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Acaricidal and Ovicidal Effects of Sage (*Salvia officinalis* L.*)* and Rosemary (*Rosmarinus officinalis* L.) (Lamiaceae) Extracts on *Tetranychus urticae* Koch (Acari: Tetranychidae)

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ABSTRACT

Tetranychus urticae Koch (Acari: Tetranychidae) is a harmful pest for crops such as vegetables, fruits, and ornamental and industrial plants. The usage of plant extracts for pest control is seen as an alternative to synthetic pesticides. The effect of methanolic extracts obtained from sage *(S. officinalis)* and rosemary *(R. officinalis)* plants from the Lamiaceae family on *T. urticae* was researched in an effort to create an alternative to synthetic pesticides. The spray tower-leaf disk method was used to determine the acaricide effects of these plant extracts. The effect of sage and rosemary extracts on the pest's eggs, in nymph and adult stage was examined in the research. Four different concentrations of the plant extracts, which were 1%, 3%, 6% , 12%, were examined. The trials were prepared such that each concentration had 4 repeats and each repeat included 15 individuals. Death-live counts were made on the 1st, 3rd and 6th days. The highest death rates of *T. urticae* at nymph and adult stages were found at 12% concentrations of sage and rosemary extracts. At this concentration, the death rate for nymph and adults was found to be 79% and 62.2% for sage extract and 58% and 82.2% for rosemary extract. The ovicidal effect of sage and rosemary extracts on pests was determined at the same concentration. As a consequence, sage and rosemary extracts are thought to be used as an alternative method to pesticides for mite control.

Keywords: *Tetranychus urticae*; Plant extract; Sage; Rosemary; Acaricidal effect

Ada çayı (*Salvia officinalis* L.*)* ve Biberiye (*Rosmarinus officinalis* L.) (Lamiaceae) Özütlerinin *Tetranychus urticae* Koch (Acari: Tetranychidae)'ye Akarisidal ve Ovisidal Etkileri

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ÖZET

İki noktalı kırmızı örümcek, *Tetranychus urticae* Koch (Acari: Tetranychidae) ülkemizde sebzeler, meyve süs ve endüstri bitkileri gibi ürünlerde önemli bir zararlıdır. Zararlı ile mücadelede bitkisel ekstraktların kullanımı sentetik pestisitlere bir alternatif olarak görülmektedir. Lamiaceae familyasına ait ada çayı (*S. officinalis)* ve biberiye (*R. officinalis*) bitkilerinden elde edilen metanollü ekstraktların *T. urticae* üzerine etkisi sentetik pestisitlere bir alternatif oluşturmak amacıyla araştırılmıştır. Bitki ekstraktlarının akarisit etkilerini belirlemek amacıyla, yaprak disk-ilaçlama kulesi yöntemi kullanılmıştır. Çalışmalarda ada çayı ve biberiye ekstraktlarının zararlının yumurta, nimf ve ergin dönemlerine öldürücü etkisi belirlenmiştir. Bitki ekstraktlarının % 1, % 3, % 6, % 12 olmak üzere dört faklı konsantrasyonu kullanılmıştır. Denemeler her konsantrasyon için 4 tekerrür ve her tekerrürde 15 birey olacak şekilde kurulmuştur. 1, 3 ve 6 günde ölü-canlı sayımları yapılmıştır. *T. urticae*'nin nimf ve ergin dönemlerinde en yüksek ölüm oranları ada çayı ve biberiye ekstratlarının % 12'lik konsantrasyonlarında belirlenmiştir. Bu konsantrasyonda ada çayı ekstraktı için nimf ve erginlerde % 79 ve % 62, biberiye ekstraktında ise % 58 ve % 82 ölüm oranı belirlenmiştir. Aynı konsantrasyonda ada çayı ve biberiye ekstraktlarının zararlı üzerinde ovisidal etkisinin de bulunduğu belirlenmiştir. Sonuç olarak, iki noktalı kırmızıörümcek mücadelesinde ada çayı ve biberiye ekstraktlarının pestisitlere alternatif bir yöntem olarak kullanılabileceği düşünülmektedir.

Anahtar Kelimeler: *Tetranychus urticae*; Bitki özütü; Adaçayı; Biberiye; Akarisit etki

1. Introduction

The two-spotted spider mite *Tetranychus urticae* Koch (Acari: Tetranychidae) is a ubiquitous species, present worldwide on a wide variety of plants (Helle & Sabelis 1985). The mite has been reported to attack about 1200 species of plants, of which more than 150 are economically significant (Zhang 2003). *T. urticae* causes remarkable economic loss by reaching high density because it is able to find an appropriate living environment under harmful greenhouse conditions throughout the year (Tsagkarakou et al 1999). Two-spotted spider mites feed by puncturing cells and draining the contents, producing a characteristic yellow speckling on the leaf surface. They also produce silk webbing which is clearly visible at high infestation levels (Jeppson et al 1975). The fact that this mite breeds healthily through adapting to various plant species and types can be explained by the fact that they deactivate various secondary metabolites such as toxins, repellants and nutritional inhibitors, which are the key units of defense mechanisms (Rosenthal & Berenbaum 1991; Sabelis et al 1999). Synthetic pesticides are generally utilized against the two spotted spider mite, as they are easy to apply, effective, and do not generally require identification of the species. However, using pesticides for a long time causes an ecological imbalance, side effects on natural enemies, and environmental pollution (Stumpf & Nauen 2002; Kim et al 2004). Besides, *T. urticae* has a high potential of breeding and its short life cycle facilitate its resistance against acaricides (Stumpf & Nauen 2001; Van Leeuwen et al 2006).

Because of the adverse effect of pesticide use, alternative control methods are being researched for *T. urticae*. Some of the alternative control methods including acaricidal effects of the plant essential oils, plant preparations and microbial secondary metabolites on two-spotted spider mites are currently being researched (Calmasur et al 2006; Shi et al 2006; Villanueva & Walgenbach 2006; Cavalcanti et al 2010). Recently, also with the intent of creating alternatives for chemical pesticides, the use of extracts obtained from some plants in the control against the pests has become more relevant (Feng & Isman 1995; Wewetzer 1998). Plant compounds such as extracts were used as insecticides (Ofuya & Okuku 1994; Kim et al 2003), antifeedant (Ben Jannet et al 2001; Han et al 2006; Abbasipour et al 2011), oviposition deterrents (Prajapati et al 2005; Elango et al 2009; Abbasipour et al 2010, 2011), acaricidals (Rim & Jee 2006; Fernandes & Freitas 2007) and,

repellents (Venkatachalam & Jebanesan 2001). Wang et al (2007) revealed that walnut leaf extract had both contact and systemic effect on *Tetranychus cinnabarinus* (Boisd.) and *Amphitetranychus viennensis* Zacher (Acari:Tetranychidae). Kumral et al (2010) reported that methanolic extracts of *Datura stramonium* L. (Solanaceae) leaves and seeds exhibited acaricidal, oviposition deterrent activities against two-spotted spider mites, *T. urticae*. Liu et al (2004) determined that *Plumbago zeylanica* L. (Plumbaginaceae) extract had acaricidal and oviposition deterrent effect on *Panonychus citri* (McGregor) (Acari: Tetranychidae). Since plant extract compounds are found in nature, they do not release toxic substances into the environment and do not cause water pollution by decomposing quickly. Besides, since plant extracts are suitable to use with natural enemies, they can be used safely instead of synthetic pesticides (El-Sharabasy 2010). The Lamiaceae family is recognized for their vital oils, medicinal uses and antimicrobial activity of different species (Skaltsa et al 2003). A review of the chemical breakdown of species in the family of Lamiaceae has revealed a range of chemical components, predominantly mono and diterpenoids, of which a number possess a range of activities against numerous arthropods (Cole 1992; Simmonds & Blaney 1992). Sage (*S. officinalis)* and rosemary (*R. officinalis)* belong to the Lamiaceae family. Rosemary and sage are strong aromatic plants, which are predominantly used in conventional medicine, food and the medicine industry because of their antioxidant and antimicrobial properties (Biljana et al 2007). They have been widely grown in the Mediterranean basin of Turkey since antiquity and are known for their medicinal and aromatic properties. This study is aimed to determine acaricidal effects of plant methanolic plant extracts of *S. officinalis* and *R. officinalis* on the egg, nymph and adult periods of *T. uticae*.

2. Material and Methods

2.1. Origin and rearing of Tetranychus urticae

Susceptible population of *T. urticae* (German Susceptible Strain, GSS) was brought from Rothamstad Experimental Station (England) in 2001 and it was reared under laboratory conditions until now without performing any kind of pesticide application. *T. urticae* produced on the *Phaseolus vulgaris* L. (Fabaceae) plant within the climate conditions in which 26±2 °C temperature, 50-60% humidity and 16:8 photoperiod conditions were met.

2.2. Plants and preparation of extracts

S. officinalis and *R. officinalis* plants were used in the study and were collected during the vegetation period of 2013, from production areas of the Agricultural Application and Research Centre, which is under the body of Süleyman Demirel University, Faculty of Agriculture. The leaves of sage and rosemary plants were used in obtaining plant extracts. Each plant material was dried under shade, powdered by using an electric grinder, and kept in the dark at room temperature in 3 L glass jars until it was used. The extraction procedure used in the study is described by Gokçe et al (2005). Plant extracts were prepared from a representative sample of 100 g of each powdered plant material and were taken into a 2 L capacity Erlenmeyer flask. 300 ml of methanol was added to it and shaken for 24 h in a horizontal shaker at 120 rpm at room temperature. The plant suspension was sieved through four layers of cheese cloths to separate plant parts from the suspension and it was transferred into a 250 ml evaporating flask and evaporated under a vacuum using a rotary vacuum evaporator (RV 05 Basic 1B, IKA Group) at 32 °C. The resulting residue was dissolved in 10% (w w^{-1}) acetone/water to yield 10% (w w^{-1}) extract solutions. The extract solutions were kept in a refrigerator at 4 °C until they were used in the bioassay.

2.3. Acaricidal effects of the extracts on Tetranychus urticae

Some experiments were performed at the nymph and adult period of *T. urticae* in order to determine the acaricidial effects of *S. officinalis* and *R. officinalis* plant extracts. In the experiments, Erdoğan et al's (2012) method was adapted and used with the purpose of determining the acaricide effects on the plant extracts. With the purpose of

obtaining egg, nymph and adult individuals to be used in the experiments at the same age, 15 adult female individuals were transferred into 3 cm *P. vulgaris* leaf discs and placed in 9 cm Petri dishes. After hatching, the nymph and adult individuals were placed in a total of 20 Petri dishes, which were used in the nymph and adult experiments. In the experiments, 1, 3, 6, 12% concentrations of *S. officinalis* and *R. officinalis* extracts were used. In the control, only water was applied. Triton X 100 at the rate of 0.01% was added to the pure water in which extracts were prepared and was also used in the water control as extender and sticker. The individuals were transferred to the *P. vulgaris* leaf disc in 9 cm Petri dishes, which had wet cotton on their surface in order to increase the humidity. Different concentrations of plant extracts were applied in concentrations of 2 mL on the leaf surface at 1 atm pressure *P. vulgaris* leaf disc at spray tower (Kumral et al 2010). The experiments were repeated four times for 1 control and each four concentrations. In each replication there were 15 individuals. Dead and alive counting was conducted on the 1st, 3rd and 6th days.

2.4. Ovicidal effects of the extracts on Tetranychus urticae

Yanar et al's (2011) method was adapted and used with the purpose of determining the ovicidal effects of the plant extracts that were used in the study on *T. urticae* eggs. In the experiments, the eggs of *T. urticae* belonging to the same age were used. The experiments were conducted with 15 eggs replicated and a four replications to one control for each concentration. The experiments were performed to determine ovicidal effects of plant extracts on eggs. The observation continued until all the eggs in the control group were hatched.

2.5. Statistical analysis

The mortality rate was obtained by determining the proportion of the total number of individuals that had died at the end of the experiment. The extracts acaricidal and ovicidal effects were calculated by using Abbott's formula without percentage on data obtained from experiments. The values were subjected to arcsine transformation (Zar 1999), then, groupings were made by variance analysis (ANOVA), and Duncan's multiple range test was used for determining the group differences.

3. Results and Discussion

3.1. Acaricidal effects of the extracts on Tetranychus urticae

The effects of different methanolic extracts of sage and rosemary plants on *T. urticae* nymphs at different counting times are given in Table 1. According to this, the lowest mortality rate in both of the sage and rosemary plants extracts were detected in the control group. Both mortality rate % and effect value % increased in the nymphs of *T. urticae* in sage and rosemary plant extracts depending on the concentration and the increase of counting time. The highest effect value was identified to be 79% in 12% concentration on the 6th day on *T. urticae* adults using sage plant extract and it was found statistically different from the other groups ($F= 38.83$, d.f= 6, $P<0.05$). In rosemary plant extract, the highest effects were determined to be 58% in the 12% concentration on the 6th day and it was found statistically different from the other concentrations ($F= 25.32$, d.f= 6, $P<0.05$).

The acaricide effect of different concentrations of methanolic extracts of sage and rosemary plants on *T. urticae* adults at different counting times are given in Table 2. According to this, the lowest mortality rate in both of the sage and rosemary plant extracts were detected in the control group. According to the first day counts in sage plant extracts, the effect values obtained from 1% and 3% concentrations were within the same group statistically. In rosemary plant extract, only the effect values detected in 1% concentration were the same as the control group on *T. urticae* adult on the first day. It was observed that, % mortality rate and % effect values of sage and rosemary plant extracts on *T. urticae* adults both increased depending on the concentration and the increase of counting time. The highest acaricidal effects of sage and rosemary plant extracts on *T. urticae* adults were detected at 62.2%

Table 1- The effect of different concentrations of *Salvia officinalis* and *Rosmarinus officinalis* plant extracts on *Tetranychus urticae* nymphs [Mean±St. Error (max-min)]*

*Çizelge 1- Salvia officinalis ve Rosmarinus officinalis bitki ekstraktlarının farklı konsantrasyonlarının Tetranychus urticae nimflerine etkisi [Ort±St. Hata (mak-min)]**

		Salvia officinalis		*Rosmarinus officinalis*	
Counting time (day)	*Concentration (%)*	*Mortality rate (%)*	*Effect (%)*	*Mortality rate (%)*	*Effect (%)*
1	Control	4.6	-	2.0	-
	1	10.5	7.3±0.04 e (7.0-7.4)	5.6	4.6±0.02 d (4.1-4.7)
	3	12.6	11.1±0.04 e (10.9-11.3)	7.5	6.8±0.02 d (6.0-6.9)
	6	15.5	14.2±0.02 d (14.0-14.3)	12.8	11.1±0.04 c (10.9-11.4)
	12	21.5	18.5±0.03 d (17.5-18.6)	14.8	13.8±0.02 c (13.1-13.9)
3	Control	11.4	-	3.0	-
	1	13.5	10.8±0.04 e (10.2-10.9)	7.4	5.8±0.02 d (5.0-5.9)
	3	16.0	14.8±0.04 d (14.0-14.9)	11.6	9.6±0.05 d (9.1-9.8)
	6	27.8	22.8±0.04 d (21.9-22.9)	13.1	11.6±0.04 c (11.0-11.8)
	12	39.5	35.7±0.04 c (35.7-35.9)	18.0	15.5±0.04 c (15.0-15.8)
6	Control	13.1	-	5.8	-
	1	31.5	32.1±0.04 c (31.7-32.2)	9.6	6.5±0.02 d (6.5-6.9)
	3	40.2	37.6±0.04 c (37.2-37.7)	19.6	18.7±0.04 c (17.9-18.8)
	6	70.8	64.8±0.03 b (64.1-64.9)	48.2	35.6±0.04 b (34.5-35.7)
	12	84.8	79.0±0.04 a (69.0-79.2)	62.3	58.0±0.04 a (49.8-58.8)

*, the difference between the means which are shown with different letters in the same column has been found significant ($P<0.05$, ANOVA, Duncan)

(F= 26.44, d.f= 6, $P<0.05$) and 82.2% (F= 39.24, d.f= 6, $P<0.05$) respectively in 12% concentration and on the 6th day and it was found statistically different from the control groups. At the end of the study, it was determined that the acaricidal effects of different concentrations of sage and rosemary plant extracts on *T. urticae* nymph and adults were high. Particularly, the highest mortality rate was found in the 12% concentrations of plant extracts and at the end of the 6th day. Recently, many studies on acaricide and insecticide properties of plant extracts against pests have been conducted. It was determined that *Achillea millefolium* L. (Asteraceae), *Taraxacum officinale*s F. H. (Asteraceae), *Matricaria chamomilla* L. (Asteraceae), and *S. officinalis* weed extracts have a nutrition deterrent effect on mites (Tomczy & Szymanska 1995). Our study shows that toxic effects of *S. officinalis* extracts were seen to be high during the nymph and adult periods of *T. urticae.*

Table 2- The effects of different concentrations of *Salvia officinalis* and *Rosmarinus officinalis* plant extracts on *Tetranychus urticae* adults [Mean±St. Error (max-min)]*

*Çizelge 2- Salvia officinalis ve Rosmarinus officinalis bitki ekstraktlarının farklı konsantrasyonlarının Tetranychus urticae erginlerine etkisi [Ort ± St. Hata (mak-min)]**

		Salvia officinalis		*Rosmarinus officinalis*	
Counting time (day)	*Concentration (%)*	*Mortality rate (%)*	*Effect (%)*	*Mortality rate (%)*	*Effect (%)*
1	Control	4.3	-	1.5	-
	1	7.8	6.4±0.02 d (5.9-6.7)	5.5	3.2±0.02 f (2.9-3.4)
	3	12.5	10.5±0.02 d (10.2-10.9)	11.8	9.4±0.02 e (9.0-9.6)
	6	18.8	15.6±0.04 c (14.9-16.0)	15.5	12.7±0.03 e (12.5-13.0)
	12	36.5	33.3±0.04 b (33.0-33.5)	24.6	21.6±0.03 d (21.2-22.0)
3	Control	16.1	-	11.5	-
	1	25.4	23.1±0.04 c (22.8-23.3)	16.5	14.4±0.03 e (14.0-14.8)
	3	38.5	34.5±0.04 b (34.0-34.9)	31.8	28.6±0.04 d (27.9-28.9)
	6	40.2	36.6±0.02 b (36.2-36.8)	55.2	51.4±0.04 b (51.0-51.9)
	12	65.4	57.7±0.03 a (57.2-58.0)	70.5	68.4±0.03 b (68.1-68.8)
6	Control	19.3	-	13.8	-
	1	38.4	20.1±0.03 c (19.8-20.5)	31.5	30.1±0.03 d (29.7-30.5)
	3	47.6	32.2±0.02 b (31.8-32.4)	50.0	44.1±0.02 c (43.8-44.4)
	6	55.5	44.1±0.04 b (43.8-44.6)	67.8	67.2±0.04 b (66.8-67.6)
	12	71.6	62.2±0.03 a (61.8-62.8)	83.3	82.2±0.04 a (81.5-82.5)

*, the difference between the means which are shown with different letters in the same column has been found significant ($P<0.05$, ANOVA,Duncan)

It is considered that some components involved in the sage extracts show contact effect as well as different effects such as preventing feeding on *T. urticae* (Kawka & Tomczy, 2002). In parallel with the result of our study, some extracts have acaricidal effect on *T. urticae.* Mateeva et al (2003), concluded that *D. stramonium* extract has toxic effect on each developmental period of *T. urticae* under laboratory conditions. Liu et al (2004) found that *Eupatorium adenophorum* Spreng. (Gesneriaceae) ethanolic extract (0.1% w w^{-1}) caused 71.10% mortality rate after 12 hours in *P. citri* and 73.53% after 24 hours. Rasikari et al (2005) found that a raw leaf extract obtained from 67 plants had contact effect on *T. urticae*. Miresmailli et al (2006) determined that *R. officinalis* had high acaricidial effect under laboratory conditions on two spotted spider mites. In parallel with the result of our study, it is seen

that rosemary showed acaricidal effect on *T. urticae* (Miresmailli et al 2006). Shi et al (2006) revealed that the extract of *Bassia scoparia* (L.) A. J. Scott. (Chenopadiaceae) showed contact and systemic effects, and it caused high rates of mortality in all three species (*T. urticae, T. cinnabarinus* and *T. viennensis)*. Antonious and Snyder (2006) determined that extract of wild tomato (*Solanum lycopersicum* L. (Solanaceae)) had repellent effect on *T. urticae*. El-Moneim et al (2011) found that the ethanol of *Syzygium cumini* L. (Myrtaceae) determined higher acaricidal effect compared to extracts with ether and ethyl. Kumral et al (2013) reported that leaf extract of *D. stramonium* had toxic and repellent effect both on *P. ulmi* and its predator *Stethorus gilvifrons* (Muls.) (Coleoptera: Coccinellidae). In these studies, it was specified that different plant extracts showed acaricide effect on nymphs and adults of harmful mites. Similarly, in our study, it was found that methanolic extracts of *R. officinalis* and *S. officinalis* L. had high acaricide effects on nymph and adults of *T. urticae*. One of the outstanding results of the study is that rosemary extract was found to be more harmful in adult pests although sage extracts were seen to be more effective in nymph *T. urticae* than rosemary extracts. This result leads to the idea that components involving both of the extracts could change the effects on different periods of *T. urticae*. Since both of the extracts are effective on *T. urticae*, active component or components to be obtained from the plants can be used in two-spotted spider mite control. Future detailed studies on this matter will help to reveal the full potential of sage and rosemary extracts as well as allow for better understanding of usage opportunities.

3.2. Ovicidal effects of the extracts on Tetranychus urticae

Ovicidal effects of different concentrations of extracts of sage and rosemary plants extracts on *T. urticae* eggs are given in the Table 3. It was determined that both of the sage and rosemary plant extracts ovicidal effect increased on *T. urticae* eggs depending upon the concentration increase. All of the ovicidal effects obtained in different concentrations of sage plant extract were found statistically different from the control group and from each other ($F= 11.56$, $d.f= 4$, $P<0.05$). The highest ovicidal effect in the extract of sage plant extract was observed in 12% concentration with 30.2% ovicidal effect. In 1%, 3%, 6% and 12% concentration of rosemary plant extract, 17.1%, 32.2%, 41.2% and 82.2% effect were observed respectively. The percentage of the effect values obtained from all of the concentrations of rosemary plant extract were different from the control group and from each other ($F= 14.28$, $d.f= 4$, $P<0.05$).

Table 3- Ovicidal effect of different concentrations of *Salvia officinalis* and *Rosmarinus officinalis* plant extracts on *Tetranychus urticae* eggs [Mean±St. Error (max-min)]*

*Çizelge 3- Salvia officinalis ve Rosmarinus officinalis bitki ekstraktlarının farklı konsantrasyonlarının Tetranychus urticae yumurtalarına ovisidal etkisi [Ort ± St. Hata (mak-min)]**

	Salvia officinalis	*Rosmarinus officinalis*
Concentration (%)	*Ovicidal effect (%)*	*Ovicidal effect (%)*
1	1.4±0.02 c (1.0-1.8)	17.1±0.03 c (16.5-17.4)
3	4.1±0.02 b (3.8-4.4)	32.2±0.03 b (31.6-32.4)
6	24.1±0.03 a (23.6-24.4)	41.2±0.04 b (39.0-41.8)
12	30.2±0.03 a (28.6-30.4)	82.2±0.04 a (81.0-82.8)

*, the difference between the means which are shown with different letters in same the column was found significant ($P<0.05$, ANOVA, Duncan)

There have been some studies in which ovicidal effects of some plant extracts on spider mite eggs were determined. There are studies that show parallel results to our study that explored for the ovicidal effects in *T. urticae* eggs of plant extracts obtained from different plants in addition to sage and rosemary extracts. However, the importance of this study increases since there is no study that

determines the effects of sage and rosemary extracts on *T. urticae* egg hatching. Dimetry et al (1993) determined that both of the commercial preparations of neem germ extracts reduced the egg-opening rate in *T. urticae* and showed ovicidal effect. Sarmah et al (2009) reported 87.09% egg mortality at 10.0% concentration of aqueous plant extracts of *Xanthium strumarium* L. (Compositae) against *T. urticae*. Kumral et al (2010) have determined oviposition deterring, acaricidal and repellent, activities for both leaf and seed extracts of *D. stramonium* against adult *T. urticae*. According to Mozaffari et al (2012) indicated that *Mentha pulegium* L. (Labiatae) ethanolic extract reduced production of *T. urticae* and had a repellent effect. Similarly, in our study it was found that sage and rosemary plants extracts had high ovicidal effect on *T. urticae* eggs. However, the fact that particularly rosemary extract is highly effective on egg hatching in *T. urticae* is considered to be a result of some components it involves. Further studies determining active substances of especially rosemary extract should be conducted in detail.

4. Conclusions

As a result, it was represented that sage and rosemary plants methanolic extracts showed ovicidal effect on *T. urticae* eggs and acaricidal effect on nymph and adults under laboratory conditions. Synthetic pesticides, which are widely used today, are known for causing adverse effects on human beings, the environment, and other creatures. Therefore, especially in the last 10-15 years many studies have been conducted on plants which are known for their biological activities towards pests and diseases. The reason why herbal materials are highlighted is because they are available in nature and do not release toxic substances into the environment. In the study, it was concluded that sage and rosemary plants extracts could be used in the control against *T. urticae* in conjunction with integrated management program. However, it is necessary to perform experiments of sage and rosemary plants extracts in field conditions and compare them with the laboratory conditions and results. In addition, it is believed that performing different types of research by determining the effects of both plant extracts on natural enemies would be beneficial.

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