



## Leaves and Flowers Insecticidal Activity Investigation of *Salvia officinalis* L. against *Sitophilus oryzae* L.

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### Abstract

To lessen the use of synthetic pesticides and their negative effects on the environment, leaves and flower extracts of *Salvia officinalis* L. were obtained with methanol and distilled water as solvents. These extracts were evaluated under laboratory conditions using filter diffusion method for their insecticidal effect against adult's rice weevil *Sitophilus oryzae* L. individuals at 0.5, 1 and 1.5 concentrations and made observations after 24 hours. Methanolic extract of leaves was effective and caused mortalities (100 %, 80 % and 60 %) respectively at 1.5, 1 and 0.5 concentration while flower extract in methanol showed significant insecticidal effect (60%, 20% and 40%) against 1.5%, 1% and 0.5% concentrations respectively. The aqueous leaves extracts showed good insecticidal activity and caused mortalities (60%, 40% and 20%) at 1.5, 1 and 0.5, while aqueous flower extract in methanol did not show any significant insecticidal effect (40%, 20% and 0%) against 1.5%, 1% and 0.5% concentrations respectively. The results obtained suggest that we can make bio insecticides based on leaves methanolic extracts from plant for use in integrated pest management.

**Keywords:** *Sitophilus oryzae*, aqueous extract, methanolic extract, bioinsecticide, mortality.

### Öz

### *Sitophilus oryzae* (L.)'ye Karşı Kullanılan *Salvia officinalis* (L.)'in Yaprak ve Çiçeklerindeki İnsektisidal Aktivitesinin Araştırılması

Sentetik pestisitlerin kullanımı ve bunların çevre üzerindeki olumsuz etkilerini azaltmak için *Salvia officinalis* (L.)'in yaprakları ve çiçek özleri çözücüler olarak metanol ve damıtılmış su ile elde edilmiştir. Bu ekstraktlar 0,5, 1,0 ve 1,5 konsantrasyonda *Sitophilus oryzae* (L.)'nin ergin bireylerine karşı insektisit etkisi açısından filtre difüzyon yöntemi kullanılarak laboratuvar koşulları altında değerlendirilmiş, ve 24 saat sonra gözlemlenmiştir. Yaprakların metanolik özütü 1,5, 1,0 ve 0,5 konsantrasyonlarda sırasıyla etkili ve buna bağlı mortalitelere (%100, %80 ve %60) neden olurken, metanoldeki çiçek özü ise %1,5'e karşı anlamlı böcek öldürücü etki (%60, %20 ve %40) sırasıyla %1 ve %0,5 konsantrasyonları olarak tespit edilmiştir. Sulu yaprak özleri iyi bir böcek öldürücü aktiviteye sahip olduğunu göstermiş, ve 1,5, 1,0 ve 0,5'de mortalitelere (%60, %40 ve %20) neden olurken, metanolde sulu çiçek özütünün anlamlı bir böcek öldürücü etkisi (%40, %20 ve %0) sırasıyla %1,5, %1,0 ve %0,5 konsantrasyonlara karşı olmuştur. Elde edilen sonuçlara göre, zararlıların entegre mücadelesi için bitkisel metanolik ekstraktlara dayanan böcek öldürücü biyo insektisitler üretebileceği göstermektedir.

**Anahtar Kelimeler:** *Sitophilus oryzae*, sulu ekstrakt, metanolik ekstrakt, biyo insektisit, mortalite.

### Introduction

The genus *Salvia* is one of the largest members of the family Lamiaceae (subfamily Nepetoideae) throughout the world comprising nearly 900 species are spread widely (Tzakou et al., 2003). *Salvia officinalis* L. is also termed as a Dalmatian sage which is a perennial sub shrub. It is a native species of Mediterranean but it has been cultivated throughout the world for cooking and medical purposes (Demirci et al., 2002). Sage used in traditional medicine, the leaves, flowers and stems have also been used in mixtures and alcoholic extracts for different beneficiaries' solutions. It specifically used in the treatment of oropharyngeal infection, pharyngitis, stomatitis, gingivitis and dyspepsia (Veliokovic et al., 2003). Dried leaves of *Salvia* are best known as a spice for, stuffing's and some canned, soups vegetables and flavor in sausages. Fresh leaves are also used in butters, cheeses,



vinegars, liqueurs, pickles and salads. Fresh leaves make a good dentifrice (Duke, 1969). The essential oil of Sage used in the food, drink and perfume industries, with several healing applications (Vagionas et al., 2007). Essential oil of Sage is effective against numerous bacteria like *Listeria monocytogenes*, *Bacillus cereus*, *Bacillus subtilis*, *Escherichia coli* and *Staphylococcus aureus* all recognized food borne pathogens (Veliokovic et al., 2003). Traditionally, it is highly treasured and economically valued. The plant is both cultivated and collected in Turkey, Italy, Greece, France and Spain and serves as the standard sage to which others are compared (Svoboda and Deans, 1992). To reduce the use of synthetic pesticides on fruit and vegetable plantations, phytochemicals and plant extracts have long been a subject of research in an effort to develop alternatives to conventional insecticides but with reduced health and environmental impact (Dancewicz et al., 2011). Most plant species that are used in phytomedicine contain ingredients, which inhibit the development of insects, hinder their feeding (antifeedants) or act as repellents and confusants (Laznik et al., 2010). This study aims to assess the insecticidal properties of *Salvia officinalis* L. methanolic and aqueous leaves and flower extracts against adults of the rice weevil *Sitophilus oryzae* L. by using several concentrations.

## Materials and Methods

### Plant materials

In May 2013, the leaves and flowers of *Salvia officinalis* L. (sage) plant were collected from the crop free from agrochemical and fertilizer, specially grown in Botanical garden of Sardar Bahadur Khan Women's University Quetta. The leaves were dried under shade for one week before grinding. The dried plant materials were ground into powder with an electrical blender.

### Preparation of Aqueous/Methanolic extract of leaves and flowers of *Salvia officinalis*

0.5%, 1.0% and 1.5% of leaves and flowers solution in methanol and water were prepared and kept at room temperature for 24 hours. After 24 hours the solution were filtered and filtrate were kept in spray bottles for further process.

### Insect collecting and rearing

We collected a small population of rice weevil (*Sitophilus oryzae* L.) from infected yellow gram pluses (*Cicer arietinum* L.) kept in go downs of arid zone research center. These were identified and reared in the laboratory on same pulse.

### Bioassay test

To determine the insecticidal effect of ethanolic, and aqueous extracts leaves and flowers of *Salvia officinalis* L. group of 5 weevil adults were placed in a Petri dish and sprayed 0.5%, 1.0% and 1.5% aqueous and methanolic filtrate with three replications each. The experiment was carried out in the laboratory. The mortality was determined after 24 hours from the beginning of exposure. When no leg or antennal movements were observed, insects were considered dead (Salari et al., 2010). The %age mortality was calculated by using following formula.

Percentage insect mortality = No. of dead insect / total No. of treated insect × 100

## Result and Discussion

In the conducted experiment, effects of *Salvia officinalis* L. leaves and flower extracts were recorded in the control of rice weevil *Sitophilus oryzae* L. after 24 hours. The statistical analyses indicated that only 1.5% aqueous and methanolic leaves extracts of plants showed a dependence between the mortality and different concentrations (Figure 1.). The results revealed that 0.5% aqueous extract of leaf (*S. officinalis* L) showed lowest mortality (20 %) on *S. oryzae* L. and 1.5% aqueous extract of leaf showed highest mortality (60 %), while 1.5% aqueous extract of flower (*S. officinalis* L.) showed highest mortality (40 %) on *S. oryzae* (rice weevil) and 0.5% flower of *Salvia officinalis* aqueous extract showed no mortality on *S. oryzae*. Our results agreed with the results of Iloba and Ekkrakene (2006) who worked on the leaves of *Hyptis suaveolens*, *Azadirachta indica* and *Ocimum gratissimum* against *Sitophilus zeamais* and *Callosobruchus maculatus* at concentration of 1.5, 2.5 and 3.5/80g. The *A. indica* and *O. gratissimum* showed greater mortality against *C. maculatus* and *S. zeamais* while the *H. suaveolens* showed lowest mortality against *S. zeamais*, Al-Malaly et al., (2013)



, who worked on the aqueous extract of two medicinal plants i.e. *S. officinalis* L and *Zingiber officinalis* L. against *Awassi sperm* at different concentration (0.001,0.005,0.1g) and the extract of the two plants decreased sperm activity in proportion with the progression of time and concentration, Mona et al., (2008) worked on (antimicrobial and cytotoxicity ) aqueous and methanolic extract of *S. officinalis* flower against different bacteria. The 70% methanolic extract were showed stronger anti-microbial activity then the aqueous one. Figure 2 showed that 1.5% methanolic extract of leaf (*S. officinalis* L.) showed highest mortality (100 %) on *S. oryzae* (rice weevil) and 0.5% plant leaves methanolic extract showed lowest mortality (60 %), while 1.5% flower methanolic extract showed highest mortality ( 60 %) on rice weevil and 1% flower methanolic extract showed that lowest mortality (20 %) on *S. oryzae*. Our results agreed with the results of Mahmood et al., (2012), who worked on the *Castanospermum austral* leaves against adult *Callosobruchus analis* at concentrations of 3, 9, 48, 240 and 354 ug/cm<sup>2</sup>.The lowest mortality showed at 3 ug/cm<sup>2</sup>(14%) while highest (96%) mortality showed at 354 ug/cm<sup>2</sup> of *Callosobruchu sanalis*. the result agreed with the work of (Hamed et al., 2012) worked on the insecticidal activity of methanolic extract of leaf and flower of eight *Chrysanthemum* species against *Tribolium confusum*. The methanolic extract of flower showed more toxicity while the extract of leaves showed low toxicity.

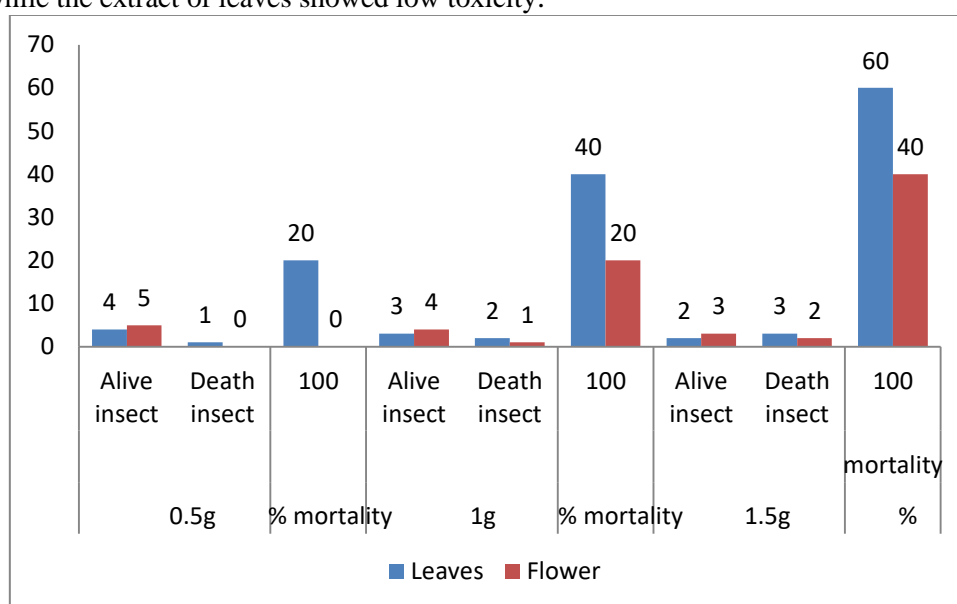


Figure 1. %age mortality of aqueous extract of leaves and flowers of *Salvia officinalis* L.

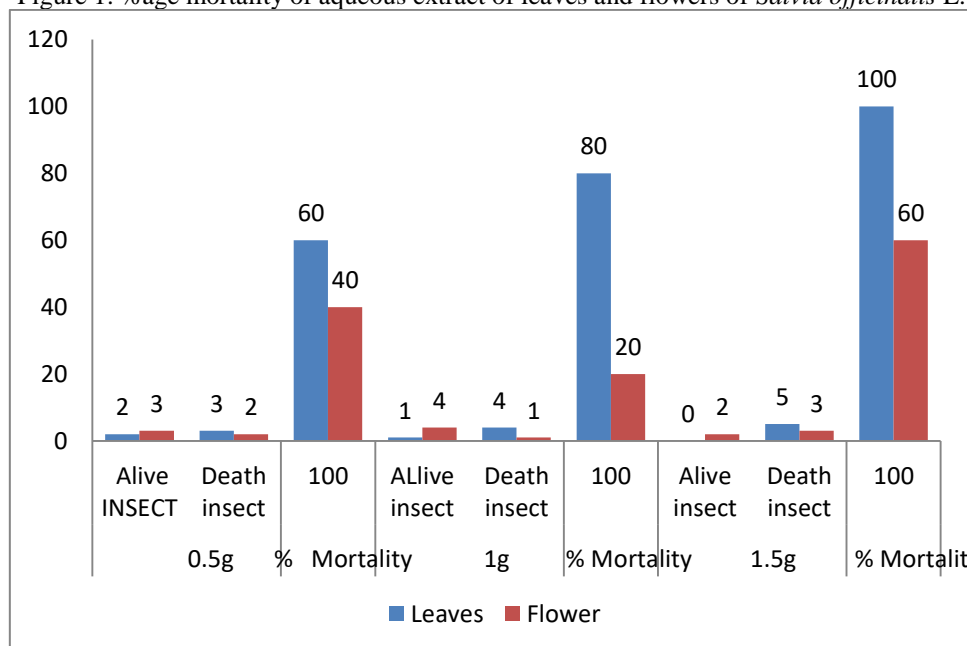


Figure 2. %age mortality of methanolic extract of leaves and flowers of *Salvia officinalis* L.



## Conclusion

*Salvia officinalis* leaves aqueous and methanolic extract were efficacious against *Sitophilus oryzae*. The results obtained suggest that we can make bio insecticides based on extracts from Sage for use in integrated pest management, which are a good alternative to conventional synthetic insecticides. This study purpose enables us to compare the effect of several plants leaves and flowers crude extracts against rice weevil. More studies will necessary to test the active compounds of plants against weevil species and other pests.

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