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INHIBITORY EFFECTS OF CERTAIN HERBICIDES ON PANICLES FORMATION AND GRAINS PRODUCTION OF WILD OATS IN WHEAT FIELDS

[52]

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ABSTRACT

Two field experiments were conducted in 2000/2001 and 2001/2002 winter seasons at the Agricultural Experiment Centre and Research Station, Faculty of Agriculture, Cairo University, at Giza-Egypt, to evaluate the role of rate and time of application of clodinafop-propargyl (Topik), fenoxaprop-P-ethyl (Puma-S) and tralkoxydim (Grasp 25 %) herbicides on wild oats (*Avena fatua* and *A. sterilis*) growth inhibition the panicles and grains production in wheat cv. "Sakha-69". Herbicide treatments were applied at the recommended rates (50, 90 and 238 g a.i./ha, respectively) at 40 day after sowing (DAS). Also, the compounds were used at double and recommended rates at 90 DAS. Data indicated that components of wild oats in untreated plots were; panicles/m² 93.2 to 130.0, grains/m² from 6795 to 9730 and dry weight from 173.3 to 273.7 g/m² in both seasons. All herbicide treatments decreased wild oats components but in various values according to the type of used herbicide and rate as well as the time of application. The reduction percent reached between 96.7-99.9, 97.9-99.9 and 60-99 % of panicles; 98.3-99.9, 97.9-99.9 and 59.7-99.1 % of grains/m² and 76.9-98.7, 59.7-98.5 and 46.2-95.5 % of dry weight in case of the herbicides clodinafop-propargyl, fenoxaprop-P-ethyl and tralkoxydim, respectively. Data, also showed that, the most effective treatments were clodinafop-propargyl at 40 DAS and fenoxaprop-P-ethyl at 90 DAS with double rates. While, tralkoxydim at 90 DAS with normal rates was less effect, compared with other treatments. On the other hand, wheat grain yield and its component increased with normal application time and rate treatments. However, yield was generally increased exponentially as herbicide rate increased at late application, especially with used clodinafop-propargyl and fenoxaprop-P-ethyl.

Keywords: Clodinafop-propargyl, propynyl (R)-2-[4-[(5-chloro-3-floro-2-pyridinyl) oxy]-phenoxy] propionate; Fenoxaprop-P-ethyl, (R)-2-[4-[(6-chloro-2-benzoxazolyl) oxy] phenoxy] propionic acid; Tralkoxydim, 2-[1-(ethoxyimino) propyl]-3-hydroxy-5-(2, 4, 6-trimethylphenyl)-2-cyclohexen-1-one; Bromoxynil, 3, 5-dibromo-4-hydroxybenzonitrile; Herbicides; Wild oats (*Avena fatua* L., *A. sterilis* L.), Wheat, *Triticum aestivum* L.

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INTRODUCTION

Wild oat is one of the most associated weed species in wheat fields. Great losses in wheat yield are attributed to grassy weeds interference and competition especially wild oats. Wheat yield losses ranged 30-65 % because of the presence of wild oat as reported by **Dahima and Eleftherohrinos (2001) and Shaban *et al* (2002).** On the other hand, **O'Donovan *et al* (2003)** showed that wild oat weed grains production in untreated plots were 6000 to 12000 grains/m², and grains decreased to 800 to 1000 seed/m² with tralkoxydim treatment.

Sharma and Vanden Born (1978) reported that, uncontrolled wild oat can produced 100 to 150 seed per plant. Also, **Chanceller and Peters (1970 & 1972)** mentioned that, wild oat produced 116 to 27360 grains/m² at plant densities of 16 to 700 plant/m² when grown in competition with spring barley at densities of 169 to 305 barley plant/m².

Gorfu *et al* (1992) stated that fenoxaprop-ethyl (0.7 kg/ha) at 20 DAS reduced panicle densities of wild oat by 94 % at wheat maturity. **Medd *et al* (1992)** used fenoxaprop-ethyl (60 g/ha) and tralkoxydim (50 g/ha) when wild oat was between stem elongation and booting stage. They found that herbicides significantly reduced inflorescences emergence and seed production for wild oat by 99 % and 96 %, respectively. Also, fenoxaprop-ethyl reduced the formation of wild oat inflorescences and seed production significantly more than tralkoxydim. **Raffel and Fluh (1992)** mentioned that clodinafop as post-em. at 30-60 g/ha have given reliable control of wild oat in winter wheat, and the application is best when the grasses at tillering stage. **Montazeri, (1993)** showed that, fenoxaprop-P (55 and 69 g/ha) and tralkoxydim (360 g/ha) was applied when wild oat at from two tillers to stem elongation stage, both herbicides reduced the biomass and number of inflorescences of weed. Also, **Orlando *et al* (1993)** found that fenoxaprop-P and clodinafop were effective at low rate against wild oat at all developmental stages. While, **Abtali *et al* (1995)** found that application of clodinafop-propargyl (0.8 and 1.0 L/ha) when applied at late tillering stage of wheat gave 100 % control of wild oat. Also, **Juan *et al* (1995)** found that, wild oat seed production was reduced between 69 and 90 % by tralkoxydim (150 and 200 g/ha), and fenoxaprop-P-ethyl (69 and 83 g/ha). Meanwhile, **Ormeno and Diaz (1995)** found that clodinafop at rates ranging from 60 to 80 g/ha sprayed early or before the full tillering of grasses were effective for controlling wild oat in wheat. Also, **Shaban *et al* (2002)** showed that dry weight means of wild oat decreased by split doses of fenoxaprop-P-ethyl (45+45 g/ha) and clodinafop-propargyl (28+28 g/ha) than full rates.

Deschamps *et al* (1990) showed that, wheat spike densities increased with fenoxaprop application at 50 and 100 g/h (15.2 and 34.8 %) as compared to weedy control. Also, **Hugo and Biljon (1993)** found that clodinafop-propargyl at double the recommended rate (60 g/ha) not reduce wheat yield. While **Mirkamali, (1993)** found that clodinafop-propargyl at 48-80 g/ha, fenoxaprop-P-methyl at 75 g/ha and tralkoxydim at 100-300 g/ha increased wheat grain yield as compared to untreated control. Clodinafop-propargyl at 80 g/ha resulted in the greatest yield (130 %). Meanwhile, **Ismael *et al* (1994)** showed that, highest application

of tralkoxydim (1200 g/ha) caused a significant reduction in grain yield, number of grains/spike, number of spikes/m² compared to the lower rates (300 and 600 g/ha). **Montazeri, (1994)** showed that fenoxaprop-P significantly increased wheat grain yield than tralkoxydim in sterile oat infested field. **Al-Marsafy *et al* (2001)** appeared that, the critical period of competition between wild oat and wheat beginning at 50 DAS and continued the competition to harvest decreased wheat grain yield by 47 %.

The aim of the present study was to clarify the role of herbicide treatments on the panicle formation and grains production of wild oat in wheat fields.

MATERIAL AND METHODS

Two field experiments were carried out at the Agricultural Experimental Centre and Research Station, Faculty of Agriculture, Cairo University at Giza-Egypt, during 2000/2001 and 2001/2002 winter growing seasons. The randomized complete block design with four replications was followed. Plot area was 10.5 m² (3 x 3.5 m). Wheat grains cv. Sakha-69 at 170 kg/ha were sown by broadcasting method by hand on November 15 and 19 in first and second seasons, respectively. Nitrogen (180 kg/ha) was added in the form of ammonium nitrate (33 % N) in two equal rates of before first and second irrigation during the two seasons. Phosphorus (35 kg/ha) was added as calcium phosphate (15 % P_2O_5) in one rate at soil tillage. Harvesting was carried out on May 20 and 25 in the first and second seasons, respectively. All plots were treated by bromoxynil 24 % (2.5 L/ha) for controlling broadleave weeds. Graminicides tested were: clodinafop-propargyl (15 %), fenoxaprop-P-ethyl (7.5 %) and tralkoxydim (25 % + oil). All herbicides were used at the recommended rates (50, 90 and 238 g/ha) at 40 and 90 days after sowing (DAS) and at double recommended rates at 90 (DAS) for evaluation the role of herbicide rates and time of application on inhibition the panicles, grains and dry weight of *Avena* spp. compared with unweeded check. One sample of grasses was taken at 120 DAS from one square meter from each plot to estimate the dry weight of wild oat. The panicle numbers of wild oats were counted from the whole plots at lower density and in one square meter with higher density (20 panicle in plots). Also, panicles at lower density were collected for the estimation the number of grains/ panicle with high density 10 panicle were collected and the means of grains/panicle were estimated. At harvest, the number of spikes of wheat/m² were counted; and ten culms of wheat were selected at random from each plot to determine the grains weight/spike, 1000-grain weight, and grain yield in the whole plot basis.

Data are subjected to the proper statistical analysis of variance according to **Snedecor and Cochran (1973)**. Treatments means were compared by L.S.D. at 5%.

RESULTS AND DISCUSSION

Effect of graminicide treatments on wild oats

Data in Tables (1 & 2) indicated that wild oat grains production per panicle was decreased significantly with all herbicide applications compared with the unweeded treatment (9730 grains/ panicle). Also, the reduction in wild oat seeds production was significant between *all*

herbicide treatments except with late application of tralkoxydim at the recommended rates. The most promising results were obtained by fenoxaprop-P-ethyl and clodinafop-propargyl, showing 3.7, 3.7 (1*st* season) and 17.7, 24.5 (2*nd* season) grains/m² at recommended rates and early application. The most effective late treatments were obtained by fenoxaprop - P-ethyl and clodinafop-propargyl at double recommended rates at both seasons.

The highest inhibition rising wild oats panicle obtained by fenoxaprop-P-ethyl and clodinafop-propargyl (0.05 and 0.05 panicle/m²) in the 1*st* season and (0.2 and 0.3 panicle/m²) in the 2*nd* season, followed by tralkoxydim (0.8 and 1.5 panicles/m²) in the two successive seasons. High rates of fenoxaprop-P-ethyl, clodinafop-propargyl and tralkoxydim inhibited the panicles of wild oats to (0.7, 0.7 and 3.5 panicles/m², in 2000/2001) and (0.9, 1.4 and 4.3 panicles/m² in 2001/ 2002). While, low rates at 90 DAS of fenoxaprop-P-ethyl and clodinafop-propargyl decreased the number of panicles of wild oats significantly compared to tralkoxydim in both seasons. Also, all tested herbicides inhibited wild oat panicle compared to unweeded treatments.

Data in the same tables showed that dry weights of wild oats decreased significantly by all tested herbicide treatments. Lower dry weights were obtained by fenoxaprop-P-ethyl, clodinafop-propargyl and tralkoxydim, reaching 2.3, 2.5 and 7.7 g/m² and 5.1, 4.2 and 10.3 g/m² at early application in both seasons, respectively. Also the same result was obtained with double rates at 90 DAS (31.1, 37.1 and 52.7 g/m²) and (34.5, 45.6 and 57.1 g/m²) in 2000/2001 and 2001/2002 seasons, respectively. On the other hand, the results showed that, fenoxaprop-P-ethyl and clodinafop-propargyl when applied at recommended rates at 90 DAS achieved best performances than tralkoxydim. Also, all herbicides were decreased the wild oats dry weight significantly than tralkoxydim at 90 DAS and unweeded check.

Effect of weed control treatments on wheat yield and its components

Data in Tables (1 & 2) showed that weed control treatment had a significant effect on spike number/m² in both seasons. The most effective treatments were at early application for all tested herbicides, followed by double rates of herbicide. While, clodinafop-propargyl and fenoxaprop-P-ethyl at low rates after 90 days from sowing showed better performance than tralkoxydim at the same applications time. In addition, all herbicidal treatments caused significant influences than the unweeded check. The higher grain weight/spike was obtained from clodinafop-propargyl, fenoxaprop-P-ethyl and tralkoxydim at 40 DAS, *i.e.* 3.04, 3.03 and 2.52 g, respectively. While, clodinafop-propargyl and fenoxaprop-P-ethyl were better than tralkoxydim at 90 DAS at high rate. Also, tralkoxydim herbicide (238 g/ha) at 90 DAS revealed insignificant influence compared to unweeded check in first season. In second season, clodinafop-propargyl, fenoxaprop-P-ethyl and tralkoxydim at 40 and 90 DAS with the lower and higher rates, especially at early application showed the best performance in this respect. The highest 1000-grain weight was obtained by clodinafop-propargyl, fenoxaprop-P-ethyl and tralkoxydim at early application in both seasons.

Table 1. Effect of tested herbicidal treatments on wild oats and wheat yield characters as well as their components in 2000/2001 season

Herbicides used	Appl.		Wild oats			Wheat			
	Rates g a.i./ha	time DAS*	Panicles no./m²	Grains/ m²	Dry wt. g/m²	Spikes no./m²	grains wt./spike	1000-grain wt. (g)	Grain yield (t/ha)
Clodinafop-propargyl	50	40	0.05	3.7	2.3	502	3.03	51.87	6.46
	100	90	0.70	51.0	31.1	461	2.80	49.32	4.93
	50	90	1.90	141.5	49.7	378	2.58	48.10	3.93
Fenoxaprop-P-ethyl	90	40	0.05	3.7	2.5	509	3.04	51.55	6.49
	180	90	0.70	55.0	37.1	435	2.81	49.70	5.12
	90	90	1.90	141.2	42.9	397	2.70	49.02	3.99
Tralkoxydim + oil (1 : 1)	238	40	0.80	58.2	7.7	482	2.82	49.72	6.18
	476	90	3.50	58.2	52.7	406	2.18	47.27	4.14
	238	90	20.0	1452.5	107.5	347	1.88	42.15	3.61
Unweeded check			93.2	6795.0	173.3	239	1.73	39.07	2.89
L.S.D.0.05			9.60	844.0	60.5	51.5	0.58	2.16	0.85

* DAS : days after sowing

Table 2. Effect of tested herbicidal treatments on wild oats and wheat yield characters as well as their components in 2001/2002 season

Herbicides used	Appl.		Wild oats			Wheat			
	Rates g a.i./ha	time DAS*	Panicles no./m²	Grains/ m²	Dry wt. g/m²	Spikes no./m²	grains wt./spike	1000-grain wt. (g)	Grain yield (t/ha)
Clodinafop-Propargyl	50	40	0.3	24.5	4.2	473	2.79	49.35	5.51
	100	90	1.4	107.0	45.6	416	2.66	48.77	4.34
	50	90	4.3	162.7	63.9	382	2.48	45.82	3.50
Fenoxaprop-P-ethyl	90	40	0.2	17.7	5.1	456	2.81	49.77	5.39
	180	90	0.9	71.2	34.5	407	2.62	48.02	4.29
	90	90	2.7	204.5	54.7	385	2.31	46.00	3.66
Tralkoxydim + oil (1 : 1)	238	40	1.5	117.3	10.3	448	2.68	48.85	5.14
	476	90	4.3	336.2	57.7	397	2.16	45.50	3.51
	238	90	52.0	3925.0	147.3	326	1.92	40.15	2.83
Unweeded check			130.0	9730.0	273.7	275	1.59	37.02	2.36
L.S.D.0.05			7.9	602.5	119.0	35.6	0.66	1.61	0.64

* DAS : days after sowing

Clodinafop-propargyl and fenoxaprop-P-ethyl at the two tested rates when applied at 90 DAS were more performance than tralkoxydim in both seasons. However, all herbicidal treatments caused significantly higher influences than unweeded check treatment.

The highest grain yield was obtained with clodinafop-propargyl, fenoxaprop-P-ethyl and tralkoxydim when applied at 40 DAS. They achieved 6.49, 6.46 and 6.18 t/ha in first season, compared with 5.51, 5.39 and 5.14 t/ha in second season, respectively. Also, herbicides when applied at double recommended rates gave grains yield of 5.12 and 4.34 t/ha with clodinafop-propargyl, 4.93 and 4.29 t/ha with fenoxaprop-P-ethyl and 4.14 and 3.91 t/ha with tralkoxydim in first and second seasons, respectively. Meanwhile, the herbicides when applied in recommended rates at 90 DAS grains yield were 3.99 and 3.60 t/ha with clodinafop-propargyl, 3.93 and 3.66 t/ha with fenoxaprop-P-ethyl and 3.61 and 2.83 t/ha with tralkoxydim at 2000/2001 and 2001/2002 seasons, respectively.

Reviewing the aforementioned results, it could be concluded, in general, that grains production, panicles formation and dry weight of wild oats were decreased significantly when herbicides applied at 40 DAS in the recommended rates. These results are in harmony with the results obtained by **Gorfu *et al* (1992)**. However, clodinafop-propargyl and fenoxaprop-P-ethyl when applied at 90 DAS and when wild oats growth cases at booting stage with normal and double recommended rates significantly decreased grain panicle and dry weight of wild oats than tralkoxydim. The same findings were obtained by **(Medd *et al* (1992); Raffel & Fluh (1992), Montazeri (1993); Orlando 1993); Abtali *et al* (1995); Juan *et al* (1995); Ormeno & Diaz (1995) and O'Donovan *et al* (2003).**

The tested herbicides when applied at 40 DAS with recommended rates increased grain yield and improved its components. While, the higher rates and late application of clodinafop-propargyl and fenoxaprop-P-ethyl increased grain yield than tralkoxydim **(Mirkamali, 1993; Hugo & Bilijon, 1993 and Montazeri, 1994)**. High rates and late application of tralkoxydim injured wheat plant and grain yield **(Ismael *et al* 1994)**. However, late application of herbicides at booting stage may be break the competition between wild oat and wheat **(Medd *et al* 1992; Montazeri, 1993; Abtali *et al* 1995 and Al-Marsafy *et al* 2001)**.

In conclusion, application of the tested herbicides of the recommended or the double rates at early or late time of application resulted increase in wheat grain yield and improved its components, while inhibited grains production, panicles and dry weight of wild oat plants.

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مجلة حوليات العلوم الزراعية ، كلية الزراعة ، جامعة عين شمس ، القاهرة ، م٥٠ ، ع(٢)، ٧٤٩-٧٥٨ ، ٢٠٠٥

تثبيط تكوين سنابل وإنتاج حبوب الزمير فى القمح

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أجريت تجربتين حقليتين فى الموسمين الشتويين ٢٠٠٠/٢٠٠١ و ٢٠٠١/٢٠٠٢ بمحطة البحوث الزراعية التابعة لكلية الزراعة - جامعة القاهرة بالجيزة لتقييم دور معدلات وميعاد الإضافة لكل من مبيدات الحشائش : كلودينافوب - بروبارجيل، الفينوكسيابروب- ب -إيثيل، التراكوكسيديم على تثبيط نمو سنابل حشيشة الزمير (أفينا فاتيوا، أفينا إستيريليس) وإنتاج الحبوب فى القمح صنف "سخا-٦٩". أستخدمت معاملات المبيدات بالمعدل الموصى به (٥٠، ٩٠، ٢٣٨ جم/هكتار) عند ٤٠ يوم بعد الزراعة وضعف المعدل الموصى به عند ٩٠ يوم من الزراعة. وكانت كثافة الزمير فى القطع التجريبية للحبوب تتراوح بين (٦٧٩٥ إلى ٩٧٣٠/م^2) وعدد السنابل/م^2 (٩٣,٢ إلى ١٣٠) بينما الوزن الجاف كان بين ١٧٣,٣ و ٢٧٣,٧ جم/م^2. أدت جميع المعاملات للمبيدات إلى إنخفاض مكونات الزمير. الكلودينافوب - بروبارجيل خفض عدد سنابل الزمير بين ٠,٠٥ و ٤,٣ سنبلة/م^2، والحبوب من ٣,٧ و ١٦٢,٧ حبة/م^2، والوزن الجاف من ٢,٣ و ٦٣,٩ جم/م^2. بينما الفينوكسيابروب -ب-إيثيل ثبط تكوين حبوب الزمير بين ٣,٧ و ٢٠٤,٥ حبة/م^2، بينما تكوين السنابل إلى ١,٩ و ٢,٧ سنبلة/م^2، والوزن الجاف بين ٢,٥ و ٥٤,٧ جم/م^2. أيضا التراكوكسيديم

أنقص إنتاج الحبوب فى المتر المربع بين ١٥٨,٢ و ٣٩٢٥، وتكوين سنابل الزمير بين ٥,٨ و ٥٢ سنبلة/م^{٢} والوزن الجاف بين ٧,٧ و ١٤٧,٣ جم^{٢}. أظهرت النتائج أن جميع معاملات المبيدات أعطت نتائج جيدة عدا التر الكوكسيديم بالجرعة العادية عند ٩٠ يوم.

من ناحية أخرى زاد محصول الحبوب ومكونات المحصول مع المعدل العادى. إزداد المحصول يـــزداد طرديـــا مع زيادة معدل المبيد مع الميعاد المتأخر وبخاصة عند إستخدام الكلودينافوب – بروبارجيل، والفينوكسيابروب – ب – إيثيل عن التر الكوكسيديم.

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