Influence of Adjuvant Arkopal with Panther on Weeds Control, Wheat Yield, Photosynthetic Pigments and Anatomical Features of Wheat Leaf

Tagour[1], R. M. H.; G. M. Abd El-Hamed[1] and I. M. El-Metwally[2]

[1] Weed Research Central Laboratory, Agricultural Research Center, Giza, Egypt
[2] Botany Dept., National Research Center, Dokki, Giza, Egypt
*im_elmetwally@yahoo.com

Abstract: Two field experiments were conducted at the Experimental Station of Agricultural Research Center, El-Serw Station, Damietta Governorate Egypt, in 2008/2009 and 2009/2010 winter seasons to determine the effect of adjuvant Arkopal N100 on the efficacy of Panther (Isoproturon + diflufenican) at the rates of 450, 510 and 600 cm^3/fed with or without adjuvant Arkopal N100 at the rates of 4, 8 and 12% as well as hand pulling twice and weedy check on weeds and wheat plants. Results illustrated that all weeded treatments decreased dry weight of each weed group compared with unweeded check. Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant of Arkopal N100 of 4% concentration came in the first order for decreasing number, fresh and dry weight of total weeds. Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 at 8% came in the second rank followed by that of Panther at the rate of 510 m^3/fed tank-mixed with adjuvant Arkopal N100 at the rate of 8%, Panther at the rate of 510 m^3/fed tank-mixed with adjuvant Arkopal N100 at 4% and hand weeding-twice at 30 and 45 days after sowing. Also, the previous treatments gave the highest values of chlorophyll b, a+b, carotenoids, yield and yield components of wheat as well as N, P and K percentage in straw wheat. While, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% produced the maximum values of chlorophyll a. Mixing Panther at the rate of 600 cm^3/fed with adjuvant Arkopal N100 at 4% exceeded the rest of other weeded practices for enhancing leaf thickness in the keel region, mesophyll tissue thickness, large vascular bundles dimensions (length and width), xylem tissue thickness and meta xylem vessel diameter. Thus, the use of adjuvant at 4% can play a good role in enhancing Panther efficacy either at full reduced rates of Panther for weed control in wheat.
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1. Introduction

The entire world depends upon the wheat production; as a major source of food. In Egypt, there is gap between production and consumption, therefore considerable interest has developed for increasing wheat production. Wheat production in Egypt increased from 2.08 in 1983 to 7.37 million ton in 2007 season. This increase was achieved by increasing wheat area from 1.83 to 2.71 million fed/ year and grain yield from 1.50 to 2.71 million ton/fed through the same period **(Aermae, 2007)**. Weed control plays an important role in influencing wheat production and quality. **Shaban *et al.* (2009)** indicated that the reduction in wheat yield due to broad leaved weeds competition were 27.5 and 19.2%, for grassy weeds 43.7 and 33.2% and for total weeds 40.3 and 37.8% in 2006/2007 and 2008/2009, respectively. Using chemical weed management in intensively grown crops (e.g. wheat) is easier and more economical than manual or mechanical ones, especially after hand labors scarce and pay rise. But under the warnings against manipulating herbicides recently, the supply of their authorized components became extremely restricted.

Most available herbicides used in wheat are assigned for controlling particular weeds, unlike little (e.g. isoproturon) that controls broad spectrum of weeds. However, the recommended dose of herbicides is relatively high and hence its cost price is too expensive under the Egyptian conditions. Recently, some evidences had been gathered that adding some additives, especially the surfactants (surface-active agents) and nitrogenous fertilizers (Urea or Ammonium sulphate) to herbicide solution could increase its activity, consequently the dose could be lowered and its cost price could be decreased. Moreover, lowering the dose of any herbicide is much appreciated from the point of view of minimizing pollution **(Rajvir and Sharma, 2003)**. Adjuvant may also improve a herbicides efficacy so that the concentration or total amount of herbicide required to achieve a given effect is reduce **(Green, 1992; Green and Hazen, 1998 and Green, 2001)**. Sometimes as much as live or tenfold **(WSSA 1982)**. In this respect, **Metwally and Hassan, 2001; El-Metwally, 2002** and **El-Metwally *et al.*, 2010** recorded that using some herbicides and some adjuvant had higher efficiency in controlling annual

weeds and increased yield and its components of wheat, maize and onion as compared with other treatments used.

Nonyl phenol and related compounds are used as surfactants (surface-active agents). Surfactants reduce the surface tension of water and form a bridge between two chemicals that don't readily mix (**Witt, (ed.) 1988)**. They are used to increase the amount of a spray solution that remains on leaf surfaces, to make the spray droplets stick better to the leaf **(Cserhati, 1995).** Nonyl phenol inhibited growth and caused a loss of chlorophyll in some weeds. On sometimes caused damage in the chloroplasts of these plants (the site of photosynthesis) **(Prasad, 1989)**.

Thus the present work was conducted in order to determine the effects of adjuvant Arkopal rates on improving the efficacy of Panther as post emergence herbicide on weed control in wheat.

2. Materials and Methods:

Two field experiments were carried out during winter seasons of 2008/2009 and 2009/2010 in the Experimental Station of Agricultural Research Center, El-Serw Station, Damietta Governorate Egypt. The soil of the experiments was clay, the mechanical analysis (**Piper, 1950**) and chemical analysis (**Jackson, 1960**) of the soil were carried out before sowing and presented in Table (1).

Table (1): Mechanical and chemical analysis of El-Serw soil before executing experiment.

Particle Size distribution					OM	Total N	Available N	Available P	Available K	PH of soil Susp 1:25	EC ds/m at 25c°
Coarse sand %	Fine sand %	Silt %	Clay %	Texture	%	%	ppm	ppm	ppm		
1.55	10.70	22.4	85.0	Clayey	1.20	0.038	8.30	32.0	520	8.7	3.6

A complete randomized blocks design with four replications was used in the two seasons. Twelve treatments included three Panther (Isoproturon 500g/L+ Diflufenican 50g/L) rates and three Arkopal N100 (Nonly phenol polyglycol ether) adjuvant rates in addition to hand weeding and unweeded checks as follows:

1-Panther 55%SC at the rate of 600 cm^3/fed without adjuvant.
2-Panther 55%SC at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% of spray solution.
3-Panther 55%SC at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% of spray solution.
4-Panther 55%SC at the rate of 600 cm^3/fed mixed with adjuvant Arkopal N100 12% of spray solution.
5-Panther 55%SC at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% of spray solution.
6-Panther 55%SC at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% of spray solution.
7-Panther 55%SC at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 12% of spray solution.
8-Panther 55%SC at the rate of 450 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% of spray solution.
9-Panther 55%SC at the rate of 450 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% of spray solution.
10-Panther 55%SC at the rate of 450 cm^3/fed tank-mixed with adjuvant Arkopal N100 12% of spray solution.
11-Hand weeding-twice at 30 and 45 days after sowing (DAS).
12-Unweeded (control).

The panther was used alone or tank-mixed with adjuvant Arkopal N100 treatments were sprayed at 2-3 leaf stage of wheat plants (after 25 days from sowing) by using knapsack sprayer (200 liter water/fed). The experimental plot area was 16 m^2. Wheat grains Sakha-93 cultivar was sown broadcasted at a rate of 60 kg/fed, then followed by irrigation. Grains were sown in dates 15 November in both seasons. All the normal cultural practices of growing wheat recommended for the region were followed. During the growing seasons, the following data were recorded:

1- Weed growth:

Weeds were hand pulled from one square meter of each experimental unit at 60 days after sowing, then identified and classified into grasses and broad-leaved groups. Numbers, fresh and dry weight of total weeds were recorded after drying in a forced draft oven at 70° C for 72 hours.

2- Photosynthetic pigments:

Concentration of photosynthetic pigments in wheat leaves (mg/g fresh weight) was determined in both seasons at 60 days after sowing from the flag leaf of stem. Pigments were extracted with 100% methanol according to **Mackinney**, **(1941).**

3- Anatomical features:

Specimens were taken from first season of wheat leaves from the middle of the terminal interned of the middle portion from the flag leaf blade were taken at flowering stage at the age of 90 days. The specimens were killed and fixed in FAA, dehydrated in alcohol series followed by xylene and embedded in paraffin wax (52-54 C.m.p.). Cross sections 15-20µm thick were prepared by a rotary microtome, stained in saffranin-light green combination, cleared in clove oil and mounted in Canada balsam **Gerlach, (1977).** The sections were examined microscopically.

4-Wheat yield and yield components:

At harvest, samples of ten wheat plants were taken randomly from the central area of each plot to study: number of spike/ m^2, weight of 1000 grain (g). All wheat plants of each plot were harvested to determined grain yield (ardab/feddan, one ardab = 155 kg) and straw yield (ton /feddan).

5- Chemical composition of wheat plants:

Nitrogen percentage of straw wheat was determined according to **A.O.A.C**. **(1980).**While, Phosphorus and potassium percentage of straw wheat was determined according to **Cottenie *et al*. (1982).**

Statistical analysis:

All data obtained were statistically analyzed according to **Snedecor, and Cochran (1967).** LSD at 5 % level of significance was used to compare between means.

3. Results and Discussion:

1- Weed growth:

The most commonly surveyed weeds in the experimental situations through the two growing seasons were: beard grass (*polypogon monspeliensis*,L.),canary grass(*Phalaris minor*, Retz.), as grasses and sweet clover (*Melilotus indica*, L.), dentated dock (*Rumex dentatus,* L.),wild beet (*Beta vulgaris,* L.) and lambsquarters (*Chenopodium album*, L.) as broadleaf weeds. The effect of different weed control treatments on number, fresh and dry weight of total weeds after 60 days from sowing are presented in Table (2).

The results clear that weed management caused a significant effect on number, fresh and dry weight of total of weeds after 60 days from sowing. All weeded treatments decreased number of weeds comparing to the unweeded one. However, the weeded treatments differed in their efficiency in weed suppression. In this respect, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% came in the first order for decreasing number of total weeds. Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% came in the second rank followed by that of Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 4%, hand weeding-twice at 30 and 45 days after sowing (DAS) and Panther at the rate of 600 cm^3/fed without adjuvant.

Table (2): Effect of weed control treatments on the total number, fresh and dry weight of weeds g / m^2 after 60 DFS of wheat plants during 2008/2009 and 2009/2010 seasons

Characters / Treatments		Total number of weeds/ m^2		Total fresh weight of weeds g/ m^2		Total dry weight of weeds g/ m^2	
		2008/9	2009/10	2008/9	2009/10	2008/9	2009/10
1- Panther SC 55% 600 cm^3 / fed	-	9.0	9.2	188.9	195.5	13.2	13.7
2- Panther SC 55% 600 cm^3 / fed	4%	6.3	6.7	147.0	158.4	10.3	11.0
3- Panther SC 55% 600 cm^3 / fed	8%	8.0	8.1	171.8	178.2	12.0	12.4
4- Panther SC 55% 600 cm^3 / fed	12%	9.6	10.3	201.3	215.8	14.1	15.1
5- Panther SC 55% 510 cm^3 / fed	4%	8.6	9.3	180.3	189.5	12.6	13.7
6- Panther SC 55% 510 cm^3 / fed	8%	8.0	8.9	175.1	185.3	12.2	12.9
7- Panther SC 55% 510 cm^3 / fed	12%	11.0	10.7	216.6	220.9	15.1	15.4
8- Panther SC 55% 450 cm^3 / fed	4%	11.0	12.1	217.5	237.3	15.2	16.6
9- Panther SC 55% 450 cm^3 / fed	8%	10.6	11.8	213.7	231.1	14.9	16.2
10-Panther SC 55% 450 cm^3 / fed	12%	11.0	12.1	223.1	241.8	15.6	16.9
11- Hand weeding twice	-	9.0	9.6	195.4	208.1	13.7	14.7
12- Unweeded control	-	42.3	45.3	689.2	737.4	48.2	51.4
L.S.D. at 5%		1.67	1.09	24.76	15.58	1.73	1.09

Also, it is obvious from the results in Table (2) that weed control treatments revealed significant decrease in the fresh and dry weight of total of weeds. Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4%, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 4%, Panther at the rate of 600 cm^3/fed without adjuvant and hand weeding-twice at 30 and 45 (DAS) recorded the highest efficiency in decreasing fresh and dry weight of total of weeds. These treatments reduced dry weight of weeds than unweeded check by 78.6, 75.1, 74.6, 73.8, 72.6 and 71.5 % in the first season and 78.6, 75.8, 74.9, 73.3, 73.3 and 71.4 % in the second season, respectively. This result suggest that the use of by Arkopal 4% diluents can be used to in enhance the panther phytotoxicity against weeds especially when mixed in tank with reduced of 510 cm^3/fed this herbicide. **Harrison *et al.* (1986)** recorded that emulsifier oil adjuvant enhanced post emergence herbicide and can be recommended to use this adjuvant to enhance Panther for weed control in wheat.

Generally, results in Table (2) revealed that Panther treatment used alone or tank-mixed with Arkopal N100 and hand weeding decreased statistically the number, fresh and dry weight of total weeds grown with wheat crop as compared with unweeded treatment. This treatment may be due to the inhibitory effect of herbicidal treatment on weed growth. Hand weeding twice was the most effective for controlling the weeds. Also, Panther (as urea herbicide) is used for selective control of both grasses and broad-leaved weeds in cereals. The herbicidal action of urea herbicides is due to inhibition of the Hill reaction in photosynthetic electron transport with consequent inhibition of ATP and $NADPH_2$ formation. These results cause irreversible damage to photosynthetic process and a permanent lack of food production **(Cremlyn, 1991).** Accordingly, isoproturon achieved the best control of all weed classes. Isoproturon recorded high efficiency against broad leaved and grassy weeds in wheat **(Metwally and Hassan, 2001; Muhammad *et al.*, 2007 and El-Metwally and Soudy, 2009).** These results are in good harmony with those of **Khan *et al.*, 1999**; **Khan *et al.*, 2001**; **Khan *et al.*, 2002** and **Saad El Din and Ahmed, 2004.**

2- Photosynthetic pigments:

Table (3) show that weed control treatments increased significantly the concentrations of chlorophyll (a), chlorophyll (b), chlorophyll (a+b) and carotenoids in comparison with unweeded control in both seasons. Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% exceeded the rest of other weeded practices for enhancing chlorophyll (a) in the first and second seasons.

Table (3): Effect of weed control treatments on chlorophyll a, b, a + b and carotenoids in the flage of wheat plants after 60 DAS during 2008/2009 and 2009/2010 seasons

Treatments \ Characters		Chlorophyll (a) mg / g		Chlorophyll (b) mg / g		Chlorophyll (a + b) mg / g		Carotenoids mg / g	
		2008/9	2009/10	2008/9	2009/10	2008/9	2009/10	2008/9	2009/10
1- Panther SC 55% 600 cm^3 / fed	-	2.75	3.01	0.83	1.76	3.58	3.77	0.42	0.43
2- Panther SC 55% 600 cm^3 / fed	4%	2.84	2.96	0.87	0..95	3.71	3.83	0.49	0.52
3- Panther SC 55% 600 cm^3 / fed	8%	2.89	3.03	0.77	0.84	3.66	3.88	0.46	0.50
4- Panther SC 55% 600 cm^3 / fed	12%	2.69	2.79	0.75	0.88	3.44	3.67	0.34	0.37
5- Panther SC 55% 510 cm^3 / fed	4%	2.81	3.01	0.82	0.82	3.63	3.83	0.43	0.46
6- Panther SC 55% 510 cm^3 / fed	8%	2.83	3.00	0.81	0.88	3.64	3.87	0.45	0.49
7- Panther SC 55% 510 cm^3 / fed	12%	2.46	2.71	0.65	0.67	3.12	3.40	0.33	0.43
8- Panther SC 55% 450 cm^3 / fed	4%	2.49	2.56	0.56	0.56	3.05	3.12	0.23	0.27
9- Panther SC 55% 450 cm^3 / fed	8%	2.45	2.68	0.61	0.70	3.07	3.37	0.26	0.28
10-Panther SC 55% 450 cm^3 / fed	12%	1.89	2.02	0.58	0.64	2.49	2.72	0.20	0.22
11- Hand weeding twice	-	2.74	2.92	0.76	0.83	3.50	3.76	0.39	0.42
12- Unweeded control	-	1.73	1.90	0.57	0.60	2.30	2.55	0.19	0.21
L.S.D. at 5%		0.44	0.44	0.17	0.08	0.47	0.42	0.09	0.02

While, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% gave the highest value of chlorophyll (b) and carotenoids in both seasons. Also, spraying of Panther at the rate of

600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% gave the highest values of chlorophyll (a+b) in the first season. While, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% produced the highest value of chlorophyll (a+b) in the second season. There is no significant differences between Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4%, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% and Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% on the previous characters.

On the other side, the lowest values of photosynthetic concentrations of chlorophyll (a), chlorophyll (b), chlorophyll (a+b) and carotenoids (mg/g fresh weight) of wheat plants were recorded by unweeded treatment. These results are in harmony with those obtained by **Gaweesh *et al.* (1992)** who indicated that the bromoxynil significantly increased the content of chlorophyll (a and b) per unit area of wheat blades and carotenoids in tissues of wheat flag leaves. Also, **Mosalem and Shady (1992)** who mentioned that the herbicide had a significant effect on chlorophyll (a and b) in wheat plant.

3- Anatomical features:

Data in Table (4) and Fig.1 show that there were significant effects of weed control treatments on flag leaf anatomy of wheat after 90 DFS. Mixing Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% exceeded the rest of other weeded practices for enhancing leaf thickness in the keel region, mesophyll tissue thickness, large vascular bundle dimension (length and width), xylem tissue thickness and metaxylem vessel diameter, respectively. Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8% came in the second rank followed by that of Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%. While, mixing Panther at the rate of 510 cm^3/fed tank-with adjuvant Arkopal N100 4% exceeded the rest of other weeded practices for enhancing phloem tissue thickness.

On the other hand, unweeded treatment gave the lowest values of previous characters. These results suggest that Arkopal elimination of weeds by Panther with adjuvant can minimize weed competition and consequently improve photosynthetic fluid assimilates in the phloem in one side and other side nutrient uptake from soil and consequently enhance source and sink apparatus of wheat plant. Many researchers mentioned that flag leaf is considered as one main sources of assimilate in this situation for carbohydrate storage in grains and finally increasing productively.

Table (4): Effect of weed control treatments on anatomical studies the flag leaf blade of wheat plant after 90 DAS during 2008/2009 season.

Characters / Treatments		Leaf thickness in the keel region µm	Mesophyll tissue thickness µm	Large V.B. dimension µm		Xylem tissue thickness µm	Phloem tissue thickness µm	Metaxylem vessel diameter µm
				Length	Width			
1- Panther SC 55% 600 cm^3 / fed	-	516	496	166	160	84	82	42
2- Panther SC 55% 600 cm^3 / fed	4%	624	588	178	180	96	82	54
3- Panther SC 55% 600 cm^3 / fed	8%	590	556	176	176	96	80	52
4- Panther SC 55% 600 cm^3 / fed	12%	486	452	162	158	82	80	40
5- Panther SC 55% 510 cm^3 / fed	4%	530	504	176	170	92	84	46
6- Panther SC 55% 510 cm^3 / fed	8%	566	510	174	172	94	80	50
7- Panther SC 55% 510 cm^3 / fed	12%	460	438	156	154	80	76	38
8- Panther SC 55% 450 cm^3 / fed	4%	396	362	154	116	82	72	32
9- Panther SC 55% 450 cm^3 / fed	8%	410	380	152	148	82	70	36
10-Panther SC 55% 450 cm^3 /fed	12%	382	350	150	110	78	72	32
11- Hand weeding twice	-	492	468	158	160	80	78	40
12- Unweeded control	-	360	320	144	90	78	66	30
L.S.D. at 5%		39.68	17.28	11.49	11.92	12.35	10.66	8.62

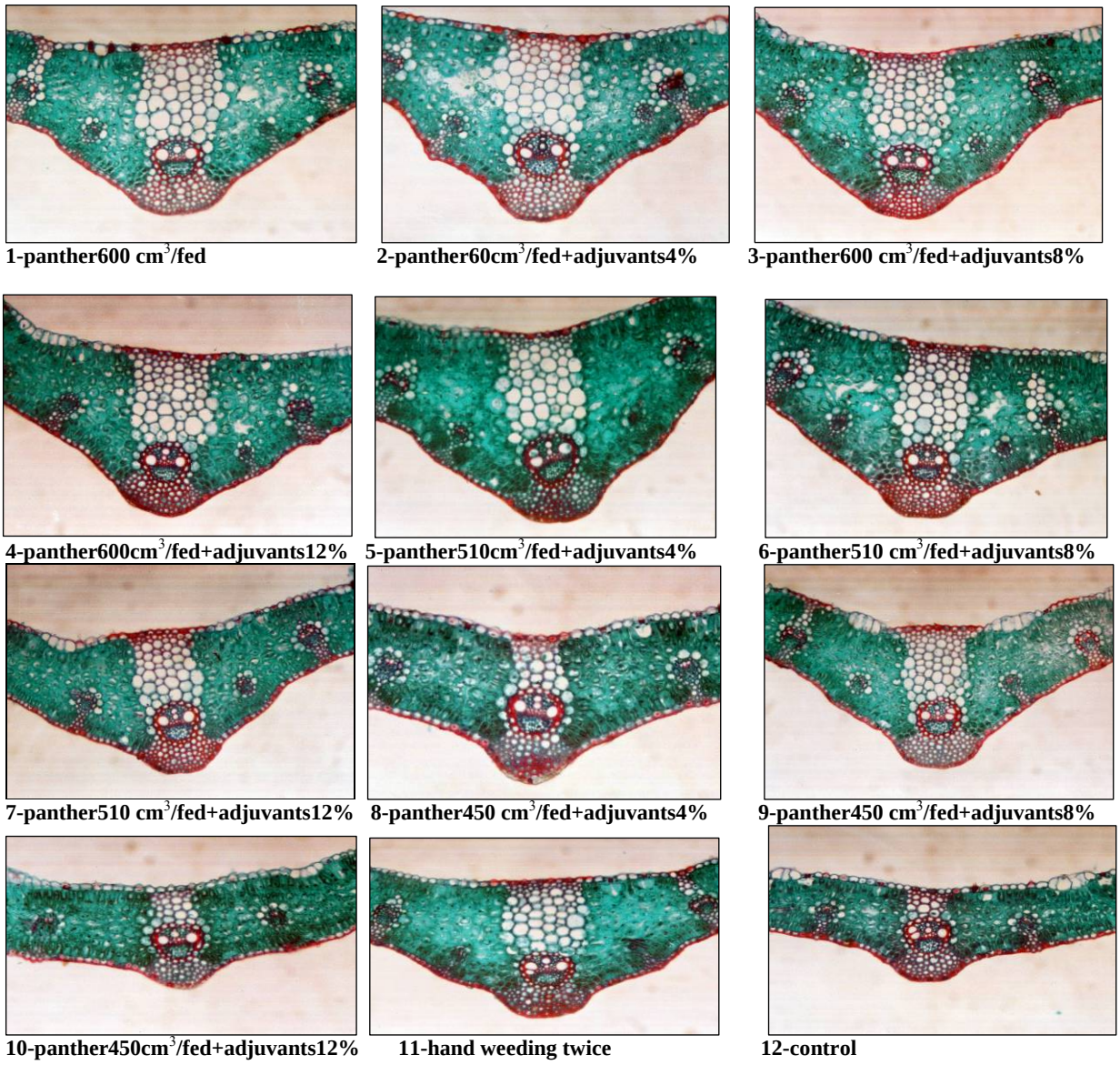

Figure (1): Cross sections of the flag leaf of wheat plants as affected by weed control treatments (objx10xOc.x10).

4-Wheat yield and yield components:

Table (5) indicated that all weed control treatments increased significantly the number of spike/m^2, weight of 1000 grain, grain and straw yields/fed in both seasons. The highest values of the previous character were obtained from Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4%, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% and Panther at the rate of 600 cm^3/fed without adjuvant. Whereas, the lowest value of the previous characters ware obtained from the unweeded check (Table 5).

Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 4%, Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% and Panther at the rate of 600 cm^3/fed without adjuvant treatments gave higher values of grain yield /fed. They significantly increased grain yield /fed over the unweeded check by 79.8, 75.4, 57.9, 53.9 and 50.7% in the first season and 81.8, 78.8, 61.9, 54.6 and 48.8% in the second

season, respectively. Such superior weeded treatments minimized weed-crop competition (Table, 2). So, Panther (isoproturon + diflufinican) alone or mixed with adjuvant were more effective in controlling total weeds and resulted in the highest reduction in dry matter compared with other treatments. Vice–versa, the least yield and yield attributed were recorded in wheat plant of that unweeded plots. The increase in yield and yield attributed by different weed control treatments may be due to good control of wheat weeds and minimizing weed competition which gave good chance of wheat growth and improved good characters. The promoting effect of weed control treatments on growth and yield attributed may be reflected on increasing the grain yield of wheat. The positive effect of weeded practices on wheat yields and its components have been confirmed by **Ikramullah *et al*. (2002); El-Metwally and El-Rokiek (2007) and El-Metwally and Soudy (2009).**

5- Chemical composition of wheat straw:

The results indicate that there were significant increases in the contents of N, P and K percentage of wheat straw due to different weed control treatments Table (6). Maximum levels of N, P and K percentage in of wheat straw were recorded with Panther at the rate of 600 cm^3/fed mixed with adjuvant Arkopal N100 4%, followed by Panther at the rate of 600 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 8%, Panther at the rate of 510 cm^3/fed tank-mixed with adjuvant Arkopal N100 4% and Panther at the rate of 600 cm^3/fed without adjuvant. While, the unweeded chick gave the lowest of N, P and K percentage of wheat straw. These results may be due to the less competition for nutrients, water and light through limiting weeds infestation with herbicidal and hand weeding treatments due to increasing the uptake of different nutrients. Similar results were obtained by several workers **El-Metwally (2002)** and **El-Metwally *et al.* (2010).** The increases of NPK uptake may be attributed to successful weed control treatments which reduced below and above ground competition and allowing wheat plants to per from their maximum photosynthetic capacity. This could increased the metabolites synthesized by wheat plant, their translocation in plant sink which in turn increase growth, NPK uptake, yield and yield attributes.

Table (5): Effect of weed control treatments on yield and yield components of wheat plants during 2008/2009 and 2009/2010 seasons

Characters / Treatments		Number of spike / m^2		Weight of 1000 grain (g)		Grain yield (ardab) / fed		Straw yield (ton) / fed	
		2008/9	2009/10	2008/9	2009/10	2008/9	2009/10	2008/9	2009/10
1- Panther SC 55% 600 cm^3 / fed	-	371.3	393.3	46.0	48.4	18.31	19.35	3.78	3.98
2- Panther SC 55% 600 cm^3 / fed	4%	393.6	419.0	49.6	52.9	21.85	23.64	4.07	4.43
3- Panther SC 55% 600 cm^3 / fed	8%	393.3	416.9	48.2	52.3	21.32	22.21	4.10	4.32
4- Panther SC 55% 600 cm^3 / fed	12%	358.3	390.1	41.3	44.4	16.56	18.06	3.64	3.89
5- Panther SC 55% 510 cm^3 / fed	4%	372.6	400.5	47.3	50.5	18.71	20.11	3.80	4.09
6- Panther SC 55% 510 cm^3 / fed	8%	378.6	415.5	48.0	51.4	19.19	21.05	3.88	4.26
7- Panther SC 55% 510 cm^3 / fed	12%	359.3	385.2	40.3	42.6	16.49	17.67	3.63	3.84
8- Panther SC 55% 450 cm^3 / fed	4%	353.6	370.5	38.6	41.5	15.41	16.23	3.45	3.84
9- Panther SC 55% 450 cm^3 / fed	8%	358.6	381.9	40.0	42.1	16.04	17.08	3.62	3.85
10-Panther SC 55% 450 cm^3 / fed	12%	342.3	365.9	37.0	40.9	14.71	15.78	3.41	3.65
11- Hand weeding twice	-	358.6	391.9	45.7	38.3	16.64	18.30	3.66	3.93
12- Unweeded control	-	314.3	337.7	36.5	39.1	12.15	13.00	3.29	3.60
L.S.D. at 5%		21.87	12.31	1.52	1.39	0.92	0.65	0.20	0.14

Table (6): Effect of weed control treatments on N, P and K percentage of wheat straw during 2008/2009 and 2009/2010 seasons

Treatments \ Characters		Nitrogen %		Phosphorus %		Potassium %	
		2008/9	2009/10	2008/9	2009/10	2008/9	2009/10
1- Panther SC 55% 600 cm^3 / fed	-	0.206	0.225	0.131	0.138	0.876	0.945
2- Panther SC 55% 600 cm^3 / fed	4%	0.233	0.263	0.135	0.146	0.923	0.977
3- Panther SC 55% 600 cm^3 / fed	8%	0.230	0.242	0.134	0.143	0.906	0.974
4- Panther SC 55% 600 cm^3 / fed	12%	0.163	0.185	0.121	0.128	0.843	0.912
5- Panther SC 55% 510 cm^3 / fed	4%	0.208	0.228	0.133	0.141	0.880	0.958
6- Panther SC 55% 510 cm^3 / fed	8%	0.223	0.231	0.134	0.142	0.896	0.966
7- Panther SC 55% 510 cm^3 / fed	12%	0.160	0.195	0.119	0.127	0.840	0.913
8- Panther SC 55% 450 cm^3 / fed	4%	0.136	0.150	0.114	0.120	0.836	0.895
9- Panther SC 55% 450 cm^3 / fed	8%	0.140	0.167	0.114	0.125	0.846	0.899
10-Panther SC 55% 450 cm^3 / fed	12%	0.130	0.142	0.113	0.120	0.833	0.888
11- Hand weeding twice	-	0.183	0.193	0.124	0.134	0.860	0.916
12- Unweeded control	-	0.120	0.124	0.103	0.108	0.810	0.862
L.S.D. at 5%		0.026	0.018	0.004	0.002	0.038	0.026

Corresponding author
I. M. El-Metwally
Botany Dept., National Research Center, Giza, Egypt
im_elmetwally@yahoo.com

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