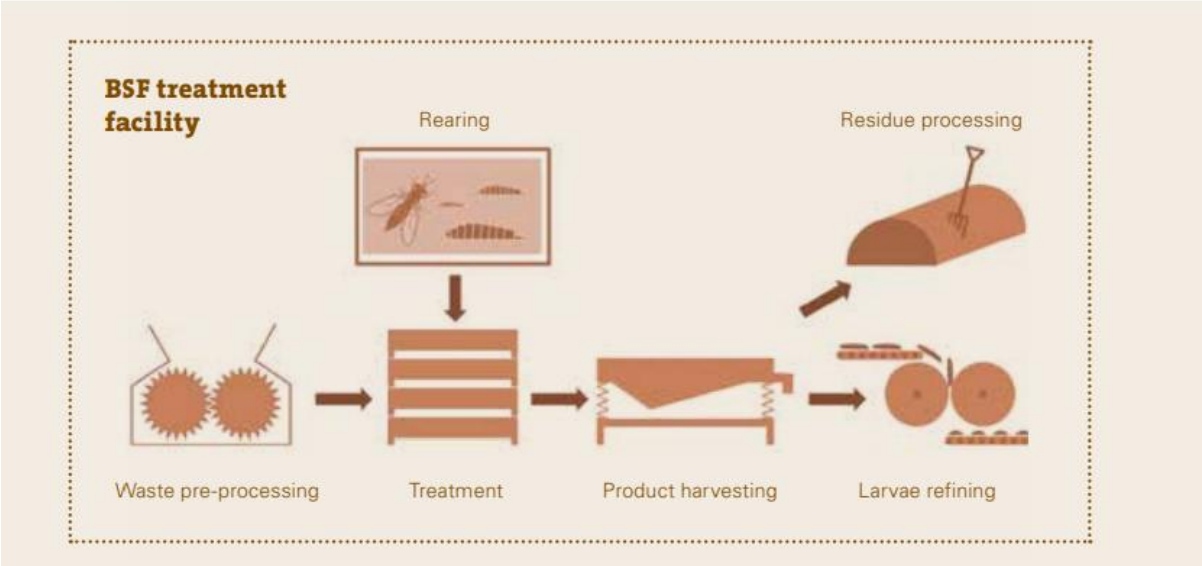
Now a days Because of the use of herbicides and pesticides over the agricultural land soil get polluted. Results the reduction in yielding of soil. Because of that the lowering the nutrients present in the soil. Crop growing capacity also reduces. Using Black soldier fly we reduce the pollution of soil and improving the nutrients and yielding of soil. In this method we use Black soldier fly to improve fertility of soil.

Background: Because of its nutritious properties, the black soldier fly has emerged as one of the most popular species in advancing circular economy through the re-valorization of anthropogenic organic wastes to insect biomass. Black soldier fly frass accumulates as a major by-product in artificial rearing set-ups and harbors great potential to complement or replace commercial fertilizers. We applied frass from larvae raised on different diets in nitrogen-equivalent amounts as soil amendment, comparing it to NH_4NO_3 fertilizer as a control. While the soil properties did not reveal any difference between mineral fertilizer and frass, principal component analysis showed significant differences that are mainly attributed to nitrate and dissolved nitrogen contents. We did not find significant differences in the growth of perennial ryegrass between the treatments, indicating that frass serves as a rapidly acting fertilizer comparable to NH_4NO_3. While the abundance of coliform bacteria increased during frass maturation, after application to the soil, they were outcompeted by gram-negatives. We thus conclude that frass may serve as a valuable fertilizer and does not impair the hygienic properties of soils.

OBJECTIVES

- To produce organic Fertilizer using Food waste by locally available Food Waste.
- The specific objectives are: -
  - To enrich the soil with nutrients and increase its fertility.
  - To produce organic fertilizer at low cost within short period of time
  - To reduce the percentage of generation of solid waste.

METHODOLOGY



- **BSF rearing unit:**

  It ensures that reliable and consistent amount of small larvae is available to inoculate the daily amount of biowaste that is received at treatment facility. Collection of 25 gm black soldier fly eggs. Placing them in room temperature of 28 degree Celsius and let them hatch for 5 days. After hatching these larvae are supposed to fed with food waste

- **Waste receiving and pre-processing unit:**

  In this we have to ensure that waste received at the facility is suitable for feeding to the larvae, removal of hazardous substance and in organic material if any.

- **BSF waste treatment unit:**

  This is where the rearing unit are fed with biowaste in contains called ‘larveros’. Receiving of biowaste and separating it in two trays ensuring each tray contain 4kg of food waste, adding 20 gm

larvae to each tray. These larvae grow large by feeding on food waste for 22 days till they reach prepupae stage.

- **Product harvesting:**

  Shortly before BSF turning prepupae stage the larvae are harvested from the larveros. The waste residue itself is product of value i.e. hermicompost fertilizer. After 22 days by means of sieving and hand picking, larvae are separated from waste matter. Crush it using suitable equipment's to make it powder like substance and weigh it on balance. Quantity of BSF fertilizer produced is about 2.04 kg.

- **Testing unit:**

  Both product, larvae and residue can be further processed testing of the **fertilizer** product has to be done in nearest agriculture department. Crushing of organic fertilizer been followed by collection of black cotton soil in three trays with 20 kg in each. 200 gm of BSF fertiliser is added to one tray, 200 gm of chemical fertilizer to other, another tray is free from any kind of fertilizer and corn been sowed on each tray, this has been done to check the growth of crops.

Work done photo gallery:

BSF rearing facility

BSF waste treatment unit

Separation of waste matter and BSF Larvae

BSF Larvae

BSF Fertilizer

Observation of Plants Growth using BSFL Fertilizer

RESULTS AND CONCLUSIONS

Soil test results from ICAR Agricultural Science Centre Belagavi.

Table 5.1: Result of soil test

Sl. No.	Main Nutrients (kg/hector)	Obtained Nutrients (kg/hector)		
		Sample 1 (BSFL)	Sample 2 (Without any fertilizer)	Sample 3 (Chemical fertilizer)
1	Nitrogen (N)	310	57.20	337
2	Phosphorus (P)	373	21.6	219
3	Potassium (K)	345	76.13	361

Table 5.2: Critical limit table

Sl. No.	Main Nutrients (kg/hector)	Critical Limit of Nutrients (kg/hector)		
		Minimum	Medium	Maximum
1	Nitrogen (N)	280	280 - 560	560
2	Phosphorus (P)	22.5	22.5 - 55	55.0
3	Potassium (K)	125	125 - 300	300

We have produced organic soil fertilizer using food waste by locally available Black Soldier Fly and it is rich in Nitrogen (N), Phosphorus (P), and Potassium (K). From Soil Nutrients test conducted on soil with BSFL we can conclude that soil with BSFL fertilizer is rich in minerals and it increases the fertility of soil significantly. We have been able to produce organic fertilizer at low cost within 22 days. By utilizing solid food waste for producing organic fertilizer we considerably reduced of generation of solid waste.

SCOPE OF FUTURE WORK

The residue, a substance similar to compost, contains nutrients and organic matter and, when used in agriculture, helps to reduce soil depletion. An engineered BSF processing facility can be designed and operated to achieve certain target objectives based on the natural life cycle of BSF. These, for instance, can be to cost effectively augment larvae quality or maximize the larval mass quantity produced within a certain time frame or based on a particular feedstock, similar to a typical livestock rearing system (chicken, beef, etc.). The primary goal, therefore, is to process biowaste in an efficient way with regard to investment and operational costs, as well as space requirements. By processing biowaste, threats to public health and the environment can be reduced. In this manual, however, we follow a waste management perspective. In other words, we start from the premise that biowaste is the substance of concern for which we suggest to use the BSF treatment technology as a suitable processing and recycling solution to produce larvae and waste residue.