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Study the Response of Five Canola Cultivars to Foliar Spraying by some Antioxidants

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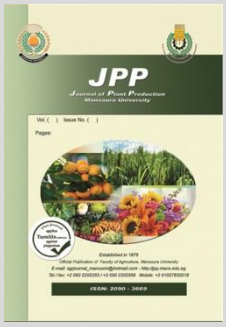

ABSTRACT

During the 2017/2018 and 2018/2019 seasons a field experiment was conducted at the Agriculture Faculty Experimental Farm, New Valley University to study the response of some canola cultivars to foliar spraying with antioxidants. The experiment carried out in the complete randomized block design (RCBD) with using strips orthogonal system in the experimental units' arrangement. Antioxidants foliar application of 200 ppm of Ascorbic, Citric and Ascorbic + Citric were arranged vertically while, canola cultivars (Pactol, Tpaz, Serw-4, Serw-6 and AD-201) were assigned horizontally. The obtained results showed that Serw-6 cultivar exhibit superiority other cultivars under study in racemes number, silique number and plant seeds weight as well as seed and oil yields/fed. in the two growing seasons. While, Serw-4 cultivar superior other cultivars under study in plant height and thousand seed weight. In addition, Pactol cultivar superior other cultivars in oil% in both seasons. Antioxidant foliar spray significantly improved all traits under this study the results were in favor of foliar spraying by Citric acid (200 ppm).The highest seed yield/fed (971.8 and 1020.5 kg/fed) in the two successive seasons, respectively were obtained from plants of Serw-6 cultivar which were sprayed by Citric acid. While, the highest oil yield/fed (379.60 and 379.10 kg/fed) in the two successive seasons, respectively were obtained also from Serw-6 cultivar plants which were sprayed by Ascorbic acid in the first season and Citric acid in the second season. This study recommends cultivation of Serw-6 canola cultivar with foliar spraying by Citric acid or Ascorbic acid (200 ppm).

Keywords: Canola, Cultivars, Varieties, Antioxidants, Ascorbic acid, Citric acid, Seed and oil yields.

INTRODUCTION

Canola (*Brassica* sp.) is one of the most important oil crops in many countries in the world. Its oil is used as biofuel, human consumption (edible oil), feeding animals, and used in chemical and pharmaceutical industries (Friedt and Snowdon, 2009). It belongs to the family of Brassicaceae, which is becoming one of the major sources of the vegetable oil in the world (Baghdadi *et al.*, 2013). It is the second largest oil seed after soybean worldwide, producing high-protein meal used for animal feed during processing. El-Hamidi and Zaher (2018) point that in Egypt, production of edible vegetable oil in Egypt has faced countless problems. In the year of 2018, Egypt produced approximately 0.66 million tons of edible oils while, its consumption about 2.66 million tons and import about 2 million tons (FAS, 2019), therefore, the gap between production and consumption was more than 75%. So, increasing the production of oil crops to net the high demined is a must by choosing the suitable canola cultivar and supplied it by some enhancement growth substances such as antioxidants.

There are positive roles of antioxidants by scanning or extracting free radicals and activating natural resistance against biotic and abiotic stress. (Rao *et al*., 2000). Ascorbic acid (AS) and citric acid (CA) are both antioxidants and anti-stress factors and also act as a signaling molecule in some plant physiological and defense mechanisms (El-Kobisy *et al*., 2005). Due to its role as a co-factor in the biosynthesis of phytohormones such as gibberellins, ethylene and abscisic acid, Acorbic acid has an important regulatory role in many physiological and biochemical process of plants. Since they have stimulatory effects on growth and production of most fruit trees, Ascorbic and Citric acids are considered to have auxinic actions (Ragab, 2002). Sakr and Arafa (2009) reported that applied of spermine 10 mg/L and ascorbic acid 200 mg/L antioxidants increased growth characters including; plant height and yield and its components including; racemes and siliques numbers/plant, seed number/silique, seed yield/plant and seed oil content of canola plant. Sharghi *et al*. (2011) pointed out that many workers have observed the changes in physiological and morphological aspects of plants due to application of growth regulators and on this aspect a considerable amount of literature has been accumulated. Meanwhile, antioxidants are natural compounds that are safe for humans, animals and the environment. Since natural compounds and antioxidants are more acceptable than synthetic compounds, so these compounds can be considered as a good alternative to chemicals in agricultural production systems (Asghari and Hasanlooe, 2015). El-Sabagh *et al.* (2017) revealed that the application of phytochemical (salicylic and ascorbic acids) improved the growth and yield parameters of canola plant. Nehal *et al.* (2017) pointed that foliar application of plant growth regulators improved all the growth (plant height and number of branches/plant) and the yield and yield

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attributing characters under normal and drought conditions. Salem and Shoman (2018) showed that antioxidants application had remarkable effects on plant height, head diameter, number of seeds/head, 1000-seed weight, seed and oil yields as well as harvest index, shelling, seed protein and seed oil percentages of sunflower plants.

Canola cultivars differed significantly in morphologic, physiologic and yield attributes, these varying were reported by Naghizadeh and Hasanzadeh (2012), Khedri and Golparvar (2012), Ul Haq *et al*. (2014), Sher *et al.* (2017), Barekati *et al.* (2019), Manaf *et al*. (2019), Zorzenoni *et al*. (2019), Afsahi *et al.* (2020) and Monfared *et al*. (2020) . Also, Noreen *et al.* (2016) showed that various cultivars of canola differed significantly amongst themselves with respect to components of seed yield.

The study main objective was to elucidate the response of some canola cultivars to foliar spraying by some antioxidants under New Valley conditions.

MATARIALS AND METHODES

This work was carried out during 2017/2018 and 2018/2019 seasons at the Experimental Farm of Agriculture Faculty, New Valley University in order to study the effect of foliar spraying by some antioxidants on seed yield and its components as well as oil yield of some canola cultivars.

Design of experiment and treatments:

The experiment was laid out in randomize complete blocks design (RCBD) using strips orthogonal system in the experimental units' arrangement with three replications. Antioxidant foliar application of 200 ppm of Ascorbic, Citric and Ascorbic + Citric were arranged vertically. While, canola cultivars (Pactol, Tpaz, Serw-4, Serw-6 and AD-201) were allocated horizontally.

Antioxidants treatments and control (tab water) were applied using back sprayer after 45 and 60 days after sowing.

The mechanical and chemical analyses results of the experimental soil are presented in Table 1.

Table 1. Some physical and chemical properties of the experimental soil.

Properties	2017/2018	2018/2019
Mechanical analysis (%)		
Sand	89.55	87.46
Silt	6.35	6.83
Clay	4.10	5.71
Soil texture	Sandy	Sandy
Chemical analysis:		
pH(sp. m^{-1})	8.63	8.53
E.C. (dS m^{-1})	2.27	2.23
Organic matter (%)	0.50	0.50
Total $CaCO_3$ (%)	35.20	35.65

Soil analysis was done according to the method described by Jackson (1967) at the Laboratory of Water and Soil Department, Faculty of Agriculture, New Valley University.

The sub plot area was 10.5 m^2 (included 5 ridges, in apart of 60 cm width and 3.5 m long). Maize was the preceding summer crop in both seasons.

Canola seeds were hand sown on rows 60 cm distance in hills 20 cm apart on 1st and 3rd Nov in the first and second growing seasons, respectively and thinning was done to secure two plants/hill after 30 days from planting. All other recommended cultural practices for canola crop were done in the two seasons according to recommended.

Measured traits:

1- **Yield attributes:** Five guarded plants at harvest were taken randomly from each experimental unit then plant height (cm), number of racemes/plant, siliques number/plant, 1000-seed weight (g) and seed weight (g/plant) were measured.

2- **Seed yield (kg/fed.):** Plants in the three inner ridges were harvested dried threshed and seeds were weighted in kg/m^2, then it was converted to seed yield kg/fed.

3- **Oil percentage (%):** Oil percentage in canola seeds was estimated by extraction using Soxhlet apparatus and petroleum ether (bp 40 – 60°C) as solvent according to A.O.A.C. (2000).

4- **Oil yield (kg/fed.):**

Oil yield/fed = Seed yield/fed. × oil percentage (%).

Statistical analysis:

All data were collected, tabulated and analyzed using analysis of variance (ANOVA), for the strip-plot design using the MSTAT-Co-statistical analysis. Comparing among all treatments means were performed using revised least significant difference (RLSD) at 5% level of significant (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

1- Plant height (cm) and racemes number/plant traits:

Canola cultivars differed significantly in all studied traits i.e., plant height, racemes number/plant, siliques number /plant, 1000-seed weight, seed weight/plant and oil% as well as seed and oil yields/fed. In both seasons. The results as shown in Fig 1 point out that Serw-4 and Serw-6 cultivars superior significantly the other studied cultivars in plant height and racemes number/plant in the both seasons. The tallest plants (157.95 and 158.57 cm in the two respective seasons) were recorded from Serw-4 cultivar. While, the largest racemes numbers/plant (7.67 and 8.11in the two successive seasons, respectively) were recorded from Serw-6 cultivar. This may be due to the interaction between genotype and environmental conditions which were more suitable for Serw-4 and Serw-6 canola cultivars. These finding are in a good line with those obtained by Khedri and Golparvar (2012), Ul Haq *et al*. (2014), Barekati *et al.* (2019), Manaf *et al*. (2019), Zorzenoni *et al*. (2019) and Monfared *et al*. (2020).

Furthermore, the illustrated results in Fig. 2 reveal that antioxidants foliar spray had a significant effect on plant height and racemes number/plant in the both seasons. The tallest canola plants (156.35 and 154.43 cm in the two successive seasons, respectively) as well as the highest mean values of racemes number/plant (7.80 and 8.20 the two successive seasons, respectively) resulted from canola plants which when it were sprayed by Citric acid (200 ppm). This due to fact that antioxidants its beneficial effect on vegetative growth of such plants. These results are in the similar trend with those found by El-Sabagh *et al.* (2017) and Nehal *et al.* (2017) in canola plants and Salem and Shoman (2018) in sunflower.

Moreover, canola cultivars and antioxidants interaction as shown in Fig 3 exhibited that significant response of canola cultivars to antioxidant foliar spray for plant height and number of racemes /plant traits in the first season, only. Serw-4 cultivar had the tallest plants (167.60 cm) when it was sprayed by Citric acid while, Serw-6 cultivar had the highest number of racemes/plant (8.89) when it was received the same treatment.

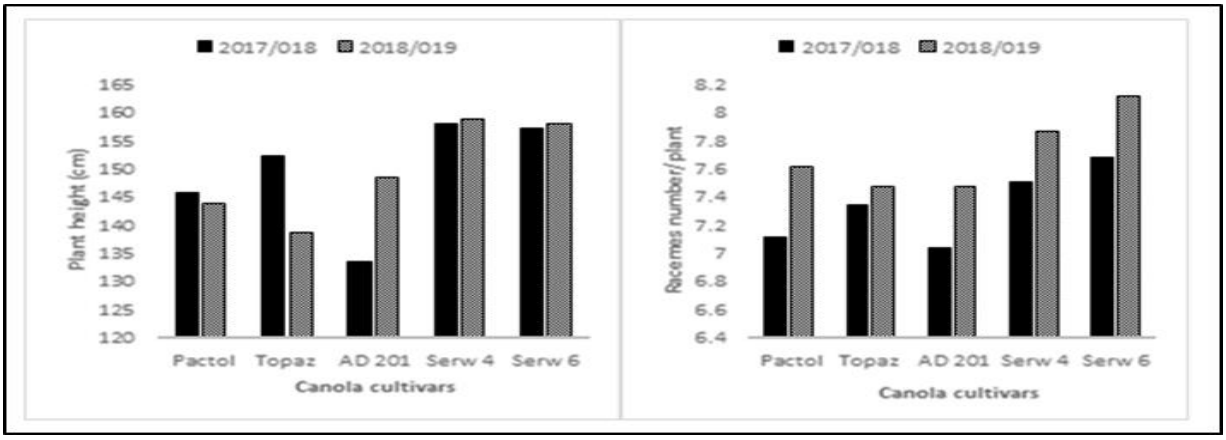

Fig. 1. Effect of some canola cultivars on plant height and racemes number/plant in 2017/2018 and 2018/2019 seasons.

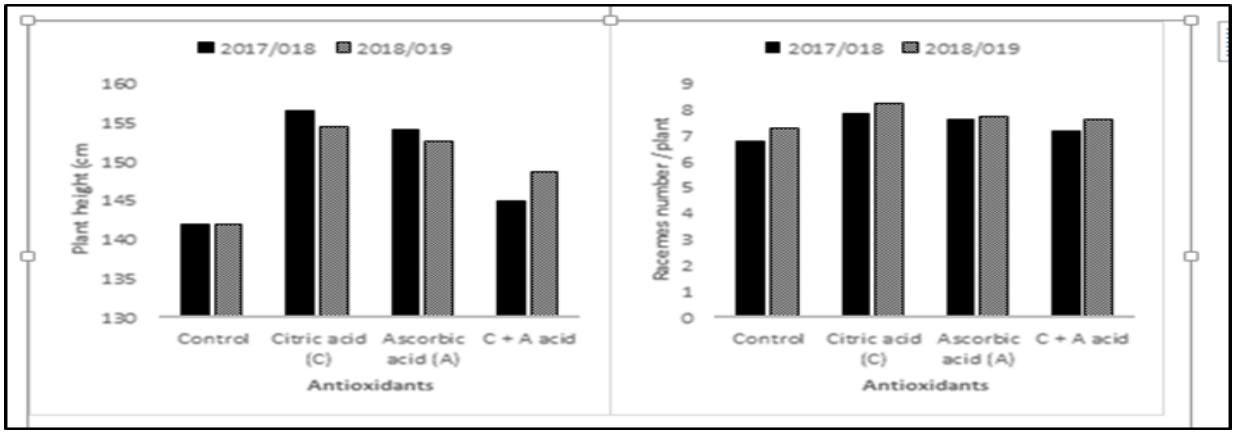

Fig. 2. Effect of some antioxidants on plant height and racemes number/plant in 2017/2018 and 2018/2019 seasons.

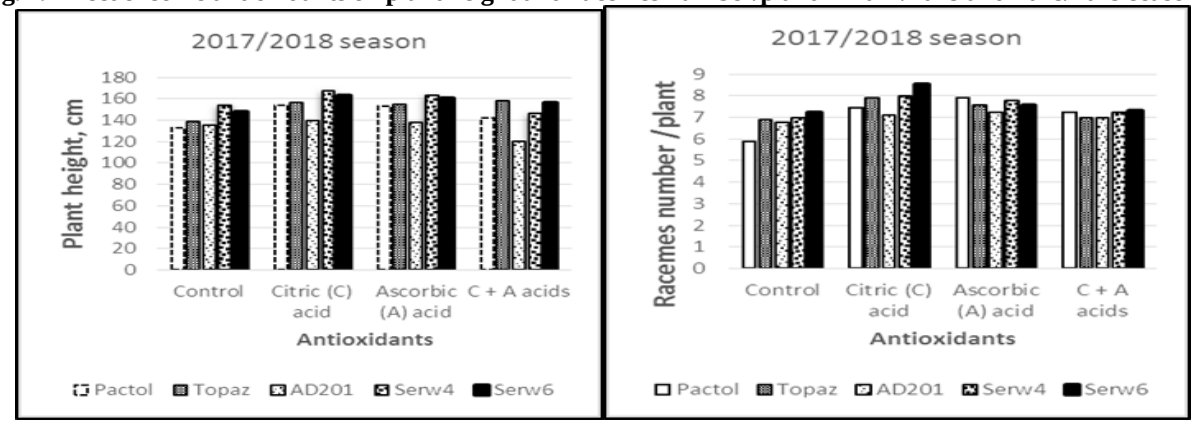

Fig. 3. Effect of canola cultivars and antioxidants interaction on plant height and resumes no./plant in 2017/2018 season.

2- Siliques Number/plant and 1000-seed weight traits:

The obtained results in Table 2 point out that Serw-4 and Serw-6 cultivars superior significantly the other studied cultivars in siliques number/plant and 1000-seed weight in the both seasons. Thus, Serw-6 cultivar had the highest number of siliques/plant (141.9 and 141.2 in the first and second seasons, respectively), this may be due to the high increase of racemes number/plant recorded for Serw-6 compared the other studied cultivars while, Serw-4 cultivar had the heaviest 1000-seed weight (3.34 and 3.32 g in the first and second seasons, respectively). This may be due to the interaction between genotype and environmental conditions which were more suitable for Serw-4 and Serw-6 canola cultivars. The previous results are in accordance with those obtained by Khedri and Golparvar (2012), Barekati *et al.* (2019), Zorzenoni *et al.* (2019), Afsahi *et al.* (2020) and Monfared *et al.* (2020).

Moreover, the presented results in Table 2 reveal that the antioxidants foliar spray had a significant effect ($P \leq 0.05$) on number of siliques/plant and a highly significant effect ($P \leq 0.01$) on 1000-seed weight in the two growing seasons. Canola plants which were sprayed by Citric acid registered the highest siliques number/plant mean values (135.0 and 132.4in the two respective seasons) as well as the highest 1000-seed weight mean values (3.38 and 3.34 g in the first and second season, respectively). This could be due to improvement number of fertile flowers and translocation of metabolites products to seed. These findings are in the same trend with those reported by Nehal *et al.* (2017) and Salem and Shoman (2018).

Table 2. Effect of antioxidants, cultivars and their interaction on siliques no. /plant and 1000-seed weight (g) of canola in 2017/2018 and 2018/2019 seasons.

Trait	Siliques number /plant										1000-seed weight (g)									
Season	2017/2018						2018/2019						2017/2018						2018/2019			
Antioxidants (A) Cultivars (C)	Control	Citric acid	Ascorbic acid	Citric + Ascorbic	Mean		Control	Citric acid	Ascorbic acid	Citric + Ascorbic	Mean		Control	Citric acid	Ascorbic acid	Citric + Ascorbic	Mean		Control	Citric acid	Ascorbic acid	Citric + Ascorbic	Mean	
Pactol	100.6	116.1	145.0	115.6	119.3		123.9	140.0	125.9	118.9	127.2		3.31	3.32	3.32	3.31	3.32		3.33	3.34	3.26	3.27	3.22	
Topaz	125.9	136.4	129.7	101.6	123.4		105.5	108.8	135.7	116.6	116.7		3.18	3.36	3.17	3.27	3.25		3.25	3.18	3.36	3.22	3.28	
AD-201	118.8	114.8	111.6	103.1	112.1		117.3	118.4	112.1	117.7	116.4		3.22	3.21	3.26	3.37	3.27		3.27	3.23	3.34	3.35	3.32	
Serw-4	152.3	161.1	107.3	102.5	130.8		135.3	148.0	135.9	141.5	140.2		3.23	3.49	3.41	3.31	3.36		3.35	3.27	3.44	3.35	3.34	
Serw-6	131.7	146.6	142.1	147.3	141.9		133.4	146.7	146.3	138.6	141.2		3.12	3.54	3.42	3.26	3.34		3.33	3.26	3.29	3.37	3.32	
Mean	125.9	135.0	127.1	114.0	----		123.1	132.4	131.2	126.6	----		3.21	3.38	3.32	3.30	----		3.26	3.34	3.31	3.28	----	
F_{test} / $R.LSD_{0.05}$	F test		R. LSD.0.05				F test		R. $LSD_{0.05}$				F test		R. LSD.0.05				F test		R. LSD.0.05			
C	**		10.73				**		5.87				*		0.06				*		0.07			
A	*		10.60				*		7.87				**		0.08				**		0.05			
A × C	**		12.10				**		7.75				**		0.15				**		0.09			

Where: * and ** mean significant at 5 and 1 % level of probability, respectively.

The interaction effect between canola cultivars and antioxidants treatments had a highly significant (P≤0.01) effect on number of siliques/plant and 1000-seed weight in the both seasons (Table 2).Thus, Serw-4 cultivar exerted a good response to foliar spray by Citric acid where the highest numbers of siliques/plant (161.1 and 148.8 in the two respective seasons) were recorded. While, it exerted the same response for 1000-seed weight when Serw-4 was foliar sprayed by Citric and Ascorbic acids in the first and second season, respectively.

3- Seeds weight /plant and fed. traits:

Results presented in Table 3 demonstrate that high significant (P≤0.01) differences between canola cultivars in seed weight/plant and seed yield/fed. were observed in the both season except, seed yield/fed. in the second season where it was significant (P≤0.05), only. Serw-6 cultivar superior the other cultivars in both traits and recorded the highest seed weight/plant (15.43 and 15.23 g/ plant in the two respective seasons) as well as the highest seed yield/fed. (889.3 and 925.5 kg/fed. In the two respective seasons). This is to be logic since Serw-6 cultivar registered the highest numbers of resumes and siliques/plant traits as mentioned before and consequently gained the highest seed weight/plant and seed yield/fed. These results are in agreement with those reported by Sher *et al.* (2017), Barekati *et al.* (2019), Hemmati *et al.* (2019), Monfared *et al.* (2020), Ozturk (2019), Safdari- Monfared (2019), Zorzenoni *et al.* (2019) and Afsahi *et al.* (2020).

Table 3. Effect of antioxidants, cultivars and their interaction on seed weight/plant (g)and seed yield (kg/fed.) of canola in 2017/2018 and 2018/2019 seasons.

Trait	Seed weight/plant (g)										Seed yield (kg/fed.)									
Season	2017/2018						2018/2019				2017/2018						2018/2019			
Antioxidants (A) Cultivars (C)	Control	Citric acid	Ascorbic acid	Citric + Ascorbic	Mean		Control	Citric acid	Ascorbic acid	Citric + Ascorbic	Mean		Control	Citric acid	Ascorbic acid	Citric + Ascorbic	Mean		Control	Citric acid	Ascorbic acid	Citric + Ascorbic	Mean	
Pactol	10.91	11.88	12.38	12.27	11.86		9.50	12.94	11.91	11.16	11.38		607.6	861.2	852.1	843.5	791.1		793.0	868.4	848.4	818.5	832.0	
Topaz	10.84	12.89	12.76	11.57	12.02		9.54	11.95	11.64	11.71	11.21		734.0	787.9	803.2	741.9	766.7		650.2	702.0	992.9	859.7	801.2	
AD-201	11.13	11.53	11.80	12.51	11.74		10.24	12.29	11.96	10.48	11.24		711.6	858.9	849.8	728.2	787.1		758.5	973.7	831.6	780.5	836.1	
Serw-4	13.79	15.96	11.57	10.45	12.94		11.20	14.60	13.43	12.94	13.04		763.2	938.6	811.3	732.4	811.4		786.7	904.0	841.6	838.0	842.6	
Serw-6	14.76	16.39	15.29	15.29	15.43		13.43	15.22	16.94	15.31	15.23		772.0	971.8	941.5	871.7	889.3		774.2	1020.5	975.2	932.0	925.5	
Mean	12.29	13.73	12.76	12.42	---		10.78	13.40	13.18	12.32	---		717.7	883. 7	851.6	783.5	---		752.5	897. 9	893.7	845.7	---	
F_{test} / $R.LSD_{0.05}$	F test		R. LSD.0.05				F test		R. $LSD_{0.05}$				F test		R. LSD.0.05				F test		R. LSD.0.05			
C	**		0.97				**		0.55				**		51.8				*		85.5			
A	*		1.00				**		0.66				**		31.3				**		29.8			
A × C	**		1.29				*		1.28				**		86. 8				**		140.9			

Where: * and **significant at 5 and 1 % level of probability, respectively.

The antioxidants foliar spray applications had a significant effect (P≤0.05) on plant seed weight in the first season and highly significant in the second season where, the highest seed weight/plant mean values (13.73 and 13.40 g in the two respective seasons) were obtained from Citric acid treatment. In this trend, a highly significant effect (P≤0.01) on seed yield/fed. by antioxidants foliar application was observed in the two growing seasons. Seed yield/fed. increased by applied antioxidants foliar spray especially, Citric acid in both seasons. The increases in seed yield/fed. with using Citric acid foliar spray were 23.13, 19.32% compared to control in the first and second season, respectively. This increase may be due to increasing all yield attributes under this study by antioxidants foliar spray especially, Citric acid. These results are in the same trend with those reported by El-Sabagh et al. (2017), and Salem and Shoman (2018).

The interaction effect between canola cultivars and antioxidants treatments was highly significant (P≤0.01) on seed weight/plant in the first season and significant (P≤0.05) in the second season. The highest mean values of seed weight/plant (16.39 and 16.94 g/plant in the two

respective seasons) were recorded from Serw-6 when sprayed by Citric acid and Ascorbic acid in the first and second season, respectively. Seed yield/fed. was affected significantly by the interaction between canola cultivars and antioxidants treatments in both seasons. Serw-6 exerted a good response to foliar spray by Citric acid and recorded the highest mean values of Seed yield/fed. (971.8 and 1020.5 kg/fed. in the two respective seasons).

4- Seed oil content and oil yield traits:

Results presented in Table 4 demonstrate that high significant (P≤0.01) differences between canola cultivars in seed oil% and oil yield/fed. were observed in the first season and significant (P≤0.05) only in the second season. Pactol canola cultivar superior other cultivars in seed oil content % in both seasons and recorded the highest seed oil contents (39.81 and 37.54% in the first and second season respectively). These differences may be due to genetic makeup. On the other hand, Serw-6 cultivar superior other cultivars in oil yield/ fed. in both seasons and registered the highest oil yield/fed. (339.70 and 336.12 kg/fed.in the two respective seasons). The superiority of Serw-6 cultivar in oil yield due to the superior it in seed yield/fed. trait. These results are in a good line with those reported by Khedri and Golparvar (2012), Naghizadeh and Hasanzadeh (2012), Sher *et al.* (2017), Nazeri *et al.* (2018), Barekati *et al.* (2019) and Hemmati *et al.* (2019)

Here too, the antioxidants foliar spray treatments had a highly significant effect on seed oil content in the first season and significant effect (P≤0.05) in the second season where, the highest mean values of seed oil contents (38.52 and 36.95% in the two respective seasons) were obtained from Citric acid treatment in both seasons. In this trend, a highly significant effect (P≤0.01) on oil yield/fed. by antioxidants foliar application was observed in the two growing seasons. Oil yield/fed. increased by applied antioxidants foliar spray especially, Citric acid in the both seasons. The increases in oil yield/fed. with using Citric acid foliar spray were 23.93 and 20.19% in the first and second season, respectively compared to control treatment. This increase may be due to increasing seed oil% and seed yield/fed. by, Citric acid. This results in agreement with those reported by Sakr and Arafa (2009), El-Sabagh *et al.* (2017) and the similar trend was found in sunflower by Salem and Shoman (2018).

Table 4. Effect of antioxidants, cultivars and their interaction on oil % and oil yield (kg/fed.) of canola in 2017/2018 and 2018/2019 seasons.

Trait	Oil %										Oil yield (kg/fed.)									
Season	2017/2018					2018/2019					2017/2018					2018/2019				
Antioxidants (A) Cultivars (C)	Control	Citric acid	Ascorbic acid	Ascorbic + Citric	Mean	Control	Citric acid	Ascorbic acid	Ascorbic + Citric	Mean	Control	Citric acid	Ascorbic acid	Ascorbic + Citric	Mean	Control	Citric acid	Ascorbic acid	Ascorbic + Citric	Mean
Pactol	38.76	39.68	38.21	42.59	39.81	36.60	38.47	36.36	38.71	37.54	235.5	341.72	325.6	359.24	315.52	290.23	334.05	308.47	316.82	312.39
Topaz	36.08	36.59	32.00	39.18	35.96	35.90	36.15	34.45	37.31	35.95	264.83	288.28	257.02	290.68	275.20	233.43	253.75	342.05	320.76	287.50
AD-201	39.44	38.60	36.72	36.03	37.70	37.59	36.28	35.36	35.67	36.23	280.64	331.54	312.06	262.38	296.65	285.14	353.24	294.06	278.4	302.71
Serw-4	38.14	39.11	34.18	35.05	36.62	35.12	36.72	33.62	33.97	34.86	291.1	367.07	277.3	256.7	298.04	276.3	331.96	282.95	284.66	293.97
Serw-6	39.22	38.61	40.32	34.55	38.18	37.39	37.15	35.37	35.51	36.36	302.79	375.22	379.60	301.17	339.70	289.49	379.10	344.94	330.95	336.12
Mean	38.33	38.52	36.29	37.48	---	36.52	36.95	35.03	36.23	---	274.97	340.77	310.31	294.03	---	274.92	330.42	314.49	306.32	---

F_{test} / $R.LSD_{0.05}$	F test	R. LSD.0.05	F test	R. $LSD_{0.05}$	F test	R. LSD.0.05	F test	R. LSD.0.05
C	**	0.44	*	1.26	**	20.29	*	27.42
A	**	0.84	*	1.39	**	8.44	**	15.96
A × C	**	1.88	*	2.29	**	31.81	**	53.77

Where: * and ** mean significant at 5 and 1 % level of probability, respectively.

Furthermore, the interaction effect between canola cultivars and antioxidants treatments was highly significant (P≤0.01) on seed oil content in the first season and significant (P≤0.05) in the second season. The highest mean values of seed oil contents (42.59 and 38.71% in the two respective seasons) were recorded from Pactol cultivar when sprayed by Citric + Ascorbic acids in both seasons. Oil yield/fed. was affected significantly by the interaction between canola cultivars and antioxidants treatments in both seasons. Serw-6 exerted a good response to foliar spray by Ascorbic acid in the first season and Citric acid in the second season where, the highest mean values of oil yields/fed. (379.60 and 379.10 kg /fed. in the first and second seasons, respectively) were recorded.

CONCLUSION

Serw-6 cultivar had the highest seed and oil yields/fed.. Antioxidants foliar spraying (200 ppm) led to the increasing seed and oil yields/fed. especially, Citric acid foliar spraying. The highest seed and oil yields/fed. were obtained from Serw-6 cultivar when sprayed by Ascorbic or Citric acids.

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دراسة استجابة خمسة أصناف من الكانولا للرش الورقى ببعض مضادات الأكسدة

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أجريت تجربة حقلية بمزرعة كلية الزراعة ، جامعة الوادى الجديد خلال موسمي 2018/2017 و2019/2018 وذلك لدراسة استجابة خمسة أصناف من الكانولا للرش الورقى ببعض مضادات الأكسدة. وقد استخدم تصميم القطاعات كاملة العشوائية بترتيب الشرائح المنشقة بثلاث مكررات .وقد رتبت مضادات الأكسدة (كنترول، حامض الستريك, حامض الاسكوربيك، حامض الستريك + حامض الاسكوربيك) رأسياً بينما رتبت الأصناف (باكتول، توباز، سرو-4، سرو-6 و AD- 201) أفقياً. أظهرت النتائج التي تم الحصول عليها تفوق الصنف سرو-6 على الأصناف الأخرى في عدد الراسيمات والخرادل ووزن البذور/النبات وكذلك محصولي البذور والزيت/الفدان في كلا الموسمين. بينما تفوق الصنف سرو-4 على الأصناف الأخرى في ارتفاع النبات ووزن الألف بذرة، وكذلك تفوق الصنف باكتول في النسبة المئوية للزيت في البذور في كلا الموسمين. حسن استخدام الرش الورقي بمضادات الأكسدة وخاصة حامض الستريك (200 جزء في المليون) بشكل كبير معظم الصفات قيد الدراسة. تم الحصول على أعلى محصول بذور/ فدان من الصنف سرو-6عند رشه بحمض الستريك بينما تحقق أعلى محصول زيت / فدان أيضاً من الصنف سرو-6عند رشه بحامض الأسكوربيك في الموسم الأول وحامض الستريك في الموسم الثاني. وتوصي هذه الدراسة بزراعة صنف الكانولا سرو-6مع الرش الورقي بحامض الستريك أو حامض الأسكوربيك (200 جزء في المليون).