

The Role of Biological Methods of Pest Control in Producing Healthy Pistachios

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1. Introduction

Iran is one of the major producers of pistachios in the world, and pistachios are considered among the most valuable farming products in Iran. This country has a long history of exporting pistachios to other countries, with pistachios being considered among traditional trade goods in Iran. Thus, controlling pests of this product is of high economic significance. Accordingly, the use of chemical pesticides is very common in pistachio producing cities. Pesticide residues are the second most important problem in pistachio exports after the rejection of cargoes for the presence of aflatoxins. Given these problems, new methods are required to be defined, and additional methods need to be employed so that the use pesticides will be the last solution [1].

Pests and chemical pesticides

Psylla (*Agonoscena pistaciae*) is the most important pest of pistachio trees, which is a very small orange insect reproduced very quickly. Not only does this insect feed on the tree sap by sucking its leaves, but it also covers leaves, thereby preventing sufficient sunlight as well as leading to leaf drop and serious damage to pistachio trees. Nearly 80% of pesticides used in pistachio orchards are sprayed against this pest. Other pests of this farming product are *Campylomma verbasci*, *Spilostethus pandurus*, *Acrosternum arabicum*, *Brachynema germarii*, *Chroantha ornatula*, *Lepidosaphes pistaciae*, *Melanaspis inopinata*, and *Kermania pistaciella*, each of which being able to cause serious damage to different parts of the plant [2].

Common chemical pesticides used to control pistachio psylla in Iran include Phosalone and Chlorpyrifos (organophosphates), Zolone, Amitraz (Mitak), Endosulfan, Dursban, Fenpyroximate (Artus), and Spirodiclofen (Envidor). In addition, some other pesticides are used arbitrarily, including Ethion, Diazinon, Metasystox, Fenthion, as well as different kinds of pyrethroid pesticides. The use of pesticides creates some problems; accordingly, resistance is created against pesticides; in addition, some pesticides have non-selective properties, such

as neonicotinoids, and some others may be released to the environment to pose health hazards. Nowadays, the use of plant-based pesticides is being studied for the control of pistachio psylla; accordingly, these pesticides are produced from plant extracts and their components, yet most of them have not been tested on pistachio psylla. The use of plant pesticides has numerous advantages, including the reduced use of other pesticides, reduced environmental pollution, and fewer adverse effects on natural enemies of pests.

Biological control

Various pilot laboratory studies have investigated biological varieties and parameters of natural enemies of pistachio psylla. Over the past decade, biological control has been conducted in Iran through pilot experiments in some pistachio producing cities using natural enemies of pests. There may exist some natural enemies of pests at the same time in a given orchard. Saving natural enemies of pests especially early in the growing season is of high importance in controlling pests and reducing damage caused by pistachio psylla. Different natural enemies have been reported for pistachio psylla in Iranian pistachio orchards. Predatory insects are commonly considered the most important natural enemies of pistachio psylla, especially of wild pistachios for which no pesticides are used. Green lacewing (*Chrysoperla carnea*) and *Psyllaephagus pistaciae* are among these natural enemies; however, irregular and non-selective spraying of pesticides has resulted in the reduction of their population. In addition to these insects, some other natural enemies have been reported against psylla in Iranian pistachio orchards, which include psylla-eating ladybugs, predatory ticks, and spiders [3, 4]. One of the biological methods of pest control is the use of microorganisms, such as fungi, bacteria, and pathogenic viruses in the body of insects for reducing populations of different pests. Different laboratory studies have been conducted for identifying and using pathogenic strains of different microorganisms to control pistachio psylla. For example, pathogenic fungi, such as *Lecanicillium muscarium* and *Beauveria bassiana*, have been used to control pistachio psylla in Iran and Syria, with acceptable results having been obtained [1].

Conclusion

Biological control has some advantages over chemical control. These advantages include environmental benefits (non-pollution of water, soil, and air), lack of pesticide residues in products, and lack of resistance of harmful factors, including pests, diseases, and weeds. Higher effectiveness of chemical control than that of other methods and accessibility of chemical pesticides cannot be denied. However, it is recommended that training courses be held about using them. However, by encouraging gardeners to produce healthy products, persuading consumers to use healthy products, providing special booths for supplying

authorized products based on acceptable criteria, using media advertisements, and setting proper prices, the use of healthy and organic products could be propagated [5]. Identifying, maintaining, and helping grow natural enemies of pests, as well as supporting research projects on them could be effective in producing high-quality pistachios in Iran; accordingly, their export position will improve in the world.

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