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EFFECT OF IRRIGATION INTERVALS, WHEAT STRAW MULCH, AND ALUMINUM SILICATE ANTI-TRANSPIRANT ON SOME VEGETATIVE GROWTH TRAITS OF EGGPLANT UNDER LOW PLASTIC TUNNELS IN EL- ARISH REGION

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ABSTRACT

Field trials were conducted during the winter seasons of 2020-21 and 2021-22 at the Experimental Farm of the Faculty of Environmental Agricultural Sciences, Arish University, North Sinai, Egypt. This study aimed to assess the impact of various irrigation intervals (daily, every two days, and every three days), the application of organic mulch (without or with crushed wheat straw mulch), and the use of foliar anti-transpirant (without or with aluminum silicate) on the growth of eggplant. Seedlings of *cv*. "Betra" were transplanted on October 20th and were irrigated using a drip irrigation system. Each plot measured 10.5m² (7 m in length and 1.5 m in width), with a plant spacing of 50 cm within rows, resulting in a planting density of 1.33 plants/m². Experimental treatments were arranged in a split-split plot design with three replications. The combination of irrigation every two days, the use of crushed wheat straw mulch, and the application of aluminum silicate anti-transpirant yielded the highest values for all measured growth parameters, including plant height, number of leaves/plant, leaf area/plant, and shoot dry weight, except for the chlorophyll a+b content in leaves during both sampling dates.

INTRODUCTION

Eggplant (*Solanum melongena* L.) is a summer vegetable crop belongs to the Solanaceae family. It grew up in tropical regions of India and China. Eggplant have a degree of tolerance to moderate drought stress without suffering significant reductions in yield **(Mohawesh, 2016; Müller *et al.*, 2016**). According to FAO in 2016, 90% of eggplant production comes from China (28.4 million tons), India (13.4 million tons), Egypt (1.2 million tons), Turkey (0.82 million tons), and Iran (0.75 million tons) **(Wei *et al.*, 2020)**. According to the **FAO (2018)**, global eggplant production totaled approximately 54 million tons, with Asia contributing 93.7%, Africa 3.8%, Europe 1.8%, and America 0.7% **(Hossaini *et al.*, 2021)**. The statistical database of FAO stated that Egypt was the third Eggplant producer in the world in 2016-2018 **(Maha *et al.*, 2021)** cited after **(FAOSTAT, 2019)**. The total cultivated area of eggplant in Egypt in 2019 was approximately 44743.02 hectares **(Maha *et al.*, 2021)**. Total eggplant production increased to 1.4 million tons in 2018 from 1.37 million tons in 2017 (**Saifaddin, 2021**).

Eggplant fruits comprise 89.0 g water, 1.4 g protein, 1.0 g fat, 8.0g carbohydrate, 1.5 g cellulose, 105 mg vitamin C, 1.6 mg iron, and 130 mg calcium **(Romain, 2001)**. Additionally, they are rich in various

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phytochemicals, including aspartic acid, tropane, flavonoids, lanosterol, glycoalkaloids, histidine, oxalic acid, solasodine, ascorbic acid, and tryptophan, which contribute to their pharmaceutical applications such as anti-inflammatory, anti-asthmatic, and anti-platelet hypo-lipidemic effects **(Naeem and Ugur, 2019)**. Eggplants are low in calories and provide a beneficial mineral composition for human health, being a rich source of potassium, magnesium, calcium, and iron **(Quamruzzaman *et al.*, 2020)**.

The soil in El-Arish region of North Sinai is sandy and exhibits several challenging characteristics: low nutrient content, rapid infiltration, poor water retention, low cation exchange capacity, single grain structure, and susceptibility to erosion. Furthermore, irrigation in this area relies on limited underground water resources with high salinity. Additionally, climate change has led to a decrease in annual rainfall globally **(Amiri *et al.*, 2012; Kimura, 2007),** exacerbating water scarcity and posing a significant challenge for vegetable cultivation under these conditions.

Many researchers show in their studies how to solve these problems by developing water-saving practices in irrigated agriculture including irrigation methods to minimize water use like irrigation scheduling, defined as the number of days between watering sessions during dry periods, depending on the crop's consumptive water use and available moisture in the root zone. Irrigation intervals can make balance between productivity and vegetative growth **(Goodwin and Boland, 2002)**, reduce irrigation amount **(Pérez-Pérez *et al.*, 2008)**, reduce transpiration rate (**Bafeel and Moftah, 2008)**, keep soil water content close to field capacity **(Amiri *et al.*, 2012; Boamah *et al.*, 2011)**, increase water use efficiency and fruit quality, occur good solubility and uptake from soil nutrients for eggplant **(Rakha, 2014)**. Also, suitable soil moisture enhances all plant physiological processes like photosynthesis, transpiration, cell turgidity, cell and tissue growth and translocation of the assimilates through plant organs **(Amiri *et al.*, 2012; El-Koumy and Moursi 2018; Sarker *et al.*, 2005)**.

Rakha (2014) and El-Said (2015) both found that a 10-day interval significantly increased total chlorophyll content of eggplant leaves. **El-Said (2015)** illustrated that 10-day interval significantly increased the number of branches/plant, leaf area/ plant, fresh and dry weight, number of fruits/plant, average fruit weight, early and total yield/feddan, and N, P, K leaves content of eggplant *cv*. black beauty in Dakahlia Governorate. found that a 10-day interval significantly boosted fresh and dry weights, number of leaves/plant, and plant height of two eggplant cultivars (long white and long black) in Mansoura University. **Abdalla *et al.* (2018)** reported that a 10-day interval produced the highest value for each fresh and dry weight and plant height of three eggplant genotypes (Hanen F1, Classic F1, and Alabaster F1) in Assiut University. **El-Koumy and Moursi (2018)** noted that a 7-day interval increased fresh and dry weight, stem length, leaf number, branch number, and leaf area of eggplant *cv*. Sawad EL Laiel in Kafr el-Sheikh Governorate.

Mulching is one of the agricultural management practices used in case of water deficient **(Behzadnejad *et al.*, 2020),** because it can reduce the water amount that evaporates from soil, reduce needed water plants, improve the quality of soil by breaking up clay to allow better water and air movement, it can also provide nutrients to sandy soil and improves its ability to hold water, acts as an insulating layer on top of soil, keeping it cool in summer and warm in winter, keeps weeds down, and minimizing seed weeds germination as well as enhance the plants roots under drought **(Zhang *et al.*, 2020).** Also, enhance soil water capacity, plant growth, and pest control **(Mendonça *et al.*, 2021)**. Organic

mulch, made from plant or animal matter, helps minimize nitrate leaching, improve soil physical qualities, enhance biological activity, balance the nitrogen cycle, provide organic matter, control temperature, and water retention, and reduce erosion **(El-Beltagi *et al.*, 2022)**.

Pirboneh *et al.* (2012) found that increasing mulch rates gradually increased the number of leaves/m² of eggplant in Iran. Also, **El-Semellawy and El-Koumy (2015)** observed that all organic mulch treatments significantly increased leaf area/plant and number of branches/plant of eggplant *cv*. Sawad. El laiel F1 in Kafr el-Sheikh Governorate. **Helaly *et al.* (2018)** reported that mulching increased leaf chlorophyll and photosynthetic rate under Dakahlia conditions.

Foliar application of anti-transpirants is a crucial tool to improve vegetable growth, because it reduces free water on leaf surfaces, reduces transpiration by reducing the size and number of stomata, enhances growth, and boosts productivity. It is cost-effective, environmentally safe, and has no toxic effects on humans, animals, or plants **(Al-Moftah and Al-Hamaid, 2005)**. Under drought, spraying with anti-transpirants effectively reduced water consumption use and enhanced water productivity **(Rania and Maha, 2018)**.

El-Said (2015) found that foliar spray with kaolin (aluminum silicate) in 4% concentration had a significant effect on the number of branches/ plant, fresh and dry weight, leaf area/plant, total chlorophyll, N, P, K and Fe contents of leaves, number of fruits/plant, average fruit weight, early and total yield/feddan of eggplant *cv*. black beauty in Dakahlia Governorate. **El-Koumy and Moursi (2018)** illustrated that spraying with kaolin had a significant impact on plant fresh weight, yield components, and fruit quality. The highest early and total yields were with kaolin (2%), but kaolin (4%) under water stress was the best for plant growth and yield of eggplant *cv*. Sawad El Laiel. Kafr El-Sheikh Governorate.

MATERIALS AND METHODS

Experimental Site and Duration

Field experiments were carried out during the winter growing seasons of 2020-2021 and 2021-2022 at the Experimental Farm of the Faculty of Environmental Agricultural Sciences, Arish University, North Sinai, Egypt.

Objective

This research aimed to evaluate the effects of different irrigation intervals, organic mulch application, and anti-transpirant spraying on the growth of eggplant (*cv*. "Betra") under low plastic tunnels.

Plant Material and Plot Layout

Seedlings

Eggplant (*cv*. "Betra") from Fito Company.

Transplanting Date

October 20th in both seasons.

Irrigation system

Drip irrigation in 1.5 m between drip/ lines.

Plant spacing

50 cm among plants in the same row.

Plot area

10.5 m² (7 m length and 1.5 m width), with a planting density of 1.33 plants/m².

Soil characteristics

Sandy loam texture, pH 8.02, EC 1.03 dS/m, 17.65% $CaCO_3$, and 0.143% organic matter content.

Irrigation water

Groundwater with an EC of 4.92 dS/m (high salinity).

Experimental Treatments

Irrigation interval

Daily - every two days - every three days.

Organic mulch application

Without-with crushed wheat straw mulch.

Anti-transpirant spraying

Without-with aluminum silicate (sprayed every ten days at a rate of 5 g/20 L water).

Agricultural Practices

The fertilization program and traditional agricultural practices were conducted following the recommendations of the Ministry of Agriculture and Soil Reclamation for Arish region.

Data collection

Data were recorded after 75 days from transplanting and included:

Vegetative growth traits

Plant height (cm) - Number of leaves/ plant - Leaf area / plant (m^2)

Shoot dry weight (g)

Leaf Chlorophyll content a+b (mg g^{-1}FW)

Determined using the method described by **Moran (1982)**.

Experimental Design

The experiment was arranged in a complete randomized block design with a split-split plot arrangement and three replications:

Main plots

Irrigation intervals treatments.

Sub plots

Crushed wheat straw treatments.

Sub-sub plots

Aluminum silicate treatments.

Statistical Analysis

The data were analyzed using analysis of variance (ANOVA) following the methodology outlined by **Snedecor and Cochran (1980)**. Means were separated using the Least Significant Differences (LSD) test at the 5% level, as described by **Snedecor and Cochran (1967)**. Statistical analyses were performed using the SAS software program.

RESULTS AND DISCUSSION

Effect of Irrigation Intervals, Crushed Wheat Straw Mulch, And Aluminum Silicate Anti-Transpirant on Plant Height (cm) of Eggplant

Results in Table 1 illustrates the significant effects of studied factors and their interactions on plant height during both growing seasons, with specific exceptions noted.

Irrigation interval

The tallest plants were consistently observed with irrigation every two days across both seasons.

Organic mulch

In the second season, the treatment without wheat straw mulch recorded the highest plant height. However, in the first season, the effect of wheat straw mulch was not significant.

Anti-transpirant spraying

Aluminum silicate anti-transpirant did not significantly affect plant height in both seasons.

Interactions among Factors

The interaction between irrigation every two days and wheat straw mulch treatment resulted in the highest plant height in both seasons.

The interaction between irrigation every two days and no aluminum silicate anti-transpirant recorded the highest plant height in both seasons. There was no significant difference from the treatment of irrigation every two days with aluminum silicate anti-transpirant in the first season.

Table 1. Effect of irrigation intervals, crushed wheat straw mulch, and aluminum silicate anti-transpirant on plant height (cm) of eggplant at 75 days after transplanting in 2020-21 and 2021-22 seasons

Irrigation Interval	Wheat straw mulch	First season (2020-21)			Second season (2021-22)		
		aluminum silicate anti-transpirant			aluminum silicate anti-transpirant		
		Without	With	Mean	Without	With	Mean
Every day	Without	66.00	70.33	**68.16**	64.33	71.33	**67.83**
	With	58.66	63.00	**60.83**	54.00	56.66	**55.33**
	Mean	**62.33**	**66.66**	**64.50**	**59.16**	**64.00**	**61.58**
Every 2 days	Without	69.66	64.00	**66.83**	67.33	66.00	**66.66**
	With	72.33	73.66	**73.00**	68.00	72.33	**70.16**
	Mean	**71.66**	**68.16**	**69.91**	**69.83**	**67.00**	**68.41**
Every 3 days	Without	50.33	53.33	**51.83**	55.33	56.66	**56.00**
	With	52.00	51.33	**51.66**	52.33	53.33	**52.83**
	Mean	**51.16**	**52.33**	**51.75**	**53.83**	**55.00**	**54.41**
Mean for Wheat straw mulch	Without	62.00	62.55	**62.27**	62.33	64.66	**63.50**
	With	61.44	62.22	**61.83**	59.55	59.33	**59.44**
Mean for aluminum silicate anti-transpirant		**61.72**	**62.38**		**61.72**	**61.72**	
LSD 5% for:							
I			2.485			1.665	
WSM			2.029			1.359	
ASA			2.029			1.359	
I× WSM			3.515			2.355	
I× ASA			3.515			2.355	
WSM× ASA			2.870			1.922	
I× WSM× ASA			4.971			3.330	

I: Irrigation intervals WSM: wheat straw mulch ASA: Aluminum silicate anti- transpirant

The combination without wheat straw mulch and aluminum silicate anti-transpirant recorded the highest plant height in both seasons.

The triple interaction of irrigation every two days, wheat straw mulch, and aluminum silicate anti-transpirant produced the highest plant height in both seasons.

These results may be due to the presence of appropriate water content in ground solution around plant roots and reduction in plant water consumption making the physiological processes rate in the balanced case for best plant growth and highly formed dry matter. Wheat straw mulch raised soil temperature and reduced water

evaporation loss from soil, and increased water use efficiency. Consequently, the nutritional status improved, and this was reflected in the vegetative growth of the plant. Also, the anti-transpirant reduced water loss from the plant, which improved the process of photosynthesis due to the availability of water in the leaf tissue, then the plant's growth was better.

Supporting studies

Pirboneh *et al.* (2012) observed that a 6-day irrigation interval combined with straw mulch increased eggplant plant height under silty loam soil conditions in Guilan, Iran.

Abdalla *et al.* (2018) found that a 10-day irrigation period across three eggplant genotypes (Hanen F1, Classic F1, Alabaster F1) resulted in the highest average plant height under clayey soil conditions in Assiut.

El-Koumy and Moursi (2018) showed that a shorter irrigation interval (7 days) and spraying plants with a 2% kaolin solution gave the highest plant height values for eggplant under clayey soil conditions in Kafr-El Sheikh Governorate.

Effect of Irrigation Intervals, Crushed Wheat Straw Mulch, And Aluminum Silicate Anti-Transpirant on the Number of Leaves Per Plant of Eggplant

Results in Table 2 reveal the significant effects of studied factors and their interactions on the number of leaves/plant in both sampling dates, with the following exceptions: the effect of wheat straw mulch in the second season, the effect of aluminum silicate anti-transpirant in both seasons, and the interaction between wheat straw mulch and aluminum silicate anti-transpirant in the second season.

Irrigation interval

The highest number of leaves/plant was consistently recorded with irrigation every two days in both seasons.

Organic mulch

The application of wheat straw mulch resulted in the highest number of leaves/ plant in the first season. Its effect was not significant in the second season.

Anti-transpirant spraying

Aluminum silicate anti-transpirant did not significantly affect the number of leaves/plant in either season.

Interactions among factors

The combination of irrigation every two days and wheat straw mulch recorded the highest number of leaves/plant in both seasons.

The interaction of irrigation every two days without aluminum silicate anti-transpirant recorded the highest number of leaves/plant in both seasons, with no significant difference from the treatment with aluminum silicate anti-transpirant in the first season.

The treatment combining wheat straw mulch and aluminum silicate anti-transpirant recorded the highest number of leaves/ plant, followed by the treatment with wheat straw mulch without aluminum silicate anti-transpirant in the first season.

The triple interaction of irrigation every two days, wheat straw mulch, and aluminum silicate anti-transpirant achieved the highest number of leaves /plant in both seasons.

These findings may be due to the presence of adequate water in ground solution enhancing solubility and uptake of soil nutrients. Mulching keeps soil moisture at optimal levels, which improves the translocation of assimilates throughout the plant. Organic mulch also minimizes nitrate leaching, enhances soil physical properties, increases biological activity, balances the nitrogen cycle, provides organic matter, and improves temperature and water retention. Conversely, anti-transpirant application helps close stomata, reducing water loss and improving plant water potential under water deficit conditions.

Table 2. Effect of irrigation intervals, crushed wheat straw mulch, and aluminum silicate anti-transpirant on number of leaves of eggplant at 75 days after transplanting in 2020-21 and 2021-22 seasons

Irrigation Interval	Wheat straw mulch	First season (2020-21)			Second season (2021-22)		
		Aluminum silicate anti-transpirant			Aluminum silicate anti-transpirant		
		Without	With	Mean	Without	With	Mean
Every day	Without	83.33	88.33	**85.83**	87.67	86.33	**87.00**
	With	78.00	86.33	**82.16**	79.33	86.66	**83.00**
	mean	**80.66**	**87.33**	**84.00**	**83.50**	**86.50**	**85.00**
Every 2 days	Without	91.66	91.67	**91.66**	93.33	95.33	**94.33**
	With	96.00	103.0	**99.50**	95.00	108.3	**101.6**
	mean	**97.33**	**93.83**	**95.58**	**100.8**	**95.16**	**98.00**
Every 3 days	Without	69.33	69.33	**69.33**	76.00	76.66	**76.33**
	With	74.67	77.67	**76.16**	73.33	73.33	**73.33**
	mean	**72.00**	**73.50**	**72.75**	**74.67**	**75.00**	**74.83**
Mean for wheat straw mulch	Without	81.44	83.11	**82.27**	85.67	86.11	**85.89**
	With	85.22	86.66	**85.94**	87.00	85.00	**86.00**
Mean for aluminum silicate anti-transpirant		**83.33**	**84.88**		**86.33**	**85.56**	
LSD 5% for:							
I			2.876			2.622	
WSM			2.348			2.141	
ASA			2.348			2.141	
I× WSM			4.067			3.709	
I× ASA			4.067			3.709	
WSM× ASA			3.321			3.028	
I× WSM× ASA			5.753			5.245	

I: Irrigation intervals WSM: wheat straw mulch ASA: Aluminum silicate anti- transpirant.

Supporting studies

Abd El-Hady and Samar (2017) reported a significant increase in the number of leaves/plant for eggplant *cv.* "long black" under sandy clay loamy soil conditions in Mansoura Governorate with irrigation every 10 days.

Effect of Irrigation Intervals, Crushed Wheat Straw Mulch, And Aluminum Silicate Anti-Transpirant on Leaf Area Per Plant (m^2) of Eggplant

Results in Table 3 show the significant effects for studied factors and their interactions on leaf area (m^2/plant) in both sampling dates.

Table 3. Effect of irrigation intervals, wheat straw mulch, and aluminum silicate anti-transpirant on leaf area (m^2 /plant) of eggplant at 75 days after transplanting in 2020-21 and 2021-22 seasons

Irrigation Interval	Wheat straw mulch	First season (2020-21)			Second season (2021-22)		
		Aluminum silicate anti-transpirant			Aluminum silicate anti-transpirant		
		Without	With	Mean	Without	With	Mean
Every day	Without	1.269	1.493	**1.381**	1.358	1.543	**1.451**
	With	1.146	1.357	**1.251**	1.058	1.709	**1.383**
	mean	**1.208**	**1.425**	**1.316**	**1.208**	**1.626**	**1.417**
Every 2 days	Without	1.206	2.390	**1.798**	1.412	1.225	**1.318**
	With	1.564	1.335	**1.450**	2.024	2.054	**2.039**
	mean	**1.271**	**1.977**	**1.624**	**1.639**	**1.718**	**1.679**
Every 3 days	Without	1.061	1.151	**1.106**	0.848	1.199	**1.023**
	With	1.238	1.341	**1.289**	1.346	1.288	**1.317**
	mean	**1.149**	**1.246**	**1.197**	**1.097**	**1.243**	**1.170**
Mean for wheat straw mulch	Without	1.179	1.678	**1.428**	1.206	1.322	**1.264**
	With	1.240	1.421	**1.330**	1.476	1.684	**1.580**
Mean for aluminum silicate anti-transpirant		**1.209**	**1.549**	**1.543**	**1.341**	**1.503**	
		LSD 5% for:					
I		0.059			0.072		
WSM		0.048			0.059		
ASA		0.048			0.059		
I× WSM		0.083			0.102		
I× ASA		0.083			0.102		
WSM× ASA		0.068			0.083		
I× WSM× ASA		0.118			0.144		

I: Irrigation intervals WSM: wheat straw mulch ASA: Aluminum silicate anti-transpirant.

Irrigation interval

The highest leaf area/plant was consistently recorded with irrigation every two days in both seasons.

Organic mulch

In the first season, the treatment without wheat straw mulch recorded the highest leaf area/plant. Conversely, in the second season, the application of wheat straw mulch resulted in the highest leaf area/ plant.

Anti-transpirant spraying

Spraying aluminum silicate anti-transpirant resulted in the highest leaf area/plant in both seasons.

Interactions among factors

The interaction of irrigation every two days and no wheat straw mulch recorded the highest leaf area/ plant in the first season. However, in the second season, the interaction of irrigation every two days and wheat straw mulch recorded the highest leaf area/ plant.

The combination of irrigation every two days and aluminum silicate anti-transpirant recorded the highest leaf area/ plant in both seasons.

The treatment combining wheat straw mulch and aluminum silicate anti-transpirant recorded the highest leaf area/ plant.

The three-way interaction of irrigation every two days, wheat straw mulch, and aluminum silicate anti-transpirant achieved the highest leaf area/plant.

These results may be due to the combined use of organic mulch (wheat straw) and anti-transpirant (aluminum silicate) effectively mitigating environmental stress under the specific conditions of loamy sand soil in the study site. Organic mulch helps maintain soil moisture, reduces evaporation, and improves soil structure and nutrient availability. The anti-transpirant reduces water loss through stomatal closure, enhancing water use efficiency and maintaining leaf turgor.

Supporting studies

Rakha (2014) found that a 10-day irrigation interval and foliar application of 4% kaolin significantly increased the leaf area of eggplant *cv.* 'Black Beauty' under clay loam soil in Dakahlia Governorate.

El-Said (2015) reported that a 10-day irrigation interval and 4% kaolin foliar application induced a significant increase in leaf area of eggplant *cv*. 'Black Beauty' under clayey soil conditions in Dakahlia Governorate.

El-Semellawy and El-Koumy (2015) found that organic mulch treatments (rice straw, wheat straw, dry grass) significantly increased leaf area per plant of eggplant *cv*. "Sawad. El laiel F1" under clayey soil conditions in Kafr El-Sheikh Governorate.

Effect of Irrigation Intervals, Crushed Wheat Straw Mulch, and Aluminum Silicate Anti-Transpirant on Shoot Dry Weight (g) of Eggplant

Results presented in Table 4 indicate the significant effects of the studied factors and their interactions on shoot dry weight, except for the effect of wheat straw mulch in the first season.

Irrigation interval

The highest shoot dry weight was consistently recorded with irrigation every two days in both seasons.

Organic mulch

In the second season, the application of wheat straw mulch resulted in the highest shoot dry weight. Its effect was not significant in the first season.

Anti-transpirant spraying

Spraying aluminum silicate anti-transpirant resulted in the highest shoot dry weight in both seasons.

Interactions among factors

The combination of irrigation every two days and wheat straw mulch recorded the highest shoot dry weight in both seasons.

The interaction of irrigation every two days and aluminum silicate anti-transpirant treatment also gave the highest shoot dry weight in both seasons.

The treatment combining wheat straw mulch and aluminum silicate anti-transpirant recorded the highest shoot dry weight.

The three-way interaction of irrigation every two days, wheat straw mulch, and aluminum silicate anti-transpirant achieved the highest shoot dry weight in both seasons.

Table 4. Effect of irrigation intervals, crushed wheat straw mulch, and aluminum silicate anti-transpirant on shoot dry weight (g) of eggplant at 75 days after transplanting in 2020-21 and 2021-22 seasons

Irrigation Interval	Wheat straw mulch	First season (2020-21)			Second season (2021-22)		
		Aluminum silicate anti - transpirant			Aluminum silicate anti-transpirant		
		Without	With	Mean	Without	With	Mean
Every day	Without	127.1	135.6	**131.3**	136.0	146.4	**141.2**
	With	131.8	129.6	**130.7**	144.1	144.3	**144.2**
	Mean	**129.4**	**132.6**	**131.0**	**140.2**	**145.2**	**142.7**
Every 2 days	Without	139.4	132.3	**135.9**	138.8	141.1	**139.9**
	With	133.2	148.4	**140.8**	143.2	156.4	**150.1**
	Mean	**136.3**	**140.3**	**138.3**	**142.2**	**147.8**	**145.0**
Every 3 days	Without	129.2	127.6	**128.4**	130.7	132.6	**131.7**
	With	127.5	130.9	**129.2**	131.7	132.4	**132.0**
	Mean	**128.3**	**129.3**	**128.8**	**131.5**	**132.2**	**131.9**
Mean for wheat straw mulch	Without	131.9	131.8	**131.9**	136.0	139.3	**137.6**
	With	130.8	136.3	**133.3**	140.1	144.2	**142.1**
Mean for aluminum silicate anti-transpirant		**131.4**	**134.1**		**138.8**	**141.7**	
LSD 5% for:							
I			2.477			2.493	
WSM			2.023			2.036	
ASA			2.023			2.036	
I× WSM			3.504			3.526	
I× ASA			3.504			3.526	
WSM× ASA			2.861			2.879	
I× WSM× ASA			4.955			4.987	

I: Irrigation intervals WSM: wheat straw mulch ASA: Aluminum silicate anti-transpirant.

These results can be attributed to increased vegetative growth as reflected in the results for plant height, number of leaves, leaf area (Tables 1, 2 and 3), and the increase in shoot fresh weight.

Supporting studies

Abd El-Hady and Samar (2017) found that irrigation every 10 days resulted in significant increases in the dry weight of eggplant under conditions in Dakahlia Governorate.

Abdalla *et al.* (2018) reported that irrigation every 10 days significantly increased plant dry weight in both seasons under Assiut conditions.

El-Koumy and Moursi (2018) demonstrated that irrigation every 7 days and spraying with 2% kaolin increased dry weight of eggplant in Kafr-El Sheikh Governorate.

Effect of Irrigation Intervals, Crushed Wheat Straw Mulch, And Aluminum Silicate Anti-Transpirant on Chlorophyll a+b Content of (mg g^{-1}FW) Eggplant Leaves

Results presented in Table 5 show the significant effects for studied factors and their interactions on chlorophyll a+b content, with exceptions noted in the first season for the effects of irrigation interval, wheat straw mulch, aluminum silicate anti-transpirant, and the interaction between irrigation interval and wheat straw mulch.

Irrigation interval

The highest value of chlorophyll a+b was consistently recorded with irrigation every two days in both seasons.

Organic mulch

The application of wheat straw mulch resulted in the highest chlorophyll a + b content in both seasons.

Table 5. Effect of irrigation intervals, crushed wheat straw mulch, and aluminum silicate anti-transpirant on chlorophyll a+b (mg g^{-1}FW) of eggplant leaves at 75 days after transplanting in 2020-21 and 2021-22 seasons

Irrigation Interval	Wheat straw mulch	First season (2020-21)			Second season (2021-22)		
		Aluminum silicate anti - transpirant			Aluminum silicate anti-transpirant		
		Without	With	Mean	Without	With	Mean
Every day	Without	4.956	5.281	**5.118**	3.866	4.719	**4.293**
	With	6.149	5.603	**5.876**	5.819	6.061	**5.940**
	mean	**5.552**	**5.442**	**5.497**	**4.842**	**5.390**	**5.116**
Every 2 days	Without	5.558	5.864	**5.711**	5.952	5.162	**5.557**
	With	6.613	5.387	**6.005**	6.130	5.122	**5.626**
	mean	**6.085**	**5.626**	**5.855**	**6.041**	**5.142**	**5.591**
Every 3 days	Without	4.672	5.725	**5.198**	5.226	4.904	**5.065**
	With	5.252	5.980	**5.616**	4.661	4.494	**4.577**
	mean	**4.962**	**5.853**	**5.407**	**4.943**	**4.699**	**4.821**
Mean for wheat straw mulch	Without	5 .062	5.623	**5.343**	5.015	4.928	**4.971**
	With	6.004	5.657	**5.831**	5.536	5.225	**5.381**
Mean for aluminum silicate anti-transpirant		**5.533**	**5.640**		**5.275**	**5.077**	
		LSD 5% for:					
I		0.780			0.075		
WSM		0.636			0.061		
ASA		0.636			0.061		
I× WSM		1.103			0.106		
I× ASA		1.103			0.106		
WSM× ASA		0.900			0.087		
I× WSM× ASA		1.560			0.151		

I: Irrigation intervals WSM: wheat straw mulch ASA: Aluminum silicate anti-transpirant

Anti-transpirant Spraying

Without spraying aluminum silicate anti-transpirant, the highest chlorophyll a+b content was recorded in the second season.

Interactions among factors

The interaction of daily irrigation with wheat straw mulch recorded the highest chlorophyll a+b content in the second season.

The interaction of irrigation every two days without aluminum silicate anti-transpirant recorded the highest chlorophyll a+b content in both seasons.

The combination of wheat straw mulch and no aluminum silicate anti-transpirant treatment recorded the highest chlorophyll a+b content in both seasons.

The three-way interaction of irrigation every two days, wheat straw mulch, and no aluminum silicate anti-transpirant achieved the highest chlorophyll a+b content in the second season.

These findings can be attributed to the increased number of leaves/plant (Table 2) and leaf area/plant (Table 3).

Supporting studies

Mohawesh (2016) found that water deficit decreases chlorophyll content because plants under water deficiency reduce their growth, including the number of leaves per plant, leaf area, plant height, fresh weight, and dry weight under Jordanian conditions.

Rodan *et al.* (2022) showed that the use of organic mulch and an impermeable layer under water requirements of 70% and 40% increased chlorophyll content by reducing the adverse effects of dehydration and preventing the destruction of chlorophyll content in eggplants.

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الملخص العربي

تأثير فترات الري، تغطية سطح التربة بتبن القمح ، ومضادات النتح على بعض صفات النمو الخضري للباذنجان تحت الأنفاق البلاستيكية المنخفضة بمنطقة العريش

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أجريت تجارب حقلية فى المزرعة التجريبية الخاصة بكلية العلوم الزراعية البيئية فى العريش، محافظة شمال سيناء خلال الموسم الشتوي لعامي 2020-21 و2021-22م. كان الهدف منها هو دراسة تأثير ثلاث فترات ري مختلفة (كنترول؛ الري كل يوم، وكل يومين، وكل ثلاثة أيام)، وتغطية سطح التربة بالملش العضوي (كنترول بدون إضافة قش القمح المجروش، وإضافة قش القمح المجروش)، ورش النباتات بمضاد للنتح (كنترول بدون رش سليكات الألمونيوم، ورش سليكات الألمونيوم) على إنتاجية الباذنجان. وقد جرى شتل صنف "بترا" فى العشرين من أكتوبر فى الموسمين، وتم استخدام نظام الرى بالتنقيط؛ حيث كانت المسافة بين خطوط الرى بالتنقيط 1.5 متراً، و بين النباتات في نفس الخط 50 سم؛ و كانت مساحة الوحدة التجريبية 10.5 م^2 (7م طول × 1.5 م عرض)، وبذا فإن الكثافة النباتية كانت 1.33 نبات/م^2. وزعت المعاملات بصورة عشوائية باستخدام تصميم القطاعات كاملة العشوائية بنظام القطع المنشقة مرتين فى ثلاث مكررات. نتج عن التفاعل بين الرى كل يومين مع إضافة قش القمح المجروش ورش سليكات الألمونيوم أعلى القيم لكل الصفات المدروسة: طول النبات، وعدد الأوراق/النبات، والمساحة الورقية/النبات، والوزن الجاف للمجموع الخضرى ما عدا محتوى الأوراق من كلورفيل (أ + ب) فى الموسمين.

الكلمات الاسترشادية: الباذنجان، فترات الرى، الملش العضوى، مضاد نتح .

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