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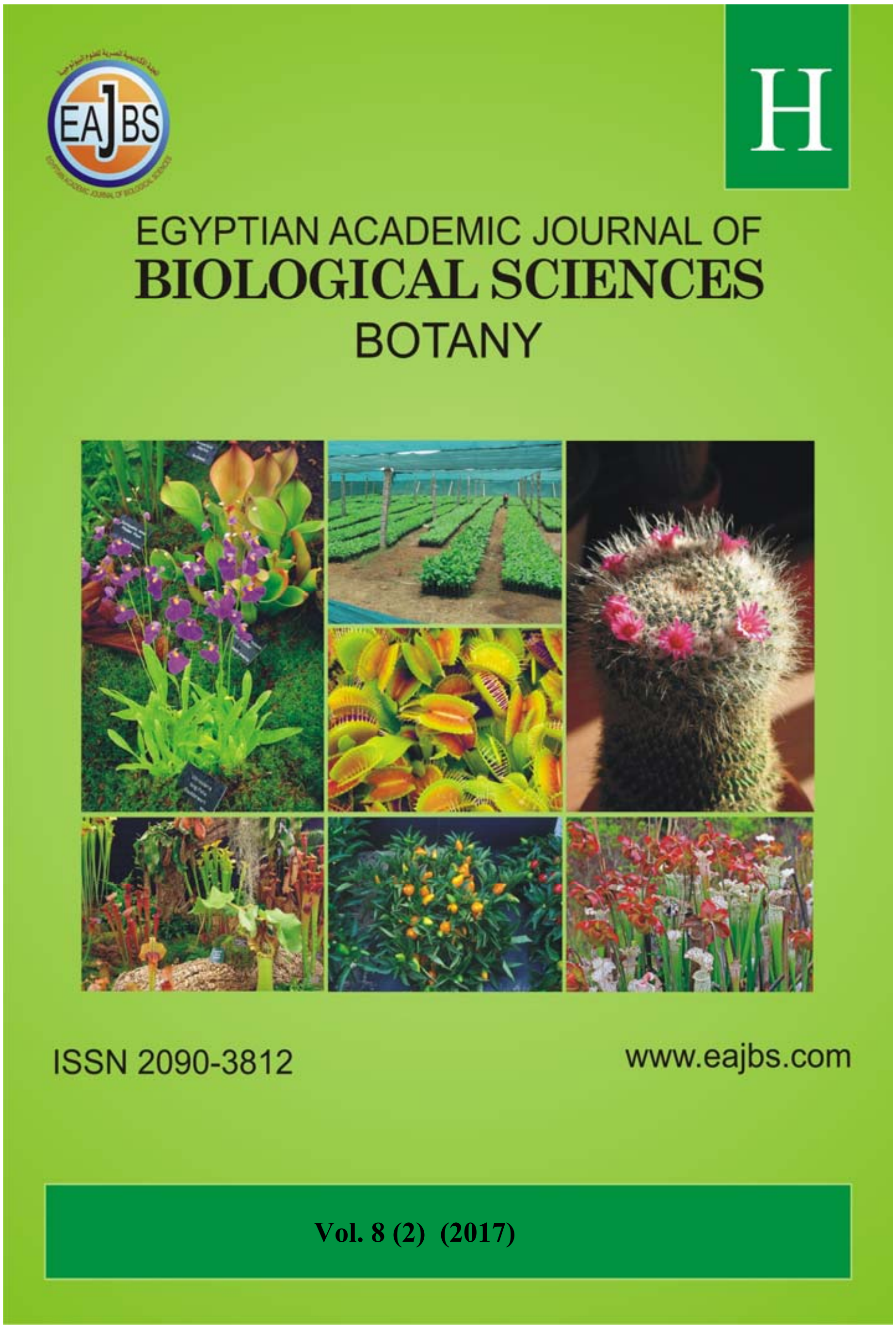

Egyptian Academic Journal of Biological Sciences is the official English language journal of the Egyptian Society for Biological Sciences , Department of Entomology ,Faculty of Sciences Ain Shams University .

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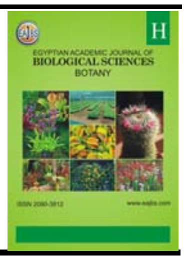
www.eajbs.eg.net

Egypt. Acad. J. Biolog. Sci.,8(2):49–58 (2017)

Egyptian Academic Journal of Biological Sciences
H. Botany
ISSN 2090-3812
www.eajbs.eg.net



Efficiency of Some Post Emergence Acetyl Coenzyme A Carboxylase-Inhibitor Herbicides Against Certain Grassy Weeds in Canola Fields

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ARTICLE INFO

Article History
Received: 21/10/2017
Accepted: 11/11/2017

Keywords:
ACCase-inhibitors, canola, flucarbazone-sodium, grass weeds, herbicides

ABSTRACT

Two field experiments were conducted in Plant Protection Department Farm, Faculty of Agriculture, Assiut University, Egypt during 2014/2015 and 2015/2016 winter seasons to evaluate the efficacy of five ACCase-inhbitors (fenoxaprop-p-ethyl, quizalofop-p-ethyl, clethodim, clodinafop+pinoxaden and tralkoxydim), addition toflucarbazone-sodium as ALS-inhibitor herbicides and hand hoeing against two noxious grassy weeds,i.e.*Avenafatua* L. and *Phalaris minor* Retz. in canola fields. Results showed that all ACCase- and ALS- inhibitor herbicides and hand hoeing treatments performed effectively against both *A. fatua* and *P. minor*weed species and achieved to significance high fresh weight reduction of the individual and total grass weeds than unweeded check after 30 days of treatments. The reduction in fresh weight were ranged from 92.9 to 98.9 % for *P. minor* and 95.5 to 99.7% for *A. fatua* as well as 93.8 to 99.1 for total grass weeds versus weedy check during 2014/2015 and it were ranged 88.0 to 98.4% for *P. minor*, 91.8 to 99.8 for *A. fatua* and 89.3 to 98.7% for total grass weeds during 2015/2016 season. However, concerning the effect on canolaflucarbazone-sodium completely killed canola plants after 30 days of the application thus it should not be used to control grassy weeds in canola fields. Meanwhile, clethodim and clodinafop+pinoxaden exhibited slight phytotoxicity on canola plants but they did not continue to cause any reduction in canola seed yield per feddan and other tested herbicides, fenoxaprop-p-ethyl, quizalofop-p-ethyl and tralkoxydim did not cause any phytotoxicity on canola plants after treatments. Concerning canola seed yield, all tested ACCase-inhibitors particularly tralkoxydim and hand hoeing treatments increased seed yield per feddan of canola as compared with weedy check which had lowest yield in both seasons. The percent of canola seed yield increment ranged from 4.1 to 39.8% during 2014/2015 and from 51.7 to 73.3% during 2015/2016 compared to control.According to this study, tralkoxydim could be used to control the grass weeds as it showed a high performance than other ACCase-inhibitor herbicides and hand hoeing versus weedy check as well as increased the final yield.

INTRODUCTION

Canola (*Brassica napus*L.) is one of the most economically important oilseed crops worldwide which grown mainly for edible vegetable oil and biodiesels production as well as animal feed. Canola seeds is a rich source of oil (about 40 - 45%) and protein (25%) and it is cultivated in more than 120 countries mostly in Asia, Europe, North America and Australia (Roshdy *et al.* 2008). The oil seed crops production area is still limited that make up 1.8% of the total agricultural land in Egypt. Thus, there is a national target to increase land cultivated with oil seed crops include canola to fill the huge local oil production gap (more than 85%) (Kandil and Gad 2012). Canola plants during its initial growth stages are very sensitive to weeds interference (Kaur *et al*. 2015). Weeds are one of the most problematic pests of canola all over the worldwhich caused considerable loss in quantity and quality of canola yield production (Mekki *et al.* 2010; Khan *et al.* 2003). There are many various grass and broadleaf weed species infested canola fields in the world and resulting in yield loss of 20-50% (Kaur *et al.* 2015). Among different grassy weeds, *Phalaris minor* Retz. And *Avenafatua* L. are the two most widespread, noxious and competitive annual grassy weeds present in canola and other winter crops in the world(Bagherani and Shimi 2001; Karimi *et al.* 2016; Khan *et al.* 2008). Dew and Keys (1976) stated that the yield loss of canola by wild oat competition was 32%.

Herbicides are the most effective, cheaper and widespread strategic method to control weeds in canola and other crops as compared to conventional weeds control methods such as hoeing and tilling (Delchev and Georgiev 2015). Many post-emergence herbicides such as fluazifop-p-butyl, quizalofop-p-ethyl, fenoxaprop-p-ethyl and clodinafop-propargyl (Aryloxyphenoxypropionate “AOPP” group), and clethodim, tralkoxydim and sethoxydim (cyclohexanedione “CHD” group) as well as pinoxaden (phenylpyrazoline “DEN” group) are the common and popular graminicides recommended for control several grass weeds such as *Phalaris*spp and *Avena*spp in major dicotyledonous crops include canola in the world (Valaie *et al.* 2012; Rashed-Mohassel *et al*., 2010). All these graminicides inhibit acetyl coenzyme A carboxylase (ACCase),thereby blocking fatty acid synthesis in the grass weeds thus they called as ACCase-inhibitors(Kobek *et al*. 1988). However, although these are graminicides, however some of these herbicides such as clethodim have been exhibited adverse effect on growth and yield of canola plants (Zerner and Wheeler 2013). Also, cycloxydim, quizalofop-p-ethyl and propaquizafop provided good control of *P. minor*Retz.,*Bromustectorum* L. and *Setariaviridis* L. Beauv. with no injury effect on canola yield whereas sethoxydim and fluazifop-p-butyl were also effective on grass weeds but they caused adverse effect on canola plants (Valaie *et al.* 2012). Little information is known about control of grass weeds in canola in Assiut. Thus, the main investigation of this research was to evaluate the effect of certain ACCase-inhibitor and an ALS–inhibitor herbicides against the two noxious grass weeds, *P. minor* Retz and *A. fatua* L., in canola fields at Assiut, Egypt.

MATERIALS AND METHODS

The present study was conducted at the Plant Protection Department Farm, Faculty of Agriculture, Assiut University, Assiut, Egypt during 2014-2015 and 2015-2016 winter season. The soil was clayey. Canola variety Serw 4 was sown on the first and 23$^{th.}$ of November in 2014 and 2015, respectively. The experimental plot size was10.5 m^2, 3 m × 3.5 m, consisted of 6 ridges of canola with 3 m long and 58 cm apart between-ridges. Full package of agricultural practices like irrigation, fertilization and insect control for canola were followed uniformly and all broadleaved weeds were removed by hand. The grass weed control treatments included five post emergence ACCase-inhibitors and an ALS-inhibitor herbicides, hand hoeing and weedy check.

2014/2015 Experiment:

This experiment included seven grass weed control treatments as follows:

1- Select Super 12.5% EC (clethodim2-[1-[[[(2*E*)-3-chloro-2-propen-1-yl]oxy]imino]propyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one) applied at 1.0 Lfed^{-1} at 35 days from planting.
2- Traxos 4.5% EC (clodinafop-propargyl{2-propynyl (2*R*)-2-[4-[(5-chloro-3-fluoro-2-pyridinyl)oxy]phenoxy]propanoate}/ pinoxaden {8-(2,6-diethyl-4-methylphenyl)-1,2,4,5-tetrahydro-7-oxo-7*H*-pyrazolo[1,2-*d*][1,4,5]oxadiazepin-9-yl 2,2-dimethylpropanoate} at 2.25 : 2.25) applied at 0.5 Lfed^{-1} at 35 days from planting.
3- Puma Super 7.5% EW (fenoxaprop-p-ethylethyl (2*R*)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy]propanoate) applied at 0.5 Lfed^{-1} at 35 days from planting.
4- Targa Super 5% EC (quizalofop-p-ethyl, ethyl (2*R*)-2-[4-[(6-chloro-2-quinoxalinyl)oxy]phenoxy]propanoate)applied at 0.5 Lfed^{-1} at 35 days from planting.
5- Vulcano 35% SC (flucarbazone-sodium, sodium [(4,5-dihydro-3-methoxy-4-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl)carbonyl]{[2-(trifluoromethoxy)phenyl]sulfonyl}azanide)applied at 0.035 Lfed^{-1} at 35 days from planting.
6- Hand hoeing (twice) at 20 and 35 days from planting.
7- Unweeded check.

2015/2016 experiment:

This experiment included six grass weed control treatments as followed:

1- Select Super 12.5% EC (clethodim) applied at 1.0 Lfed^{-1} at 43 days from planting.
2- Traxos 4.5% EC (clodinafop-propargyl/pinoxaden) applied at 0.5 L/feddan at 43 days from planting.
3- Avalansh 40% WG (tralkoxydim, 2-[1-(ethoxyimino)propyl]-3-hydroxy-5-(2,4,6-trimethylphenyl)-2-cyclohexen-1-one) applied at 0.5 Lfed^{-1} at 43 days from planting.
4- Targa Super 5% EC (quizalofop-p-ethyl)applied at 0.5 Lfed^{-1} at 43 days from planting.
5- Hand hoeing (twice)at 20 and 35 days from planting.
6- Unweeded check.

The experimental treatments were established as randomized complete block design with three replications in both winter seasons. The selected herbicides were sprayed on broadcast applications by knapsack sprayer at water spray volume of 200 L fed^{-1}.

Data Recorded:

Each grass weed *P. minor* and *A. fatua* was hand-pulled and collected separately from one square meter area in each plot and then its fresh weight were recorded 30 days after treatments (DAT) in both seasons. At harvest, all canolaplants from the middle two rows of each canola plot were harvested in 2014/2015 season but in 2015/2016, all canola plants from each plot were harvested early in the morning to avoid seeds shattering and placed on big plastic sheet to dry on air and under sunshine. Canola seeds of each plot were separated from the siliques manually and cleaned then the seed yield (kg fed^{-1}) was recorded.

Statistical Analysis:

Density and fresh weight of *P. minor* and *A. fatua* and its rates found in weedy check plots were calculated. The efficiency of grass weed control treatments were also estimated and the data of each experiment was expressed as percent fresh weight reduction of grass weeds as compared with weed control. After that, data were transferred using square root of x + 0.5 to normalize the distribution then each one subjected to analysis of variance separately and means of treatments were compared by LSD test at 5% level of probability (Steel and Torrie 1980).

RESULTS AND DISCUSSION

A- Effect of weed control treatments on grassy weeds

Table (1) showed that canola fields were infested mainly with the two serious grassy weeds *Phalaris minor* Retz and *Avenafatua* L. during 2014/2015 and 2015/2016 seasons. *P. minor* was dominant than *A. fatua* where it had the highest weed density 37.3 and 257.0individual m^{-2} with weed density rates of 84.9% and 94.8% and its fresh weight of 522.5 and 5070.0g m^{-2} with rates of 68.7% and 83.0% in 2014/2015 and 2015/2016, respectively. The weed density of *A. fatua* were 6.7and 14.0individual m^{-2} and its fresh weight were 237.7 and 1040.5g m^{-2}, respectively in both seasons with weed density rates of 15.2 and 5.2% and their fresh weight rates of 31.3 and 17.0%, respectively. Both *P. minor* and *A. fatua*were recorded as major serious grassy weeds in canola fields all over the world (Khan et al. 2008; Valaie et al. 2012; Karimi *et al*. 2016).

In 2014/2015, results in Table 2 indicated that all selected ACCase-inhibitors (fenoxaprop-p-ethyl, quizalofop-p-ethyl, clethodim and clodinafop + pinoxaden) and an ALS-inhibitor (flucarbazone-sodium) as well as hand hoeing treatments were effective against *P. minor* and *A. fatua*and achieved a significant high fresh weight reduction in both grass weeds compared to weedy check after 30 DAT. The reduction in fresh weight were ranged from 92.9 to 98.9% for *P. minor* and 95.5 to 99.7% for *A. fatua* as well as 93.8 to 99.1for total grass weeds versus weedy check.

In 2015/2016, results in Table 3 revealed that all tested ACCase-inhibitors included trakoxydim, clodinafop + pinoxaden, quizalofop-p-ethyl, clethodim and hand hoeing treatments also exhibited high efficacy against the target grassy weeds and significantly reduced fresh weight of *P. minor* by 88.0 to 98.4% and *A. fatua* by 91.8 to 99.8% as well as total grass weeds by 89.3 to 98.7%, 30 DAT compared to weedy check.

In general, all selected ACCase-inhibitors, an ALS-inhibitor herbicide and hand hoeing treatments showed effectiveness against both *P. minor* and *A. fatua*weeds and they significantly decreased the fresh weight of the individual and total grass weeds versus weedy check in both seasons (Tables 2 and 3). Various ACCase-inhibiting herbicides include clodinafop, quizalofop-ethyl, fenoxaprop, fluazifop, propaquizafop and tralkoxydim possessed excellent efficacy against graminaceous weeds include *P. minor* and *A. fatua*with selectivity in canola and increased in the crop seed yield(Tibets and Saskevich 2006; Saskevich et al. 2009; Khan et al. 2003, 2008; Delchev and Georgiev 2015). Chaudhry *et al.* (2011) demonstrated that clodinafop provided good control of grass weeds (98.37%) in canola and increased the crop yield by 33.23%. Valaie *et al.* (2012) detected that cycloxydim, fluazifop, propaquizafop, quizalofop and sethoxydim achieved excellent efficacy on *A. fatua*and other grass weeds infested canola and propaquizafop and quizalofop-ethyl were performed as the most potential ones. Alvi et al. (2004) confirmed that clodinafop and fenoxaprop provided good (more than 95%) control *A. fatua*and *P. minor* and increased grain yield of wheat.

B- Effect of Weed Control Treatments on Canolacrop:

Flucarbazone-sodium killed all canola plants after 30 days from its application thus this ALS-inhibiting herbicide should not be used to control grass weeds in canola and carefully when it applied next to canola fields. Indeed, the persistence of residues of some ALS-inhibitors such as chloursulfuron, traisulfuron and mesosulfuron plus iodosulfuron from the previous crop possessed phototoxic and inhibitory effects on canola and reduced crop yield i.e., 13 and 20% (Fletcher et al. 1996; Kim et al. 1997; Delchev and Georgiev 2015).

Clethodim exhibited also phytotoxic injury symptoms on some canola plants at the flowering and siliques development stages which were observed as deformation and destroyed in the flowers and siliques on the main stems but not or very few on the secondary branches of affected plants (Fig. 1). A slight injury symptomon the flowers and siliques was also observed on some canola plants treated with clodinafop + pinoxaden. Furthermore, the effect of clethodim on these canola plants were more than that treated with clodinafop + pinoxaden. However, the affected canola plants particularly treated with clodinafop + pinoxaden then clethodim performed ability to decrease this inhibitory action on the flowers and siliques of the main stems in the initial growth of crop through complete growth, flowering and consequently siliques development of the secondary branches in these plants.

Phytotoxicity effects on canola have been confirmed as a delay in flowering and disruption in the flowers and siliques shape after the canola plants treated with some different herbicides such as metribuzin (Sharma and Mishra 1997; Khan et al. 2008; Chaudhry *et al.* 2011). Also, clethodim caused various injury symptoms on plants of different canola varieties which include a few change in the color of canola leaves and main damage in the flowers and siliques resulting in decreasing in the crop yield (Zerner and Wheeler 2013). They also detected the variability in response of canola varieties to different rates and application times of clethodim and results indicated that canola variety Garnet exhibited tolerance to clethodim at 0.5 L/ha without any yield loss but other varieties like TT Gem and Hyola were affected by this herbicide with yield losses about 13% in both.

However, other tested ACCase-inhibitors (quizalofop-p-ethyl, fenoxaprop and tralkoxydim) did not cause any phytotoxic injury or adverse effects on canola plants in any stages after its application. Similar results were confirmed by Khan *et al.* (2008) and Valaie *et al.* (2012) who used the same ACCase-inhibitors to control grass weeds in canola.

Table 1: Density and fresh weight of grass weeds found in weedy check plots in canola fields during 2014/2015 and 2015/2016.

Season	2014/2015				2015/2016			
Grass weed species	weed density m^{-2}	% of untreated	Fresh weight (g m^{-2})	% of untreated	weed density m^{-2}	% of untreated	Fresh weight (g m^{-2})	% of untreated
P.minor	37.3	84.9	522.5	68.7	257.0	94.8	5070.0	83.0
A. fatua	6.7	15.2	237.7	31.3	14.0	5.2	1040.5	17.0
Total weeds	44.0		760.3		271.0		6110.5	

Table2: Effect of selected post-emergence graminicidesand hand hoeing treatmentson fresh weight of *P.minor and A. fatua*in canola fields during 2014/2015season.

Treatment	*P.minor*		*A. fatua*		Total grassy weeds	
	Fresh weight (g m^{-2})	Controlling %	Fresh weight (g m^{-2})	Controlling %	Fresh weight (g m^{-2})	Controlling %
Clethodim	5.8b	98.9	0.8b	99.7	6.6c	99.1
Clodinafop + pinoxaden	8.2b	98.4	2.5b	98.9	10.7bc	98.6
Fenoxaprop-p-ethyl	37.2b	92.9	10.2b	95.7	47.3b	93.8
Flucarbazone-sodium	11.7b	97.8	10.7b	95.5	22.4bc	97.1
Quizalofop-p-ethyl	5.7b	98.9	2.3b	99.1	8.0c	99.0
Hand hoeing(twice)	16.0b	96.9	1.6b	99.3	17.7bc	97.7
Weedy check	522.5a	0.0	237.7a	0.0	760.5a	0.0
L.S.D 0.05	3.5		6.9		3.0	

* Means followed by the common letter(s) within a column are not significantly different at 5% level of probability.

Table 3: Effect of selected post-emergence graminicidesand hand hoeing treatmentson fresh weight of *P.minor and A. fatua*in canola fields during2015/2016season.

Treatment	*P.minor*		*A. fatua*		Total grassy weeds	
	Fresh weight (g m^{-2})	Controlling %	Fresh weight (g m^{-2})	Controlling %	Fresh weight (g m^{-2})	Controlling %
Clethodim	123.9c	97.6	3.3b	99.7	127.2c	97.9
Clodinafop + pinoxaden	79.8c	98.4	1.7b	99.8	81.5c	98.7
Quizalofop-p-ethyl	91.6c	98.2	6.1b	99.4	97.7c	98.4
Tralkoxydim	194.4c	96.2	85.4b	91.8	279.8c	95.4
Hand hoeing (twice)	610.1b	88.0	45.9b	95.6	656.0b	89.3
Weedy check	5070.0 a	-	1040.5a	-	6110.5a	-
L.S.D 0.05	5.4		12.5		8.1	

* Means followed by the common letter(s) within a column are not significantly different at 5% level of probability.

Fig 1: Phytotoxicity effects of clethodim and clodinafop + pinoxaden herbicides on the flowers (a, b and c) and siliques (d) of canola plants

Effect on Seed Yield of Canola (Kg/Feddan):

Concerning the effect of weed control treatments on seed yield of canola data presented in Fig. 2. In 2014/2015 season, all grass weed control treatments except flucarbazone-sodium increased the seed yield of canola (kg fed^{-1}) compared to weedy check without significant differences among them and the highest canola seed yield were recorded on plots treated with clodinafop + pinoxaden (658.4kg fed^{-1}) followed by quizalofop-p-ethyl (580.8), fenoxaprop (575.9), hand hoeing (540.3) then clethodim (412.9) which have the lowest value among the former herbicides. The lowest seed yield was recorded in weedy check with 396.1kg fed^{-1}.These treatments increased the canola yield by 39.8, 31.8, 31.2, 26.7 and 4.1%, respectively compared with weedy check.

In 2015/2016season, all tested ACCase-inhibitors and hand hoeing treatments were also significantly increased canola seed yields compared with control (Fig. 2). The highest seed yield 1155.6kg fed^{-1} was recorded with used of tralkoxydim followed by clodinafop + pinoxaden (854.4kg fed^{-1}) with similar statistics. Clethodim, quizalofop and hand hoeing also influenced increment in the canola yields 840.8, 694.1 and 630.4kg fed^{-1}, respectively and without significantly different with clodinafop + pinoxaden. However, the lowest canola yield was also recorded from control plots 304.4kg fed^{-1}.Also, the treatments caused increments in the canola seed yield by 73.3, 64.4, 63.8, 56.4 and 51.7%, respectively versus control.

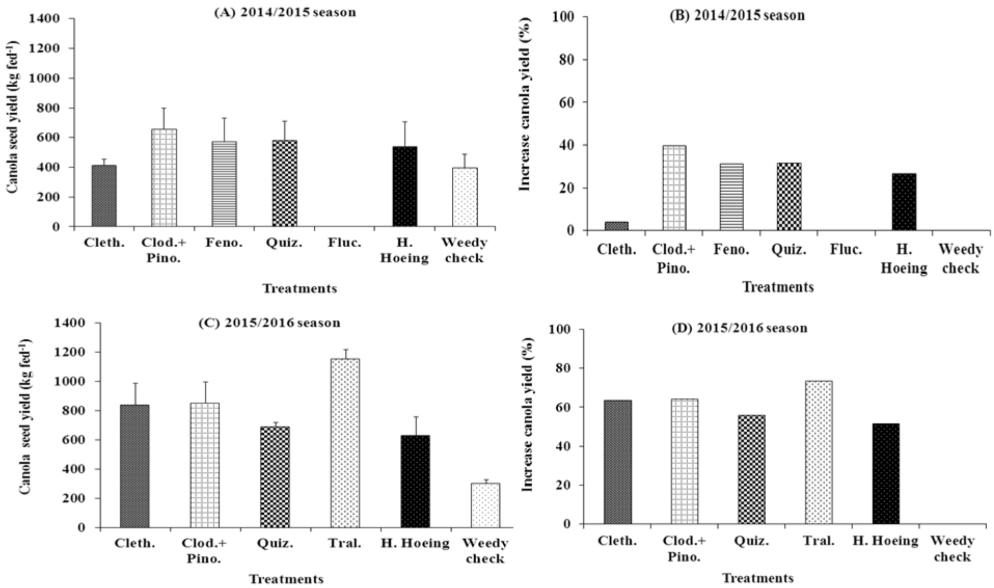

Fig 2: Canola seed yield (kg fed^{-1}) (A and B) and percentage of yield increased (C and D) as affected by selected post-emergence herbicides and hand hoeing treatments in canola fields during 2014/2015 and 2015/2016, respectively [Cleth: celthodim, Clod + pino: clodinafop + pinoxaden, Feno: fenoxaprop-p-ethyl, Quiz: quizalofop-p-ethyl, Tral: tralkoxydim, Fluc: flucarbazone-sodium, and H. Hoeing: Hand hoeing].

In general, all ACCase-inhibiting herbicides and hand hoeing achieved increment in canola seed yield compared with weedy check that had the lowest crop yield in both seasons. The increment of canola seed yield may be contributed to the excellent efficacy of these treatments on suppression of *P. minor* and *A. fatua* which encouraged the crop growth, flowering and siliques development and consequently the crop yield. Similarly, the high performance of herbicides and manual weeding in control weeds in canola resulted in reduced in the weeds-canola competition and increased the capacity of crop plants to growth and improve the canola yield components from flowers, pods, seeds per pods that consequently due to increase the canola seed yield (Mekki et al. 2010; Chaudhry et al. 2011; Roshdy et al. 2008). Hand hoeing twice also resulted in a decrease in the populations and biomass of various weeds and increased in the yield and yield components of canola and Indian mustard (Mekki et al. 2010; Rajput et al. 1993; Singh et al. 2001). In contrast, interference of *P. minor* and *A. fatua*with their canola plants on the main soil nutrition, moisture, sun light and space led to inhibit the growth and flowering and siliques development of canola then consequently reduced the crop yield to the lowest quantity in weedy check plots during both seasons. Also, canola is a slowly growing oil crop thus it exposed to severe interference by many annual weeds include *P. minor* and *A. fatua*that cause reduction in the growth and development of crop plants as well as a large yield loss (Blackshaw and Harker 1992; Harker 2001; Pacanoski 2014; Roshdy et al. 2008).

Karimi et al. (2016) stated that increases of *A. fatua* populations led to reduced number of siliques, seeds in each siliques and seeds weight and subsequently decrement the canola yield. Yield losses caused by weeds in canola were ranged from 23 to 64% (Bagherani and Shimi 2001), 48% (Pacanoski 2014) and 50.40% (Miri and Rahimi 2009) as well as in Indian mustard from 30 to 50% (Gill et al. 1984). Tomass (1992) confirmed that competition of annual and perennial weeds with oilseed rape has decreased it yield through inhibition the crop growth and reduced the fertile of flowers and siliques.

In conclusion, all selected ACCase-inhibitors (particularly tralkoxydim) and hand hoeing treatments were high effectively against the two common and serious grassy weeds, *A. fatua*and *P. minor*, in canola fields in Assiut in both seasons and caused in improvement in the canola seed yield compared to weedy check. Flucarbazone-sodium should not be sprayed for controlling grassy weeds in canola. More studies are needed to determine the response of other canola varieties to the selected and other ACCase-inhibitor herbicides used in Egypt.

Acknowledgments

Funding for this research was obtained from Faculty of Agriculture, Assiut University, Egypt.

REFERENCES

Baghrani N., P. Shimi. 2001: Evaluation of some herbicides for weed control in oil rapeseed (*Brassica napus* L.). J. Agric. Sci. Natur. Resour. 8: 157-163.

Blackshaw, R. E., K. N. Harker. 1992: Combined post emergence grass and broadleaved weed control in canola (*Brassica napus* L.). Weed Technol. 6: 892-897.

Chaudhry S. U., M. Hussain, J. Iqbal. 2011. Effect of different herbicides on weed control and yield of canola (*Brassica napus*). J. Agric. Res., 49(4): 483-489.

Delchev G., M. Gergiev.2015. Achievements and problems in the weeds control in oilseed canola (*Brassica napus* L.). Series A. Agron. LVIII, 174-180.

Dew D. A., C. H. Keys.1976. An index of compétition for estimating loss of rape due to wild oats. Can J. Plant Sci. 56:1005-1006.

Fletcher J. S., T. G. Pfleeger, H. C. Ratsch, R. Hayes. 1996. Potential impact of low levels of chlorsulfuron and other herbicides on growth and yield of nontarget plants. Environ. Toxicol. Chem. 15(7): 1189-1196.

Gill H. S., K. S. Sandhu, S. P. Mehra, S. Tarlok. 1984: Efficacy of some herbicides for control of weeds in indian mustard. Indian J. Weed Sci. 10: 171-175.

Harker, K. N. 2001.Survey of yield losses due to weeds in Central Alberta. Can J. Plant Sci. 81: 339-342.

Kandil H., N. Gad. 2012. Growth and oil production of canola as affected by different sulphur sources. J. Basic. Appl. Sci. Res. 2 (5): 5196-5202.

Karimi H., S. A. Kazemeini, N. Valaie. 2016. Interrelationships between nitrogen rate and wild oat density on oilseed rape yield components. J. Biol. Environ. Sci. 10(29): 61-69.

Kaur S., M. S. Bhullar, S. Singh, T. Singh. 2015. Control of weeds in canola gobhisarson cultivars and their tolerance to herbicides. Indian J. Weed Sci. 47: 376–378.

Khan I. A., G. Hassan, M. A. Khan. 2003. Efficacy of post-emergence herbicides for controlling weeds in canola. Asian J. Plant Sci. 2(3): 294-296.

Khan I. A., G. Hassan, K. B. Marwat, I. Daur. 2008. Efficacy of some pre and post-emergence herbicides on yield and yield components of canola. Pakistan J.Botany. 40(5): 1943-1947.

Kim S. M., J. H. Hur, D. S. Han, H. V. B. William. 1997. Chlorsulfuron-induced phytotoxicity in Canola (*Brassica napus* L.) seedlings. Korean J. Weed Sci. 17(2): 199-206.

Mekki B. B., A. Faida, A. Sharara, Kowthar G. El-Rokiek. 2010. Effect of weed control treatments on yield and seed quality of some canola cultivars and associated weeds in newly reclaimed sandy soils. American-Eurasian J. Agric. Environ. Sci. 7: 202-209.

Miri, H. R., Y. Rahimi. 2009: Effects of combined and separate herbicide application on rapeseed and its weeds in Southern Iran. Int. J. Agric. Biol. 11: 257-260.

Pacanoski Z. 2014. Application time and herbicide rate effects on weeds in oilseed rape (*Brassica napus* var. oleifera). Herbologia 14(1): 33-45.

Rajput R.L., D. S. Gautam, O. P. Verma. 1993. Studies on cultural and chemical weed control in mustard. Res. J. Gujarat Agric. Univ. 18(2): 1-5.

Rashed-Mohassel M. H., A. Aliverdi, H. Hamami, E. Zand. 2010. Optimizing the performance of diclofop-methyl, cycloxydim, and clodinafop-propargyl on littleseedcanarygrass (*Phalaris minor*) and wild oat (*Avenaludoviciana*) control with adjuvants. Weed Boil. Manag. 10: 57-63.

Roshdy A. M., G. M. Shams El-Din, B. B. Mekki, T. A. A. Elewa. 2008. Effect of weed control on yield and yield components of some canola varieties (*Brassica napus* L.). American Eurasian J. Agric. Environ. Sci. 4: 23-29.

Saskevich P. A., J. L.Tibets, E. I. Gurikova. 2009. Agroecological assessment of plant protection products in the cultivation of spring rape. Bulletin of the Belarusian State Academy of Agriculture: Scientific-methodical magazine. 2: 83-87.

Sharma S. N., P.J. Mishra. 1997. Effect of weed control methods on weed, crop growth and yield of Indian mustard *Brassica juncea* (L.) Czernj&Cosson varieties.Envir. Ecol. 15(3):511-514.

Singh H., B. P. Singh, H. Prasad. 2001. Weed management in Brassica species. Indian J. Agron. 46(3): 533-537.

Steel R. G. D., J. H. Torrie. 1980. Principles and Procedures of Statistics. 2nd Ed. McGraw Hill Book Co., Inc. New York. 481. pp.

Tibets J. L., P. A. Saskevich. 2006. Comparative efficacy of herbicides with vozdelivanii spring rape. Agroecol. 4: 182-185.

Tomass P. 1992.Canola grower Manual.Canola Council of Canada. Winnipeg, Canada.

Valaie N., S. A. Kazemeini, H. Hamzehzarghani. 2012. Chemical control of downy brome, little seed canary grass and green foxtail in rapeseed in Southern Iran. J. Biol. Environ. Sci. 6(16): 91-97.

Zerner M. and WheelerR. 2013.Clethodim tolerance in canola (C.f. http://www.hartfieldsite.org.au/media/2013%20TRIAL%20RESULTS/17_Clethodim_tolerance_in_canola_2013HartTrialResultsBook.pdf).

ARABIC SUMMARY

فاعلية بعض المبيدات الحشائش النجيلية بعد الانبثاق المثبطة لانزيم الاسيتيل كو أ كاربوكسيلاز ضد بعض الحشائش النجيلية بحقول الكانولا

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اجريت هذة الدراسة في مزرعة قسم وقاية النبات، كلية الزراعة، جامعة اسيوط لتقييم فاعلية خمسة من مبيدات الحشائش التابعة لمجموعة المبيدات المثبطة لانزيم الاسيتيل كو أ كاربوكسيلاز(فينوكسابروب – بي – ايثيل،كويزاليفوب- ايثايل، كليثوديم، كلودينافوب + بينوكسادين و ترالكوسيديم) و مبيد فلوكاربازون صوديوم المثبط لانزيم الاسيتو لاكتايت سينسيز ومعاملة العزيق ضد حشيشتى الفلارس و الزمير كحشائش نجيلية بحقول الكانولا خلال الموسمين الشتويين٢٠١٤/٢٠١٥ و ٢٠١٥/٢٠١٦. وقد اظهرت النتائج فاعلية كل المبيدات المختبرة ومعاملة العزيق ضد الحشيشتين المستهدفتين من الحشائش النجيلية وقد ادت جميع المعاملات الى خفض كبير بالوزن الخضرى للحشيشتين وبصورة معنوية عن معاملة المقارنة وذلك بعد ٣٠ يوم من المعاملة بالمبيدات.وقدرت نسبة الخفض بالوزن الخضرى لحشيشة الفلارس بحوالى ٩٢.٩ الى ٩٨.٩% وحشيشة الزمير بحوالى٩٥.٥ الى ٩٩.٧% ومجموع الحشائش النجيلية بحوالى ٩٣.٨ الى ٩٩.١% عند مقارنتهم بمعاملة المقارنة خلال موسم ٢٠١٤/٢٠١٥ وقد قدرت نسبة الخفض بالوزن الخضرى لحشيشة الفلارس بحوالى ٨٨.٠ الى ٩٨.٤% و حشيشة الزمير بحوالى ٩١.٨ الى ٩٩.٨% و مجموع الحشائش النجيلية بمقدار ٨٩.٣ الى ٩٨.٧% خلال موسم ٢٠١٥/٢٠١٦.وقد ادى تطبيق مبيد فلوكاربازون صوديوم فى قتل كل نباتات المحصول لذا يوصى بعدم استخدامه فى مكافحة الحشائش النجيلية بحقول الكانولا. كما احدث مبيدى كليثوديم وكلودينافوب + بينوكسادين اضرار طفيفة ببعض نباتات الكانولا ولكن لم يحدث هذا التاثير خفض فى انتاج محصول الكانولا. لم تؤثرالمبيدات المختبرة الاخرى (فينوكسابروب – بي – ايثيل،كويزاليفوب- ايثايل و ترالكوسيديم) على نباتات الكانولا. وقد اوضحت النتائج ايضا ان تطبيق كل المبيدات التابعة للمبيدات المثبطة لانزيم الاسيتايل كو ا كاربوكسيلاز (خاصة مبيد ترالكوسيديم) و معاملة العزيق ادوا الى زيادة بمحصول الكانولا عن معاملة المقارنة والتى احتوت على اقل انتاجية من المحصول.وقدرت نسبة الزيادة فى كمية محصول الكانولا بحوالى ٤.١ الى ٣٩.٨% خلال موسم ٢٠١٤/٢٠١٥ و بحوالى ٥١.٧ الى ٧٣.٣% خلال موسم ٢٠١٥/٢٠١٦ مقارنة بمعاملة المقارنة. طبقا لنتائج هذه الدراسة فانه يمكن استخدام مبيد ترالكوسيديم في مكافحة الحشائش النجيلية في حقول الكانولا حيث انه اعطي افضل اداء واعلي كمية محصول مقارنة بالمبيدات الاخري ومعاملة العزيق.