

Sustainable Development

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Overview: Integrated Management of Plant Diseases towards Sustainable Development

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Abstract

Sustainable Agriculture aims to achieve a lot of accomplishments, mainly; the production of the humanitarian needs of food and clothing. Improving the quality of environment and natural resource base of the agricultural economy. Optimize the use of non-renewable energy and resources in the fields and integration between biological control methods and natural biological cycles, whenever possible. Sustainability in field production improving the quality of life of farmers and the community. Necessary to know that, Organic and sustainable are not quite synonyms, because organic standards leave some practices that are not optimal from a sustainability, and not all farmers who use sustainable practices qualify for constructions or choose to follow it. Plant pathology research and extension work has historically emphasized integration of several control strategies and fits both historical and modern definitions of IPM. This article deals with the fundamental values of sustainable agriculture, definitions that explain on integrated pest management, program essentials to achieve the IPM included sustainable development in terms of Plant Diseases. This article also highlights the Impact of IPM on Plant Health, Pesticide use and yield, and IPM and sustainable development in terms of Plant Diseases.

Keywords: Plant Health; Pest management; Sustainability; Definitions; IPM

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Introduction

Over the past decades growing interest in agricultural production for access to higher productivity with lack of attention to quality and lack of interest in causing the agricultural system of adverse effects on ecosystems, resulting in increased farming systems that rely on chemical pesticides or chemical fertilizers, and that's caused significant damage to soil, water, air and climate. But over time scientific started research the efforts concerned sustainable agriculture, organic farming, clean agriculture and other concepts which then became agricultural systems maintain the



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balance in all aspects of agricultural and process, production consumer and environmental. Interest has increased in these agricultural systems and pet many farmers and now many large farms interest in organic farming in the context of sustainable agriculture. The concept of sustainable agriculture is simply the production of food or fiber or other plants or even animal products through the agricultural techniques protecting the environment and public health and human societies from the negative impacts arising from undertaking that process with the usual format as well as technology that also takes into account animal welfare, such as this type of agriculture will enable us to the production of healthy foods without compromising the ability of future generations to do this [1-3].

The fundamental values of sustainable agriculture

Sustainable agriculture is that come with protecting ecosystems and natural resources that rely on farming or dependent on agriculture [4,5]. Some of the most important are conservation of the biodiversity, soil conservation and prevent deterioration and combat the desertification, optimum use of irrigation water and reduce pollution of the water, soil and air. This would be achieved through:

Environmental protection: The sustainable farms produce crops and animal husbandry without relying on toxic chemical insecticides or synthetic fertilizers or genetically modified seed, or even certain practices that are harmful to soil and water or some natural sources. Cultivation of various types of plants and use some techniques such as exchange and the rotation of different crops and traditional agricultural operations; all this helps to protect biodiversity and promote the development of ecosystems and preserved [6].

The protection of public health: food production and economics must take account of

human health, and that sustainable crop cultivation must reduce the use of pesticides that are dangerous to human health, even be able to produce fruit and vegetables safer for consumers and also the communities surrounding those farms. And the smart management and sustainable farm responsible for human protection against pathogens, toxins and other environmental pollutants.

Agricultural industry : In many states, with a growing population has become a lot of food industries do not produce organic farms and sustainable, and has become a lot of farms rely on their production of agriculture to industrial fertilizers and pesticides chemicals. And because the Agro-chemical industry a huge market dominated by many companies Intercontinental, multinational, is to promote the use of agricultural chemicals and pesticides more widespread, and so moved by the quality of food manufacturers because they require preservatives also to ensure the preservation and storage for longer periods, and all this leads to negative effects on human health and the environment.

The future of sustainable agriculture

The development of sustainable agriculture was adopted to increase awareness of their importance, and also support the governments of the plantations and companies that operate within the framework of sustainability and particular organic agriculture, clean and, most recently devoted a lot of studies and research also big scientific conference on and sustainable agriculture, as were a lot of big exhibitions around the world for organic products and food made from organic agriculture, clean, all of this encourages organic agriculture and so sustainable agriculture. on the level of international policy sustainable agriculture became the subject of interest in the forums of international politics, especially the potential contribution of organic agriculture to reduce the negative effects of climate change and reduced deforestation rates and maintain



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biological risk and also arranged on the steady increase in the world's population.

Agricultural and environmental policies around the world interested in integrating sustainable agriculture in national plans and development. For change in agricultural production systems with an increase in production in terms of quantity and quality. This helps to increase investments in sustainable agriculture significantly, reflected on increasing scientific research budgets and land reclamation and economic incentives and improve infrastructure [7,8].

Sustainable agriculture practices

Depending on the recommendations and applications of scientific research, there are a lot of practices which were used to access to sustainable agriculture such as rotating crops; reducing or eliminating tillage, planting cover crops, integrating livestock and crops, adopting agroforestry practices, managing whole systems and landscapes, and applying integrated pest management (IPM).

In this article will highlight the (IPM), with IPM a wide range of approaches, including biological and chemical controls, can be used systematically to control of pest populations and plant diseases with minimizing use of chemical pesticides.

There are many definitions that explain on integrated pest management

Integrated Pest Management IPM involves an integrated approach to the prevention and/or suppression of organisms harmful to plants through the use of all available information, tools and methods. IPM aims to keep the use of pesticides and other forms of intervention only to levels that are economically and ecologically justified and which reduce or minimize risks to human health and the environment.

IPM is an effective and environmentally sensitive approach to pest management that

relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of their pests and interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

IPM is a program that should be based on prevention, monitoring, and control which offers the opportunity to eliminate or drastically reduce the use of pesticides, and to minimize the toxicity of and exposure to any products which are used. IPM does this by utilizing a variety of methods and techniques, including cultural, biological and structural strategies to control a multitude of pest problems.

IPM is a term that is used loosely with many different definitions and methods of implementation. IPM can mean virtually anything the practitioner wants it to mean. Beware of chemical dependent programs masquerading as IPM. There are six program essentials to achieve the IPM included; monitoring; record-keeping, action levels, prevention, tactics criteria, and evaluation. and a brief explanation of these concepts will be dealt with in the following table:

Evaluation of Pest Management Results

The success and impact of any IPM program must be evaluated. You should note whether pest management results were achieved, and how the program could be improved. An IPM program can be evaluated using; (1) Noting any changes, including preventive actions that can avoid future problem, (2) Changing injury and action thresholds in light of experience, (3) Planning for seasonal pest infestations, (4) Tracking the costs and benefits of a pest management program, (5) Visual inspections or counts of pests and non-target organisms before and after treatments, (6) Post-treatment data versus pre-treatment monitoring records, (7)



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Treatment records (methods, dates, times, rates, costs, etc), (8) Feedback from clients or site users, (9) Possible pest management improvements and preventive actions that can be taken [9].

Brief explanation of IPM elements	
Program essential	*Explanation
Monitoring	Types and infestation levels of pests at each site.
Record-Keeping	To establish trends and patterns in pest outbreaks. Information recorded at every
	inspection or treatment should include pest identification, population size,
	distribution, recommendations for future prevention, and complete information on the
	treatment action.
Action Levels	The population size which requires remedial action for human health, economic, or
	aesthetic reasons.
Prevention	Incorporated into the existing structures and designs for new structures. Prevention is
	and should be the primary means of pest control in an IPM program.
Tactics Criteria	Under IPM, chemicals should be used only as a last resort only, but when used, the
	least-toxic materials should be chosen, and applied to minimize exposure to humans
	and all non-target organisms.
Evaluation	Evaluation program is essential to determine the success of the pest management
	strategies.
*Source: https://www.beyondpesticides.org	

IPM and Plant Diseases

Plant pathology research and extension work has historically emphasized integration of several control strategies and fits both historical and modern definitions of IPM. Applicators can learn to identify common pests and plant diseases. It is ideal to have a sample of the pest, and pathogenic organisms to make sure that it is identified correctly. This may not always be possible. Some plant diseases are often identified by the damage or symptoms they cause. Also, most of plant disease causal agents need laboratory tests and examination to identify it.

Control and/or Management of Plant Diseases

Plant disease management is depending on several important principles or practices, but the control of plant disease is not practical or even possible, it aims to reduce the disease progress and keep it at an acceptable level or at the economical level, so the basic principles of plant disease management are mentioned below.

IPM and Host Plant Resistance

A strategy that involves the use of pest-resistant and pest-tolerant cultivars developed through traditional breeding or genetic engineering [10]. These cultivars possess physical, morphological, or biochemical characters that reduce the plant's attractiveness or suitability for the pest to feed, develop, or reproduce successfully. These cultivars resist or tolerate pest damage and thus reduce the yield losses. This option is the first line of defense in IPM.

IPM and sustainable development in terms of Plant Diseases

IPM is a strategy that is widely adopted by all pest control programs. As mentioned above, the term IPM has been used sparingly in the phytopathology field. Generally, the integrated



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disease management approaches are considered to be at the principals of biointensive pest control and IPM is broadly used in crop protection fields [11]. Some of IPM programs describe the tools and decision requirements for individual crop pests, especially plant disease control. IPM that related to all types of pathogens with the crops and plant species in all agroecological systems, it needs a lot of achievements in modern technology applications like crop growth loss models to support the growers needs in agriculture for sustainability also to achieve the knowledge and implementation structure in potential of IPM [12].

Table: Principles of plant disease management.	
Method	Examples
Protection	Practical disease avoidance and use of pesticides, use of biocontrol and fungicides,
	avoid of the time of planting that favor causal agent, provide adequate plant spacing
	avoid crowding, group plants according to their nutrient and water needs, avoid injury
	to the plants and make proper pruning cuts, use care when harvesting, and handle plants
	and plant parts carefully during transplanting, harvest.
Exclusion	Prevent the transportation and introduction of plant pathogens, Government
	regulations, prevent introductions, Quarantine stations, Purchase of certified disease
	"free stock, clean seed", Seed treatments (fungicides on seed coating) and
	disinfestations, modify actions to prevent spread into uncontaminated area
Resistance	The most reliable, effective and economical way of controlling plant diseases; Contain
	resistance genes within the plant, Horizontal resistance and physical barriers, synthesis
	of toxins, plant systemic immune response like Salicyclic acid, mild infections "Vertical
	resistance – one gene - one protein, no infection; Resistance crop can endure an attack
	by a pathogen (Penetration, no colonization).
Therapy	Achieved by incorporating a chemical control agent into the physiological processes of
	the plant to reverse the progress of disease development after infection has occurred.
Avoidance	Like the cultural practices that help avoid the potential for infection, such as planting
	date, seedbed preparation and water management, also fertilization and space for each
	plant. prevent injury of plants etc.
Eradication	Prevents spread of introduced diseases, reduction of inoculum density, sanitation,
And reduction	removal infected plant debris, pruning of diseased plants and infected wood, crop
of inoculum	rotation, eliminate weeds and alternative hosts, use of techniques that disfavor vectors
	movement, soil sterilization and biocontrol.

Impact of IPM on Plant Health, Pesticide use and yield

Plant heath management under the umbrella of IPM is related to achieve the sustainability. Generally, the greatest efforts for plant health management are the amount of diseases managed with ecofriendly approaches. For example, most of the previous researches for root diseases management is more related to the approaches of soil fumigants, and other practices such as crop rotation, etc. the advanced applications for plant diseases management have come from the efforts aimed to control of the plant pathogens. Genetic studies also like the gene-for-gene model and other advanced application based on molecular levels are the most significant contribution of plant pathology to the wifehood recently. The main target of IPM is protecting of crops from all types of pests with interesting of the natural balance. Biological control has various significant approaches to plant disease management during the twentieth century and advanced through modern biotechnology to become the most significant field recently.



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Plant health management is a moving aim with biocontrol and IPM [13].

There is a relationship between IPM programs and pesticide use where it can be reduced and pest management practices can be modified without yield [14-16]. Also, there are four possible scenarios of impact if IPM is applied as mentioned in Figure 1:



Figure 1: Scenarios of Impact of IPM on Pesticide Use and Yield.

Conclusion

Sustainable agriculture is that come with protecting ecosystems and natural resources that rely on farming or dependent on agriculture. Integrated Pest Management IPM involves an integrated approach to the prevention and/or suppression of organisms harmful to plants through the use of all available information, tools and methods. IPM aims to keep the use of pesticides and other forms of intervention only to levels that are economically and ecologically justified and which reduce or minimize risks to human health and the environment. Plant heath management under the umbrella of IPM is related to achieve the sustainability. Generally, the greatest efforts for plant health management are the amount of diseases managed with ecofriendly approaches. There are four possible scenarios of impact if IPM is applied such as pesticide use declines, but yields increase; both pesticides use and yields fall; pesticide use increases but yields decline or pesticide use and yields increase.

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