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Weed Control Effects on the Grain Yield, Chemical Composition and Some Technological Properties of the Common Wheat (*Triticum aestivum* L .) Cultivar

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TWO field experiments were carried out in a newly reclaimed lands at Ismailia Research Station during 2003/2004 and 2004/2005 to investigate of the effect of six weed control treatments for the fresh weight of annual broad–leaved weeds (g/m^2), grain yield (ardab/fed)*, chemical composition and some technological properties of the common wheat (*Triticum aestivum* L.). Results showed that 240 g (a.i)/fed. Bromoxynil 24% EC (Brominal) and 14.28 g (a.i)/fed. Tritsuluron 71.4% WG. (Tarouk) treatments were reduced significantly the fresh weight of annual broad-leaved weeds 90.5 and 85.4%, respectively in first year and 94.3 and 90.4%, respectively in second year. Similarly, wheat grain yield (ardab/fed.) was also increased significantly by (103.8% and 94.0%) and by (100% and 90.2%), respectively in the first and second years. The previous treatments 240 g (a.i)/fed. Bromoxynil 24% EC (Brominal) and 14.28 g(a.i) /fed Tritsuluron 71.4% WG. (Tarouk) were increased 1000-grain weight, hectoliter (Kg. Hectoliter) weight, extraction ratio, protein and gluten (wet and dry) fraction percentages in the flour (Flour, Short and Bran) for both years. The highest rheological values were found with the Farinograph analyzing. All the weed control treatments decreased the dough weakening as compared with the control in both years. It could be concluded that treatments under the present study improved mainly of the used common wheat's physiological, flour properties and dough making characteristics.

Keywords: Weed herbicide, Weed, Wheat, Grain yield, Physical-Chemical, Technological properties.

In Egypt, wheat (*Triticum aestivum* L.) plant is considered as the important cereal crops because it is the principle food and main source of the energy for the human nutrition. Total production of the wheat is still far below the consumption and annual demand. This gab can be filled by the increasing of its planting area in the reclaimed lands. The main factor constrains spreading wheat planting in

(ardab/fed)*. Ardab = 150 kg
Fed. = Feddan = 4200 m^2

the new reclaimed area are covered with the weeds. There are more than sixty weed species such as *Ammi majus* L., *Anagallis arvensis* L., *Beta vulgaris* L., *Chicorium pumilum* Jacq. *Chenopodium album* L., *Coronopus niloticus* (Del.), *Medicago spp.*, *Melilotus indica* L., *Rumex dentatus* L., *Sinapis arvensis* L.and *Sonchus oleraceus* L. as annual broad-leaved weeds in the wheat fields in Egypt (El-Hassanien *et al.* 2000). The number of weeds may differ owing to soil type, irrigation system, temperature (climate), crop rotation and other factors.

Weeds associated with the wheat as a competitor for some of the essential growth factors such as light, nutrients and water. They caused the losses in quantity and quality of the grain yield. Successful weed control practices play an important role in the productivity of the wheat.

The highest cost of hand weeding and their damaging to the wheat plants showed that herbicides usage is the necessary and economical. Aim of this study is to fix and observed to the effect of the some weed control treatments on the fresh weight of the some annual broad-leaved weeds (g/m^2), the wheat grain yield (ardab/fed), the chemical composition and some of the technological properties of the dough.

Material and Methods

Two field experiments were conducted at Ismaillia Agricultural Research Station, ARC during the 2003/2004 and 2004/2005 to study the effect of weed control treatments on the fresh weight of associated the annual broad-leaved weeds (g/m^2),yield (ardab/fed) of the common wheat (*Triticum aestivum* L.) cultivar, grain chemical composition and some technological properties of the dough. Used weed control treatments in both seasons can be summarized as follows: First, 14.28 g (a.i)/fed. Tarouk, (Tritsuluron 71.4% WG.) applied as post-emergence at the two or four leaves stage (seedling); second, 240 g (a.i)/fed. Bromoxynil (2, 6-dibromo-4-cyanophenyl octanoate) (Bromoxynil 24% EC.) as the post-emergence at the three or five leaves stage and 240 g (a.i) /fed applied as the post-emergence at the three or five leaves stage; third, 5 g (a.i) /fed (Pyraflufen-ethyl 2% SC.) applied as the post-emergence at the two or four leaves stage; four, hand weeding twice at 30 and 45 days after the sowing and finally untreated or the (control). A common wheat variety Gemiza 7 seeds (50 kg / fed.) were sown in rows 20 cm apart on the 3rd week of November in both seasons. Plot area was 10.5 m^2 (3x3.5m.). Treatments were arranged in a randomized block design with four repliications .For comparisons within the two control treatments [hand weeding twice at 30 and 45 days after the sowing and control] were included. All herbicide treatments were sprayed with a knapsack sprayer (made in Germany.) at water volume of 200 L/fed. The soil type was sandy texture. Grassy weeds were existed with relatively low infestation in both seasons and controlled by hand pulled. All other practices were applied as recommended for wheat production in the region. The summer preceding crop

was corn (*Zea maize* L.) in both seasons. Weed assessment was carried out at 60 days after sowing. Weeds were hand pulled out from one square meter chosen at random from each plot. Annual broad-leaved weeds were identified according to Tackholm (1974) and classified into their species. The fresh weight of weeds (g/m^2) was recorded. Seed yield (ardab/fed.) was determined from each plot ($10.5m^2$) at harvest time. Chemical and technological analysis were done in both seasons at harvest time and samples were taken at random for crude protein (Anonymous 1990); Hectoliter (Kg. Hectoliter) and gluten content (wet and dry), and 1000 grain weight were found according to Anonymous (1970). The wheat grains were separated and milled was done on a Buhler pneumatic mill to give extraction flour. Farinograph test was done as described by Anonymous (1970). Obtained data were subjected to statistical analysis according to Snedecor and Cochran (1980) and tested with the Least Significant Differences (LSD) at 5% level of significance. The fresh weight of the weeds was transformed to the logarithmic values to be able to obtain for their normal distribution (Erwin *et al.*1966).

Results and Discussion

1- Effect of the weed control treatments on the fresh weigh (g/m^2) of the annual broad-leaved weeds in 2003/2004 *and* 2004/2005

Weed diagnosis and assessments shows that pre-dominated weed species in the experimental flora in both years are *Ammi majus* L., *Anagallis arvensis* L., *Beta vulgaris* L., *Chicorium pumilum* Jacq, *Chenopodium album* L., *Coronopus niloticus* (Del.), *Medicago spp.*, *Melilotus indica* L., *Rumex dentatus* L., *Sinapis arvensis* L.and *Sonchus oleraceus* L. as annual broad–leaved weeds.

Data presented in the Table 1 revealed that all weed control treatments were significantly reduced the fresh weight of the weeds in both years. Bromoxynil 24% EC. 240 g (a.i)/fed and 14.28 g (a.i)/fed. Tritsuluron 71.4 % WG. have been given the lowest fresh weight of the weeds (g/m^2) in both years. These treatments reduced the fresh weight of the broad-leaved weeds by 90.5 and 85.4%, respectively in the first year. In the next year, previous treatments were decreased the significantly fresh weight of the broad-leaved weeds by 94.3 and 90.4%, respectively. These results indicate that 240 g (a.i)/fed Bromoxynil 24% EC and 14.28 g (a.i)/fed Tritsuluron 71.4% WG were the most promising treatments in reducing the dry weight of the annual broad-leaved weeds. The superiority of these treatments in controlling the broad-leaved weeds may be due to the highly efficiency against to them. Researchers have been reported that 240 g (a.i)/fed. Bromoxynil 24% EC was the superiority treatment in reducing the fresh weight of the broad-leaved weeds associated with the wheats as compared with the control. The obtained results are in accordance with Kholosy *et al.* (1991) and Al-Marsafy *et al.* (1992).

TABLE 1. Effect of the weed control treatments on the weed fresh weight and the grain yield in 2003/2004 and 2004/2005

Treatments	Amount g (a.i) /fed	2003/2004			2004/2005		
		Weed fresh weight (g /m^2)		Yield (ardab /fed.)	Weed fresh weight (g /m^2)		Yield (ardab /fed.)
		O*	T*		O	T	
Control		508.56	2.351	4.600	785.15	2.895	5.1
Tritsuluron (Tarouk)	14.28	74.10	1.867	8.925	75.45	1.877	9.7
Bromoxynil(Framinal)	240	141.10	2.145	6.550	132.83	2.123	7.8
Bromoxynil (Brominal)	240	48.45	1.680	9.375	44.80	1.651	10.2
Pyraflufen-ethyl (Ekopart)	5	104.72	2.018	7.550	107.68	2.032	8.5
Hand Weeding		175.98	2.245	6.200	185.43	2.268	6.7
$LSD_{0.05}$			0.5719	1.760		0.002	0.41

O* = Original data T* = Transformed data.

2- *Effect of the weed control treatments of the grain yield in the* 2003/2004 *and* 2004/2005

Table 1 shows that all treatments were significantly increased the grain yield (ardab/fed.) of the wheat in both years. 240 g (a.i)/fed Bromoxynil 24% EC and 14.28 g (a.i)/fed. Tritsuluron 71.4% WG applications were given the highest grain yield (ardab/fed.) in both years. On the other hand, these treatments were increased the grain yield of wheat (ardab/fed.) by 103.8 and 94.0%, respectively in the first year; in the second year the previous treatments increased significantly the grain yield of the wheat (ardab/fed.) by 100 and 90.2%, respectively. The superiority may be due to reducing in the fresh weight of the total broad-leaved weeds (g/m^2) which minimize competition on the growth factors between weeds and wheat, then maximizes the grain yield. Results are in harmony with Saad *et al.* (1991), Kholosy *et al.* (1991) and Al-Marsafy *et al.* (1992) who found that 240 g (a.i)/fed. Bromoxynil 24% EC. was increased the grain yield as compared with weedy check.

3- Effect of weed control treatments on 1000-grain weight, hectoliter weight and extraction ratio of the flour in 2003/2004 and 2004/2005

Data presented in Tables (2 and 3) show that all treatments increased 1000-grain weight, hectoliter weight (kg. Hectoliter) and extraction ratio in both years. 240 g (a.i)/fed. Bromoxynil 24% EC. was the superior treatment. That treatment was increased the 1000-grain weight, hectoliter (Kg. Hectoliter) weight and extraction ratio with 47.3, 14.4 and 10.8% in the first year and 48.1, 14.9 and 7.5% in the second year. It was observed that 14.28 g (a.i)/fed. Tritsuluron

71.4% WG. was the second of bromoxynil 24% EC. as concern to the same characters .This treatment 14.28g(a.i)/fed. Tritsuluron 71.4%WG also gave 42.1, 14.0 and 9.2% increasing in the 1000 grain weight, hectoliter (Kg. Hectoliter) weight and extraction ratio in the first year and 46.3, 14.7 and 7.2% in the second year; but, control treatment was given the lowest values. Increasing in the 1000-grain and hectoliter (kg. Hectoliter) weight may be due to the increasive effect of the starch accumulation into the grain. It could be concluded that 240 g (a.i)/fed. Bromoxynil 24% and 14.28 g (a.i)/fed. Tritsuluron 71.4% WG. are the best doses so they were given the highest values for all examined the parameters. On the other hand, this may be due to reduction of the weeds which compete with the wheat for the nutrient and light usage or utilization and in parallel to enhance accumulation relevant grain components. The obtained data were in harmony with those of Barhoma *et al.* (1990) and Barhoma *et al.* (1996).

TABLE 2. Effect of the weed control treatments on 1000-grain weight, hectoliter (Kg. Hectoliter) weight and extraction ratio in 2003/2004.

Treatments	Amount g (a.i) /fed	1000-Grain Weight (g)	Hectoliter Weight (Kg.Hectoliter)	Extraction Ratio		
				Flour	Short	Bran
Control		28.5	69.60	65.0	6.1	27.7
Tritsuluron (Tarouk)	14.28	40.5	79.40	71.0	7.4	21.4
Bromoxynil (Framinal)	240	39.0	79.20	70.0	6.6	22.8
Bromoxynil (Brominal)	240	42.0	79.60	72.0	6.5	21.1
Pyraflufen-ethyl (Ekopart)	5	39.6	79.24	70.5	7.3	22.0
Hand Weeding		32.0	78.80	68.8	6.5	24.5

TABLE 3. Effect of weed control treatments on 1000-grain weight, hectoliter (Kg. Hectoliter) weight and extraction ratio of the flour in 2004/2005.

Treatments	Amount g (a.i) /fed	1000-Grain Weight (g)	Hectoliter Weight (Kg.Hectoliter)	Extraction Ratio		
				Flour	Short	Bran
Control		27.0	69.20	66.8	6.0	26.6
Tritsuluron (Tarouk)	14.28	39.5	79.40	71.6	7.1	21.0
Bromoxynil (Framinal)	240	38.6	79.12	70.0	7.0	22.7
Bromoxynil (Brominal)	240	40.0	79.50	71.8	7.3	20.0
Pyraflufen-ethyl (Ekopart)	5	39.0	79.20	71.3	7.2	21.3
Hand Weeding		35.4	79.00	69.8	6.7	23.4

4-Effect of weed control treatments on the protein and gluten fraction's ratios in 2003/2004 and 2004/2005

Data presented in Table 4 revealed that all weed control treatments resulted in the increasing both protein and gluten percentage in two years. Bromoxynil 24% EC. was the most effective treatment in the increasing of the protein and gluten (wet and dry) fractions percentage. This treatment was given the increasing as 8.85 and 7.76% in the first and second years, respectively for the protein level. The wet and dry gluten ratios were also increased by 21.13 and 22.7% in the first year and by 24.29 and 29.52% in the second year. It was noticed that 14.28g (a.i)/fed Tritsuluron 71.4% WG. was the second of 240g (a.i)/fed bromoxynil 24% EC. as concern to protein and gluten (wet and dry) characters. Control application was given the lowest value. The increasing in protein and gluten percentage may be due to depression in the weed growth as a result of bromoxynil 24% EC. But this point is not clear and needs more detailed physiological studies to clarify this aspect. This is revealed that the dosage of 240 g (a.i)/fed and14.28 g (a.i)/fed Tritsuluron 71.4% WG. is optimum for this trait. Our findings were supported by Barhoma *et al.* (1996) and El-Shazly (1996).

TABLE 4. Effect of weed control treatments on protein (%) and gluten (%) fractions on dry weight of the flour in 2003/2004 and 2004/2005.

Weed control treatments	Amount g (a.i) /fed.	2003/2004 season			2004/2005 season		
		Protein (%)	Gluten (%)		Protein (%)	Gluten (%)	
			Dry	Wet		Dry	Wet
Control		11.3	7.1	22.9	11.6	7.0	22.7
Treatments:							
Tritsuluron (Tarouk)	14.28	12.0	8.5	27.1	12.3	8.1	26.5
Bromoxynil (Framinal)	240	11.7	8.2	25.3	12.1	7.6	25.2
Bromoxynil (Brominal)	240	12.3	8.6	28.1	12.5	8.7	29.4
Pyraflufen-ethyl (Ekopart)	5	11.8	8.3	26.4	12.2	7.8	25.8
Hand Weeding		11.5	7.2	23.2	11.9	7.3	24.5

5- Effect of weed control treatments on the farinograph parameters of the wheat flour dough in 2003/2004 and 2004/2005

Data presented in Tables (5 and 6) show on the rheological properties of wheat flour dough tested by Farinograph in 2003/2004 and 2004/2005. According to findings, control treatments increased water absorption, mixing time and dough stability in both seasons as compared with control. 240 g (a.i)/fed. Bromoxynil 24%EC. at the rate of the highest values for the water absorption, mixing time and dough stability over those of all other treatments. In the first year, this treatment increased the previous characters with 12.1, 27.3 and 26.1%, respectively and increased them with the 19.8, 54.5 and 27.3 % in the second year. Tritsuluron 71.4%WG. at14.28 g (a.i)/fed. was the second of

bromoxynil 24%EC. at the rate of 240 g (a.i)/fed.as concern to water absorption, mixing time and dough stability. The increasing in the water absorption of the 240g(a.i)/fed bromoxynil 24% EC. and 14.28g(a.i)/fed. Tritsuluron 71.4%WG. at attributed to the increasing in protein content due to greatly reducing the competition between broad-leaved weeds and wheat. Similar finding was reported by El-Farra *et al.*(1982). As concern to dough weakening all weed control treatments decreased in both years.

TABLE 5. Effect of weed control treatments on the farinograph parameters in the dough in 2003/2004.

Treatments	Amountg (a.i) /fed.	Water Absorption (%)	Mixing Time (min.)	Dough Stability (min.)	Dough Weakening (B.U.)*
Control		58.0	1.1	2.3	130
Tritsuluron (Tarouk)	14.28	62.0	1.4	2.8	108
Bromoxynil (Framinal)	240	61.6	1.2	2.6	119
Bromoxynil (Brominal)	240	65.0	1.4	2.9	105
Pyraflufen-ethyl (Ekopart)	5	61.8	1.3	2.7	115
Hand weeding		60.5	1.1	2.4	123

*B.U. = Brabender unit.

TABLE 6. Effect of weed control treatments on the farinograph parameters in the dough in 2004/2005.

Treatments	Amount g (a.i) /fed.	Water Absorption (%)	Mixing Time (min.)	Dough Stability (min.)	Dough Weakening (B.U.)*
Control		53.0	1.1	2.2	135
Tritsuluron (Tarouk)	14.28	63.2	1.5	2.7	105
Bromoxynil(Framinal)	240	62.5	1.3	2.4	125
Bromoxynil(Brominal)	240	63.5	1.7	2.8	100
Pyraflufen-ethyl (Ekopart)	5	63.0	1.4	2.5	117
Hand weeding		62.4	1.2	2.4	130

*B.U. =Brabender unit.

Finally it could be concluded that treatments under the present study improved mainly the common wheat's physiology, flour properties and dough making characteristics.

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تاثيرمقاومة الحشائش على الحشائش والمحصول والمكونات الكيميائية والصفات التكنولوجية فى القمح

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قسم بحوث تكنولوجيا المحاصيل ، معهد بحوث تكنولوجيا الأغذيه و*المعمل المركزى لبحوث الحشائش- مركز البحوث الزراعيه- القاهرة - مصر .

أقيمت تجربتين حقليتين فى الأراضى حديثة الإستصلاح بمحطة البحوث الزراعية بالإسماعيليه خلال الموسمين الشتويين ٢٠٠٣/٢٠٠٤ و٢٠٠٤/ ٢٠٠٥ لدراسة تأثير ستة معاملات لمقاومة الحشائش على الوزن الغض(جم/ م٢) للحشائش الحولية العريضة الأوراق والمحصول(أردب للفدان) والمكونات الكيميائية والصفات التكنولوجية فى القمح.أشارت النتائج إلى أن معاملتا البرومينال بمعدل ٢٤٠جم ماده فعاله للفدان و التاروك بمعدل ١٤,٢٨ جم/ للفدان أدتا إلى نقص معنوى فى الوزن الغض للحشائش الحولية العريضة الأوراق قدر بحوالى(٩٠,٢و٨٥,٤%) فى الموسم الأ ول وحوالى(٩٤,٣ و٩٠,٤ %) فى الموسم الثانى وأعطتا أعلى زيادة للمحصول (إردب للفدان) قدرت بحوالى (١٠٣,٨ و٩٤%) فى الموسم الأول وحوالى(١٠٠ و٩٠,٢ %) فى الموسم الثانى على التوالى مقارنة بمعاملة الكنترول. كما أدتا إلى زيادة وزن الألف حبة والهيكتوليتر ونسبة الإستخلاص(الدقيق - النخالة) وتحسين نسبة البروتين والجلوتين (الرطب والجاف) كما أعطتا أعلى قيم للصفات الريولوجية المختبرة بالفارينوجراف مثل إمتصاص الماء وزمن الخلط والثبات للعجين. وأدت كل معاملات الحشائش إلى نقص ضعف العجين مقارنة بمعاملة الكنترول فى الموسمين.