Biocontrol Agents: Need and Importance in Soybean Crop

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***Abstract*—Biological controls widely described as the use of natural or modified organisms, genes, or gene products to mitigate pest and disease effects. Tillage, open field burning, heat treatment, and other physical treatments are commonly used to remove pests or separate them from crops. Chemical control refers to the employment of synthetic chemical insecticides to remove or reduce pest populations. The many approaches to biological control can be commonly classified into three categories: population regulation, exclusionary protection systems, and self- self-defense systems. The pest or disease agent itself are example of biological control agents. The principles of plant health care include understanding the agroecosystems production limits, rotating crops maintaining soil organic master, using clean planting materials, minimizing environmental and nutritional stresses, maximizing environmental and nutritional stresses, maximizing the benefits of beneficial organisms, and protecting with pesticides as required mode of action of biocontrol agents competition , antibiosis, mycoparasitism, lytic enzymes, hydrogen cyanide, induced systemic resistance, and plant growth promotion.**

***Index Terms*—Biocontrol agents, plant diseases, fungi, bacteria**

I. INTRODUCTION

When evaluating the contributions of biological pest control to sustainable agriculture, it may be helpful to first quickly review some of the benefits and drawbacks of each of the main techniques. Physical control, chemical control, and biological control are the three main types of base control techniques. These broad categories can be combined to create integrated crop and paste management (ICPM), also known as integrated pest management (IPM). Although biological control has been used in agriculture for centuries, it is still in its early stages. Biological control agents involve the control of one organism by another, which can result in a longer population of the pest or a reduction in the incidence of base damage without affecting the pest population. Biological control is increasingly being recognized as a main pest control approach for a variety of crops and controlled ecosystems. The reason for its gaining popularity it is record of over the last 100 years, which is considered the era of contemporary biological control proposes to become as far as can be determined, and there is no evidence of significant or even negligible detrimental consequences of biological control agents on the environment. Long before the word was coined, biological control was used in agriculture after being discovered via trial and error (Baker and Cook, 1947). Growing the same crop species in the same field more regularly, than every second, third, or even longer year is one example of this practice. Because of the predatory, competitive, and other antagonistic impact imposed by the accompanying microflora and fauna, such crop rotation gives time for the pest or pathogen population in soil to drop below a certain economic threshold.

II. BIOLOGICAL CONTROL

Biological control is the process by which parasites, predators, or pathogens keep the average population density of another creature higher than it would be in their absence. Some extremely effective biological controls of insect's pest with natural enemies are covered by this definition, while other highly effective controls that are recognized as instances of biological control in other fields are not.

Need for biological control in soybean:

To fulfil the need of the expanding population, food grain production should be increased by 250 million turns by 2020. Aside from economic and horticultural methods, growers frequently rely extensively on chemical fertilizers and insecticides. However, environmental degradation is caused by excessive use and misuse of agrochemicals, as well as by some opponents. Pesticide and fungicide resistance is increasing among species. In recent years, with the ratification of the World Trade Organization general agreement on trade and tariff, more emphasis has been placed on the use of environmentally friendly pesticides for crop production due to their low toxicity, low levels of disease resistance, and low residual concerns. However biological controls on the other hand, will be combined with other control measures because different method are effective at different times and in different environments.

III. BENEFITS OF BIOLOGICAL CONTROL

The following are some benefits of using biological control:

- Compared to other methods, Biological Control less expensive and has fewer causes.
- The crop is protected by biocontrol agents during the growing season.
- The plants are not poisoned by them.
- The term application of biocontrol agents refers to both the environment and the individual using them.
- They proliferate readily in the soil and don't cause any lasting issues.
- By boosting the beneficial microflora in the soil, biocontrol chemicals not only prevent disease but also promote root and plant growth. Additionally, it raises crop yield.
- Applying biocontrol agents to the target is quite simple.
- Biofertilizers and biocontrol agents can be mixed together.
- They are simple to produce.
- Neither humans nor animals are harmed by it.

IV. BIOCONTROL AGENTS MODE OF ACTION

Mycoparasitism:

When the antagonist invades the pathogens by secreting enzymes like cellulose, glucanases, chitinases, and other lytic enzymes, it is known as mycoparasitism or hyper-parasitism. The occurrence of one fungus parasitizing another is known as mycoparasitism. The practicized fungus is referred to as hypo parasite, while the parasitic fungus is called hyperpaasitic. There are two mechanisms at work in mycoparasitism between the fungal species involved. A number of processes, including coiling, penetration, branching and sporulation, resting body creation, barrier building, and lyses, occur that result in predation and may be the hyphal of inter-fungus interaction, or fungus-fungus interaction.

Competition:

In order to multiply and endure in their natural environments, microorganisms compete for space, minerals, and organic resources. The rhizosphere have reported this. Certain strains of luminous pseudomonas have been implicated in the biocontrol of fusarium and Pythium species through competition. For heterotrophic soil fungus, competition for substrates is crucial. The fungi with the largest mycelia growth mass or quantityhave the biggest competitive advantage. The combination of physiological traits necessary for competitive colonization of dead organic substrates is known as competitive saprophytic capacity.

Antibiosis:

Antibiosis is defined as an antagonistic relationship between lactic agents, volatile chemicals, or other harmful substances and particular or non-specific metabolites of microbial origin. In biological control, antibiosis is crucial. Antibiosis is a condition in which soil microorganisms plant wastes, underground plant sections, etc. secrete metabolites. It happens when the antagonist metabolic products inhibit or kill the pathogen. Lactic agents, volatile chemicals, and other hazardous materials are among the products.

Lytic Enzymes:

Enzymes can completely or partially destroy a cell, a process known as lysis. There are two types of lysis: endolysis and exolysis, which can be brought on by

food starvation, antibiosis, or other toxins, is the destruction of a cells cytoplasm by the cells own enzymes after death. Cell wall breakdown is typically not a part of endolysis. The breakdown of a cell by another organisms' enzymes is known as exolysis. The breakdown of an organism's walls by chitinases, cellulases, etc. is known as exolysis, and it usually leads to the attacked cells demise

Induced Systematic Resistance:

The capacity of an agent to trigger plant defense mechanism that result in systemic resistance to various diseases is known as ISR. Plants that are inoculated with mild pathogens or non-pathogens develop systemic resistance usually works against a variety of diseases and last s for 3-6 weeks .By strengthening the cell wall mechanical and physical strength and altering the hosts physiological and biochemical process , which results in the production of defense chemicals against pathogen challenge inoculation , biological control agent cause systemic resistance.

Plant Growth Promotion:

Biocontrol agents also generate growth hormones such as auxins, cytokinins, gibberellins. These hormones control harmful infections, encourage plant growth, and simultaneously improve yield. According to studies on the mechanism of growth promotion, PGPR promotes plant growth directly by producing plant growth regulators or indirectly by stimulating nutrient uptake, producing siderophores or antibiotics to protect plants from soil borne pathogens or harmful rizhosphere organisms. Pseudomonas spp. May promote plant development by generating gibberellin like compounds and mineralizing phosphates.

V. CONCLUSION

The expansion of agricultural production has created a number of new obstacles, which can only be overcome if these obstacles are addressed in a timely and suitable manner. The majority of nations, including india, have seen a plateau in agricultural production due to modern farming methods, and environmental issues brought on by the overuse of chemical pesticides and fertilizers are becoming a worry. therefore, biological control is an alternative approach that could be crucial to accomplishing the agricultural goal.

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