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Research Paper

The Effect of Lavender (Lavandula stoechas L.) Oil on the Plantlet Growth Parameters of Some Vegetable Seeds

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ABSTRACT: *Essential oils, highly complex natural compounds that are extracted from different parts such as root, leaf, flower of plants. Some of these oils, which usually benefit from allelopathic effects, have also stimulative activity for vegetative plant growth. Due to use of synthetic chemical is prohibited in organic agriculture; it is thought to be able to benefit from the incentive effects of essential oils. In this study, effects of lavender (Lavandula stoechas L.) oil on the plantlet growth of tomato (Rio Grande F_1), pepper (ÜçBurun cv.) and eggplant (Topan cv.) were determined. Lavender oil was applied at four different concentrations (0, 0.1, 0.2, 0.3, 0.4 µl/petri). At the end of the study; shoot length (mm), root length (mm), average plantlet weight (g), shoot and root fresh weights (g) were measured. In Rio Grande F_1 cultivars, 0.4µl application increased root and shoot length while 0.2 µl application increased the root, shoot and plant weight. In terms of all the parameters examined in Topan cultivar, 0.2 µl application gave the positive results. In Üç burun cv.; while 0.3 µl application encouraged to root weight and length, 0.2 µl and 0.4 µl applications increased the shoot and plant weight respectively.*

KEYWORDS: *Germination, Essential oil, Lavandula stoechas L., Organic agriculture, Vegetables*

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I. INTRODUCTION

Tomato, pepper and eggplant are important vegetable species for human nutrition. These vegetables grown widely in the world and have economic importance. According to the 2016 data, tomatoes are the first (177.042.359 tons) vegetables produced in the world, while eggplant is the fifth (51.288.169 tons) and the pepper is the seventh (34.497.462 tons) (Anonymous 2018). Use of healthy and strong seedlings as a starting material in all plant species will have a positive effect on yield and quality. Unsuitable conditions such as the formation of crusting soil and low soil temperature negatively affect seed germination and emergency. In order to eliminate these problems, there are some applications before sowing (Demirkaya 2012). The studies on this subject are concentrated in economically important species which have germination problems (Yanmaz and Özdil, 1992). After germination, good-quality growth of plantlets is important in terms of obtaining strong seedlings. Especially the strong root structure will provide an advantage in this regard. Environmental conditions and some external applications can positively affect seed germination and seedling growth (İşlek et al., 2010). Effectiveness of pre-treatments to increase the germination quality of seeds may vary depending on the plant species, developmental stage of the plant, the dose of the substance used for osmotic conditioning and the duration of the incubation. (Ashraf and Foolad, 2005). One of the applications for this purpose in organic agriculture is to treat seeds with essential oils obtained from aromatic plants. (Kenanoğlu, 2016). Essential oils produced by aromatic plants for the protection of enemies are generally used in weed control in agriculture (Bakkali et al. 2008) since they inhibit plant germination and growth (Aydın and Tursun 2010). Application dosage is very important in determining the effects of essential oils on seedling growth and development and dosage determination should be done well at the beginning of the study (Ulukapı and Şener 2016).

Lavandula stoechas L., which belongs to the *Lamiaceae* family, wildly grows in Anatolia. Lavender flowers' essential oil; linalyl acetate, linalool, limonene, β-ocymene, 1,8-cineole, camphor, a-terpineol, borneol and also contains phenolic acids, ursolic acid, cumarins flavonoids and sterols. Among these, linalool, linalyl

acetate and camphor determine the quality of lavender essential oil (Nartowska 2012; Sarker et al., 2012). Due to its antibacterial, antifungal and antioxidant properties, lavender oil is widely used for pharmaceutical, food and cosmetic purposes (Öztürk ve ark. 2005).

The effects of essential oils on plants are dose-dependent and previous studies have often demonstrated their germination and growth inhibitory properties. In this study, the effects of low doses of lavender oil on the germination and early seedling growth parameters of some vegetable seeds in the *Solanaceae* family were investigated.

II. MATERIAL AND METHOD

The experiments were carried out in Akdeniz University, Vocational School of Technical Sciences, Organic Agriculture Laboratory and climate room.

Materials

In this research tomato (Rio Grande F_1 cv.), pepper (Üç Burun cv.) and eggplant (Topan cv.) were used for plant materials. Seeds were purchased from commercial seed production concern. *Lavandula stoechas* L. oil have been extracted for 3 hours (v w-1%) by hydro-distillation method with Clevenger apparatus (Başer et al., 1998) was obtained from a commercial company and were preserved in +4 ºC until the analysis.

Method

4 different doses (0.1, 0.2, 0.3, 0.4 µl/petri) of lavender oil were used in the study and only the distilled water application was applied as control. Seeds were sterilized in 10% commercial sodium hypochlorite solution for 10 minutes and rinsed 3 times with sterile distilled water. The experiment was performed in three replicates. 25 seeds of each cultivar were put in the Petri dishes on two layer of filter paper. After the seeds were placed in petri dishes, different doses of oil or control (distilled water) solutions were applied to the petri dishes. Petri dishes were maintained in climate room with 22±2ºC in the dark until germination. After germination, petri dishes were kept in 16/8 hours (light / dark) photoperiod and 24±1ºC conditions. The trial was terminated after 20 days. At the end of the experiment, plant, shoot and root length (mm) of the plantlets were measured by digital caliper and plant, shoot and root fresh weights (g) were determined with precision scales. Data were analyzed by using SPSS statistical software program, Duncan test. Correlations were obtained by Pearson correlation coefficient in bivariate correlations.

III. RESULT AND DISCUSSION

The effect of lavender oil on the vegetative growth of plantlets of pepper seeds was evaluated and the results are given in Table 1. According to these results,; while 0.3 µl application encouraged to root (0,0452) and plant (0,0456 g) weight, root (58,40 mm) and shoot (36,83 mm) length. On the other hand, in 0.2 µl application; the result of SL, RFW and SFW are found same statistical group of 0,3 µl. So it is possible to say that 0,3 µl and 0,2 µl lavender oil applications have positive effect on vegetative growth and development of pepper (Üç Burun cv.) plantlets (Table 1).

Table1. Effects of lavender applications on root and shoot development of the pepper seedlings

Cultivar	Doses (µl)	RL (mm)	SL (mm)	RFW (g)	SFW (g)	PW (g)
Üç Burun	**Control**	18,80 b	14,42 c	0,0110 b	0,0158 c	0,0272 b
	0,1	18,40 b	23,03 b	0,0152 b	0,0214 bc	0,0378 ab
	0,2	33,80 b	35,41 a	0,0390 a	0,0314 a	0,0368 ab
	0,3	58,40 a	36,83 a	0,0452 a	0,0260 ab	0,0456 a
	0,4	18,80 b	14,42 c	0,0110 b	0,0158 c	0,0272 b

Differences between groups with different letters in the same column are statistically significant ($P < 0.05$).

The correlation between the mean values of growth and development criteria of pepper plantlets is given in Table 2. As seen in Table 2, positive correlations were found between the criteria of SW and SL (r=0,506), SW and RL (r=0,532), SL and RW (r=0,816), SL and RL (r=0,608), RW and RL (r=0,509) ($P<0,01$) in Üç Burun cv.

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Table2. Correlation of vegetative development criteria of Üç Burun cv. applied lavender oil

Üç Burun	SW	SL	PW	RW	RL
SW	1	,506**	,233	,351	,532**
SL	,506**	1	,037	,816**	,608**
PW	,233	,037	1	,066	,271
RW	,351	,816**	,066	1	,509**
RL	,532**	,608**	,271	,509**	1

**Correlation is significant at the 0.01 level (2-tailed) *Correlation is significant at the 0.05 level (2-tailed).

Due to their organic origin, essential oils are easily degraded in nature and they don't create residues on the products. Becase of the fact that they do not have any negative effects on human and nature, they stand out especially in disease and pest control (Yanar et al. 2016). Ulukapı and Şener (2016) reported that some essential oils applied in high doses had a negative effect on growth parameters and dose determination should be done well before agricultural applications. These researchers have investigated the effects of mint and thyme oil on the growth parameters of tomato seedlings and showed that high doses of oils affect the growth and development of seedlings negatively. However, the dry matter content and some nutritional values of oil-treated seedlings are higher than in commercial fertilizers applied seedlings (Ulukapı and Şener 2016). Therefore, application dosage trials are important for the stimulating properties. In this study, while up to 3 µl and 2 µl of application increases the growth parameters, the dose above it causes a decrease in the growth parameters.

The effects of lavender oil on the some vegetative growth and development criteria of the eggplant Topan cv. plantlets are given in Table 3. When these results are evaluated, it is seen that the differences between different doses of oil applications is statistically significant in egg plant plantlets (Topan cv.). Table 3 shows that, favor mean values obtained from 0,2 µl (RL:66,83 mm, SL:38,05 mm, RFW:0,0232 g, SFW:0,0408 g, PW:0,0670 g) and 0,3 µl (RL:63,80 mm, SL:37,61 mm) lavender oil application in terms of SL and RL. On the other hand for PW; 0,1µl (0,0612 g) and 0,2 µl (0,0670 g) oil applications were give the best results and they were been in the same statistical group. As seen in Table 3, when the results of the vegetative growth parameters of eggplant plantlets examined, it is found that 0.2 µl application gave the superior results.

Table3. Effects of lavender oil applications on vegetative development of the eggplant seedlings

Cultivar	Doses (µl)	RL (mm)	SL (mm)	RFW (g)	SFW (g)	PW (g)
Topan	**Control**	34,41 b	26,43 b	0,0124 b	0,0180 c	0,0338 b
	0,1	39,20 b	29,20 b	0,0182 ab	0,0268 bc	0,0612 a
	0,2	66,83 a	38,05 a	0,0232 a	0,0408 a	0,0670 a
	0,3	63,80 a	37,61 a	0,0142 b	0,0280 b	0,0410 b
	0,4	46,61 b	31,22 b	0,0138 b	0,0278 b	0,0528 ab

Differences between groups with different letters in the same column are statistically significant (P <0.05).

Table 4 shows that there is a positive correlation (P<0,01) between; RL and SW (r=0,553), RL and SL (r=0,666), RW and PW (r=0,830) for Topan cv. There is also a positive correlation between SL and SW (0,443), RL and RW (r=0,428) (P<0,05).

Table4. Correlation of the vegetative development criteria of the Topan cv. applied with lavender oil

Topan	SW	SL	PW	RW	RL
SW	1	,443*	,207	,165	,553**
SL	,443*	1	,315	,357	,666**
PW	,207	,315	1	,830**	,345
RW	,165	,357	,830**	1	,428*
RL	,553**	,666**	,345	,428*	1

**Correlation is significant at the 0.01 level (2-tailed) *Correlation is significant at the 0.05 level (2-tailed).

When the results are evaluated in tomato plantlets (Rio Grande F_1), 0,4 µl (135,90 mm) application for RL and 0,2 µl (0,0324 g) application for RFW was given the best results. 0,4 µl (56,02 mm) and 0,2 µl (49,03 mm) lavender oil applications were found better than other application doses about SL. It was determined that 0,1 µl (0,0240 g), 0,2 µl (0,0310 g), 0,3 µl (0,0214 g) and 0,4 µl (0,0274 g) lavender oil applications had a positive effect on the SFW compared to control. 0,2 µl (0,0642 g), 0,3 µl (0,0516 g) and 0,4 µl (0,0546) applications were better than control and 0,1 µl for PW (Table 5).

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Table5. Effects of lavender oil applications on vegetative development of the tomato seedlings

Cultivar	Doses (µl)	RL (mm)	SL (mm)	RFW (g)	SFW (g)	PW (g)
Rio Grande F_1	**Control**	30,20 d	29,82 b	0,0132 c	0,0120 b	0,0272 b
	0,1	54,00 cd	33,61 b	0,0172 bc	0,0240 a	0,0338 b
	0,2	71,23 c	49,03 a	0,0324 a	0,0310 a	0,0642 a
	0,3	98,80 b	34,60 b	0,0198 bc	0,0214 a	0,0516 a
	0,4	135,90 a	56,02 a	0,0288 b	0,0274 a	0,0546 a

Differences between groups with different letters in the same column are statistically significant (P <0.05).

Table 6 shows the correlation between vegetative growth criteria's of Rio Grande F_1 cv. When these results were evaluated, there was a positive correlation between SW and SL (r= 0,466), SW and PW (r= 0,539), SW and RW(r= 0,404), SW and RL (r= 0,490), SL and RL (r= 0,448), PW and RW(r= 0,443) (P<0,05).

Table6. Correlation of vegetative development criteria of Rio Grande F_1 cv. applied with lavender oil

	SW	SL	PW	RW	RL
SW	1	,466*	,539**	,404*	,490*
SL	,466*	1	,755**	,289	,448*
PW	,539**	,755**	1	,443*	,547**
RW	,404*	,289	,443*	1	,525**
RL	,490*	,448*	,547**	,525**	1

**Correlation is significant at the 0.01 level (2-tailed) *Correlation is significant at the 0.05 level (2-tailed).

REFERENCES

[1]. Anonymous (2018).http://www.fao.org/faostat/en/#data/QC (Available data: 30.11.2018).

[2]. Ashraf, M., & Foolad, M. R. (2005). Pre-sowing seed treatment—A shotgun approach to improve germination, plant growth, and crop yield under saline and non-saline conditions. *Advances in agronomy*, *88*, 223-271.

[3]. Aydin, O., & Tursun, N. (2010). Determination Of Allelopathic Effects Of Some Plant Originated Essential Oils On Germination And Emergence Of Some Weed Seeds. *KSU J. Nat. Sci.*, *13*(1), 11-17.

[4]. Bakkali, F., Averbeck, S., Averbeck, D., & Idaomar, M. (2008). Biological effects of essential oils–a review. *Food and chemical toxicology*, *46*(2), 446-475.

[5]. Demirkaya, M. (2012). The Effects of Seaweed (Ascophyllum nodosum) Extract Treatments on Viability and Vigor of Tomato Seeds. *Alatarım*, *11*(1), 2012.

[6]. İşlek, C., Koç, E., &Üstün, A. S. (2010). The Effect On in Vitro Germination of Some Plant Growth Regulators in Pepper (*Capsicum annuum* L.) Seeds. J. *BAUN Inst. Sci. Technol*., 12(2), 42-49

[7]. Kenanoğlu, B. B. (2016) The Use of Different Organic Priming Treatments in Seed Germination. *Journal of TheInstitute of Natural &AppliedSciences*, 21(2), 124-134.

[8]. Nartowska, J. (2012). Rośliny lecznicze–lawenda. *Panacea*, *3*(40), 5-7.

[9]. Öztürk, B., Konyalioğlu, S., Kantarci, G., &Çetinkol, D. (2005). Essential Oil Composition, Antibacterial Antifungal and Antioxidant Capacity of Wild *Lavandula stoechas* L. subsp. *stoechas* from Izmir. *ANADOLU, J. of AARI*, *15*(1), 61-72.

[10]. Sarker, L.S., Galata, M., Demissie, Z.A. ve Mahmoud, S.S. 2012. Sarker, L. S., Galata, M., Demissie, Z. A., & Mahmoud, S. S. (2012). Molecular cloning and functional characterization of borneol dehydrogenase from the glandular trichomes of Lavandula x intermedia. *Archives of biochemistry and biophysics*,*528*(2), 163-170.

[11]. Ulukapi, K., &Şener, S. (2016). Effect of Organic Fertilizer Containing Mint and Thyme Oil Extract on Tomato Seedling Growing. *International Journal of Engineering Research and Applications*, *6*(12), 43-49.

[12]. Yanar, Y.,Belgüzar, S., & Telci, İ. (2016). Antimicrobial activities of *Origanum spp.*, *Mentha spp.* and *Lippia sp.* Species Essential Oils Against *Clavibacter michiganensis subsp. michiganensis* and *Botrytis cinerea*. TurkishJournal of WeedScience, 19(1), 18-25.

[13]. Yanmaz, R., & Özdil, A. H. (1992). Domates ve biber tohumlarında ekim öncesi PEG (polyethylene glycol) uygulamalarının çimlenme ve çıkış oranı ile süresi üzerine etkileri. *Türkiye I. Ulusal Bahçe Bitkileri Kongresi*, 13-16.

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