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ECO-FRIENDLY MANAGEMENT OF THE SOIL BORNE PLANT PATHOGEN

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Abstract: The study indicates that soil-borne pests and pathogens cause major casualties in the traditional production environment and are very hard to regulate. Host range of soil-borne plant pathogens. Bacteroides, Fusarium oxysporum, Verticillium, Sclerotium rolfsii, Sclerotium scerotinia, Phythium and Phytophthora etc. are very broad. Conversely, soil-borne invasive plants are very rare in organic or undisturbed ecosystems, but they are very harmful to standard production processes. Chemical soil fumigants such as methyl bromide, sodium metham have provided satisfactory control but are hazardous to the ecosystem. Other methods for handling soil-borne pathogens, such as soil solarisation, crop rotation, organic modification and mulch, etc., have some potential. The study is an effort to shed some light on the various eco-friendly planning of soil-borne plant pathogens.

Keywords*: Pathogen; Eco-friendly; Organic Farming; Crop; Mulch*

I INTRODUCTION

Soil-borne pests are known for causing significant losses to cultivate crops but are very difficult to control. Due to the smaller size of the soil, plant pathogens are concealed and unequally distributed in the soil, and very small concentrations are also highly harmful. Generally, soil-borne diseases are extreme and frequently a limiting factor in modern production systems, but are uncommon in undisturbed natural habitats. Like other host plants, soil-borne disease management is also based on the basic concepts of plant disease management, i.e. Avoidance, Exclusion, Eradication, Security and Care. It is necessary for the successful management of soil-borne pathogens to understand the nature of the target pathogen throughout the soil and the various biological, biochemical and physicochemical features of soil temperature, soil moisture, soil organic matter and soil type etc. There is no complete test method available for the management of soil-borne plant pathogens and, where possible, its implementation is problematic. In addition, the emergence of fungicidal tolerance in pathogens and the degradation or circumvention of host resistance by pathogen populations are several of the reasons behind attempts to implement new disease control steps. Over the last few decades, soil fumigation with chemical fumigants has become the most efficient and commonly used process for soil pest control. Many conventional chemical soil fumigants, such as methyl bromide, chloropicrin, etc., are very effective in controlling soil diseases but harmful to the environment, poisonous to humans and harmful to soil micro-flora. The ban and phase-out of methyl bromide underlines the need to develop environmentally sustainable and efficient strategies for the control of soil-borne diseases. Diversified solutions and alternatives are needed to meet the needs of soil-borne pest control and disease management strategies. Among the various methods used to handle soil-borne plant pests, there has been some scope for eco-friendly options such as the use of biocontrol agents, green ripening, organic alteration, soil solarization and bio-fumigation.

Objective: To define the various eco-friendly approach to managing soil-borne plant pathogens.

II RESEARCH METHODOLOGY

The present research is of a descriptive sort. It depends on secondary data obtained from various journals, blogs, books and online posts.

Soil chemical-fumigants and their downsides: Methyl bromide is a colourless, fire - retardant, low vapor pressure chemical with high vapor pressure and a fair water solubility. Before the use of methyl bromide as a soil fire suppressant occurred in France. Ever since exploration and deployment, methyl bromide has been continuously effective in the control of nematodes, fungi , insects and weeds and has been used in more than 100 crops worldwide. This conventional soil fumigant was found to be harmful to the ecosystem, poisonous to animals and humans, and adversely affecting beneficial soil species. Methyl bromide has been identified as a chemical that leads to the degradation of the earth's ozone layer under the Montreal Protocol. Abundance of MB in the atmosphere as a soil fumigation agent was only one cause of ozone layer depletion. Other sources include pollution from leaded gasoline and biomass combustion, as well as from natural sources such as rivers, salt marshes, rice paddies and litter decomposition, etc. Owing to its utility as a soil fumigant, the depletion of methyl bromide has potentially significant economic implications. To this end, some progress has been made in the development of a variety of chemical soil fumigants.Many chemicals such as chloropicrin, dichloropropene, propargyl bromide, metham sodium, methyl iodide and sodium azide have been tested as alternatives to methyl bromide. The phase-out of methyl bromide focuses especially strongly on the drawbacks of chemical fumigants and highlights the need to establish a range of options and alternatives for the control of soilborne pests and diseases that could fit into a prophylactic management plan. In certain cases, the following solutions are already available for commercial applications.

Biological Control-Biological control is the reduction of the inoculum density or disease created by pathogens or parasites in their active or inactive state, by one or more species, by natural or environmental manipulation, by hosts or antagonists, or by the mass introduction of one or more antagonists. Biological regulation is the introduction of antagonistic microorganisms to regulation soil-borne pathogens in the aerial parts of the plant, in the soil or in the rhizosphere or rhizoplane. Biological control agents were dominated by bacteria (90 per cent) and fungi (10 per cent). Avirulent strains Ralstonia solanacearum, Pseudomonas spp., Bacillus spp. Streptomyces spp. And so on. Significant forms of fungi used as biocontrol agents against plant pathogens are Trichoderma, Gliocladium, Aspergillus, Penicillium, Neurospora, Chaetomium, Dactylella, Arthrobotrys, Catenaria, Paecilomyces, Glomus, etc. In order to combat soil-borne plant pathogens, a biocontrol agent must either be distributed around the root of the plant or the seed as a seed treatment or be directly introduced into the soil. It is very difficult to achieve disease suppression for a very long time by introducing a single biocontrol agent into the soil. Various studies on the failure of biocontrol agents under field conditions are primarily due to their inability to create and occupy new ecological niches to displace the pathogen.

Solarisation-The literal sense of the word solarisation refers to a chemical alteration in glass caused by sunlight or other ultraviolet radiation, which induces a photochemical reaction resulting in a decrease in ultraviolet transmission in addition to a visible shift in color. Solarisation of soil is now widely used to describe a procedure in which moist soil mulched for 4-5 weeks before planting with transparent polyethylene film during hot summer months to effectively disinfect certain phytopathogenic fungi and weeds. Solarisation by

soil, either alone or in conjunction with organic changes, and soil flooding in certain cases are important alternatives for controlling soil-borne plant pathogens in specific areas or under specific conditions. The soil has borne diseases visz. Verticillium and Fusarium wilts of many crops have been successfully regulated by solarisation, as well as by diseases caused by Bipolaris sorokiniana, Didymella lycopersicil; Phytophthora cinnamomi, Plasmodiophora brassicae, Pyrenochaeta lycopersici, Pyrenochaeta terrestris, Pythium myrothecium, Pythium ultimum, Rhizoctonia solani, Sclerotium oryzae, Sclerotium rolfsii, and Thielaviopsis basicol Pathogenic fungi, including Pythium irregulare, Sclerotium cepivorum and Sclerotinia minor, have decreased in artificially inoculated soils.

Green Manuring-Green manure is a common technique that has been used to improve soil fertility since ancient times. Green manures are soil fertility-building crops, grown for the benefit of water, for example. Legumes or cloves, medics, trefoils, sanfoins, Lupines, Fenugreek, Field beans, Peas, Cow peas, Cereals, Rye, Oats (Avena sativa) or barley (Hordeum vulgare), Grasss, Perennial ryegrass (Lolium perenne), Timothy (Phleumumum sativa) or barley (Hordeum vulgare). Green manures introduce organic matter to the soil, enhance its physical and biological properties and also aid in the control of pests, diseases and weeds. The cycle of growing plant material, usually legumes for the purpose of introducing it into the soil, is called green manure. Green manure from Brassica can also serve as a trap crop and is well known for its ability to control various soil pathogens. The well-known case of their use in trap crops is for the control of nematode sugar beet (Heterodera schactii) in northern Europe. In this situation, Brassica is invaded by nematodes, which then grow within the heart, but their sexual segregation is disrupted, resulting in a very limited number of females in subsequent generations, leading to a decrease in the nematode population. Green manure improvements in rapeseed and Ethiopian mustard have recently been reported to significantly reduce the incidence of Fusarium basal rot by 20 % and 30% and disease severity by 25 % and 30% respectively. The use of mustard (Brassica spp. and Sinapis spp.) as green manures and seed cakes offers promising alternatives to synthetic chemical fumigants and makes it a fair option for the production of new technologies such as bio-fumigation.

Traditional amendments-organic additives, such as animal manure, green manure , compost and peats, have been used to improve soil fertility well before the introduction of chemical fertilizers. It is known to improve plant health and increase crop yields by reducing pathogen populations in both traditional and organic farming systems and reducing the occurrence of disease caused by soilborne pathogens. There are other examples of the introduction of organic matter, such as dry or green oat, barley, maize, tree bark and chicken manure for the cultivation of Fusarium, Phytophthora, Pythium, Rhizoctonia and Thielaviopsis spp. etc. etc. Several studies worldwide indicated the use of organic amendments to effectively manage soilborne diseases caused by Fusarium spp., Phytophthora spp., Pythium spp., Rhizoctonia solani, Sclerotinia spp., Sclerotium spp. Thielaviopsis fundamentalola and Verticillium dahlia, etc. A variety of mechanisms have been suggested to explain the benefits of organic modification, such as stimulation of natural enemies of plant pathogens, fungi stasis effect, release of fungitoxic or nematocidal compounds during organic matter decomposition, improved plant tolerance, alteration of soil structure and ecology or induction of systemic resistance in host plants. In general, residues from previous crops are convenient to be used as organic amendments. Low nematode population rates have been recorded using crops

such as sunny hemp or marigold because they are weak or non-hosts to various nematodes.

However, given the potential benefit of organic soil alteration, there are a range of questions regarding its effectiveness, disease-reduction inconsistency and possible side-effects that restrict practical applications. Some studies suggest that the efficacy of organic modification is variable and may, in some cases, increase the severity of the disease. Organic modification has been documented to provide a substrate for saprophytic development, thereby growing the inoculum of pathogenic fungi and oomycetes, or negatively affecting the crop by releasing phytotoxic compounds that could harm plant roots and predispose them to pathogenic attacks. Such contradictory disease control results obtained with the OM amendments indicate that they may cause both a reduction in suppressive disease and an increase in the effects of the disease. Moreover, despite extensive research, the impact of the various OM amendments on the management of soil-borne plant pathogens is not always significant.

Bio-fumigation-The use of mustard green manures and seed cakes offers promising alternatives to conventional chemical fumigants and the term biofumigation has been coined. The term biofumigants is typically used in plants that contain large amounts of glucosinolates, which are organic compounds containing sulphur. Brassicas are known to have this compound in their cells; thus, they are very important as a bio-fumigant. Other essential biofumigants include sorghums, capsicum, marigolds, organic manures and swine manures, etc. Certain fungal agents such as Muscodor albus and Ceratocystis fimbriata are also known to monitor post-harvest diseases of stone fruits, citrus and grapes, etc. Bio fumigation of soil regulates a number of pests, nematodes and a variety of fungal soil diseases, but bacteria are less resistant to it. Bio fumigation is a new approach.

III CONCLUSION

Study shows traditionally the management of soil-borne diseases has also been focused on the use of chemical soil fumigants such as methyl bromide, meth sodium, chloropicrin, etc., which have been effective in managing the problem. Efforts have begun to be made to find some alternatives to these toxic soil fumigants in the world, both humans and animals. Soil-borne plant pathogens grow well in unhealthful soils which are deprived of nutrients and beneficial microflora and fauna. Therefore, the secret to their management is to keep the soil safe by adding green manures, mulches, organic changes and composts, etc. These products not only enhance soil fertility, but also kill soil-borne pathogens. Therefore, they should be used more often in soil management of plant pathogens.

REFERENCE

1) Kumar, G., & Sarma, B. K. (2016). Eco-friendly Management of Soil-borne Plant Pathogens through Plant Growth-Promoting Rhizobacteria. *SATSA Mukhapatra-Annual Technical*, (20), 167-171.
2) Hardy, G. S. J., Barrett, S., & Shearer, B. L. (2001). The future of phosphite as a fungicide to control the soilborne plant pathogen Phytophthora cinnamomi in natural ecosystems. *Australasian Plant Pathology*, *30*(2), 133-139.
3) Weller, D. M. (1988). Biological control of soilborne plant pathogens in the rhizosphere with bacteria. *Annual review of phytopathology*, *26*(1), 379-407.
4) Handelsman, J., & Stabb, E. V. (1996). Biocontrol of soilborne plant pathogens. *The plant cell*, *8*(10), 1855.
5) Hoitink, H. A., & Fahy, P. C. (1986). Basis for the control of soilborne plant pathogens with composts. *Annual review of phytopathology*, *24*(1), 93-114.
6) Bruehl, G. W. (1987). *Soilborne plant pathogens*. Macmillan publishing company.