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Sub. Biology

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Development by IARI :- Indian Agriculture Research institute & KVIC : Khadi and village Industries Commission.

Microbes as Biocontrol Agents :

• Insecticides and Pesticides toxic, harmful & are pollutants.
• Natural predation better method.
• No of pests kept in check, not totally eradicated.
• Food chains not disturbed
• Eg. Ladybird and Dragon flies useful to get rid of aphids and mosquitoes.
• **Bacillus thuringiensis** (Bt) used to control butterfly caterpillar.
• Mode of spores operation.
o Available is sachets, mixed with water and sprayed on plants.
o Eaten by insect larva
o Toxin released in gut kills larvae.
• Now Bt toxin genes introduced into plants – resistant to insect pests.
e.g. Bt cotton.
• **Tungus trichoderma** now being developed.
• **Nucleo polyhedrovirus** good for narrow spectrum insecticide applications.
• No negative impacts on plants, mammals, birds, fish or target insects.
• For overall IMP (Intergrated pest Management) programme.
• For ecologically sensitive areas.

As Biofertilizers : -

- *Chemical fertilizers major pollutant.*
- *Switch to organic farming and use of biofertilizers need of the time.*
- *Main sources of biofertilizers.* ***Bacteria, Fungi & Cyanobacteria.*** *Eg Rhizobium present in roots of leguminious plants fix atmospheric nitrogen into usable organic form.* ***Azospirillium*** *and* ***Azotobacter*** *free living bacteria – fix atmospheric Nitrogen.*
- *Symbiotic Associations*
- *Eg.Genus Glomus sp. form mycorrhiza*
- *Fungal symbiont absorbs phosphorus from soil and passes it to plant.*
- *Plants show*

o resistance to root – borne pathogens.
o Tolerance to salinity and drought
o Increase in growth and development.

- *Cynobacteria– autotrophic – fix atmospheric nitrogen*
- *Imp.biofertilizer. e.g.* ***Anabaena,***