

## **EFFECT OF SOWING METHODS AND WEED CONTROL TREATMENTS ON WHEAT (*Triticum aestivum*, L.) AND ASSOCIATED WEEDS**

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### **ABSTRACT**

During 2001/2002 and 2002/2003 winter seasons, two field experiments were conducted at Sakha Agricultural Research Station to detect the role of sowing methods and some weed control treatments on annual weeds and wheat yield.

Concerning the effect on total annual weeds, results indicated that Afir improved and Afir drilling methods significantly surpassed Afir broadcast method in its effect on annual weeds in the first season. All studied weed control treatments significantly reduced annual weeds during both seasons, as compared to weedy check. Brominal plus Topik, hand weeding (twice) and Topik (alone) were highly effective against annual weeds. The lowest fresh weights of total annual weeds were recorded by Afir improved or Afir drilling method with the application of Brominal plus Topik.

For the effect on wheat growth and yield components, data revealed that Afir drilling and Afir improved methods significantly surpassed Afir broadcast as it increased fresh weight of wheat leaves in the second season; increased number and fresh weight of tillers during the two seasons and produced the highest wheat grain yield in the second season. Brominal plus Topik, Topik (alone) and Brominal significantly increased fresh weight of wheat leaves; increased number and fresh weight of tillers and yielded the highest grain yield during both seasons. The highest fresh weight of wheat leaves was recorded by Afir drill or Afir improved methods with the application of Brominal plus Topik. Also, these practices significantly increased number and fresh weight of tillers and yielded the highest grain yield during both seasons.

It could be concluded that Afir improved or Afir drill methods with the application of Brominal plus Topik significantly effective against total annual weeds and increased wheat grain yield.

### **INTRODUCTION**

Wheat (*Triticum aestivum*, L.) is considered as one of the most important cereal winter crops in Egypt since it is a staple food for humans. Weeds are considered a great constraint in agriculture, particularly in wheat. Wheat is often infested with numerous types of weeds, which compete with crop plants resulting in grain yield depression. Getting rid of weeds is achieved through direct methods such as herbicides application or by hand weeding and other indirect measures, such as agricultural practices as crop rotation, land preparation and sowing methods.

Although, weed management is still herbicide dominated in many important agricultural areas of the world, there is strong indication that in the near future this will change (Matteson, 1995). Herbicidal control of weed must be considered in combination with other improved agronomic practice (Wetala, 1989). Weed control treatments reduced annual weeds and significantly increased wheat yield, regardless the sowing methods. The combination of Brominal 24% EC at 2.38l/ha and Topik 15% WP at 333 g/ha gave the highest

reduction for the annual weeds and gave the highest value of wheat grain and straw yields as reported by Al-Marsafy *et al.*, (1997b); Abd El-Hamid *et al.*, (1998) and Salim and Ibrahim (1998). Also, they indicated that Grasp 10% EC at 2.38 L/ha gave significant reduction for grassy weeds, *Avena spp* and *Phalaris spp* and increased wheat grain yield. Topik 15% WP at 333 g/ha was effective against annual grassy weed in wheat fields and increased grain yield (Hassanein *et al.*, 1998; Shebl *et al.*, 2000 and Abd El-Hamid and Ghalwash, 2002).

There is a recent trend toward non-chemical weed control in crops, this trends press to find some cultural practices to control annual weeds associated wheat crops. So any cultural practice that may affect weed occurrence could be considered as worth full. Soil flooding before sowing might have appeared with significance against these weeds.

Many researchers denoted to the effectiveness of pre-sowing flooding by water in wild oat control in wheat fields (Tsuruuchi, 1987; and Zahran *et al.*, 1994) and other researches for the integration between Herati sowing method and grasp herbicide (Yehia *et al.*, 1994 and Al-Marsafy *et al.*, 1995 and 1997a). Herati method (wet method) significantly reduced wild oats population, however Afir drill increased wheat grain yield significantly than Herati method (Salim and Ibrahim, 1998). Controlling wheat-associated weeds by means of the studied sowing methods not only resulted in significant reduction in annual weeds but also gave significant increase in wheat grain yield over the Afir sowing method. False irrigation / ploughing / false irrigation with Herati occupied the first category from the viewpoint of weed control and wheat grain yield (Hassanein *et al.*, 1999). Under heavy weed infestation, pre sowing irrigation / ploughing / false irrigation then Afir drill sowing method succeeded to eradicate about 83.8% of weeds and improved wheat grain yield by 1.6 t/ha (Al-Marsafy *et al.*, 2000).

Hassanein *et al.*, (2000) reported that false pre sowing irrigation treatment with Herati were more effective in controlling annual weeds associated with wheat than that with Afir drilling sowing method, and over yielded it. Kholosy *et al.*, (2002) reported that under heavy infestation rate of *Avena spp.* and *Raphanus raphanistrum*, pre-sowing irrigation used before Afir sowing method reduced these weeds by 33 and 69%, respectively and gave significant increase in grain yield, as compared to Afir sowing method directly.

When reliance on herbicides is reduced or eliminated, tillage and cultivation generally become main important for weed suppressing (Mohler, 1993 and Bowman, 1996). Herbicides are largely or entirely avoided in low external farming systems and weed is suppressed largely through physical and ecological tactics (Liebman and Davis, 2000). Herbicides alone are not a suitable weed management strategy. Herbicides remain a component in the cropping system, but they must be used in conjunction with a variety of non-herbicides control methods (Mortensen *et al* 2000).

The recent trend for reducing herbicides use press to find some cultural practices to control weeds. Thus, the present study aimed to evaluate the efficacy of three different sowing methods and some weed control treatments against annual weeds as well as to study their effect on wheat grain yield.

## MATERIALS AND METHODS

Two field experiments were carried out during 2001/2002 and 2002/2003 seasons at Sakha Agricultural Research Station to evaluate the effect of sowing methods and some weed control treatments on annual weeds and wheat yield. Treatments were arranged in split plot design, where sowing methods laid in the main plots and weed control treatments in sub plots with four replicates.

Sowing methods were as follow:

- 1- Afir broadcasting.
- 2- Afir drilling.
- 3- Afir improved: False irrigation, one month before sowing / minimum tillage then Afir broadcasted.

Weed control treatments were as follow:

- 1- Topik 15% (clodinafop propargyl) at 140 g/fed, applied 45 days after sowing.
- 2- Brominal 24% (bromoxynil) at 1 L/fed., applied 25 days after sowing.
- 3- Brominal at 1 L/fed., applied 25 days after sowing plus Topik 15% at 140 g/fed., applied 45 days after sowing.
- 4- Hand weeding (twice) carried at 30 and 45 day after sowing.
- 5- Untreated.

The plot area was 21 m<sup>2</sup>. The commercial wheat cultivar's was Giza 168 was sown on November 15<sup>th</sup> 2001 and November 17<sup>th</sup> 2002. Cultural practices for wheat growing were carried out as recommended.

Collected data were:

- Fresh weight of grassy, broad leaf weeds and total annual weeds, g/m<sup>2</sup> 75 days after sowing
- Fresh weight of wheat leaves (g/m<sup>2</sup>), 60 days after sowing.
- Number and fresh weight of tillers (g/m<sup>2</sup>), 60 days after sowing.
- Wheat grain yield, ardab/fed., at harvest.

All obtained data were subjected to the proper statistical analysis according to "F" test and the mean values were compared by least significant difference (LSD) at 5 % level according to Snedecor and Cochran (1980).

## RESULTS AND DISCUSSION

### I. Effect of sowing methods, weed control treatments and their interaction on annual weeds:

#### 1. Effect of sowing methods:

Data shown in Table (1) revealed that sowing methods significantly affected annual weeds only in the first season as Afir improved and Afir drilling sowing methods surpassed Afir broadcasting method in their effect on annual weed population. Those two methods reduced fresh weight of grassy weeds by 84.3 and 84.1%, respectively in the first season, as compared to Afir broadcasting method. The estimated fresh weight of broad leaf weeds were reduced by these sowing methods by 81 and 88%, respectively at first season, as compared to Afir broadcasting method. Also, these two sowing methods

reduced the fresh weight of total annual weeds by 84 and 85%, respectively in the first season, as compared to Afir broadcasting method. Kholosy *et al.*, (2002) reported that under heavy infestation rate of *Avena spp.* and *Raphanus raphanistrum*, pre-sowing irrigation used before Afir sowing method reduced these weeds by 33 and 69%, respectively as compared to Afir sowing method directly.

**Table (1) :Fresh weight (g/m<sup>2</sup>) of annual weeds as affected by sowing methods and weed control treatments during 2001/2002 and 2002/2003 seasons**

Weed control treatments	2001/2002 season				2002/2003 season			
	Sowing methods				Sowing methods			
	Afir broadcast	Afir drilling	Afir Improved	Mean	Afir broadcast	Afir drilling	Afir Improved	Mean
<b>Fresh weight of grassy weeds (g/m<sup>2</sup>)</b>								
Topik 15%	290	3	10	101	163	30	113	102
Brominal 24%	3950	714	530	1731	1825	775	730	1110
Brominal + Topik	562	5	40	202	100	29	155	95
Hand weeding	645	34	79	252	500	31	258	263
Untreated	3875	722	798	1798	2725	1663	1213	1867
Mean	1864	296	291		1063	505	494	
LSD for sowing methods (S)	561				NS			
LSD for treatments (T)	406				510			
LSD for (S) x (T)	703				954			
<b>Fresh weight of broad leaf weeds (g/m<sup>2</sup>)</b>								
Topik 15%	1052	97	141	430	762	218	145	375
Brominal 24%	9	0	21	10	60	18	44	40
Brominal + Topik	246	35	29	103	78	46	38	54
Hand weeding	59	24	29	37	44	36	46	42
Untreated	1058	139	244	480	968	468	273	569
Mean	485	59	93		382	157	109	
LSD for sowing methods (S)	102				NS			
LSD for treatments (T)	242				230			
LSD for (S) x (T)	420				466			
<b>Fresh weight of total annual weeds (g/m<sup>2</sup>)</b>								
Topik 15%	1342	100	151	531	925	248	257	477
Brominal 24%	3959	714	551	1741	1885	793	774	1151
Brominal + Topik	808	40	69	306	178	75	193	149
Hand weeding	703	58	108	290	544	67	304	305
Untreated	4933	861	1042	2279	3693	2130	1485	2436
Mean	2349	355	384		1445	663	603	
LSD for sowing methods (S)	565				NS			
LSD for treatments (T)	451				597			
LSD for (S) x (T)	782				1228			

**2. Effect of weed control treatments:**

Data represented in Table (1) revealed that all studied weed control treatments significantly affected annual weeds during both seasons, as

compared to weedy check. With the exception of Brominal treatment, all other weed control treatments significantly reduced the fresh weight of grassy weeds. Hence, Topik applied alone, or with Brominal and hand weeding (twice) reduced fresh weight of grassy weeds by (94, 89 and 86%) and (95, 95 and 86%), respectively in the first and second seasons. Same finding was reported by Hassanein *et al.*, (1998), Shebl *et al.*, (2000) and Abd El-Hamid and Ghalwash (2002).

Concerning broad leaf weeds, data indicated that with the exception of Topik treatment, all other weed control treatments significantly reduced fresh weight of broad leaf weeds, if compared to weedy check. Brominal, hand weeding (twice) and Brominal + Topik achieved the highest reduction in broad leaf population as it reduced fresh weight by 98, 92 and 78%, respectively in the first season and by 93, 93 and 91%, respectively in the second season (Table 1).

Data indicated that all studied weed control treatments significantly reduced fresh weight of total annual weeds, if compared to weedy check. Topik plus Brominal, hand weeding (twice) and Topik (alone) surpassed other weed control treatments and reduced fresh weight of total annual weeds by 87, 87 and 77%, respectively in the first season and by 94, 87 and 80%, respectively in the second season, as compared to the weedy check (Table 1). These results were in agreement with those reported by Al-Marsafy *et al.*, (1997b).

### **3. Effect of the interaction of sowing methods and weed control treatments:**

Data revealed that there was a significant effect of the interaction on weed population during both seasons. The lowest fresh weights of total annual weeds were recorded by Afir improved or Afir drilling with the application of Brominal plus Topik.

## **II. Effect of sowing methods, weed control treatments and their interaction on fresh weight wheat leaves:**

### **1. Effect of sowing methods:**

Data shown in Table (2) revealed that sowing methods significantly affected the fresh weight of wheat leaves in the second season only. Hence, Afir drilling and Afir improved methods surpassed Afir broadcasting method in their effect on this trait. Those two methods increased fresh weight of wheat leaves by 35 and 18%, respectively in the second season, if compared to Afir broadcasting method.

### **2. Effect of weed control treatments:**

Data revealed that all studied weed control treatments significantly affected the fresh weight of wheat leaves during both seasons, as compared to weedy check. Hence, Brominal plus Topik, Topik (alone) and Brominal (alone) increased fresh weight of wheat leaves by 43, 29 and 30%, respectively in the first season and by 29, 23 and 15%, respectively in the second season (Table 2).

### **3. Effect of the interaction between sowing methods and weed control treatments:**

Data revealed that there was a significant effect on the fresh weight of wheat leaves during both seasons. The highest fresh weight of wheat leaves

recorded by Afir drill or Afir improved method with the application of Brominal plus Topik.

**Table (2): Fresh weight of wheat leaves (g/m<sup>2</sup>) as affected by sowing methods and weed control treatments during 2001/2002 and 2002/2003 seasons**

Weed control treatments	2001/2002 season				2002/2003 season			
	Sowing methods				Sowing methods			
	Afir broadcast	Afir drilling	Afir Improved	Mean	Afir broadcast	Afir drilling	Afir Improved	Mean
<b>Fresh weight of wheat leaves (g/m<sup>2</sup>)</b>								
Topik 15%	673	561	730	655	722	1136	732	863
Brominal 24%	609	757	648	671	555	1052	743	783
Brominal + Topik	741	880	852	824	586	1253	973	937
Hand weeding	534	504	585	541	842	817	785	815
Untreated	472	399	532	468	542	742	711	665
Mean	606	620	669		649	1000	789	
LSD for sowing methods (S)	NS				97.3			
LSD for treatments (T)	43.9				74.9			
LSD for (S) x (T)	76.1				129.8			

### III. Effect of sowing methods, weed control treatments and their interaction on number and fresh weight of tillers:

#### 1. Effect of sowing methods:

Data shown in Table (3) indicated that sowing methods significantly affected number and fresh weight of tillers in the second season. Hence, Afir drilling and Afir improved methods surpassed Afir broadcasting method in their effect on these traits. Those methods increased the number of tillers by 46 and 31% and increased fresh weight of tillers by 33 and 12%, respectively in the second season.

#### 2. Effect of weed control treatments:

Data revealed that all studied weed control treatments significantly affected number and fresh weight of tillers in both seasons, as compared to weedy check. Hence, Brominal plus Topik, Topik (alone) and Brominal (alone) increased number of tillers by 42, 33 and 35%, respectively in the first season and by 20, 26 and 8%, respectively in the second season. Also, these treatments increased fresh weight of tillers by 42, 28 and 31%, respectively in the first season and by 25, 34 and 20%, respectively in the second season as sown at Table (3).

#### 3. Effect of the interaction between sowing methods and weed control treatments:

The interaction revealed a significant effect on number of tillers in the first season and the fresh weight of tillers during both seasons. The highest number and fresh weight of tillers were obtained by Afir drill or Afir improved method with the application of Brominal plus Topik.

**Table (3) Number and fresh weight of tillers g per m<sup>2</sup> as affected by sowing methods and weed control treatments during 2001/2002 and 2002/2003 seasons**

Weed control treatments	2001/2002 season				2002/2003 season			
	Sowing methods				Sowing methods			
	Afir broadcast	Afir drilling	Afir Improved	Mean	Afir broadcast	Afir drilling	Afir Improved	Mean
<b>Number of tillers per m<sup>2</sup></b>								
Topik 15%	898	1082	996	992	949	1569	1093	1204
Brominal 24%	840	1105	1140	1028	664	1275	970	970
Brominal + Topik	950	1260	1226	1145	760	1499	1064	1114
Hand weeding	900	880	866	882	932	1238	1063	1078
Untreated	598	590	819	669	655	1058	964	892
Mean	837	983	1009		792	1328	1035	
LSD for sowing methods (S)	NS				106.2			
LSD for treatments (T)	93.9				140.6			
LSD for (S) x (T)	162.7				NS			
<b>Fresh weight of tillers (g/m<sup>2</sup>)</b>								
Topik 15%	591	572	635	599.4	1171	1709	964	1281.3
Brominal 24%	588	672	619	626.4	830	1202	1111	1047.7
Brominal + Topik	698	824	713	744.8	839	1442	1087	1122.7
Hand weeding	548	469	580	532.1	1121	1200	1104	1141.7
Untreated	411	387	491	429.5	516	1161	847	841.3
Mean	567.2	584.6	607.5		895.4	1342.8	1022.6	
LSD for sowing methods (S)	NS				107.0			
LSD for treatments (T)	49.09				170.8			
LSD for (S) x (T)	84.99				295.8			

**VI. Effect of sowing methods, weed control treatments and their interaction on wheat grain yield (ardab/fed):**

**1. Effect of sowing methods:**

Data shown in Table (4) indicated that sowing methods significantly affected wheat grain yield (ardab/fed.) in the second season only. Hence, Afir drilling and Afir improved methods surpassed Afir broadcasting method in their effect on wheat grain yield. Those methods increased wheat grain yield by 23 and 18%, respectively in the second season, if compared to Afir broadcasting method. Kholosy *et al.*, (2002) reported that pre-sowing irrigation used before Afir sowing method significantly increased wheat grain yield, as compared to Afir sowing method directly.

**2. Effect of weed control treatments:**

Data revealed that all studied weed control treatments significantly affected wheat grain yield at both seasons, as compared to weedy check. Hence, Brominal plus Topik, Topik (alone) and Brominal (alone) increased wheat grain yield by 56, 51 and 47%, respectively in the first season and by 45, 33 and 35, respectively in the second season.

**3. Effect of the interaction between sowing methods and weed control treatments:**

Data showed a significant effect for the interaction on wheat grain yield (ardab/fed) in the second season. The highest grain yield was obtained by Afir drill or Afir improved method with the application of Brominal plus Topik.

**Table(4) : Wheat grain yield (ardab/fed) as affected by sowing methods and weed control treatments during 2001/2002 and 2002/2003 seasons**

Weed control treatments	2001/2002 season				2002/2003 season			
	Sowing methods				Sowing methods			
	Afir broadcast	Afir drilling	Afir Improved	Mean	Afir broadcast	Afir drilling	Afir Improved	Mean
<b>Wheat grain yield (ardab/fed)</b>								
Topik 15%	16.70	20.10	20.80	19.20	13.90	15.80	15.00	14.90
Brominal 24%	16.10	19.20	18.00	17.80	11.30	18.10	17.20	15.53
Brominal + Topik	21.80	21.60	21.20	21.50	17.10	19.20	18.60	18.30
Hand weeding	16.70	19.90	19.90	18.80	11.20	18.30	15.40	14.97
Untreated	9.10	9.50	9.50	9.40	9.40	10.50	10.20	10.03
Mean	16.10	18.10	17.90		12.58	16.38	15.28	
LSD for sowing methods (S)	NS				1.34			
LSD for treatments (T)	2.37				1.57			
LSD for (S) x (T)	NS				2.68			

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## تأثير طرق الزراعة وبعض معاملات مكافحة الحشائش على القمح والحشائش المصاحبة له

مسعد محمود ابراهيم عبد الحميد

المعمل المركزي لبحوث الحشائش - مركز البحوث الزراعية - الجيزة - جمهورية مصر العربية

أجريت تجربتان حقليتان بمحطة البحوث الزراعية بسخا بكفر الشيخ في موسمي ٢٠٠١/٢٠٠٢ و ٢٠٠٢/٢٠٠٣ لدراسة تأثير طرق الزراعة وبعض معاملات مكافحة الحشائش على الحشائش الحولية (ضيقية وعريضة الأوراق) ومحصول الحبوب في القمح. وقد استخدم لتنفيذ هذه التجارب تصميم القطع المنشقة مرة واحدة في أربعة مكررات حيث احتوت القطع الرئيسية على ثلاث طرق للزراعة: غير بدار وغير تسطير وغير محسن. بينما احتوت القطع المنشقة على خمس معاملات لمكافحة الحشائش وهي: توبيك ١٥% بمعدل ١٤٠ جم/فدان - برومينال ٢٤% بمعدل ١٤٠ جم/فدان - برومينال ٢٤% بمعدل ١٤٠ جم/فدان - برومينال ٢٤% بمعدل ١٤٠ جم/فدان ثم توبيك ١٥% بمعدل ١٤٠ جم/فدان - نقاوة يدوية مرتين، بالإضافة للقطع غير المعاملة وكان صنف القمح المنزرع هو جيزة ١٦٨.

أوضحت النتائج تفوق كلا من طريقة الزراعة غير محسن وغير تسطير على طريقة الزراعة غير بدار في خفض الوزن الغض للحشائش الحولية الكلية في الموسم الأول. كما حققت كل معاملات مكافحة الحشائش خفض معنوي في الوزن الغض للحشائش الحولية في كلا الموسمين بالمقارنة بالقطع الغير معاملة. وبالنسبة لتأثير معاملات مكافحة الحشائش، حققت معاملات برومينال + توبيك والنقاوة اليدوية (مرتين) وتوبيك (منفردا) أعلى نسب مكافحة للحشائش الحولية. وأوضح التفاعل بين طرق الزراعة ومعاملات مكافحة الحشائش أن أقل وزن غض للحشائش الحولية تحقق بالزراعة الغير محسن أو الغير تسطير مع رش (برومينال + توبيك).

كما أوضحت النتائج تفوق طريقتي الزراعة الغير محسن والغير تسطير على الغير بدار، حيث حققت هاتين الطريقتين أعلى وزن غض لأوراق القمح في المتر المربع في الموسم الثاني وأعلى عدد ووزن غض لأشطاء القمح في كلا الموسمين كما حققتا أعلى محصول لحبوب القمح في الموسم الثاني للدراسة. كما حققت معاملات برومينال + توبيك وتوبيك (منفردا) وبرومينال (منفردا) أعلى وزن غض لأوراق القمح وأعلى عدد ووزن غض لأشطاء القمح وأعلى محصول لحبوب القمح في كلا الموسمين. كما أوضحت النتائج التأثير المعنوي للتفاعل بين طرق الزراعة ومعاملات مكافحة الحشائش في كلا الموسمين، حيث تحقق أعلى وزن غض لأوراق القمح وأعلى عدد ووزن غض لأشطاء القمح وأعلى محصول لحبوب عند الزراعة بالغير محسن أو الغير تسطير مع رش برومينال + توبيك.

ويستخلص من الدراسة انه يمكن مكافحة الحشائش الحولية بفاعلية مؤكدة وبالتالي زيادة انتاجية محصول القمح عن طريق زراعة بطريقة الغير محسن أو الغير تسطير مع اضافة مييد برومينال ٢٤% بمعدل ١ لتر/فدان + مييد توبيك ١٥% بمعدل ١٤٠ جرام/فدان .