ADVANTAGES AND DISADVANTAGES OF USING CHEMICAL AND ORGANIC FERTILIZERS FOR CROP GROWTH AND SOIL FERTILITY

Among the materials used in agriculture, fertilizer is the most widely used. Based on the production process, it can be roughly categorized into three types: chemical, organic and biofertilizer. Each type of fertilizer has its advantages and disadvantages. These advantages need to be integrated in order to achieve optimum performance by each type of fertilizer and to realize balanced nutrient management for crop growth.

Chemical Fertilizers

Advantages

1. Nutrients are soluble and immediately available to the plants; therefore the effect is usually direct and fast.
2. The price is lower and more competitive than organic fertilizer, which makes it more acceptable and often applied by users.
3. They are quite high in nutrient content; only relatively small amounts are required for crop growth.

Disadvantages

1. Over-application can result in negative effects such as leaching, pollution of water resources, destruction of microorganisms and friendly insects, crop susceptibility to disease attack, acidification or alkalization of the soil or reduction in soil fertility — thus causing irreparable damage to the overall system.
2. Oversupply of N leads to softening of plant tissue resulting in plants that are more sensitive to diseases and pests.
3. They reduce the colonization of plant roots with mycorrhizae and inhibit symbiotic N fixation by rhizobia due to high N fertilization.
4. They enhance the decomposition of soil OM, which leads to degradation of soil structure.
5. Nutrients are easily lost from soils through fixation, leaching or gas emission and can lead to reduced fertilizer efficiency.

Organic Fertilizers

Advantages

1. The nutrient supply is more balanced, which helps to keep plants healthy.
2. They enhance soil biological activity, which improves nutrient mobilization from organic and chemical sources and decomposition of toxic substances.
3. They enhance the colonization of mycorrhizae, which improves P supply.
4. They enhance root growth due to better soil structure.
5. They increase the organic matter content of the soil, therefore improving the exchange capacity of nutrients, increasing soil water retention, promoting soil aggregates and buffering the soil against acidity, alkalinity, salinity, pesticides and toxic heavy metals.
6. They release nutrients slowly and contribute to the residual pool of organic N and P in the soil, reducing N leaching loss and P fixation; they can also supply micronutrients.
7. They supply food and encourage the growth of beneficial microorganisms and earthworms.
8. They help to suppress certain plant diseases, soilborne diseases and parasites.

Disadvantages

1. They are comparatively low in nutrient content, so larger volume is needed to provide enough nutrients for crop growth.
2. The nutrient release rate is too slow to meet crop requirements in a short time, hence some nutrient deficiency may occur.
3. The major plant nutrients may not exist in organic fertilizer in sufficient quantity to sustain maximum crop growth.
4. The nutrient composition of compost is highly variable; the cost is high compared to chemical fertilizers.
5. Long-term or heavy application to agricultural soils may result in salt, nutrient or heavy metal accumulation and may adversely affect plant growth, soil organisms, water quality and animal and human health.

THE ROLE OF BIOFERTILIZERS