**Uses Of microorganisms in agriculture**

1. Soil microbes break down organic matter:

 Microorganisms play an important role in the decomposition of organic matter. Different types of microbes are specialised to different types of organic matter, between them covering just about everything.

1. Soil microbes help to recycle nutrient:

 Soil microbes play a crucial role in returning nutrients to their mineral forms, which plants can take up again. This process is known as mineralization.

1. Soil microbes create humus:

 When the soil microbes have broken down all they can, what’s left is called humus, a dark brown jelly-like substance that can remain unchanged in the soil for potentially millennia. Humus helps the soil retain moisture, and encourages the formation of soil structure. Humus molecules are covered in negatively charged sites that bind to positively charged ions (cations) of plant nutrients, thus forming an important component of a soil’s cation exchange capacity. Humus is also suspected of suppressing plant diseases.

1. Soil microbes create soil structure:

 Some soil microbes secrete polysaccharides, gums and glycoproteins, which glue soil minerals together, forming the basis for soil structure. Fungal hyphae and plant roots further bind soil aggregates together. Soil structure is essential to good plant growth.

1. Soil microbes fix nitrogen:

 Agriculture depends heavily on the ability of certain microbes (mainly bacteria) to convert atmospheric nitrogen (N2 gas) to ammonia (NH3). Some live freely in the soil, while others live in association with plant roots the classic example is Rhizobiumbacteria in the roots of legumes. The process of conversion is known as nitrogen fixation. Biological nitrogen fixation contributes about 60% of the nitrogen fixed on Earth. In contrast, manufactured fertilisers contribute 25%. As the cost of energy continues to rise, so too the cost of manufactured nitrogen fertilisers will rise, so biological nitrogen fixation is likely to have ever increasing importance in food production.

1. Soil organisms promote plant growth:

 Some soil microbes produce a variety of substances that promote plant growth, including auxins, gibberellins and antibiotics.

1. Soil microbes control pests and diseases:

 The best known example of the use of soil microbes in pest control is the commercial production of the soil bacterium Bacillus thuringiensis (Bt) to control caterpillar pests of crops. Some strains of Bt are used to control beetles and flies as well. Several strains of the fungal genus Trichodermahave been developed as biocontrol agents against fungal diseases of plants, mainly root diseases. Various other genera of fungi are used for the control of insect pests.