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Efficacy of certain herbicidal combinations and growth stimulator against weeds and their impact on productivity and quality of wheat

Fouad S. Soliman, F. S. Sabra, A. M. El-Shazly and I. M. A. Awwad
Pesticide Chemistry Dept., Faculty of Agric., Alexandria University

ABSTRACT

Two field trials of wheat (*Triticum aesitivum* var. Sids 1) were carried out in two different sites in Salama Hegazy village in Bangar El-Sokkar region under optimum cultural practices. These fields were severely infested with grassy and broadleaf weeds. Nine herbicidal combinations were performed with or without atonik as a plant growth stimulator. The effects of herbicidal combinations with or without atonic on weeds; wheat grain yield and yield components; and grain quality were studied. The results indicated that most herbicidal combinations with atonik gave highly significant reduction of grassy weeds and clodinafop is a graminicide when combined with either new broadleaved herbicides (derby, harmony or metosulam) or with old broad leaf herbicides (Pyridate Fluroxypyr or bentazone) gave good results in controlling grassy and broadleaf weeds in Bangar El-Sokkar region. Regard to the number of spikes/m^2, and spikelets / spike, biological yield and grain yield, clodinafop combinations significantly increased wheat grain yield and its components. The data also revealed that the wheat quality characters (protein %, starch and total soluble sugar) were significantly improved in wheat grain especially in the presence of atonik stimulator.

INTRODUCTION

It is well known that wheat growth and productivity is highly sensitive to the competition of the grassy and broadleaf weeds during their early stages of growth. Weeds in wheat fields showed to be strong competitors for nutrients particularly nitrogen, light and moisture (Roberts, 1982). According to Tewari and Mehrotra (1978) an increase of one gram in dry weight of weeds per square meter in wheat fields was followed by a decrease of 143 g in grain yield. In a negative hyperolic function, weed biomass explained 31 % of the variation in yield loss due to weeds (Milberg and Hallgren, 2004). The problem of weeds is additionally aggravated

because of continuous intensive cereal cropping, grazing animal, manure and irrigation by water drainage in new desert reclaimed land in Egypt. It would be useful to combine graminicides with broadleaf herbicides to broaden the spectrum of weeds controlled. Several investigators controlled weeds in wheat by applying combinations of post-emergence herbicides without any harmful effects on yield and yield components. Panther gave excellent control of many weeds when applied by 1.1 kg a.i. / hectare (Chill, 1988; Horsenail and Turner, 1988; Whiting and Davies, 1990; Hallgren, 1990; and Fisher *et al*, 1993). Montazeri (1995) observed that tribenuron in combinations with four graminicides controlled many wheat weeds. Tralkoxydim with fluroxypyr or metsulfuron-methyl provided good overall weed control against grassy and broad leaf weeds (Panwar *et al* 1995). In field trials, Montazeri (1995) studied the efficacy of four grassy herbicides (fenoxaprop – p, diclofop – methyl, imazamethabenz and tralkoxydim) and five broadleaf-weeds herbicides (tribenuron-methyl, terbutryn, triasulfuron, 2,4-D and bromoxynil) for the control of many wheat weeds. He found that all the herbicidal combinations controlled *Avena spp.*, *Phalaris minor* and *Sinapis arvensis* and increased grain yield. Fluroxypyr and tralkoxydim singly or in combination were effective for controlling weeds in wheat and in most cases caused significant increases in grain yields (Heap and Mitchell, 1992; Panwar *et al* 1992; Balyan *et al.* 1992, Mirkamal, 1993; Panwar *et al* 1994, Lenerle and Verbuk, 1995; Singh *et al* 1995; Panwar *et al* 1996; and Sabra *et al*, 1999). Diclofop plus bentazone gave significant increase in wheat yield (Khosro *et al* 1983). Sabra *et al* (1999) found that the most effective herbicidal combinations for controlling weeds and increasing grain yield were metosulam and clodinafop- propargyl. Also, Sabra *et al* (1999) showed that diflufinican, isoproturon, metosulam, tralkoxydim and clodinafop – propargyl enhanced plant height, number of tillers per plant, spike length and 1000 grain weight. These results are in agreement with that found by El-Deeb *et al* (1986), Gouda *et al* (1994) and Panwar *et al* (1995).

Certain herbicides affect wheat grain quality characters in particular protein content, total sugar content, and gluten content (Sabev and Stoeva 1988, Hallgren 1989, Lisoval *et al* 1989, Martin *et al* 1989 & 1990, Ponce *et al* 1989 and Randhawa and Gill 1989).

A natural plant growth stimulator (Atonik) is extracted from Moka tree. Its chemical composition is Sodium-p-nitrophenolate 0.3%, sodium – 0-nitrophenolate 0.2%, sodium -5-nitro-guaiacolate 0.1% and inert ingeradient 99.4%. Atonik is a yield and growth enhancer which increases crop yield

through enhancing assimilation (nutrient uptake, nitrate reduction and photosynthesis), improving the flow of assimilates (assimilate translocation and cytoplasmic streaming) and increasing cell integrity (Guo and Oosterhuis,1997).

The field trials in this article were conducted to determine the efficacy of certain herbicidal combinations with or without plant growth stimulator (Atonik) for selective control of mixed populations of grassy and broadleaf weeds and their effects on growth, productivity and quality of wheat.

MATERIALS AND METHODS

Herbicide combinations and Atonik treatments: Nine herbicide combinations and unweeded check were distributed at random and performed within each with or without atonik growth stimulator during the 1997 – 1999 seasons, in Salama Hegazy village, Bangar El-Sokkar region. The experimental design was a split plot with four replicates, and the area of the single subplot was 6 x 5m. The main plots represent the atonik treatment whereas subplots represent the herbicidal combinations. Wheat (*Triticum aesitivum* cultivar Sids 1) was cultivated by afeer cross sowing method by seed drilling (using 65 kg / feddan). The herbicidal treatments were sprayed post-emergence 30 days after wheat sowing using a knapsack sprayer. On the other hand, atonik was applied at a total rate of 125 cm^3 / feddan at two times, after 2 days from the herbicide application and before the heading stage. The herbicidal treatments, formulations, common and trade names and rate / feddan are presented in Table (1).

Assessment of weed control: Weed control assessments included scoring the grown weeds by a visual rating system at early stage (Frans and Talbert, 1977 and Roberts, 1982) 25 days after the herbicide application; weed mass at heading stage by sampling weeds from random quadrats (minimum 2, with size 0.25 m^2) from each plot. The weeds were cut at the ground level, sorted and weighed immediately (Roberts 1982); grassy seed heads at harvesting stage were counted according to the methods (Roberts 1982), besides the calculation of reduction percentage for each herbicidal combination.

Table (1): Common and trade names, rate, and formulations of applied herbicides

Treatments	Common name	Trade name	Rate /fedd	Formula
1	Diflufenican + isoproturon	Panther (ready mix)	$^1/_2$ L	55 SC
2	(Florasulam 7.5% + flumetsulam 10%) + tralkoxydim.	Derby (ready mix) + Grasp	20 cm 1 L	17.5 SC 10 % EC
3	(Florasulam 7.5% + flumetsulam 10%) + clodinafop-propargyl	Derby (ready mix) + Topik	20 cm 100 ml	17.5 SC 24 % EC
4	(Thifensulfuron 68.2% + metasulron 6.8%) + tralkoxydim	Harmony (ready mix) + Grasp	15 gm 1 L	75 %WG 10 % EC
5	(Thifensulfuron 68.2% + metasulron 6.8%) + clodinafop – propargyl	Harmony (ready mix) + Topik	15 gm 100 ml	75% WG 24 % EC
6	Metosulam + clodinafop – propargyl	Sinal + Topik	40 ml 100 cm^3	10 % SC 24 % EC
7	Lentagram + clodinafop – propargyl	Pyridate + Topik	700 cm^3 160 gm	60 EC 15 WP
8	Fluroxypyr + clodinafop – propargyl	Starane + Topik	200 cm^3 160 gm	20 % EC 15 WP
9	Bentazone + clodinafop – porpargyl	Basagrane + Topik	500 cm^3 160 gm	48 % WS 15 WP
10	Unweeded check			

Assessment of wheat plant growth: Number of wheat spikes per square meter were counted using quadrate (50 cm x 50 cm) for each plot.

Assessment of grain yield and yield components: Ten spikes from each plot were collected to determine, number of spikelets / spike, and 1000 grains weight. Wheat grains yield in each plot were harvested and weighed to recorded biological yield (grain and straw yield), then the wheat was threshed for each plot, then the grain yield was calculated in ton / feddan. Harvest index was also calculated.

Assessment of grain wheat quality characters

-Total nitrogen content: The total nitrogen in grain wheat was converted into, ammonium sulfate and then distilled into boric acid, then titrated with standard sulfuric acid with an appropriate indicator. The determination was done by Micro-Kjeldahl, digestion, according to the method described by Chapman and Partte (1961).

-Starch content: Starch content was measured according to A.O.A.C (1980) and Thomas and Ducher (1924).

-Total soluble sugar contents: Total soluble sugars were determined by picric acid method as described by Thomas and Dutchar (1924). The sugar content was calculated as glucose from the standard curve in the range of 0.5 – 5 mg / ml.

Statistical analysis of the data was carried out according to Cohrt Soft Ware Inc. (1986).

RESULTS AND DISCUSSION

1) Assessment of weed control

Tables 2,3 and 4 illustrate the effect of herbicidal combinations and the atonik for controlling weeds, as a visual observation, weed mass, and weed seed heads counts

a. Visual weeds coverage (at early stage): Results of the visual coverage are recoded in Table 2, all the statistical analysis of visual percentages of weed coverage showed no significant differences between

herbicidal combinations with or without atonik except in case of grassy weeds in the first season. Since, atonik significantly enhanced the lowering of weed coverage, where the mean percent coverage were 6.66 and 10.13 for treatments with atonik and without atonik, respectively.

On the other hand, most of the herbicidal combinations with or without atonik gave significantly control of grassy and broad leaf weeds compared to unweeded check. Since, the lowest weed coverage were obtained with derby + tralkoxydim, metosulam + clodinafop – propargyl and harmony + tralkoxydim. These results are similar to the finding of Sabra *et al* (1999) and Soliman *et al* (2000). Atonik - herbicide interaction showed significant effect for broad leaved and total weeds in the first season only. So, derby + tralkoxydim and metosulam + clodinafop-proparygl were the lowest weed coverage in this respect for total weeds.

b. **Weed mass at heading stage:** Table (3) indicated significant effect for atonik stimulator except with grassy weeds in the second season. Also, herbicidal combinations had significant effects on the fresh weight of weeds in the two seasons. Atonik-herbicide interaction showed also significant effect for weeds fresh weight in both seasons.

Atonik stimulator exhibited significant differences in the first season for fresh weight of grassy weeds and in both seasons for broadleaved and total weeds. Where, the highest fresh weight for grassy, broadleaved and total weeds was observed in untreated check with atonik stimulator, this may be due to activation of weeds by atonik stimulator in absent of herbicide combinations. This result confirm the finding of Kreuz, (1993) who found that chlormequat stimulator increased total weeds.

Highly significant differences were found between the ten herbicidal combinations with regard to fresh weight of grassy, broadleaved and total of all weeds in the two seasons compared to unweeded check. Generally, clodinafop-propargyl combinations gave the best results followed by tralkoxydim mixed with either derby or harmony in controlling grassy weeds in both seasons. On the other hand, acetolactate synthase (ALS) inhibitor herbicide (derby, harmony or metosulam) when combined with tralkoxydim or clodinafop-propargyl, in addition to panther gave highly significant control for broadleaved weeds in two seasons. With respect to total of all weeds, combinations of clodinafop with derby, harmony or metosulam showed highly significant control compared to the unweeded

Table (2) : Statistical analysis of visual percentages of weed coverage (% C) of grassy, broad leaved and total weeds as a result of application of herbicide combinations and atonik stimulator during 1997 – 1999 seasons.

Year	Herbicide (B)	Atonik Stimulator (A)								
		Grassy weeds			Broadleaf weeds			Total of all weeds		
		Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean
1997-1998	1*	14.00	6.16	10.78	10.35	7.49	8.92	16.92	10.62	13.77
	2	7.60	0.25	5.37	8.80	8.72	8.76	12.64	8.72	10.68
	3	6.16	0.25	4.35	10.27	8.72	9.50	13.40	8.72	11.06
	4	14.00	7.60	4.24	7.49	11.57	9.53	16.32	13.86	15.09
	5	7.55	4.35	6.16	11.30	9.67	10.49	13.90	10.62	12.26
	6	4.35	0.25	3.08	11.57	8.72	10.15	12.28	8.72	10.50
	7	4.35	0.25	3.08	18.34	19.77	19.06	18.88	19.77	19.33
	8	6.16	0.25	4.35	14.10	31.56	22.83	16.00	31.56	23.78
	9	4.35	4.35	4.35	19.22	19.26	19.24	19.66	19.75	19.70
	10	20.05	17.85	18.98	45.55	45.89	45.72	52.48	51.36	51.92
	Mean	10.13	6.66		15.70	17.14		19.25	18.37	
	L.S.D$_{0.05}$	A = 1.46	B = 3.26	AB = N.S	A = N.S	B = 4.51	AB = 6.38	A = N.S	B = 4.34	AB = 6.13
1998-1999	1	12.28	9.21	10.74	15.19	15.35	15.27	19.89	18.28	19.09
	2	8.26	12.28	10.27	14.55	15.84	15.20	17.53	20.34	18.94
	3	8.51	10.16	9.33	16.99	16.87	16.93	9.87	20.60	20.24
	4	10.38	10.16	10.27	12.25	12.25	12.25	16.28	16.58	16.43
	5	13.23	11.57	12.40	13.88	15.70	14.79	19.42	19.79	19.61
	6	12.28	9.67	10.78	19.24	17.62	18.43	23.15	20.32	21.73
	7	8.72	9.45	9.09	24.13	22.81	23.47	25.85	25.46	25.66
	8	6.61	5.44	6.02	19.24	19.33	19.28	20.82	20.80	20.81
	9	9.67	7.56	8.61	22.24	21.80	22.02	24.56	23.67	24.11
	10	12.98	13.93	13.46	23.25	25.12	24.18	27.12	29.23	28.18
	Mean	10.29	9.94		18.09	18.27		21.45	21.51	
	L.S.D$_{0.05}$	A = N.S	B = 2.10	AB = N.S	A = N.S	B = 3.16	AB = N.S	A = N.S	B = 3.77	AB = N.S

* See Table (1)   N.S = Not Significant   AB = Interaction   Data are Arcsin transformed

Table (3) : Effect of herbicidal combinations and atonik stimulator on the fresh weight (g/m^2) of grassy and broadleaf weeds in wheat crop during 1997 – 1999 seasons.

Year	Herbicide (B)	Atonik Stimulator (A)								
		Grassy weeds			Broadleaf weeds			Total of all weeds		
		Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean
1997-1998	1*	2020	3960	2990	0.0	0.0	0.0	2020	3960	2990
	2	340	1260	800	60	0.0	30	400	1260	830
	3	595	920	757.5	5	7.5	6.25	600	927.5	763.8
	4	575	1040	807.5	5	5	5	580	1045	812.5
	5	52.5	660	356.3	25	10	17.5	77.5	670	373.8
	6	120	460	290	5	10	7.5	125	470	297.5
	7	40	0.0	20	245	537	391.25	285	537.5	411.3
	8	140	20	80	162.5	3600	1881.25	302.5	3620	1961.3
	9	90	70	80	1405	480	942.5	1495	550	1022.5
	10	1285	1790	1535	2710	2885	2797.5	3995	4675	4332.5
	Mean	525.7	1018		462.25	753.5		988.0	1771.5	
	$L.S.D_{0.05}$	A = 110.8	B = 247.7	AB = 350.3	A = 115.1	B = 257.3	AB = 363.9	A = 148.8	B = 332.7	AB = 470.5
1998-1999	1	344	284	314	244	228	236	588	512	550
	2	548	304	426	52	119	85.5	600	423	511.5
	3	260	160	210	54	78	66.0	314	238	276
	4	618	954	786	89	0	44.5	707	954	830.5
	5	500	243	371	148	12	80.0	648	255	451.5
	6	130	100	115	284	146	215	414	246	330
	7	18	184	101	481	1437	959.3	499.5	1621	1060.25
	8	160	136	148	636	572	604.0	796	708	752.0
	9	60	132	96	626	582	604.0	686	714	700
	10	924	940	932	1627	2633.5	2130.5	2551.5	3573.5	3062.5
	Mean	356.2	343.7		424.2	580.75		780.4	924.45	
	$L.S.D_{0.05}$	A = N.S	B = 60.52	AB = 85.59	A = 103.32	B = 231.02	AB = 326.71	A = 111.44	B = 249.19	AB = 352.41

* See Table (1) N.S = Not Significant AB = Interaction

check. Pyridate + clodinafop treatment gave also best control in the first season. Other herbicide combinations exhibited moderately effects against total weeds compared with unweeded check.

With regard to atonik stimulator-herbicide interaction, pyridate + clodinafop and fluroxypyr + clodinafop showed excellent results in controlling grassy weeds with atonik, whereas, panther and harmony with either tralkoxydim or clodinafop and derby with clodinafop gave highly significant control of broadleaved weeds with atonik stimulator compared with unweeded check, where, clodinafop with harmony or metosulam gave the lowest fresh weight of total weeds in the first season without atonik, while clodinafop with derby, harmony or metosulam caused the lowest weeds fresh weight in the second season with atonik stimulator.

These results are in accordance with the finding of Rasinsh *et al.*, (1987) and Kreuz (1993). They pointed out the importance of integration between more than one method of weed control specially plant growth regulator (chlormequat) or herbicides, fungicides and crop rotation to increase the efficiency of weed control. Hofmann and Pallutt (1989) observed that tank mixtures of bentazone herbicide with ammonium nitrate-urea solution increased *Galium aparine* control.

c. Grassy seedheads: There are significant differences between all treatments with and without atonik in both seasons. In unweeded check, atonik stimulated growth of grassy seed-heads / m^2 compared to without stimulator, where the number of seed-heads were 134 and 68 in 1997-98; and 61 and 47 in 1998-1999, respectively (Table 4).

Combinations of clodinafop with metosulam, pyidate, fluroxypyr, bentazone, derby or harmony gave highly significant control in two seasons for grassy seed-heads.

The atonik-herbicide interaction showed that there is a significant differences between atonik treatment and herbicidal combinations in both seasons, where the lowest grassy weed seed-heads were observed with pyridate + clodinafop and bentazone + clodinafop in the first season as well as derby + clodinafop and pyridate + clodinafop in the second season in case of atonik appliction, while, fluroxypyr + clodinafop and betazone + clodinafop were the lowest in the first season, and pyridate + clodinafop and derby + clodinafop in the second season without atonik appliction.

Table (4) : Effect of herbicidal combinations and atonik stimulator on number of seed heads/m^2 of the grassy weed in wheat crop during 1997 – 1999 seasons.

Herbicide Treatments (B)	Atonik Stimulator (A)					
	(1997 – 1998)			(1998 – 1999)		
	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean
1*	54.0	143.0	98.5	33.0	26.0	29.5
2	3.0	15.75	9.38	18.0	26.0	22.0
3	7.75	13.25	10.05	9.0	11.0	10.0
4	12.0	42.0	27.0	21.0	25.0	23.0
5	10.0	19.0	14.5	19.0	31.0	25.0
6	3.0	4.0	3.5	24.0	17.0	20.5
7	1.0	0.0	0.5	17.0	10.0	13.5
8	0.0	1.0	0.5	23.0	17.0	20.0
9	0.0	0.0	0.0	23.0	32.0	27.5
10	68.0	134.0	101	47.0	61.0	54.0
Mean	15.88	37.02		23.400	25.6	
$L.S.D_{0.05}$	A = 4.03 B = 9.01 AB = 12.74			A = 1.24 B = 2.78 AB = 3.93		

* See Table (1) AB = Interaction

2) Grain yield and yield components

Concerning the yield and yield components in the first season (Table 5) almost all treatments resulted in higher grain and biological yields than the unweeded check. Highest wheat grain yields (1.678 t/fedd.) was redorded with derby + tralkoxydim; whereas the lowest one was observed with unweeded check (1.220 t/fedd.). The increase in biological and grain yields may be due to the decrease in weed population density (Tewari and Mehrotra, 1978) and atonik treatment. Data of grain yield components indicated no significant differences among the atonik treatments on spike numbers/m^2, spikelets number / spike and 1000 kernel weight (Table 6). In contrast, harvest index was significantly increased by atonik treatment (Table 5). All herbicide treatments significantly increased spike numbers/m^2 and harvest index. On the other hand, all herbicide combinations significantly decreased 1000-kernel weight. These results are in harmony with that of Soliman (1995). He indicated that tribunil and duplosane super + arelone significantly decreased 1000 – kerenel weight when compared with the unweeded check. The lowering of biological and grain yield, and harvest index in the first season may be due to spread of rust disease in Bangar El-Sokkar region.

In the second season, almost all treatments had significant effect on biological and grain yield compared with unweeded check. The highest grain yields (2.779 t / fedd.) was observed with derby + tralkoxydim (like first season), whereas the lowest yield (1.847-t/fedd.) was found with unweeded check. Atonik stimulator also increased biological and grain yields. With regard to grain yield components in the second season, almost all herbicidal combinations gave significant differences on spike numbers /m^2, spikelets number / spike and harvest index. It is evident that, atonik treatment also increased spikelets number/spike and harvest index compared with treatment of without atonik (Table 6).

3) Grain quality characters

Data in Table (7) represent the side effects of the examined herbicide combinations and atonik stimulator on grain quality characters (starch, protein % and total soluble sugars). The results indicated significant increasing effect for atonik stimulator on starch, protein %, and total soluble sugars in two seasons compared to without atonik . The mean values of all

Table (5): Effect of herbicidal combinations and atonik stimulator on the wheat biological yield, grain yield, and harvest index in Banga El-Sokkar region during 1997 – 1999 seasons.

Herbicide Treatments (B)	Atonik Stimulator (A)																	
	Biological yield (tons / feddan)						Grain yield (tons/feddan)						Harvest index					
	1997 – 1998			1998 – 1999			1997 – 1998			1998 – 1999			1997 – 1998			1998 – 1999		
	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean
1	5.840	6.914	6.377	6.379	9.111	7.745	1.226	1.540	1.383	1.799	2.625	2.212	0.210	0.223	0.217	0.280	0.288	0.284
2	6.696	7.223	6.959	7.639	9.264	8.451	1.569	1.786	1.678	2.532	3.025	2.779	0.234	0.247	0.241	0.331	0.327	0.329
3	6.436	6.605	6.520	8.018	8.849	8.433	1.421	1.747	1.589	2.591	2.635	2.613	0.221	0.264	0.243	0.323	0.298	0.313
4	6.459	7.077	6.768	7.561	7.300	7.431	1.591	1.520	1.556	2.461	2.625	2.543	0.246	0.215	0.231	0.325	0.359	0.342
5	6.735	6.697	6.716	7.119	8.949	8.034	1.523	1.721	1.622	2.395	2.970	2.682	0.226	0.257	0.242	0.336	0.332	0.334
6	6.933	7.827	7.380	7.503	8.025	7.764	1.610	1.664	1.637	2.420	2.431	2.425	0.232	0.213	0.225	0.323	0.303	0.313
7	7.441	7.020	7.231	8.090	7.483	7.787	1.581	1.589	1.585	2.442	2.627	2.534	0.212	0.226	0.211	0.301	0.351	0.327
8	6.622	6.103	6.363	7.868	6.460	7.164	1.464	1.496	1.480	1.178	2.430	2.304	0.221	0.245	0.233	0.277	0.376	0.325
9	7.372	6.774	7.073	7.068	8.408	7.738	1.665	1.592	1.628	2.072	2.519	2.296	0.226	0.235	0.231	0.293	0.299	0.296
10	6.130	5.682	5.906	5.512	6.678	6.095	1.233	1.207	1.220	1.658	2.041	1.847	0.201	0.212	0.207	0.301	0.307	0.306
Mean	6.666	6.792		7.276	8.053		1.488	1.586		2.255	2.593		0.223	0.234		0.309	0.324	
$LSD_{0.05}$	A = N.S B = 0.614 AB = 0.868			A = 0.361 B = 0.806 AB = 1.141			A = 0.0768 B = 0.1717 AB = 0.250			A = 0.1502 B = 0.3358 AB = 0.479			A = 0.005 B = 0.010 AB = 0.014			A = 0.007 B = 0.040 AB = 0.066		

* See Table (1) AB = Interaction

Table (6): Effect of herbicidal combinations and atonik stimulator on wheat spikes / m², wheat spikelets / spike and 1000 kernel weight during 1997 – 1999 seasons.

Herbicide Treatments (B)	Atonik stimulator (A)																	
	Wheat spike number / m²						Wheat spikelets numbers / spike						1000 – Kernel weight					
	1997 – 1998			1998 – 1999			1997 – 1998			1998 – 1999			1997 – 1998			1998 – 1999		
	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean
1*	380.5	346.8	363.63	555.0	601.0	578.0	19.55	19.38	19.46	18.98	19.85	19.41	33.13	31.73	32.43	47.50	48.20	48.85
2	676.5	509.0	592.5	542.0	542.0	542.0	20.05	19.60	19.83	18.85	19.95	19.40	31.0	27.83	29.41	48.05	48.60	48.33
3	646.8	472.3	559.5	639.0	626.0	632.5	20.43	20.05	20.24	18.98	19.90	19.44	32.5	36.60	34.55	47.98	48.65	48.31
4	528.0	452.0	490.0	561.0	457.0	509.0	19.63	19.35	19.49	18.03	18.65	18.34	35.2	32.88	34.04	47.35	47.53	47.44
5	515.0	549.0	532.0	550.0	631.0	590.5	20.53	20.20	20.36	18.53	19.65	19.09	32.7	32.45	32.58	47.38	48.50	47.94
6	447.5	462.5	455.0	635.0	552.0	593.5	20.88	20.48	20.68	18.55	19.38	18.96	33.8	31.23	32.488	48.40	48.25	48.33
7	493.0	560.8	526.90	586.0	586.0	586.0	20.08	19.98	20.03	19.78	19.68	19.73	31.13	33.63	32.38	48.55	48.55	48.55
8	580.0	566.0	573.0	589.0	615.0	602.0	20.73	19.80	20.26	18.35	19.75	19.05	33.6	32.63	33.11	47.15	46.80	46.98
9	554.0	692.0	623.0	568.0	528.0	548.0	20.75	20.60	20.68	18.33	19.85	19.09	32.25	32.60	32.43	48.25	48.15	48.20
10	248.8	288.0	268.38	343	470.0	406.5	19.28	19.30	19.29	18.08	18.75	18.41	41.10	36.75	38.93	47.35	49.10	48.23
Mean	507.0	489.8		556.8	560.8		20.19	19.87		18.64	19.54		33.64	32.83		47.80	48.53	
$LSD_{0.05}$	A = N.S B = 66.74 AB = 94.39			A = N.S B = 68.134 AB = 96.360			A = N.S B = 0.869 AB = N.S			A = 0.407 B = N.S AB = N.S			A = N.S B = 3.645 AB = N.S			A = N.S B = N.S AB = N.S		

* See table (1) AB = Interaction

treatments with and without atonik were 79.3 and 73.6 mg/g for starch, 9.60 and 8.69% for protein and 26.61 and 23.86 mg/g for total soluble sugars (TSS) respectively in the first season, while the corresponding mean values in the second season were 97.17 and 94.98 mg/g; 8.78 and 7.82%; and 37.88 and 33.14 mg/g, respectively.

With respect to the effect of herbicidal combinations on wheat grain quality characters, generally, panther was the only herbicidal treatment caused highly significant increasing on protein content in two seasons compared to the other treatments. Most of herbicidal treatments significantly increased protein content in the second season. Pyridate + clodinafop increased starch content in two seasons, while Derby + tralkoxydim and metosulam + clodinafop increased starch content in the second season. Other herbicidal combinations had no effect or decreased starch content compared with unweeded check. Among all treatments, the highest significant increase in total soluble sugars was obtained in the case of clodinafop combinations with derby, harmony, pyridate or fluroxypyr in the first season compared with unweeded check. With respect to the second season, derby + tralkoxydim and metosulam + clodinafop gave highly significant increase to the studied traits. On the other hand, the other herbicidal combinations had no effect or decreased these quality characters. These results are in accordance with the findings of Martin *et al.* (1989); Sabev and Stoeva (1988); and Randhawa and Gill (1989). They indicated that herbicide treatments either increased or decreased seed protein% content and sugar contents, depending on the year.

It could be concluded from the obtained results that clodinafop-propargyl is a new good effective graminicide when combined with either new broadleaved herbicides (derby, harmony or metosulam) or old broadleaved herbicides (pyridate, fluroxypyr or bentazone) gave highly significant weed control and may be solve weed problem in wheat crop in Bangar El-Sokkar district. On the other hand, the addition of atonic stimulator to the herbicide combinations enhanced the control of grassy and broad leaf weeds compared to unweeded check. Moreover, atonik treatments increased wheat productivity by 20-30% depended on herbicidal combinations, biological and grain yields as well as quality parameters.

Table (7): Effect of the herbicidal combinations and atonik stimulator on the wheat grain content of protein, starch, and total soluble sugars during 1997 - 1999 seasons

Herbicide Treatments (B)	Atonik Stimulator (A)																	
	Protein %						Starch (mg/g)						Total soluble sugars (mg/g)					
	1997 – 1998			1998 - 1999			1997 – 1998			1998 - 1999			1997 – 1998			1998 - 1999		
	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean	Without atonik	With atonik	Mean
1*	9.63	11.81	10.72	7.69	10.94	9.915	64.78	79.69	72.24	87.58	88.71	88.150	20.57	26.73	23.65	30.40	36.05	33.32
2	9.51	9.84	9.68	8.75	9.81	9.280	73.40	74.41	73.91	108.70	111.30	100.00	23.31	24.54	23.93	39.51	44.75	42.13
3	8.10	10.94	9.52	7.69	8.63	8.160	78.90	83.90	81.40	74.85	80.43	77.64	26.65	26.48	26.57	27.56	30.81	29.19
4	8.52	10.30	9.91	7.50	9.06	8.270	66.44	79.53	72.99	96.02	97.39	96.71	21.69	21.99	21.84	33.37	39.55	36.46
5	9.41	9.84	9.63	9.06	9.25	9.145	77.66	79.47	78.57	89.28	91.05	90.17	24.66	31.48	28.07	31.20	36.31	33.76
6	7.44	10.20	8.82	6.88	7.19	7.035	69.64	79.92	71.78	104.70	106.60	105.82	21.22	25.94	23.58	35.88	43.90	39.89
7	8.10	9.73	8.92	9.06	9.38	9.220	79.24	87.12	83.18	104.15	106.1	105.13	28.41	28.73	28.57	35.85	36.58	36.22
8	8.10	9.63	8.87	6.88	7.81	7.345	76.50	83.79	80.15	95.24	97.10	96.170	24.42	30.24	27.33	32.80	38.02	35.41
9	8.31	10.10	9.21	7.69	8.13	7.910	72.54	74.03	73.29	93.83	95.95	94.89	23.23	24.05	23.64	32.15	32.99	32.57
10	8.75	9.63	9.19	7.00	7.69	7.345	76.90	77.16	77.03	95.46	96.72	96.09	24.42	25.88	25.15	32.71	39.81	36.26
Mean	8.69	9.60		7.818	8.784		73.6	79.30		94.98	97.17		23.86	26.61		33.143	37.877	
$LSD_{0.05}$	A = 0.645 B = 1.440 AB = 2.040			A = 0.047 B = 0.104 AB = 0.148			A = 2.01 B = 4.49 AB = 6.35			A = 0.467 B = 1.05 AB = 1.480			A = 0.0361 B = 0.080 AB = 0.110			A = 0.307 B = 0.696 AB = 0.970		

* See table (1) AB = Interaction

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تأثير خلائط بعض مبيدات الحشائش ومنشط النمو على الحشائش وأنتاجية وصفات جودة محصول القمح

د. فؤاد شعبان سليمان - د . فريـد سليمان صبره - د. عبد الله محمود الشاذلى - أسماعيل عواد

تم تصميم تجربة حقلية تكررت فى موسمين زراعين متتالين لمحصول القمح فى موقعين مختلفيـن بقرية سلامه حجازى بمنطقة بنجر السكر تحت ظروف الزراعة المثلى – وكانت هذه الحقـول مصـابه طبيعيا بشدة بالحشائش النجيلية وعريضة الأوراق – تم تصميم التجربة حيث تحـتوى على تسعة مخاليط مبيدات حشائش بالإضافة إلى معاملة الكنترول وذلك سواء فى وجود المنشـط النـباتى (الأتونيك) أو فى عدم وجوده وذلك لمعرفة التأثير على مكافحة حشائش القمح وكذلك ناتج محصول القمح وجودته.

أظهرت النتائج أن معظم مخاليط مبيدات الحشائش فى وجود المنشط أعطت أعلى خفض معـنوى فـى الحشائش الرفيعة وناتج خلط المبيد المتخصص للحشائش الرفيعه كلودينافوب مع مبـيدات الحشـائش عريضة الأوراق الجديدة وهى (دربى، هرمونى ، ميتوسولام) وكذلك مع مبيدات الحشائش العريضة القديمة (بيريدات ، فلوروكسيبير ، بتنازون) قد أعطت أعلى معدل فى مكافحة الحشائش العريضة والرفيعة فى منطقة بنجر السكر.

وقد أدت مخاليط مبيد كلودينافوب إلى زيادة معنوية فى محصول القمح وفى مكوناته وذلك مـع المنشـط النباتى. وأوضحت النتائج أيضا أن خصائص الجودة من (نسبة البروتين ، النشا والسـكريات الكلية) قد زادت زيادة معنوية نتيجة هذه المعاملة خاصة فى وجود الأتونيك كمنشط نباتى مع مبيدات الحشائش.