

LIQUID BIOFERTILIZERS MANUFACTURING PLANTS

Biofertilizers :

Biological Nitrogen Fixation (BNF) cultures are fertilizers of natural (microbial) origin, unlike synthetic fertilizers. They have a wide range of applicability & leave no toxic or non-biodegradable residues. They are thus gradually replacing synthetic fertilizers in several applications.

Manufacture :-

Biofertilizers are manufactured by fermentation of a variety of media, using commercially available microbial cultures.

The production plant consists of two sections, the manufacturing section & the culture laboratory. The manufacturing section consists of fermentors, blenders, conveyors, storage tanks, piping & instrumentation, & bag/pouch filling equipments. The culture laboratory is equipped with standard testing & culture propagation equipments, the main ones being autoclaves, laminar flow work benches, microscopes, rotary shakers, etc. In addition, utilities equipments such as boilers, cooling towers, air compressors, water softeners & purifiers, pumps & vacuum pumps are also deployed.

Microbial cultures have a very low shelf life, hence are commercially unviable in their native form. They thus have to be physically modified for commercial exploitation.

This can be done in either of two ways :-

1. By adsorbing the culture on a solid matrix on which the cells can remain viable for a reasonable period of time. This is the traditional process that has been followed for several years.
2. By concentrating the cell cultures using non-invasive techniques & adding suitable preservatives & other substances to transform the cells into dormant state & keep them viable in the liquid suspension itself. This is the modern process that has been recently developed.



Liquid biofertilizers :-

The salient features of the process are as follows :-

1. Fermentation is carried out in more sophisticated fermentors than those used for carrier-based biofertilizers. This is to achieve a sterile product free from contaminants, which is necessary for enjoying a high shelf life, since contaminants can spoil the product.

2. Proper control over environmental conditions in the fermentor are very important in order to get as high a cell count in the fermentor itself as possible. Mixing (agitation), aeration, temperature, pH & dissolved oxygen are crucial parameters. When all these conditions are met properly, a cell count of as high as 10^{13} CFU/mL is achievable.



3. Further concentration of the culture is carried out using suitable non-invasive methods. Heatless concentration techniques as cross-flow microfiltration are ideal for this process, since they ensure that a majority of the cells remain viable. This process also partially removes the residual nutrients in the medium & makes them unavailable to the cells, thereby fostering the transformation of the cells into the dormant phase.
4. Suitable preservatives are added to the cell concentrate. The preservatives used are safe for the production cultures, but effective for preventing the growth of spoilage cultures.
5. Packing is carried out under aseptic conditions, either manually in a clean room using a

laminar flow workbench or using an automatic aseptic filling machine. Pre-sterilized bottles are used for filling. Preferred method of bottle sterilization is by radiation. Maintenance of aseptic conditions during filling ensures highest possible shelf life.

Napro's role in liquid biofertilizers :

We manufacture process equipments required for liquid biofertilizer manufacture. The equipments manufactured by us are as follows :-

1. Fermentors & instruments for effective operations
2. Utilities for operating the fermentors
 - a. Air compressors
 - b. Temperature controlled water systems
 - c. Steam boilers
3. Cross flow microfiltration system for cell concentration
4. Aseptic filling system

In addition to the above, we can also provide assistance in setting up of the culture laboratory, as well as provide technical know-how for operating the plant, including the following aspects :-

1. Write-up of manufacturing process
2. Recommendation for purchasing mother culture(s)
3. Demonstration of working of the plant
4. Training of plant personnel in process operations

