PLANT ECOPHYSIOLGY

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Plant Ecophysiology 2 (2023) 35-43

Examining the problems and solutions for managing the use of agricultural pesticides to achieve sustainable development

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https://doi.org/10.5281/zenodo.10461049

Abstract
In recent years, due to the increase in the world population and the need to produce more food, a significant growth in the consumption of chemical pesticides has been seen in developed and especially developing countries. Although chemical pesticides are essential components of modern agriculture, they are also considered as one of the important sources of environmental pollution. Resistance of pest and disease species and weeds to chemical poisons, poisoning, destruction and severe erosion of soil, water pollution, adverse effect on non-target organisms, threat to human health and destruction of the environment are among the most important effects of these substances. are chemical. In this regard, integrated pest management (IPM) is introduced as one of the protective technologies in sustainable agriculture, which means the correct, logical and principled use of pesticides as a powerful tool along with other methods. Therefore, minimizing the use of chemical poisons, reducing the dose of poisons and using them on time, using selective, non-chemical and environmentally friendly pesticides, and finally introducing and using integrated pest management methods should be on the agenda. This is a way to achieve sustainable development in agriculture.

***Keywords*:** pesticide management, IPM, pest resistance, environmental pollution, sustainable development.

Introduction

With the beginning of the agricultural revolution, in order to use nature sustainably, the governments only indulged in temporary and economic resources and convinced the farmers that the use of pesticides is a simple, cheap and effective way to control pests and the yield of agricultural products. increases (Amiri Ardakani and Emadi, 2011; Salehi et al., 2017). Because it was impossible to reduce the loss of agricultural products and increase productivity per unit area without pest control management (Abhilash & Singh, 2009; Hashemi et al., 2009). It was estimated that fifty percent of production products, especially in developing countries, are destroyed by pests, which in addition to direct damage and plant consumption, also play a role in the transmission of viral diseases and microbial infections (Karamidehkordi & Hashemi, 2010 Therefore, in recent years due to the increase in the world population and the need to produce more food, a significant growth in the consumption of chemical pesticides has been seen in developed and

especially developing countries (5Mousoyan and Karmi Dehkordi, 2014). Chemicals are one of the essential components of modern agriculture, but they are also considered as one of the important sources of environmental pollution and exposure to them is one of the most common and serious safety-sanitary risks that farmers face (Bandari et al., 2017). Resistance of pest and disease species and weeds to chemical poisons, poisoning, severe soil destruction and erosion, water pollution, adverse effects on non-target organisms, threats to human health, occurrence of skin diseases, types of cancer Neurological diseases, diabetes, respiratory diseases, fetal failures and diseases, congenital abnormalities, fertility problems, sexual and genetic problems, and poisoning leading to death and environmental destruction are the most important effects of these chemicals.

(Qassimi and Karmi, 2018; Gol-Zardi et al., 2015; Fan et al., 2015; Chen et al., 2013; García et al., 2016; Abang et al., 2014 In this regard, integrated pest management (IPM) is introduced as one of the protective technologies in sustainable agriculture. This means the correct, rational and principled use of pesticides as a powerful tool along with other methods (Stenberg, 2017) Integrated pest management is a sustainable approach to combat pests through biological, agricultural, mechanical and chemical methods. which has the least risk for preserving the environment, human health and human economy (Adipala et al., 2003).

Resistance of pest and disease species and weeds to chemical poisons

One of the most important challenges and consequences of the indiscriminate and irrational use of pesticides, which threatens the production of agricultural products, is the emergence of pest resistance to pesticides. As one of the oldest and most successful animals on the planet, insects and mites have various mechanisms to survive and cope with unfavorable environmental conditions. (Sheikh et al., 2017) One of the unfavorable environmental conditions is exposure to pesticides. is that if it continues indiscriminately and unprincipledly, these organisms will be able to convert the above compounds into ineffective substances and as a result, the effectiveness of the pesticide will decrease. In general, the emergence of resistance to pesticides is an inevitable phenomenon and a global problem that threatens the production of agricultural products around the world. (Whalon et al., 2008) The phenomenon of resistance does not only occur in the case of insects and pest mites, but in the field of plant diseases, the resistance of pathogenic fungi to fungicides and the resistance of weeds to herbicides also exist, and it is one of the challenges. And the problems of these fields are considered. Pest resistance to pesticides has various economic and ecological consequences. Sometimes, the phenomenon of resistance of pests to insecticides may have happened in the field or garden. Due to the lack of awareness of the occurrence of resistance and to control the pest population, the first action he takes is to increase the dosage of insecticide or increase the number of times of spraying. It is certain that due to the pesticide residues in agricultural products, it will cause harmful environmental and health effects, which are all threats to the health of consumers. In addition, from an economic point of view, it will cost the farmer and the production costs will increase (Moslinejad 9, 2018). In the phenomenon of resistance, because the effectiveness of pesticides on target pests decreases, as a result, we see an increase in

damage to agricultural products and a decrease in yield and harvest, which is a serious threat to the food security of the country. Considering that creating food security along with the sustainable production and development of agricultural products is one of the most important actions in this field, therefore, to achieve the goals of food security in the country, attention and research in the field of pest resistance can be effective and open the way (Moslinejad 9 , 2018).

Occurrence of secondary pests due to the use of agricultural pesticides

The destruction of the natural enemies of pests due to the indiscriminate and incorrect use of pesticides causes the emergence of secondary pests in agricultural ecosystems, so pests that previously had a small population and lived without serious damage to agricultural products appear in the form of damage. do Agricultural pests have many natural enemies in all different ecosystems, including agricultural, garden, forest and pasture. By feeding on pests, they reduce their population and lead to natural balance in different ecosystems. These agents include pathogenic microorganisms (viruses, bacteria, and fungi), nematodes, birds, and various groups of insectivores. If these factors did not exist in nature, the population of insects would increase dramatically. In fact, their activity has prevented the outbreak of harmful species. Chemical pest control has negative effects on different parts and subsystems of the ecosystem, including a negative effect on biological control. The widespread use of pesticides leads to the destruction of useful species of insects that are naturally predators of pest species, which will cause an outbreak of pest populations and irreparable losses.

The effect of agricultural pesticides on environmental pollution

Every year, a large amount of pesticides enters the environment in different ways. The use of pesticides in agriculture has resulted in effects on the environment and the health of living organisms. These chemical inputs are known as essential elements in modern agriculture, while they are one of the important sources of environmental pollution (Qasemi and Karami, 2018). Contamination of soil and water resources by pesticides is one of the environmental problems. Irrigation of agricultural and horticultural fields causes the washing of chemical poisons and fertilizers and their transfer from different soil layers to underground water (Hosni et al., 2013). The distance between the water source (river) and the sprayed area and the amount of precipitation are among the factors that affect the level of water contamination with insecticides. Heavy rainfall causes many pesticides to enter water, especially groundwater, 1988) (Khorasgani Nazari. The accumulation of some pesticides in water has effects on the smell, taste, aquatic life, the process of oxygen formation by phytoplanktons and also the food chain. When insecticides enter the water, they accumulate in the body tissues of aquatic animals and as a result enter the chain. They become food (Chapman, 1990). Also, rain falling on the sprayed areas, before they decompose, can cause toxins to enter the surface water sources. In addition, pesticides can find their way to underground aquifers through soil layers and during water infiltration. In some cases, some pesticides can enter the air and as a result pollute surface water sources and soil through rainfall. The entry of these pollutants into the sources of drinking water can have adverse effects on human health and the environment in terms of

strong resistance to environmental factors, solubility in water, and toxicity to living organisms (Hosni et al., 2013).

The effect of agricultural pesticides on non-target organisms

Chemical poisons, in addition to many adverse effects on the health of agricultural producers and consumers, have irreparable effects on non-target organisms and biodiversity (Azeimi and Valizadegan, 2018). Many poisons, including organophosphorus poisons, are toxic to humans in addition to their cumulative effect. Because chemical pesticides have a long stability time, high solubility in fat and low rate of decomposition in the body of living organisms and aquatic environments, they accumulate in storage tissues and enter the food chain, thus causing the elimination of sensitive species. . In the long term, it can have irreparable effects on biodiversity (Zakavi and Tohidfar, 2016). The destruction of animals such as pollinating insects, earthworms and other non-target organisms is a consequence of the excessive and incorrect use of pesticides. In general, the effects of chemical poisons include all levels of the food chain, from the most elementary people, including beneficial insects and predators, to the top of the chain and humans. A wide range of insecticides such as carbamate pesticides, organophosphorus, etc. can reduce the population of beneficial insects such as honey bees, cockroaches and spiders. Many of these species play an important role in the food chain or are known as natural enemies for harmful insects (Game).

Integrated pest management and sustainable agriculture

The goal of sustainable agriculture is the existence of agricultural systems that are maintained over time and do not require a lot of inputs and do not have significant negative effects on the environment. Sustainable systems must have stable production and be beneficial for the producer, while maintaining the stability of the environment. In sustainable agricultural systems there is also pest control, because the effects of pests always cause instability. The harmful effects of pests are divided into two categories: their direct effect on the product and the effect of the methods used in pest management. The direct effect of pests includes reducing the yield, quality and increasing the sensitivity of crops and livestock to other stress-causing factors. The effects of management methods include environmental pollution, increased soil erosion as a result of agricultural control methods, by pests that cannot be easily controlled (due to the resistance of pests to management methods that result from improper use of those methods)). As a result, we cannot have a sustainable agricultural system without considering sustainable solutions for pest management. This is why Integrated Pest Management (IPM) was developed. The concept and practice of IPM predates sustainable agriculture and is without a doubt a model for sustainable agriculture. Therefore, it is appropriate and necessary for sustainable agriculture. Of course, it should be noted that no method, including IPM, can completely eliminate the effect of pests on agricultural systems. Thus, IPM is not a solution to all pest problems, but it is the best method to reduce their harmful effects, and its goals are compatible with the goals of sustainable agriculture. IPM programs include economic and environmental sustainability and are reliable methods for pest management. Economic sustainability in this category is achieved when management operations are

economically justified. Applying management methods through IPM programs using integrated methods or using a single method to minimize the selection pressure on the pest and reduces the possibility of developing resistance to the pest. In this program, the treatment method for managing pests of many crops has been successful. The consumption of pesticides is reduced and thus the costs and pollution of the environment are also reduced. Reducing pesticide use also helps preserve natural enemies. For some pests, biological pesticides with high selectivity are available.

Discussion

Due to the growing consumption of food, the widespread use of pesticides is unavoidable for the production of modern agricultural products. This has led to significant improvements in food production. But it has brought with it many problems in the field of environmental protection and health. The study and assessment of health environmental risk regarding pesticides may be able to create a better understanding of the problems related to the global use of these poisons and in addition, help us to find a suitable solution (Maksymiv). Dependence on pesticides to protect agricultural products against plant pests is associated with adverse effects on the environment and public health. Considering the reserve of water resources available in the world and the small share of underground water as recoverable fresh water resources, it is necessary to preserve the quantity and quality of these precious resources at the optimal level. In order for these important sources to remain healthy, it is necessary to quickly identify and predict the spread of the contaminated source in case of contamination, and take the necessary measures to clean and prevent its spread (Rahnama, 2001). In most cases, water pollution Underground mining is done consciously and inevitably, and therefore it is not possible to practically protect all underground water sources from pollution (Reza Zadeh Shirazi, 2001. The first step in controlling and managing the remaining toxins in water sources is to determine their concentration with acceptable accuracy and compare the obtained values with the existing standards. The European Union has determined the maximum allowed concentration of pesticide residues in drinking water sources to be 0.5 micrograms per liter (Hosseini, 2005). Integrated pest control is one of the methods in which how to use compatible methods (combination) to control a particular pest is discussed and decided and finally implemented, and it is a desirable state for agriculture from an economic and social point of view. , environment, is related to preventing product loss. It is believed that in management, not only integration is done, but the best conditions for integrating methods should be determined in a way that is a good method for a farmer from a social, environmental, etc. point of view. In addition, it is an ecologically based strategy in pest control that mainly relies on natural control factors such as natural enemies and searches for control tactics that cause the least difference in these factors as much as possible. The purpose of using this method is to use an operation or a combination of operations aimed at changing actual or potential pest populations, which leads to reducing or stopping the damage caused by the pest. In order to achieve this goal, natural enemies, agricultural operations, plant varieties and resistant plants, microbial agents, creating genetic changes, messenger chemicals and pesticides are used in combination, so that the use of combinations leads to the intensification of their mutual effects. will be

Long-term use of pesticides with high doses will increase the resistance of pests. The important thing about pest resistance to pesticides is how to manage resistance. Although the issue of resistance is a global problem, its management is local and regional. In general, pest resistance management programs should be implemented in the form of IPM. (Downes et al., 2017) Based on available scientific sources, pest resistance to insecticides can be treated, and it is possible that resistant populations will re-emerge. return to their sensitive level. The frequency of using insecticides that have different modes of action should be observed as an important principle in the chemical management of pests. For this purpose, it is necessary to know and pay attention to the mode of action of different insecticides (Moslinejad, 2018).

IPM is an applied pest control strategy that integrates a combination of chemical and non-chemical methods to control pest populations. This new strategy has been accepted as a healthy and organic pest control policy in different agricultural systems of the world. Integrated pest management is a comprehensive strategy that emphasizes natural approaches. The first executive step is to use preventive methods and they are based on agronomic, mechanical, physical and biological principles. The use of selective pesticides is used only in situations where other management tools are not sufficient. A wide range of sound control methods are used to ensure the long-term sustainability of the measures. Otherwise, continuous use of a control method will cause adaptation of pests and emergence of resistance. How to implement an integrated pest management program in an organic farming system varies in time and place. Various factors such as local cultivation pattern, land size, agricultural practices, pest density, research and development programs, the level of training of farmers and the economy have an effect on the formation of the implementation of the program. Reducing the use of pesticides along with the replacement of non-chemical strategies in organic gardening requires the redesign of production systems with different types of horticultural products and the use of new technologies. In fact, the application of IPM in organic horticulture is through a step-by-step process of using innovative solutions in control management over several years of practice and gradually adapting them to deal with pest threats. In other integrated management systems, the pest is not the main decision factor for pest management, but the entire ecosystem is considered when making decisions. For this reason, to reduce the destruction of the environment and the negative effects on other beneficial organisms of the ecosystem, it seeks to maximize biological and agricultural control factors, and chemical control is considered as the last option, which is considered only when necessary and with the condition of minimal damage to the environment. IPM is considered one of the effective, cost-effective and sustainable combination of pest and disease control methods, the success of which requires a comprehensive understanding of the ecological characteristics of harmful species, the environment under management, and the effects of pest management methods in It is the environment. Considering the many problems caused by the use of pesticides, the consumption of these poisons should be reduced. The use of environmentally friendly technologies is one of the alternative solutions for chemical pesticides. It is suggested to use pesticides more correctly by minimizing the use of chemical poisons, reducing the dosage of poisons and using them on time, using selective, non-chemical

and environmentally friendly pesticides and finally introducing and using methods Integrated pest management should be put on the agenda, which is a method to achieve sustainable development in agriculture.

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