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RESPONSE OF SOME ANATOMICAL CHARACTERISTICS OF EGGPLANT VARIETIES LEAVES TREATED WITH JASMONIC ACID AND ITS RELATIONSHIP WITH THE TWO-SPOTTED SPIDER MITE T. URTICAE KOCH SEVERITY FIELD

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Abstract
This study was performed between the 2023/2024 agricultural seasons to demonstrate that jasmonic acid significantly influences the morphological traits of eggplant cultivars' leaves and their correlation with the intensity of Tetranychus urticae (Koch) in the field. The findings validated the substantial impact of the eggplant type and jasmonic acid on the severity of T. urticae (Koch). The eggplant Barcelona variety exhibits the highest severity at 35.72%. Conversely, the karimah eggplant variety exhibited the lowest severity at 29.97%; the 5 µM jasmonic acid effectively diminished the two-spotted spider mite severity to 30.86%, in contrast to the maximum severity of 37.48% observed in the control treatment. The study's findings demonstrated that 100 µM jasmonic acid markedly diminished the thickness of the palisade cell layer to 76.11 µM, the lower epidermis to 12.11 µM, and the spongy cell layer of eggplant leaves to 90 µM. Compared with the treatment control, which exhibited 12.67, 86.11, and 115.56 µM thicknesses, respectively. The correlation analysis revealed a non-significant coefficient between the severity of two-spotted spider mite infestations and the morphological traits of eggplant leaves.

Keywords: Eggplant Varieties, Induced resistance, Tetranychus urticae, Two-spotted spider mite, Jasmonic acid.

Introduction

The Solanaceae family is plagued by numerous pests that result in considerable economic damage to plants (Hodge et al., 2018); around 30 species of eggplant mites have been identified, with the two-spotted spider mite (TSSM) Tetranychus urticae Koch being the most prominent (Kumral and

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Çobanoğlu, 2016). The chemical insecticides employed against this pest possess multiple factors, including detrimental impacts on humans, biodiversity, and the environment. The overuse of pesticides has led to the development of resistance, necessitating the exploration of novel and safe control measures (Lamichhane et al., 2017). An alternative pest control strategy entails enhancing plant resistance mechanisms against pests, exemplified by the application of phytohormones like Jasmonic acid, which can activate physical or chemical defense mechanisms in plants (Ossowicki et al., 2020; Kumari and Singh, 2022). The exogenous administration of phytohormones, including Jasmonic acid and Methyl jasmonates, is crucial for systemic resistance (SR), enhancing plant defense against pests (Siciliano et al., 2015). El-Sherbeni et al. (2019) proposed the incorporation of phytohormones into integrated pest management strategies with insecticides to control certain insect pests. Rohwer and Erwin (2010) demonstrated in their study that spraying methyl jasmonate (MeJA) at a concentration of 100 µM significantly reduced the prevalence rate of T. urticae on three plant species: including Impatiens Impatiens wallerana hook, Pansy and tomato plant 'Big Boy, that MeJA significantly reduced the reproduction rate of mites on impatiens and pansy plants by 60% (after 22-34 days after infestation). Cooper and Goggin (2005) validated the reduced population density of the Potato aphid Macrosiphum euphorbiae on tomato plants subjected to Jasmonic acid at a dose of 1.5 mmol. Fouad et al. (2016) noted a reduction in Tuta absoluta infestation by 36.24-45.05% over two successive seasons on tomato plants treated with a 1.141µmol dosage of jasmonic acid. Karban and Baldwin (1997) discovered in their research that applying jasmonic acid to plants diminished the survival and reproduction of the brown hopper Nilaparvata lugens, attributable to the synthesis of secondary chemicals that function as insect repellents. The study by Maserati et al. (2011) indicates that methyl jasmonate (MeJA) is essential for citrus protection against insect assaults. Treatment of wheat plants with jasmonic acid has diminished aphid populations and plant reproductive activity (Bruce et al., 2003). Al-Hamdani and Jasim (2023) discovered that blood orange seedlings were treated with Jasmonic acid at 10 mg. The concentration of L-1 significantly affected some anatomical characteristics of leaves. This research aimed to assess the impact of various concentrations of jasmonic acid on the anatomical characteristics of eggplant leaves (Solanum melongena L.) and their correlation with the severity of the T. urticae (Koch), given the critical role of jasmonic acid in enhancing resistance against this vermin.

Material and Methods

1. Study location

The experiment was executed in Thi-Qar Governorate, a greenhouse in the Al-Gharraf region, during the 2023-2024 season. The earth was readied for cultivation and partitioning into three rows of length, breadth, and height: 25, 40, and 20 cm, respectively, with a spacing of 100 cm between each row. By the sanctioned fertilizer guidelines, organic fertilizer, triple superphosphate, and NPK were incorporated into the rows. With each line insulated by mulches, a drip irrigation system was employed to preserve soil moisture and inhibit bush proliferation.

2. Varieties of Eggplant

Seeds from the Karimah, Barcelona, and Thuraya eggplant cultivars were utilized.

Volume 3, Issue 4, April - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

3. The preparation of Jasmonic acid

Jasmonic acid concentrations were 0 (distilled water only), 5, 50, and 100µM.

4. Planting Seeds

In the final week of September 2023, the seedlings were relocated to the greenhouse upon the emergence of the fourth genuine leaf for seeds sown in a cork container. The experimental units were segmented 1.5 meters long, with 12 units per line (3 varieties x 4 conc.). A 30-centimeter interval was preserved between each experimental unit and neighboring units devoid of planting; 8 seedlings were positioned on each side of the line, with a 30-centimeter separation between individual plants. The plants were irrigated as necessary, and a continuous fertilization regimen of urea, NPK, and complex fertilizer was implemented. The plants received jasmonic acid treatments in the final week of October 2023.

5. The Effect of concentrations of Jasmonic acid on T. urticae ´s severity on the eggplant varieties

The research continued for six months, beginning in November 2023 and taking place the first week of May 2024. The sample collection consisted of the following elements: From each experimental unit, three leaves were harvested from each of the three plants that were selected randomly (one from the upper, middle, and lower thirds) and analyzed with a dissecting microscope (40X). The population of mite individuals per leaf (including only motile stages: adults, nymphs, and larvae) was measured. The following evaluates the severity of the two-spotted spider mite. No infestation: 0, light infestation: 1-10, moderate infestation: 11-20, severe infestation: 21-30, very severe infestation: 30 individuals. The equation provided (Sháaban & Al Mallah, 1993) translated the severity degrees (ascertained by the scale above) into numerical values.

$$\text{Injury severity (\%)} = \frac{\text{(Leaves number from a grade of 0 x 0) + (Leaves number from a grade of 1 x 1) + (Leaves number from a grade of 2 x 2) + (Leaves number from a grade of 3 x 3) + (Leaves number from a grade of 4 x 4)}}{\text{The total leaves x the highest value of scale}}$$

6. Assessment of leaf anatomical parameters

The plant leaves were chosen for each treatment on January 12, 2023. The tissue sections were made and lifted on slides depending on (Al-Khafaji, 2001). Methods of work encompassed:

1- Fixation: The segment leaves were flooded in FAA Solution (Formalin Acetic Acid).

2- Washing:

To get rid of the effects of the stabilizing solution, the leaves slices washed by ethyl alcohol (70%).

3-Dehydration: Use the ethyl alcohol in concentrations of 70%, 80%, and 90% (one hour at each concentration), and 100% (overnight) to soak the leaves.

4- Clearing: The segment leaves were soaked in a mixture (1:1) from xylene: paraffin wax at 60-65 °C for 4 hours, after passing it in concentrations of a mixture of ethyl alcohol (100%) and xylene: 1:3, 1:1, 3:1 (30 minutes in each), xylene (30 minutes)

5- Infiltration: The segment leaves were soaked in paraffin wax 100% (overnight) at 60-65 °C.

6- Merging: The segment leaves are placed in liquid paraffin wax (60-65°C) in Cubic plastic templates, and then left overnight to harden.

7- Sharpening & Sectioning: 10-15µm thick wax templates cut by a Microtom (MSE) device.

8- Mounting: At a temperature of 55°C in a water bath, the segments were submerged, and then on the slides containing drops of (egg albumen: glycerin) (1:1) Meier's solution, transfer the slides

Volume 3, Issue 4, April - 2025
ISSN (E): 2938-3781

for 30 min. (50-60°C).

9- Staining: the slides were for an hour in xylene, and the paraffin wax was getting rid of. The slides were flooded in ethyl alcohol (100, 95, 90, 80, 70, and 50%) (15 minutes each).

The slides were inundated for 30-60 min. in Safranin dye (1g dye+100 ml ethyl alcohol 70%). Then in 50% ethyl alcohol, afterwards in Fast Green dye for 15-30 seconds (1 gm dye+100 ml ethyl alcohol 70%), washed with alcohol 100%. Then the slides were flooded with xylene (three times/5 minutes for each), and the slides were covered with cover slides. In the finish, add a drop of DPX, and the slide was transferred to a hot plate at 60°C/hr.

7. Measuring the layered of leaves:-

The subsequent histological measurements were obtained using an AxioCamICc3 camera attached to a ZEISS microscope, which included (in micrometers) the palisade cell layer, the spongy cell layer, the cuticle of the upper and lower epidermis, the thickness of the top and lower epidermis.

8. Statistical Analysis

Statistical analysis was performed using the method of Complete Block Design (R.C.B.D.) with the L.S.D. test at the level of 0.05. Two components, eggplant types, and acid concentrations, were implemented in the experiments using the statistical software SPSS Science version 21.

Results and Discussion

1- The effect of jasmonic acid concentrations in the two-spotted spider mite severity on eggplant varieties-

Table 1 confirmed the significant impact of the variety of the eggplant with the concentration of the jasmonic acid on the severity of the two-spotted spider mite. The Barcelona variety achieved the highest severity, 35.72%, while the Karimah variety showed efficiency with the lowest severity, reaching 29.97%.

The highest severity, 37.48%, was in the control treatment. The 5 µM concentration showed efficiency in limiting the severity of T. urticae, reaching 30.86%, accompanying a significant variance among the concentrations.

The statistical analysis results showed a significant statistical for the interaction between the eggplant variety and the jasmonic acid concentration; the Barcelona eggplant variety in the control treatment has the highest of the T. urticae severity, reaching 39.52%, while the karimah eggplant variety and a 100 µM concentration were efficiency in decreasing the T. urticae severity, as it reached 25.29%, with a significant difference among the treatments.

Web of Agriculture: Journal of Agriculture and Biological Sciences
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Volume 3, Issue 4, April - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
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Table1: Effect of Jasmonic acid concentrations in Severity of T. urticae on leaves of Eggplant Average (%)

Table1: Effect of Jasmonic acid concentrations in Severity of *T. urticae* on leaves of Eggplant					
Average (%)					
Var. \ Conc. (µM)	0	5	50	100	Var.
karimah	36.15	28.85	29.57	25.29	29.97
Barcelona	39.52	32.20	36.85	34.32	35.72
Thuraya	36.77	31.53	34.30	36.11	34.69
Conc.	37.48	30.86	33.57	31.91	
LSD(0.05)	Var.= 0.86 *		Conc.= 0.99 *	Var.*Conc.= 1.72 *	

The result in table 1 proved that the eggplant varieties assorted in the severity of T. urticae; the results confirmed that the largely sensitive variety was Barcelona, followed the Thuraya, which was medium sensitive, While the most variety resistant was karimah. Many studies have confirmed that plant varieties vary in their infestation degree with T. urticae, including the study conducted by Mustafa and Al Mallah (2021), which was conducted in northern Iraq to show the sensitivity of six tomato varieties, five are imported (Gs, Nora, Maysam, Nabaa, and Sandra) and one local variety for Tetranychus urticae Koch infestation, as it was confirmed that both the GS variety and the local variety were the least sensitive varieties to infestation depending on the two criteria: the infestation leaves percentage and T. urticae population density, as reached 63.05% compared with the Sandra variety, which was sensitive by 69.97%.

The difference in plant varieties in the degree of their infestation by the T. urticae may be because they contain genes that are responsible for inducing certain defensive compounds.

the previous explanation was identical to what Ament et al. (2004) stated in their study to show the JA role in direct and indirect defense responses against T. urticae Koch in two tomato varieties Lycopersicon esculentum variety def-1 (which carries the mutation that reduces JA induction in the wounds mechanical case or plant pest infestation) and the wild variety (which does not contain the mutation), the eggs number, damage, and hatching eggs rate was observed to be higher on the def-1 variety which had the JA lowest levels compared with the wild variety one day after infestation. Mcdaniel et al. (2016) confirmed that the plant varieties' resistance against pest infestation might be due to several reasons, including these varieties having unique genes bearing the resistance characteristics. Miyazaki et al. (2014) stated in their study to induce resistance of two cotton varieties, the commercial variety Sicot 71 (Gossypium hirsutum L.) and resistant variety BM13H (Gossypium arboreum L.) to T. urticae Koch, the jasmonic acid and methyl jasmonate (MeJA) spraying on cotton varieties reduced the population density and leaves damage of the spider mite compared with salicylic acid and methyl salicylate (MeSA) and stated that the JA content was higher in the resistant variety BM13H when measured quantified by Liquid chromatography and Electrospray ionization tandem mass spectrometry (LC-ESI-MS/MS) compared with the Sicot 71 variety, and the gene expression levels of LOX, AOX and OPR (enzymes involved in the jasmunic acid biosynthesis steps in plants) were higher in the resistant variety BM13H which was infested with T. urticae compared with the Sicot 71 variety when measured quantified with a PCR device.

The statistical analysis results (Table 1) showed, in general, that the 5 µM concentration of

Volume 3, Issue 4, April - 2025
ISSN (E): 2938-3781

jasmonic acid achieved efficiency by controlling TSSM infestation; this result agreed with many studies, including the study of Warabieda and Olszak (2010), which they confirmed the negative effect of methyl jasmonate (JA-Me) solution in the T. urticae Koch population density when treating the shoot system of the apple varieties (Jester and Close) and the strawberry varieties (Aga and Kent).

The negative effect of jasmonic acid treatment in the T. urticae severity population density may be attributed to its efficiency in attracting spider mite predators such as Phytoseiulus persimilis (Gols et al., 2003), or the jasmonic acid exogenous treatment may cause the induction of some compounds responsible for defense against insects in some plants, such as topical induction of the defense protein Polyphenol oxidase in the Chrysanthemum genus against Western floral thrips Frankliniella occidentalis infestation (Chen et al., 2020), additionally jasmonic acid treatment may lead to a lack of amino acids which are necessary for the insects growth due to activity inhibition of the Protease Trypsin enzyme in the digestive system of some insect species such as Nilaparvata lugens and the diamond-back moth Plutella xylostella by protease inhibitors PIs, resulting in inhibition of the insect's responses to nutrition (Lison et al., 2006; Nouri-Ganbalani et al. Nouri-Ganbalani et al. 2018).

2- The effect of jasmonic acid concentrations in the anatomical characteristics of leaves and their links with the T. urticae severity on varieties of eggplant:

2-1- The effect of jasmonic acid concentrations in the upper epidermis´s cuticle thickness:-

The results (Table 2) assured the no of a statistical influence for the eggplant variety. In contrast, a clear statistical significance was observed for the jasmonic acid concentration and the reaction eggplant variety with the jasmonic acid concentration in the upper epidermis´s cuticle of the eggplant variety leaves.

The 50 µM concentration has the utmost upper epidermis´s cuticle thickness of the eggplant variety leaves, reaching 5 µm. In comparison, the threshold upper epidermis´s cuticle thickness was 3.78 µm under the influence of a concentration of 5 µM of jasmonic acid in the eggplant leaves.

For the reaction between eggplant variety with jasmonic acid concentration the highest thickness of the upper epidermis´s cuticle and lowest thickness of the upper epidermis´s cuticle were 7 and 3 µm in the Karimah and Barcelona varieties leaves treated by 100 µM of jasmonic acid concentration, respectively.

A negative, non-significant linking has been observed between the thickness of the upper epidermis´s cuticle with the severity of T. urticae.

2-2- The effect of jasmonic acid concentrations in the lower epidermis´s cuticle thickness:-

The table 2 confirmed that the jasmonic acid concentration and the overlap between the eggplant variety with the jasmonic acid concentration were not had influence significant. In contrast, the effect was significant for the eggplant variety in the lower epidermis´s' cuticle thickness of eggplant leaves.

The higher thickness for lower epidermis´s cuticle amounted 4.58 µm in the leaves of Karimah variety. The Barcelona variety leaves had the minimum lower epidermis´s cuticle thickness, 3.67 µm.

A negative, non-significant correlation has been observed between the thickness of the lower epidermis´s cuticle of eggplant leaves with the severity of T. urticae.

2-3- The effect of jasmonic acid concentrations on the upper epidermis thickness:-

The table 2 proved the significant influence of the salicylic acid concentration and the eggplant variety, while the interference between them had no significant effect on the upper epidermis thickness.

The positive effect of the 50 µM concentration was the reason for increasing the upper epidermis thickness reached to 23.78 µm.

At the same time, the upper epidermis thickness were the lowest in the control treatment, as

Volume 3, Issue 4, April - 2025
ISSN (E): 2938-3781

reached 17.11 µm.

The highest upper epidermis thickness reached 22.92 µm in the leaves of Karimah variety. On the other hand, the upper epidermis of the Barcelona variety leaves were the least thickness, which amounted to 19.42µm.

The table 2 registered a negative, non-significant correlation between eggplant leaves' upper epidermis thickness and the severity of T. urticae.

2-4- The effect of jasmonic acid concentrations in the lower epidermis thickness:-

The table 2 explained the significant influence of the jasmonic acid concentration. At the same time, there was no significant effect on the eggplant variety or the overlapping between the eggplant variety with the jasmonic acid concentration in the lower epidermis thickness of eggplant leaves.

The control treatment had the maximum lower epidermis thickness, reaching 12.67 µm. In comparison, the 100 µM concentration recorded the least thickness of the lower epidermis, which stood at 12.11 µm.

The results confirmed a correlation between eggplant leaves' lower epidermis thickness and the severity of T. urticae.

The correlation between lower epidermis thickness- severity of T. urticae had a positive, non-significant effect.

2-5- The effect of jasmonic acid concentrations in the palisade parenchyma layer thickness:-

The outcomes of statistical (Table-2) cleared that the both jasmonic acid concentration, eggplant variety, and overlapping between them statistically affect the thickness of the palisade parenchyma layer of eggplant leaves.

The 100 µM concentration has the lowest palisade parenchyma layer thickness, reaching 76.11 µm. In contrast, the highest palisade parenchyma layer thickness was 86.11 µm in the control treatment, with a significant difference among the acid concentrations. The Thuraya variety leaves had the highest palisade parenchyma layer thickness, reaching 87.42 µm. The lowest palisade parenchyma layer thickness amounted to 78.33 µm in the Karimah variety leaves, with a significant difference.

Shared the Thuraya variety with a 50 µM in obtaining the highest thickness of palisade parenchyma layer as it reached 106.67 µm, while the minimum thickness of this layer was 50 µm in the leaves of Karimah varieties treated by 50 µM.

The results showed a positive, non-significant correlation coefficient between eggplant leaves' lower epidermis thickness and the severity of T. urticae.

2-6- The effect of jasmonic acid concentrations in the spongy cells layer thickness:-

Table 2 were shown a significant effect for both salicylic acid concentration, eggplant variety and an overlap between them in the spongy cell layer thickness of the eggplant varieties' leaves.

The lowest spongy cell layer thickness was 90 µm in the leaves treated with a 100 µM concentration. The highest was 115.56 µm in the leaves in a control treatment, with a significant difference among the acid concentrations. The Karimah variety leaves were distinguished by having the highest spongy cell layer thickness, which amounted to 114.17 µm. The lowest spongy cell layer thickness was 84.17 µm in the Barcelona variety leaves, with a significant difference among the varieties.

As the interaction between the eggplant variety and the jasmonic acid concentration, the highest spongy cell layer thickness was 156.67 µm in the Karimah variety leaves in the control treatment. The lowest was 60 µm in the Barcelona variety leaves treated by 100 µM.

The results confirmed a positive, non-significant correlation between eggplant leaves' lower epidermis thickness and the severity of T. urticae.

Web of Agriculture: Journal of Agriculture and Biological Sciences
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Volume 3, Issue 4, April - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Table2: Effect of Jasmonic acid concentrations in the anatomical characteristics of the eggplant varieties´s leaves

characteristic	Conc. (µM) / Var.	Thickness (µm) (average) 0	5	50	100	Var.	LSD (P≤0.05)	r
pper epidermis´s Cuticle	karimah	3.33	4.33	4.33	7	4.75	Var.= 0.52^{NS} Conc.= 0.6* Var.* Conc.= 1.03*	- 0.22^{NS}
	Barcelona	4.67	3.67	6.67	3	4.5		
	Thuraya	4.67	3.33	4	4.67	4.17		
	Conc.	4.22	3.78	5	4.89			
wer epidermis´s Cuticle	karimah	4.33	5.33	5.33	3.33	4.58	Var.= 0.55* Conc.= 0.64^{NS} Var.* Conc.= 1.11^{NS}	- 0.32^{NS}
	Barcelona	2.67	3.33	3.67	5	3.67		
	Thuraya	4.33	3.33	4.67	3	3.83		
	Conc.	3.78	4	4.56	3.78			
pper epidermis	karimah	20	25	26.67	20	22.92	Var.= 1.97* Conc.= 2.27* Var.* Conc.= 3.9	- 0.32^{NS}
	Barcelona	15.67	17.33	21.33	23.33	19.42		
	Thuraya	15.67	15.67	23.33	24.33	19.75		
	Conc.	17.11	19.33	23.78	22.56			
wer epidermis	karimah	16.67	12.67	10	13.33	13.17	Var.= 2.37^{NS} Conc.= 2.74* Var.* Conc.= 4.75^{NS}	0.02^{NS}
	Barcelona	10	7.67	16.67	12	11.58		
	Thuraya	11.33	16.67	11	11	12.5		
	Conc.	12.67	12.33	12.56	12.11			
lisade cells layer	karimah	96.67	86.67	50	80	78.33	Var.= 6.97* Conc.= 8.05* Var.* Conc.= 13.9	0.22^{NS}
	Barcelona	70	98.33	88.33	63.33	80		
	Thuraya	91.67	66.33	106.67	85	87.42		
	Conc.	86.11	83.78	81.67	76.11			
ongy cells layer	karimah	156.67	120	90	90	114.17	Var.= 8.88* Conc.= 10.26* Var.* Conc.= 10.76*	0.16^{NS}
	Barcelona	83.33	86.67	106.67	60	84.17		
	Thuraya	106.67	70	90	120	96.67		
	Conc.	115.56	92.22	95.56	90			

r = indicates the correlation coefficient between the characteristic with the severity of *T. urticae*.

Volume 3, Issue 4, April - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

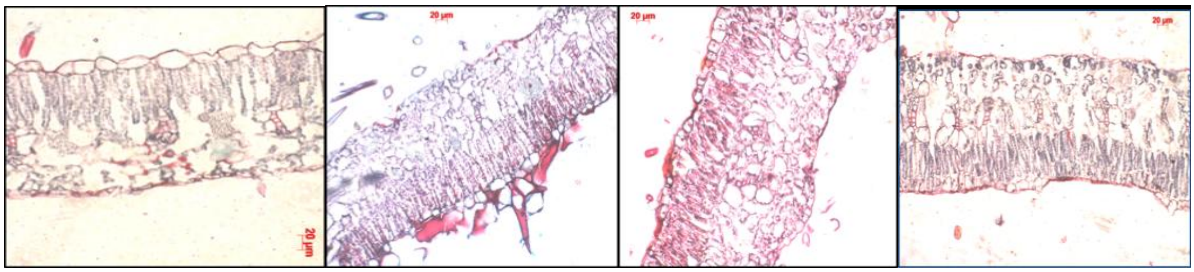
The statistical analysis results in Table 2 showed that the eggplant Varieties differed in the thickness of the leaf tissue layers, which may have affected the severity of the TSSM. Accordingly, there may be a relationship between the thickness of the leaf tissue layers and the severity of the TSSMs. The physical properties of plant leaf surfaces have an active role in defense against pest infestation (Hirota and Kato, 2001). For instance, adults of some insect species prefer to lay their eggs in thin- epidermis leaves (Lundgren et al., 2008). In addition, the leaf thickness also affects the presence of some species of insects, such as whiteflies (Taggar and Gill, 2012). Furthermore, the waxy layer on the leaf´s epidermis surface of some plant species is the first barrier to protect them from insects and plant pathogens (Kunst and Samuels, 2013).

As a result, the plant resistance against insects may be attributed to the plant tissue thickness because of the waxy layer presence, which plays a vital role in keeping insects away before they nutrients, reproduce, or lay eggs on it (Smith, 2005). On the other hand, waxy crystals on the leaf surface, thickness, and leaf tissue hardness negatively affect spider mites by reducing their severity (Nain and Rathee, 2017).

The statistical analysis results, shown in Table 2, confirmed the negative effect of jasmonic acid concentrations on the thickness of most eggplant leaf layers.

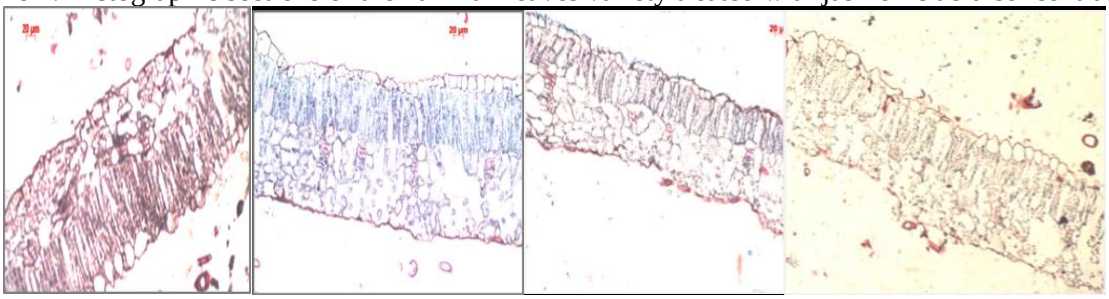
Despite this, these results were contrary to Li et al. (2018), who found that the exogenous application of methyl jasmonate (MeJA) led to changes in anatomical characteristics such as cuticle thickness and trichome density in the leaves of each sunflower (Helianthus annuus), tomato (Solanum lycopersicum), and soybean (Glycine max), especially at high concentrations (1.0 and 2.5 mM).

In the same way, Kılıç et al. (2008) confirmed that most of the acid concentrations used in their study reduced the width of the lower surface, the number of epidermis cells on both surfaces and the distance between vascular bundles of Radish seedling leaves.



0µM 5µM 50µM 100µM

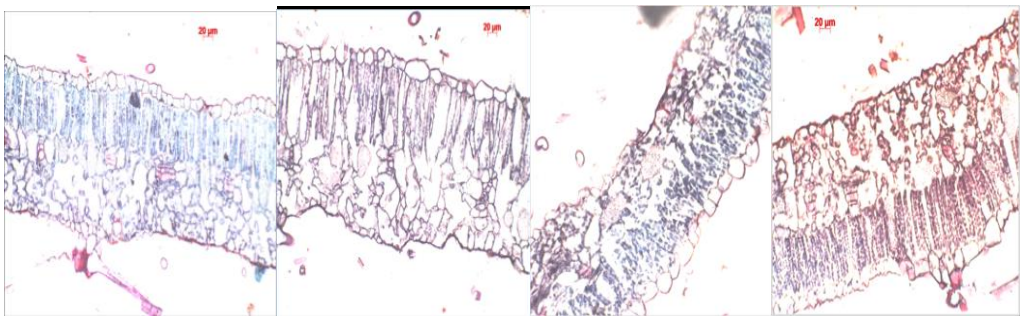
Picture 1: Histographic sections of the karimah leaves variety treated with jasmonic acid concentrations



Picture 2: Histographic sections of the Barcelona leaves variety treated with jasmonic acid concentrations

Volume 3, Issue 4, April - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8



Picture 3: Histographic sections of the Thuraya leaves variety treated with jasmonic acid concentrations

Conclusion

In conclusion, this study concluded that the Barcelona eggplant variety is the most sensitive to the two-spotted spider mite infestation, while the Karimah eggplant variety is the most resistant. Besides, a 5µM concentration of jasmonic acid has effectively reduced the severity of the TSSM infestation. In addition, Eggplant varieties varied in the anatomical characteristics of the leaf's thickness. Also, the higher concentration of jasmonic acid (100 µM) is the most efficient in reducing the thickness of each of the lower epidermis, palisade cells layer, and spongy cells layer of eggplant leaves. Furthermore, there is no significant correlation between the anatomical characteristics of eggplant variety leaves and the severity of the TSSM.

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