
***Zataria multiflora* plant and its Essential oil usage with influence as a possible green pesticide. A review**

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Abstract

The core of this current review is based on the medicinal plant Zataria multiflora that is associated with the Lamiaceae family of

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plants. It can only be located in the regions of Pakistan, Iran and Afghanistan. Zataria multiflora plant leaves and stem are consumed for various conditions of fever, upper respiratory infections, anti-bacterial, anti-fungal in few cases as anti-viral. Zataria multiflora plant is fundamentally consists of volatile oil and non-volatile compounds. Raw volatile oil can be separated most often by means of steam distillation. These essential oil in plants are factors for the repulsion of bugs or aroma or spicy taste. This Contemporary review would cover Zataria multiflora essential oil composition of chemical compounds its Miticidal and pesticidal tendencies. Essential oil prospect of being less threatening as a pesticide to health and environment than synthetic chemicals. Brief Comparisons of synthetic and plant-based pesticide. usefulness to protect different corps and gardens from mites and different pests.

Keywords: Zataria multiflora, Various usages, Essential oil, pest killer, Harmful pesticides.

INTRODUCTION:

The Lamiaceae plant family has above 400 species that are very valuable in-sight of scientists due to pharmaceutical utilization in treating diverse diseases and conditions from microbes to bacteria and fungus¹. *Zataria multiflora* belongs to the mint family is a medicinal plant called in Iran as Avishan Shirazi while in Balochistan it is called Izghad. This plant is common in dried mountainous regions in Iran, Afghanistan and Pakistan. All different *Zataria multiflora* these regions have a similar spicy aroma. *Zataria multiflora* flowers are white stem is woody and leaves are short².

The potent hazardous chemicals in pest control are usually non-decomposable in the climate of earth and stay in soil or reach waterbody and filed of crops and threaten living conditions for men and other organisms. With the development of new technologies and modern methods of attaining better yields, humans are in desperate need of some highly precise and specific aim chemicals that can eliminate definite pest without impacting the life of insects or living

creatures or the environment. Obtaining these eco-friendly chemicals from laboratories in from of synthetic compounds is somewhat seems to be impossible so researchers have to look for an answer from natural oriented product sources. Safe pesticides could be plant or organism oriented are enormously decomposable by nature³.

In past few decades' green pesticides of plants have started to build domination over synthetic chemical pest control methods. Environment concerned organizations in America promote utilization of plant originated essential oil, contaminants and other natural compounds for replacement of hazardous artificial laboratory substances which are used for elimination of pests⁴. The protection mechanism of the various plant produces certain fragranced, volatile compounds in for of essential oil. The number of these plants excide seventeen thousand Such plants are potentially suitable candidates for the production of green pesticides⁵. In the field of pest control management, there are several constant studies or research that revolve around the essential oil of medicinal plants that are one of the main contributors which would become as selective green pesticides and would not affect health and environment. In short, these raw volatile oils can be a substitute for damaging chemicals in gardens and agricultural corps⁶. This review glances at the derived essential oil of the Lamiaceae family in particular *Zataria multiflora* for prohibition and demise of mites or bugs in a safer way. This family contains plants with stems, leaves and flowers that possess essential oil and fragrance. These oils are the prime part of pharmaceutical to perfume and various other industries⁷. The volatile oils of plants exist as liquid in various parts of the plant from leaves to stem flowers and roots. These oils perform certain functions like shielding from hot and cold temperatures, appealing, keeping at bay the arthropods or make plant inedible for cattle. Essential oils have a low existence period out in open ranges from one to three days thanks to the presence of volatile components⁸.

CHEMICAL COMPOSITION OF *ZATARIA MULTIFLORA* ESSENTIAL OIL:

Constituents present in the extracted essential oil of *Zataria multiflora* vary under weather condition, ecotype, topographical

locations⁹. The most abundant constituents of essential oil of *Zataria multiflora* are phenolic compounds like Thymol, Carvacrol, p-cymene, gamma-Terpinene. By means of Gas chromatography and mass spectrometry Mahmoud has verified twenty-two chemical substances in essential oil and found the percentage composition of essential oil mainly containing a high composition of Thymol 40.8%, Carvacrol 27.8%, P-cymene 8.4% and γ -Terpinene 4.0%¹⁰. Using Gas chromatography and mass spectrometry analysis Saedi detected and verified twenty-five chemical substances in essential oil and the highest percentage showed was Thymol 41.81%, Carvacrol 28.85%, P-cymene 8.36% and γ -Terpinene 3.98%¹¹. Rastegar using same GC/MS method obtain percentage Thymol 30.72%, Carvacrol 29.95%, P-cymene 11.38% and γ -Terpinene 8.86%.¹²

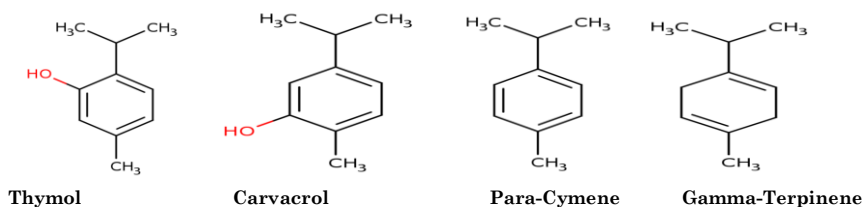


Figure 1: Structure of four main components of Essential oil of *Zataria multiflora*.

Multifaceted usage of *Zataria multiflora* essential oil:

Zataria multiflora essential oil as anti-parasitic:

The larva stage of a certain kind of parasitic type worm called *Echinococcus granulosus* found in the feces of dogs inadvertently infect the host generally sheep and cattle. The definitive hosts are dogs and secondary hosts are sheep and men. In cattle and men these parasites form Hydatid cysts (sack of watery fluids) in organs like the liver, Bones, Heart, lungs and central Nervous system. In the study of Kowsari *Zataria multiflora* essential oil was applied to infected cells of cattle organs with dilutions of 3 to 8 mg/ml with high dilutions of 7 and 8 mg/ml just in 25 minutes all the infected cells were terminated¹³. These cysts enlarge with time and their pressure cause organ damage and cracking of bones. The parasite life cycle includes

dogs and other canids as definitive hosts, while domestic ruminants and humans act as intermediate hosts for the parasite¹⁴.

***Zataria multiflora* essential oil toxicity towards cancer cells and immune responses in Mice:**

It is one of the most concerning threats to the modern age and life of men uttered as Cancer. All around the globe after the hearth attack it is second most life-threatening disease. As a whole cancer tendency in male is far less than that of female^{15,16}. To check the lethal effect of *Zataria multiflora* essential oil effects Azadi conducted experimentation on mice. Where the formation of the tumor was appraised by artificial means to persuade as breast and cervical cancer. These mice were treated with the essential oil of *Zataria multiflora*. At last when tumor size was reducing and there was no weight loss in mice that were introduced to essential oil as treatment which was opposite to control groups. This study feather added that essential oil of *Zataria* had shown a nontoxic effect on the liver and their enzymes in mice. *Zataria* essential oil also triggered the immunity of mice which assisted in reducing tumor cells. In results it was suggested that the essential oil of *Zataria multiflora* would become a useful nutritional agent during treatment of cancer¹⁶.

***Zataria multiflora* essential oil as anti-inflammatory, anti-bacterial and antifungal:**

Zataria multiflora essential oil constituents' mainly thymol and Carvacrol and it is used for the treatment of many conditions particularly, reparatory tract infections, bacterial, and fungal infections^{17,18}. For centuries *Zataria multiflora* has been used to treat reparatory tract infections in the lungs also as herbal medicine. The healing of respiratory tract discomfort because of chemical war fare had been recorded. Essential oil soothes the lung muscle and relax the pathway for breathing and control and as well as regulate immune response by intensifying, reducing, forcing and forbidding certain segments of the immune system¹⁷. The hydro-alcoholic extract of *Zataria multiflora* has shown immense good in asthma and chronic Obstruction pulmonary disease in guinea pigs. Carvacrol is among the main constituents of essential oil of *Zataria* act as a mediator for

inflammation of lungs and coughing. Different dilutions of thymol, Carvacrol and p-cymene can produce a great anti-inflammatory effect on mice and reduce response to some of white blood cells^{19,20}.

Besides anti-Inflammatory *Zataria multiflora* essential oil also possesses antibacterial nature. In a study by Osanloo, the essential oil of *Zataria multiflora* and *Mentha Piperita* (a type of hybrid mint) were tested against four types of bacteria. The micro-emulsion of essential oil of *Zataria* worked on three bacteria types that surpassed the essential oil of mint in efficacy. *Zataria* essential oil introduced an anti-bacterial substance. By mixing both essential oil of *Zataria* and mint the blend showed enhancements in eliminating bacteria. The food economy is deeply impacted by fungi as it grows on anything which becomes a waste. Furthermore, harmful compounds are released from certain food fungi can be threatening to different organisms²¹.

Nowadays in most the cases of denture stomatitis (fungal infections) are treated by oral anti-fungal while these chemicals posse adverse effects and after sometimes the fungal infection is often occurring again. In clinical trial done. Where two patient groups were treated for denture stomatitis for 14 days with nystatin (antifungal medication) and *Zataria multiflora* essential oil simultaneously. 0.05% of *Zataria multiflora* 5ml of essential oil had 5mg/ml of Carvacrol and thymol. The outcome showed *Zataria multiflora* essential oil was being as effective as Nystatin²².

WORLD AGAINST SPIDER MITES A LOSING BATTLE:

In the early 20th-century Spider mites were not considered as any kind of danger to fruits or crops as these mites in from of Red spider mites or Two Spotted Spider mites had no large scale of destruction thanks to the predator insects like that consumed these mites. Then men introduced laboratory toxins became the reason for putting an end to insects in gardens and fields. This synthetic chemical over-usage eliminated the entire population of predatory insects. As science enhanced the standard and value of food in fields these mites took advantage of situation like lack of predators and resistance shown by mites. Predatory insects of mites were targeted by excessive

utilization of toxic chemicals like organophosphorus and carbamate. Spider mites are enlisted at the top position among pesticides for being a destructive army for plants and trees throughout the globe. Without any predator to kill these mites now the outbreak of Red and Two Spotted Spider Mites is more frequent all around the world. Irregular usage of miticides have limited the choices and now mites show resistance against these chemicals²³. Two Spotted Spider Mites are found under the leaves of the trees they cut a hole in leaves and suck out nutrients from the tree and as a result fruit yield is reduced and tree is damaged. When female mites lay eggs web just like a spider is formed over these eggs to safeguard their eggs. In three to four days' eggs hatch and turn into nymphs and the last stage is adult mites. This all process takes 21 days and it can be enough for mites to destroy orchard^{24,25}. The rate of photosynthesis is reduced and continuous feeding by these mites can be lethal for a plant can lead to death. Two Spotted Spider Mites cause a huge decline in yields like in 15%, 14%, 44% and 23% strawberries, corn, cotton, and cucumber respectively²⁶. Miticides of current time are in great jeopardy as there has been resistance shown by Two Spotted Spider Mites for 93 constitutes of pesticides undoubtedly these mites are most resilient insects on the surface of earth²⁷.

SYNTHETIC PESTICIDES THE NIGHTMARE OF CHEMICAL WORLD:

Miticides of earlier 1st and 2nd generation are history and organochlorine pesticides around 13 in number are constrained by law because of impact to health and environment. Now world relies upon organophosphorus and carbamate compounds as a pesticide. These days' insect killers are among the most abandoned toxins on surface of the earth that strike helpful micro or marco organisms, animals, plants, aquatic life and most of all pose threat to human health. In infants and adult's Chemical exposure to pest-killers can result in cancer, nerve damages, and other sicknesses. In extreme cases of an extended acquaintance of these compounds lead to liver failure, Suppuration of the immune system, hearth and lungs diseases^{28,29}. Eco-friendly green safe pesticide is a dream of pest control which is a

step toward substitute chemicals as pesticides. Green pesticides are derived forms of chemicals that have selective effects on certain pests and no effect on other organisms. In Europe laws are very strict when it comes to the risk of pesticides on health and earth climate and for the usage of toxic compounds. In new increased safety guidelines, only 30 miticides are given approval and 130 are banned^{30,31}. Methyl Viologen, used to eradicate weed is utilized wildly all around the world is jeopardizing the health and the environment. It binds with soil in various crops like sunflower, cotton and rice. According to the American environmental agency Methyl Viologen, has half-life of 160 days and has been debarred in 50 countries in the world³².

An incident that occurred during the Vietnam war where American forces applied 19 million gallons of herbicide to eliminate jungle to avoid guerrilla warfare in an area of 3.6 million acres. The compounds that were used called as agent orange or 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid. These chemicals not only affected soldiers from both sides also common men and women and the bar of cancer risk were raised high³³.

PLANT ESSENTIAL OILS AND THEIR PESTICIDAL ACTIVITIES:

The essential oil obtained from various plants have a wide-range of toxicity to different arthropodae like mites, ticks and worms. The volatile oil of the plant is a protective guard against pests and are safe for the environment. The essential oil can show two types of pesticidal activity in form of deadly impact or just repelling properties³⁴.

The red mites in hen farming are one of the huge causes of the decline in the yield of eggs. There were 56 essential oils extracted from plants and tested on red mites of poultry in which 37 essential oils caused more than 90% death of red mites³⁵. The essential oil of mint 20% was introduced in water for hens and caused 92% mortality in red mites of poultry³⁶. Essential oil of mint posse toxicity of certain effect on more than 200 insects with no effect of unselective organisms. Few essential oils have shown the Miticidal effect against *varroa* mites in bee hives^{37, 38, 39}.

The toxicity of four essential oil of peppermint, Penny Royal, *Thymus daenensis* and *Zataria multiflora* were checked on storage product beetles. The outcome of the study was with the high concentration and greater exposer towards the essential oil of the above plants show great tendency to kill the beetles⁴⁰. When essential oil and its compounds come in contact with cockroaches (American and German Cockroaches) and housefly it was deadly. The essential oil targeted the nerve protein of cockroaches and could never harm other organisms^{41, 42}.

Tobacco white-fly and spider mites of different stages from eggs, nymphs and adults were treated with dosage sprays of three essential oils of *Satureja hortensis*, Basil and *Thymus vulgaris* in time intervals of 24,48 and 96 hours to find mortality. The essential oils were found to be fatal to all stages of spider mites and white-fly. The mortality was dependent on the high concentration of these oils and timely exposer⁴³.

CONCLUSION:

This review highlights *Zataria multiflora* plant extract or essential oil derived from it. The essential oil of the Plant was evaluated in detail from the composition of volatile oil to main constituents. And its utilization in various fields of life and science. Furthermore, the pests and their effect on health and the environment and the threat of toxic pesticides were elucidated. At last, the possibility of essential oil as green pesticide for future was considered concerning to previous studies.

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Asif Zahid Ali, Shahbaz Khan, Nizam Baloch, Temoor Qambrani, Murad Bibi, Irshad Baloch, Attiq-Ur-Rehman, Sheraaz Khan, Abdul Basit, Abdul Hakeem– ***Zataria multiflora* plant and its Essential oil usage with influence as a possible green pesticide. A review**

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