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An Overview on Bio Herbicides in Organic Horticulture

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ABSTRACT: For organic horticulturists, weeds are one of the most difficult, time consuming, or costly production concerns. As the consequence of the organic agriculture has grown, so has the demand for innovative bio pesticides to control weeds. Pathogens, organic chemicals, and natural fiber extracts might all be employed to develop viable bio herbicides. Pathogenic fungus and bacteria are two of the most common microorganisms that might be used as bioherbicides. Herbicidal properties have been proven in byproducts from natural source like as dry distiller's grain with soluble, corns gluten meals or mustard seeds meal. Bioherbicide potential has also been discovered in essential oil extracts. When applying a bioherbicide, the most important factor to consider is its efficacy, which may be impacted by a variety of factors such as humidity and moisture, application technique, bioherbicide spectrum, and formulation type. Aside from efficacy, bioherbicide use is limited due to cost and concerns about potential human health risks. Because incorporating advanced bioherbicide techniques into existing weed-control offerings could help manage herbicide, lower costs, but also increase crop yields, future research should focus on developing more cost-effective but still effective bioherbicides for weed control, as well as optimizing manufacturing techniques rather than traditions through the use of application submission bioherbicides.

KEYWORDS: Bio Herbicide, Corn Gluten Meal, Distillers Grains, Essential Oil, Mustard Seed Meal.

I. INTRODUCTION

There's a Problem with Weed Growth in the Organic Horticultures Weed are most expensive sort of the agricultural pest, incurring significant production losses and labor costs. Agricultural weeds may quickly establish themselves by competing for minerals and water while also releasing compounds that inhibit crop development, decreasing crop photosynthetic activity and output. Annual weeds generate a child as well as germination in response to stimulation, continuously rising volatility in surface temps or relative humidity, continuing to increase oxygenation, and hastened nutrient release. Perennial grasses grow back new nuclear power plants from tiny fragments of origins, corms, or other underground structure, so even though perennial weeds produce children through really well successful seeds, along with germinates in response to exposure, enlarged volatility in soils temperature or otherwise relative humidity, or improved nutrient availability. When there are optimal climatic conditions, a sensitive crops, or a huge weed seed bank in soils, severe weeds issues pose a significant danger to horticulture crop productivity [1,2].

Herbicide (pre-emergent or postmortems), organics herbicide, manual techniques (hand weedings or mulching), and bio herbicides are all used by horticultural growers to manage weeds. Herbicides used before and during the germination of weed seeds are known as pre-emergence pesticides. Emerging roots or shoots are blocked when germination seeds come into touch with both herbicides; however, a pre-emergent herbicide that does not make excellent contact with developing seeds may not be effective. Post-emergent herbicides are pesticides that are applied after weeds have emerged from the soil, ideally while they are still seedlings. To guarantee that organic pesticides do not harm agriculture plants, they must be used before to agriculture seedling emergence, transplanting, and immediately after current agricultural plantings have been generated. Ammonia nominate, fatty acids, vinegar, clove oil, or D-limonene are among of the current organic herbicides. On immature, high-value onions, sweet corn, and potatoes, a broadcast application of vinegar or essential oils was used to suppress weeds. Physical weed control procedures like hand picking or mulches (especially weed discs) are required for some high-value crops, but they are labor-intensive, time-consuming, and expensive. In addition to the measures mentioned above, domestic goat feeding has been shown to be effective in removing a variety of plant kinds. Complete drip irrigation was achieved after that, before weed control, by combining hand-weeding with topical ointment and comment herbicides. Consumer demand, conservation of natural resources, and food security are all driving organic horticulture's growth in both North America and Europe. Organic farming has resulted in the development of nutritionally superior food crops that use fewer inputs and have a lower environmental impact. Crops, whether they be fruits or vegetables, are important parts of a well-balanced diet. Organic foods include more vitamins and minerals than commercially produced meals,

according to various studies, and they have gained in favor among consumers [3].

The natural food and beverage industry in North America was valued at $35 billion in 2013, with a strong growth rate projected. Because organic production regulation prohibits the use of pest, disease, and weed control agents, organic horticulture products may be a little more difficult to cultivate than regularly produced commodities. Due to high cost of pest and weeds control, and the length of time needed to endorse the systems, organic gardening relies on price premiums for economic security, which may make it more financially viable than traditional horticulture obviously it depends on managerial areas of strength as well as cultural traditions. There are no easy or typical weed control measures in organic agriculture. To eradicate weeds without triggering crop loss, organic farmers must use long-term strategies. The foundation for effective organic weed management is a thorough knowledge of weeds and their behaviors in the farm or garden context. To reduce weed-induced production losses or keep pest management expenses low, organic agriculture should use hand weeding or cultural techniques. Bioherbicides, which employ natural ingredients, extracts, as well as natural biological representatives such as microorganisms to attack weeds, are becoming a real tool for managing weeds in organic horticulture owing to the danger of contamination of crops and natural resources [4].

Biological controls for weed management have been developed using living things like as insects, nematodes, bacteria, and fungus, as well as natural materials. Bioherbicides answer the desire for new weed management approaches by providing a long-term, low-cost, and environmentally friendly alternative to existing weed control techniques. The two main approaches of biological weed management are traditional biological control and bioherbicides. Introducing a natural enemy that spreads over the target weed's environment is the standard biological strategy. This strategy, however, carries the risk of injuring non-target plants after introducing the bio control agent to a new location. Due of the introduction of potentially harmful microorganisms into agricultural output, the traditional technique is subject to strict limits. To offer considerable weed elimination while minimizing crop harm, this bioherbicide technique focuses on natural enemies found in the plant's native habitat. Traditional approaches rely on the natural enemies' inherent ability to multiply, while bioherbicide relies on natural enemies reproducing under controlled settings or being spread by humans. Bioherbicides, which provide a greater variety of uses in agriculture, lawns, especially especially gardens, are gradually replacing traditional pesticides. The main goal of the following presentations is to evaluate the efficacy of different bioherbicide techniques, given the growing relevance of the bioherbicide in the organic agriculture [5].

Bioherbicide produced from the pathogen Several microbial agents have indeed been examined for its potential as bioherbicides in crop species, turf, especially forest tree, include obligate fungal parasite, soil-borne pathogenic fungus, non-photo pathogenic, fungi, or save non-pathogenic bacteria, and nematodes. De Vine (Encore MN, Technologies, Plymouth, USA) was among the first bioherbicides to be approved, and it was meant to control strangler vines on orange trees in Florida. Several additional harmful fungi and bacteria were created to manage weeds during the next quarter century. Plant diseases may cause serious harm to target weed species when used as bio control agents. To be become acceptable pathogens, they has to be mass produced having their pathogenicity verified on plants in range of environments, followed with field efficacy but also host range testing. Plants diseases produce a variety of phytotoxins that can cause everything from small gene expression alterations to full plant death [6].

The numbers of the emerging creeping creeping charlie seedling was decreased by 26% when DDGS was sprayed at 225 g m2 on the ground surface. CGM, a herbicidal byproduct of maize wet milling, has the potential to be used as a natural pesticide to manage a wide range of broadleaf and grass species. Microsphaeropsis amaranthi and Phomopsis amaranthicola spore suspensions, either alone or in combination as bioherbicides, drastically decreased weed biomass in water hemp and pigweed, resulting in better pumpkin and soybean yields. Two fungi, Fusarium tricinctum and Alter aria conjunct/infectoria, were isolated from parasitic weeds dodder and Fusarium tricinctum. These two fungus have the potential to be used as bioherbicides in organic agriculture since they effectively decreased dodder without hurting cranberry growth.

Natural Ingredients Bioherbicides Weed control bioherbicides have been developed from natural-source byproducts. Dried distillers grains with soluble (DDGS) is indeed a byproduct of bioethanol production which is often used as cattle feed, but due to its high nutritional value, this might also be used as a fertiliser in horticultural production systems. When 800–1600 g m2 of DDGS was added to the surface of potting mix, the number of perennial bluegrass seedlings was decreased by 41%–58% and the number of equivalent chickweed seedlings was reduced by 33%–58%, respectively [30]. The number of emerging creeping creeping charlie (Oxalis corniculata) seedlings was decreased by 25% when DDGS was sprayed at 225 g m2 on the ground surface. CGM, a herbicidal byproduct of maize wet milling, has the potential to be used as a natural pesticide to manage a wide range of broadleaf and grass species.

When sprayed on the soil surface in a greenhouse, the CGM decreased 23 germinating weeds species at levels of 400–1000 g m2, resulting in losses in plants survival, shoot length, or roots development of black nightshade, common lamb squatters, creeping bent grass, or curly docks. Purslane is a byproduct of the manufacture of industrial mustard oil. The glucosinolates (GLS) in MSM may be broken down by enzymes to produce isothiocyanates, thiocyanates, nitriles, and other chemicals. A number of plant species poison these physiologically active chemicals. MSM sprayed at 114, 226, or 451 g m2 on the soils surface of containers decreased the number of annual bluegrass seedlings by 61, 87, or 99 percent, respectively. The number of emerging seedlings or fresh weights of creeping wood sorrel were decreased by 91 percent or 95 percent

with an MSM treatment rate of 226 g m2. MSM at these three rates reduced liverwort by 84 to 98 percent after emergence without affecting plant growth. However, since MSM treatment rates are 11–20 times greater than normal granular herbicides used in nurseries, its usage is restricted. MSM treatment decreased the emergence rates of kochia common lambs quarters or barnyard grass by 84 percent, 73 percent, or 66 percent, respectively, when compared to non-treated controls [7].

In organic agriculture, bioherbicides generated from plant sources have shown a lot of promise. In Pythium ultimum infested soils, seeds meals from canola or mustard greens boosted tomato and pepper seedling emergence. Brassicaceae seeds meals (BSMs) were utilized in sustainable farming to increase carrot yields by boosting soil organic nitrogen. They were also highly effective in weed control. Smoking organic matter of shepherd's purse, Italian ryegrass desert rock purslane, and annual country music reduced after using canola derived BSM but not MSM in producing crops, while strawberry fruit yields increased, implying that BSMs might have potential utilized in sustainably grown gardening system as merged bicarbonates. Combining steam disinfestation with MSM soil additives improved strawberry output, weed control, or disease control, according to Fennimore et al.

Extract-based bioherbicides Bio herbicides might be made from components from natural sources. Root root development of emerging weeds was reduced by five dipeptides extracted from hydrolyzed CGM. In Medicago saliva, secondary chemicals extracts of leaves of the Ailanthus altissima reduced seed germination and plant growth. According to studies, rice husk extracts have a substantial allopathic potential. Elevated concentration of water temperature hull extraction from carefully chosen rice cultivars inhibited barnyard grass fertilization, seedling development, and weight. Red clover germination and root development were reduced by metabolic extracts from Everniastrum sorocheilums, Usnea roccellina, and Caledonia confusing. Phenolics derived from the lichen Caledonia verticillaris altered the ultrastructure of lettuce seedling extracts of leaves, indicating that they might be beneficial bioherbicides. The blacks walnut (Juglans nigra) has allopathic properties, and walnut extracts have been offered as a bioherbicide. A commercial version developed on black walnut extractor Chemicals, LLC, Burley, fully inhibited horseweed and hairy fleabane development at a level of 38%, demonstrating its promise as a pre/post bioherbicide. Bioherbicide Efficacy is a factor that plays a role.

II. LITERATURE REVIEW

Weinberger et al. looked into Horticultural and processed goods from emerging countries are gaining popularity in both local and international markets. Production and exports on a global scale are constantly increasing. In the least developed nations, however, yields gains have been lower than areas expansion or have been insignificant and even negative. While experience indicates that horticulture may help reduce poverty by increasing revenue and creating jobs, it is important to ensure that small or poor farmers are not left out of these market areas. They argue in this study that horticultural research and innovation should be prioritized by donor agencies, specifically in the realm of genetic transformation, safe manufacturing processes, commercial seeds production, postharvest facilities, and the urban setting [8].

Lamont Jr. et al. conducted research on although high tunnels have been utilized for several years throughout the globe, their usage in the United States for the cultivation of horticulture crops is a relatively new occurrence. High tunnels, both single and multiday, are utilized all over the globe to prolong the growing season. The exclusion of rain, which reduces disease pressure or crop loss while increasing crops quality or shelf life, is a major benefit of the high tunnel in the temperate or tropical areas of globe. They are often grouped together under the title "protected cultivation." Although it may be difficult to tell the difference, high tunnels are not greenhouses. Despite its resemblance to conventional plastic-covered greenhouses, high tunnels are an entirely distinct technology. High tunnels are made out of a pipe or other structure coated in a single sheet of greenhouse-grade 4 to 6-mil plastic and have no electrical supply, automated ventilation. Although there is no permanent heating system, crops are occasionally protected against unexpected low temperatures in the spring or autumn by using a standby portable heater or another form of heating. Most high tunnels include a supply of water for irrigation, and drip irrigation is used in most cases. A greenhouse, on the other hand, has a second layer of air-inflated plastic with fully automated ventilation including heating systems. A greenhouse gives you a lot more control over the cropping environment [9].

Cai, Xiaoya, et al. studied about Weeds are one of the most problematic, time consuming, or expensive manufacture issues for organic horticultures growers. The needs for novel bioherbicide to manage weed has increased as organic agriculture has risen in importance. Pathogens, natural products, or extracts of organic fibers may all be used to create potential bioherbicides. Two types of microbes that can be used as bioherbicides include pathogenic fungus or bacteria. Organic wastes from plant sources, including dry distiller's grains containing soluble, corn germ meals, especially mustard seed feeds, have been proven to have herbicidal actions. Volatile oils extracts have also been discovered to have bioherbicide potential. The efficiency of a deeper penetration is the most important factor to consider when using it, or it may be impacted by factors such as humidity but also moisture, active learning, bioherbicide spectrum, or formulations type. In additions to effectiveness, bioherbicide usage is limited by price and worries about possible human health risks. Future studies should focus on developing that much cost-effective but also effective bioherbicides for the weed management, while also improving manufacturing techniques but also cultural heritage with using candidate bioherbicides, even though incorporating bioherbicide newer technology into existing weed management services might very well better handle defence mechanisms, bring down costs, and improve crop yield [10].

III. DISCUSSION

Weeds are among the most bothersome, time-consuming, but also costly production issues for organic horticulturists. The demand for innovative bioherbicides to manage weeds has increased as organic agriculture has grown in importance. Pathogens, natural ingredients, including extracts of organic fibers might all be used to create potential bioherbicides. Pathogenic microbes are two key kinds of pathogenic microbes that might be employed as bioherbicides. Many weed species have been controlled using byproducts from natural sources including such dry distiller's grain containing soluble (DDGS), corn gluten meals (CGM), as well as mustard seeds meals (MSMs). Bioherbicide potential has also been discovered in several volatile oils extracts. Despite extensive attempts to produce bioherbicides, only a handful have been approved for usage. The creation of more cost effectives or effectual bioherbicide, and even the optimizing of their usage in agricultural system, should be the reference for future study. The efficiency of bioherbicide is key limiting's factors in their use, and it is typically influenced by environmental factors. Specific formulations have been created to ensure the efficacy of agents used in fields due to humidity requirement for development or spread of many foliar or stem fungal infections used for weed management. Certain viruses need a protracted dew period to infect the apical surfaces of target weeds. Some organisms have a short shelf life and are thus unsuitable for long-term storage. Xanthomonas campestris pv. xanthomonas campestris pv. xanthomonas Xanthomonas campestris pv. xanthomonas campestris pv. xanthomonas Xanthomonas Poannua, a pathogen that causes bacterial wilt of annual bluegrass, was not commercially marketed because to poor performance and inconsistent efficiency under varied climatic conditions. Pathogens that attack weeds may be influenced by the quantity of moisture in the soil. A jute cloth was used to cover soils that had been treated with a Sclerotinia tiny granular for improved absorption in order to reduce water loss while also controlling dandelion white clover broadleaf plantain (Plants ago majors), buckhorn plantain (Plants ago major), and prostrate knotweed (Polygonal aviculare). The impact of moisture was minimized within the absence of moisture by adding an invert oil dispersion to Colletotrichum truncatum conidial treatments, resulting in 100% management of hemp sesbania in the greenhouses but 95% point control in the fields.

IV. CONCLUSION

Because bioherbicides are scarce, including microbial inoculants into conventional weed control approaches might be a feasible organic horticulture alternative. Bioherbicide technology might be used in organic agriculture as part of an integrated pest management approach to help reduce resistance mechanisms, minimize production costs, and increase crop yield. Only a few bioherbicides have been licensed for use, despite enormous efforts to develop them. Future research should focus on developing more cost-efficient and effective bioherbicides, as well as optimizing their use in agricultural systems. Bio pesticides in organic agriculture are discussed in this research.

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