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MAXIMIZING WHEAT PRODUCTIVTY BY USING SOME IMPROVED SOWING METHODS AND WEEDING TREATMENTS

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ABSTRACT

Two field experiments were conducted during 2010/2011 and 2011/2012 seasons at Shandaweel Agriculture Research Station, Sohag Governorate, Egypt, to study the effect of six sowing methods (Afir broadcast (AB), Afir broadcast on raised beds at 50 cm width (ABB-50cm), Afir broadcast on raised beds at 75 cm width (ABB-75cm), Afir drill at 15 cm apart rows (AD), Afir drill on raised beds at 50 cm width (ADB-50cm) and Afir drill on raised beds at 75 cm width (ADB-75cm), and five weed control treatments (Turonex at 1.0 l/fed, Ecopart at 250 cm^3/fed + Illoxan at 1.0 l/fed., Ecopart + Topik at 140 g/fed, hand weeding twice and unweeded control) on weed growth, yield and yield components of wheat cultivar Giza 168. Split plot design was used. The results indicated that the sowing methods of Afir drill and broadcast on raised beds at 75 cm widths were the best methods in weed control and gave the lowest values in the dry weight of grassy, broad- leaved weeds and total weeds (g/m^2), followed by Afir drill and Afir broadcast on raised beds at 50 cm in both seasons, respectively. Sowing methods Afir drill and broadcast on raised beds at 75 cm widths gave the highest values for plant height, spike length, weight of the spike, the number of spikes m^{-2}, grain protein, straw (ton/fed) and grain yield (ardeb/ fed) in both seasons. Weed control treatments reduced significantly the dry weight of grassy, broad-leaved and total weeds compared with unweeded treatment in both seasons. Ecopart + Topik and hand weeding twice were the best in weed control of grassy, broad-leaved and total weeds and plant height, spike length, weight of the spike, the number of spikes/m^{-2}, grain protein %, 1000-grain weight, straw (ton/fed.) and grain yield (ard./ fed.) in both seasons compared with unweeded treatment. The interaction between sowing methods and weed control treatments was significant on all dry weight weeds and plant height in both seasons and spike weight in the second season only. Afir drill and broadcast on raised beds at 75 cm width with (Ecopart + Topik) or hand weeding twice gave the highest average of the numbers of spikes/ m^2 (443.3 and 332.2) and (488.7 and 437.3), 1000- grain weight (52.4 and 53.6 g) and (47.7 and 50.5 g) and grain yield (21.97 and 22.52) and (19.42 and 19.93 ard./fed.) in the average in both seasons for two sowing methods with two weed control treatments.

There were no residues of herbicides (isoproturon 55% SC at a rate of 1.5 L/fed., pyraflufen–ethyl 2% SC at 250 cm^3 /fed. and clodinafop-propargyl 15% WP at 140 g/ fed. as post emergence herbicide on the tested wheat grain. However, detection residue for (diclofop- methyl 36% EC at 1 L/fed.) herbicide in wheat grain (0.09 ppm) was lower than the Maximum Residue Limits (MRL).

Economic evaluation of the results indicated that the benefit/cost ratios for wheat yield/fed reached about 128.36 and 181.42%/fed with Ecopart + Topik with Afir drill on raised bed at 75 cm width in the first and the second seasons, respectively. While, unweeded treatment with Afir broadcast gave the lowest values (25.02 and 67.29 %/fed.) in the first and the second seasons, respectively. Afir drill on raised beds at 75 and 50 cm with Ecopart + Topik increased gross income, net income and profitability.

Key words: *herbicides weed control, wheat, raised beds, residues, sowing method.*

1. INTRODUCTION

Great losses in wheat yield are attributed to weeds. The problem of weeds in Egyptian wheat fields has mostly recognized in Upper Egypt, where grassy weeds (wild oats) are the predominat amongst all other weed species. So, weed control in wheat includes the use of cultural practices and the application of suitable herbicides.

New interventions were recorded by Abo Elenin *et al*. (2009) showing that planting wheat on wide furrows (raised seed beds) produced the highest water productivity and saved considerable amount of irrigation water. Such method had been spread now widely all over Egypt, but its effect on weeds need to be clarifyed as integrated with the use of herbicides. Planting wheat on ridges insures good aeration of the roots, better use of solar radiation, efficient use of fertilizers and easier weed control and other agricultural practices. Sowing methods of wheat became necessary to increase productivity. Improving sowing methods is important to increase wheat production. Fakkar (1999) found that Herati method had a significant effect on the dry weight of grassy weeds (g/m^2) by 35.3 % compared to Afir drill method. El-Afandy (2006) indicated that sowing wheat grains on sloping of furrows or rows significantly increased spike length, the no. of grains/spike, grain weight/spike, 1000-grain weight, no. of spikes/m^2, grain yield/fed., straw yield/fed as compared with the broadcast and drill methods. Muhammad *et al*. (2011) stated that row sowing in 30 cm apart with manual hoeing gave the best regarding weed control (87.23%), grain yield (4073 kg ha^{-1}) and 1000- grain weight (45.23 g). Fakkar and Amin (2012) indicated that the sowing method Afir in furrows was the best to control the grassy, broad-leaved and total weeds compared with the other methods.

The chemical weed control is one of the improved methods and recent technology to control weeds. In wheat, the most easy and cheap method is the use of herbicides, which take less time and is effective to control weeds on large scale. Fakkar (1999) showed that the application of Topik 24 % EC at 100 cc fed^{-1} and hand weeding twice at 30 and 45 days after sowing had a significant effect on grain weight $spike^{-1}$, spike length, the number of spikes m^{-2}, 1000-grain weight, straw yield ton fed^{-1} and grain yield (ardeb fed^{-1}) in wheat. Fakkar (2005) reported that the application of Topik at 100 cc fed^{-1} and hand weeding at 30 and 45 days after sowing significantly increased plant height, spike length, weight of grains $plant^{-1}$, weight of grains $spike^{-1}$ and grain yield fed^{-1}. Singh *et al*. (2008) investigated the residues of isoproturon in soil, wheat grain and straw during harvest. Isoproturon was applied at 1.0 kg a.i./ha after 35 days of sowing wheat. The minimum detection limit of the herbicide in HPLC was 0.01 micro g/g. There was no detectable herbicide residue at the time of wheat harvest. Yasin *et al*. (2010) found that clodinafop (Topic-15 WG) at 37 g.a.i. ha^{-1} produced relatively less weed biomass, more plant height, number of spike bearing tillers, number of grains per spike, 1000-grain weight and grain yield (4.20 t ha^{-1}). Khan *et al*. (2011) indicated that Topik was effective in decreasing weed biomass and enhancing grain yield and its contributing traits. Fakkar and Amin (2012) showed that using hand hoeing twice before the first irrigation and before the second irrigation and hand hoeing once before the first irrigation and before the second irrigation resulted in the best weed control than the other treatments in both seasons and gave the highest values of weight of spike, weight of grains $spike^{-1}$, number of grains $spike^{-1,}$ number of spikes m^{-2}, seed index and grain yield ardeb fed^{-1} in both seasons compared with unweeded treatment.

The fate and behavior of herbicides in the soil are influenced by many factors, including soil properties, management, application methods, herbicide properties, landscapes, cultivated crops and climatic conditions. Also, the accumulation of herbicides in ground water is affected by physical, chemical and biological mechanisms (Ramesh and Balasubramanian, 1999). Melander *et al*. (2002) found that the residues of isoproturon in the grain were 0.25 and 0.26 ppm in both seasons, collected from treated plots contained 1.74 and 1.76 ppm. Ramesh and Beena (2008) estimated clodinafop-propargyl residues by high performance liquid chromatographic (HPLC) technique. Limits of determination in grain and straw were 0.5 and 1.0 micro g/g, respectively. Harvest time residues in soil, wheat grain, and straw were found to be below detectable limits. Mitwaly (2012) showed that the degradation of clodinafop-propargyl, isoproturon and diclofop- methyl occurred faster in the field after 120-180 days of treatment.

The present investigation was carried out to maximize wheat productivity by:

1- Improvement of sowing methods to increase grain yield/fed.

2- Improvement of water management to reduce water losses and better water saving.
3- Increasing efficiency of weed control treatments.

2. MATERIALS AND METHODS

The experiment was conducted at Shandaweel Agriculture Research Station, Agricultural Research Center, Sohag Governorate (Upper Egypt) in two winter seasons 2010/2011and 2011/2012. The experiment aimed to study the effect of sowing methods and some weed control treatments on wheat variety Giza 168 (*Triticum aestivum*, L.) productivity. The preceding summer crop was maize (*Zea mays* L.) in both seasons.

The sowing dates were the 28th and the 26th of November in the first and the second seasons, respectively. Seeding rate used was as recommended (60 kg/fed.). Phosphorus fertilizer was applied as calcium super phosphate (15.5 % P_2O_5) during preparation at the rate of 22.75 kg P_2O_5/fed. Nitrogen fertilizer was added in the form of urea (46.5% N) at the rate of 75 kg N fed^{-1} in two equal portions before the first and the second irrigation. Physical and chemical analysis of the soil of the experimental sites showed that the soil was clay loam and containing 15, 19 and 12 ppm for N, P and K, respectively with 7.9 Ph, 0.8 OM%, 7.57 $CaCO_3$% and total N 1.26. The other normal agricultural practices of wheat growing in the region were done as recommended.

A split-plot with RCBD design was used and the arrangement of the treatments in a completely randomized block design with three replicates was used and the plot area was 10.5 m^2 (3×3.5 m). Sowing methods were allocated to the main plots and weed control treatments in the sub plots as follows:

2.1. Main plots: Five sowing methods

1) - Afir broadcast (check).
2) - Afir broadcast on raised beds at 50 cm width.
3) - Afir broadcast on raised beds at 75 cm width.
4) - Afir drill at 15 cm apart rows.
5) - Afir drill on raised beds at 50 cm width and 15 cm apart rows.
6) - Afir drill on raised beds at 75 cm width and 15 cm apart rows.

Sowing methods number 2, 3, 5 and 6 were a better performance as there is less need to apply water to all the land, which leads to a decrease in percolation losses. Planting wheat on the ridges insures good aeration of the roots, better use of solar radiation, efficient use of fertilizer and easier weed control and agricultural practices **(**Karrou *et a.,l* 2011)

2.2. Sub-plots: Five weed control treatments were used as follows

1- Turonex 55 % SC (isoproturon) at the rate of 1.5 l/fed from 30 days from sowing to control all species of weeds.
2 - Ecopart 2 % SC (pyraflufen-ethyle) at 250 cm^3 /fed from 30 days after sowing to control broad-leaved weeds +Illoxan 36% EC (diclofop - methyl) at 1 l/fed from 30 after sowing to control grassy weeds.
3- Ecopart 2% SC at 250 cm^3/fed + Topik 24% (clodinafop- propargyl) at 140 g/fed at 30 days after sowing to control grassy weeds.
4 - Hand weeding twice at 30-45 days after sowing.
5 - Unweeded (Control).

2.3. Data recorded: The following data were recorded as follows

2.3.1. Weeds survey

Weeds were hand pulled from a square meter randomly of each plot after 75 days from sowing, then identified into species and classified into the following two groups and total annual weeds:

1-Annual grassy weeds.
2-Annual broad-leaved weeds.
3-Total weight of annual weeds: combined of grassy and broad -leaved weeds.

Weeds were air dried for 3 days and dried in oven at 70 C$^{\circ}$ until constant weight and weighed. Therefore, the dry weight of total weeds was recorded in gm/m^2. Herbicides were sprayed by Cp3 knapsack sprayers with 200 liter of water/fed.

2.3.2. Yield and yield components

At harvest the following characters were recorded: Plant height (cm), spike length, spike weight, the number of spikes/m^2, 1000 - grain weight, straw yield (ton /fed.), grain yield (ardeb /fed.) and grain protein.

2.4. Residue analysis of tested herbicides

2.4.1. Extraction of herbicides

The residues of Turonex (isoproturon), Ecopart (pyraflufen - ethyl), Illoxan (diclofop- methyl) and Topik (clodinafop-propargyl) herbicides in grains were extracted according to the method of El Beit *et al.* (1978). Fifty grams of each sample were homogenized in a blender and transferred into a shaking bottle (250 ml) with 150 ml of methylene chloride. The bottles were shaken for one hour, and then the solvent was filtered through filter paper watman No. 1, and dried over anhydrous sodium sulphate. The filterate was evaporated till dryness, and the residues were quantitatively transferred into small vials with (5 ml) acetone evaporated at room temperature, the vials with residues were kept at 10 °C for clean up. The resulting extract of grains was cleaned according to Jarczyk (1983). Following the techniques previously mentioned, the rate recovery of Turonex, Ecopart, Topik and Illoxan were 98.99, 99.12, 97.15 and 98.56% for each herbicide, respectively. Turonex, Ecopart, Topik and Illoxan residues were measured by High Performance Liquid Chromatography (HPLC).

2.4.2. Clean up of herbicides

The clean up of Turonex, Ecopart, Topik and Illoxan in the extractions were carried out according to Jarczyk (1983). Small amount of glass wool was placed into the bottom of a chromatographic column of 1.5 cm diameter, and half of the tube was filled with methanol. Ten grams of silica gel were slurred with the solvent into the chromatographic column and 2 of anhydrous sodium sulphate were placed into the top. Air bubbles were removed by a glass rod, and the 50 ml. solvent were allowed to drain down until just covered the silica gel. The herbicide residues were dissolved in 10 ml of the solvent methanol and added to the top of the column. The herbicide residues were placed into measuring flasks of 10 ml. of methanol.

2.4.3. Determination of active ingredient of the tested herbicides

The active ingredients for isoproturon, pyraflufen-ethyl, clodinafop propargyl and diclofop-methyl were determined by HPLC instrument according to the method of Luke *et al*. (1981). A reverse phase high-performance liquid chromatographic was used for quantitative analysis. Agilent Technologies 1260 infinity HPLC instrument equipped with degasser, quaternary pump, UV-DAD (diodarray) Detector with rheodyne injection system and a computer (model vectra) was used for analysis. The stationary phase consisted of Agilent Zorbax SB-C 18 packed stainless steel column. {5 µm (4.6 X 250 mm)}. The conditions of analysis for each herbicide are summarized in Table (1).

Table (1): HPLC conditions for Turonex,Iquopart, Topik and Illoxan determinations.

Herbicides	Conditions			
	Mobile phase	Flow rate (ml / min)	Wave length (nm)	Retention time (min)
Isoproturon (Turonex)	Methanol (MeOH): Acetoniltrile (AcN) : H2O 30% : 60% :10%	**0.8 ml**	**235**	**3.726**
Pyraflufen– ethyl (Iquopart)	Methanol (MeOH): Acetoniltrile (AcN) : H2O 30% : 60% :10%	**0.7 ml**	**235**	**2.565**
Clodinafop- propargyl (Topik)	Methanol (MeOH): Acetoniltrile (AcN) : H2O 35% : 60% :5%	**1 ml**	**235**	**4.776:4.956**
Diclofop- methyl (Illoxan)	Methanol (MeOH): Acetoniltrile (AcN) : H2O 35% : 60% :5%	**1 ml**	**235**	**3.130**

2.5. Economic analysis

Economic evaluation for the results by estimating the average of seed yield (ard. fed^{-1}), Total variable cost, Gross Income (GI), Gross Margin (GM), Benefit/cost ratio (B/C) and profitability according to Heady and Dillon (1961).

Where: Gross Income (GI) = (price L.E) × Yield (Ardeb or ton/ fed.)

Gross Margin (GM) = Gross Income- Total cost.

Benefit/cost ratio (B/C) = Gross Income/Total cost.

Profitability = 100× Gross Margin/Total cost.

2.6. Statistical analysis

The collected data were statistically analyzed according to the method of Snedecor and Cochran (1981). Least Significant Differences (LSD-

Received) test was used for treatments mean separation.

3. RESULTS AND DISCUSSION

3.1. Effect of sowing methods on

3.1.1. Dry weight of weeds (g/ m^2)

The dominant weed species in the present study were recorded: *Avena* spp. (wild oats) and *Phalaris* sp. (canary grass) as annual grassy weeds; *Brassica* sp. (Kabar, black mustard), *Emex spinosus* (spiny emex), *Chenopodium* sp. (Lambsquar), *Ammi majus* (common bishop) and *Rumex dentatus* (curly dock) as annual broadleaved weeds. The other weed species in rare infestation rates were *Lolium* sp. (rye grass) as annual grassy weed and *Anagallis arvensis* (preinpernel), *Beta vulgaris* (wild beet, sea beet), *Medicago polymorpha* (medic, toothed medik), *Melilotus indica* (sweet clover, indica melilotm), and *Sonchus oleraceus* (annual sowthistle) as annual broadleaved weeds.

The results listed in Tables (2 and 3) revealed that sowing methods affected significantly the dry weight of grassy, broad-leaved weeds and total weeds (g/ m^2) in the average seasons. The sowing method Afir broadcast (common method) gave the highest effect on the dry weight of grassy (142.2 and 128.2 g), broad- leaved weeds (116.7 and 102.3 g) and total weeds (258.9 and 230.3g/ m^2) in 2010/11 and 2011/12 seasons, respectively. The sowing methods of Afir drill and broadcast on raised beds at 75 cm width were the best methods in weed control and gave the lowest values in the dry weight of grassy (74.0 and 92.3)and (65.5 and 82.3 g), broad-leaved weeds (48.6 and 60.0 g) and (43.9 and 59.1g) and total weeds (172.6 and 152.7 g/m^2) and (166.1 and 141.2 g/m^2) followed by Afir drill on beds at 50 cm and Afir broadcast in both seasons respectively. On the other hand Afir broadcast and drill on raised beds at 75 cm significantly decreased the dry weight of grassy weeds by (33.03 and 47.07 %) and by (31.67 % and 85.17 %) in the first and the second seasons, respectively, compared with Afir broadcast. The broad-leaved weeds decreased by (45.39 and 57.75%) and by (41.53 and 57.57%) and the total weeds by (41.25 and 54.18 %) and by (36.18 % and 52.28 %) in the first and the second seasons, respectively compared to Afir broadcast method (133.20 and 120.70 g/ m^2). These results are in agreement with those mentioned by Singh and Singh (1996). It may be, the methods Afir broadcast on raised beds and Afir drill on raised beds increased plant tillers and number plants per unit area and decrease size and growth the weeds. On the other hand, the competition between weed and plant crops decrease and increase efficiency of sowing methods.

Generally, Afir drill on beds at 75 cm width was the best methods in weed control compared to the other sowing methods in both seasons. This result is probably due to the fact that increasing the distance between rows guaranteed more area, nutrients, water and solar radiation for weed plants to grow well. Moreover, increasing the area of raised beds decreased shading and competition of wheat plants with weeds and hence assured better growth conditions. Also, wide beds that saved considerable amount of irrigation water produced higher wheat grain yield and increased WUE compared to farmers' practices (Abo Elenin *et al.,* (2009).

3.1.2. Yield and yield components

The results presented in Tables (3,4 and 5) showed that sowing methods increased significantly plant height, spike weight, the number of spikes/ m^2, 1000-grain weight, straw yield (ton/fed.) and grain yield (ardeb./fed.) in both seasons. The Afir broadcast and drill on raised beds at 75 cm gave the highest values in plant height and weight of spike compared with Afir broadcast (common method) in the two seasons. Afir drill on beds at 50 cm, Afir drill (normal) and Afir broadcast normal gave the lowest values in the plant height, spike length and spike weight**.** The sowing method Afir drill on beds at 75 cm gave the tallest plant height (115.7 and 117.5 cm), highest spikes weight (2.90 and 3.20 g), number of spikes/ m^2 (427.7 and 416.4), 1000 grain weight (51.5 and 51.8 g) and grain yield (20.55 and 21.39 ard./fed.) in the first and the second seasons respectively, compared with Afir broadcast (common method). These results are in agreement with those mentioned by Rizk (1993), and El-Afandy (2006)**.** These results showed that Afir hills on furrows and Afir hills in rows methods were more effective in controlling weeds than Afir drill method which decrease weeds before emergence of the crop. According to decreased competition between weeds and increased number of tillers, the number of spike m^{-2} and seed index finally gave the highest yield.

Table (2): Effect of sowing methods and weed control treatments on dry weight of weeds g/m^2 of grassy, broad- leaved and total weeds of wheat in 2010/11 and 2011/12 seasons.

Treatments	Seasons					
	2010/2011			2011/2012		
	Grassy weeds	Broad- leaved weeds	Total weeds	Grassy weeds	Broad- leaved weeds	Total weeds
Sowing methods						
1- Afir broadcast (AB)	142.2	116.7	258.9	128.2	102.3	230.3
2- Afir broadcast on raised beds at 50 cm width(ABB)	115.0	93.1	208.1	100.9	76.3	212.8
3- Afir broadcast on raised beds at 75 cm width	92.3	60.1	152.7	82.3	59.1	141.2
4- Afie drill at 15 cm apart rows (AD)	127.8	101.1	229.0	115.5	90.0	201.1
5- Afir drill on raised beds at 50 cm width (ADB)	93.7	71.6	165.3	89.0	69.8	158.7
6- Afir drill on raised beds at 75 cm width	74.0	48.6	172.6	65.5	43.9	166.1
LSD at 5%	**18.9**	**14.1**	**78.5**	**12.3**	**12.6**	**104.8**
Weed control treatments						
1- Turnex	100.3	74.5	174.6	83.2	83.2	192.4
2- Ecopart t+ Illoxan	82.6	60.1	184.1	71.4	71.4	120.8
3- Ecopart + Topik	69.6	46.4	116.4	57.4	57.4	125.7
4- Hand weeding twice	19.3	19.3	38.8	18.3	18.3	34.2
5- Unweeded treatment	265.7	209.0	474.9	254.1	254.1	451.9
LSD at 5%	**9.9**	**11.10**	**67.3**	**7.1**	**7.1**	**80.4**

Table (3): Effect of sowing methods and weed control treatments on plant height (cm), spike length (cm) and spike weight (gm) of wheat in 2010/11 and 2011/12 seasons.

Treatments	Seasons					
	2010/2011			2011/2012		
	Plant height	Spike length	Spike weight	Plant height	Spike length	Spike weight
Sowing methods						
1- Afir broadcast (AB)	113.1	11.1	3.21	112.2	10.5	3.07
2- Afir broadcast on raised beds at 50 cm width(ABB)	113.5	10.4	2.77	112.6	10.6	3.02
3- Afir broadcast on raised beds at 75 cm width	111.9	10.8	2.91	113.4	10.6	3.19
4- Afie drill at 15 cm apart rows (AD)	116.6	11.2	3.09	116.5	10.7	3.08
5- Afir drill on raised beds at 50 cm width (ADB)	119.3	11.2	3.03	116.0	11.4	3.03
6- Afir drill on raised beds at 75 cm width	115.7	11.7	2.90	117.5	10.5	3.20
LSD at 5%	**2.4**	**0.73**	**0.16**	**2.2**	**NS**	**NS**
Weed control treatments						
1- Turnex	115.8	11.1	3.09	114.7	10.9	3.08
2- Ecopart t+ Illoxan	115.4	10.9	3.14	114.6	10.9	3.27
3- Ecopart + Topik	115.3	12.3	3.21	115.3	11.5	3.41
4- Hand weeding twice	114.2	11.7	3.01	116.9	11.1	3.21
5- Unweeded treatment	114.4	9.4	2.39	112.9	9.2	2.53
LSD at 5%	**114.4**	**0.83**	**0.19**	**114.3**	**0.72**	**1.69**

Table (4): Effect of sowing methods and weed control treatments on no. of spikes/ m^2 and 1000- grain weight (g) in 2010/11 and 2011/12 seasons.

Treatments	Seasons			
	2010/2011		2011/2012	
	No. of spikes/ m^2	1000-grain weight	No. of spikes/ m^2	1000-grain weight
Sowing methods				
1- Afir broadcast (AB)	381.1	41.6	373.6	38.7
2- Afir broadcast on raised beds at 50 cm width(ABB)	403.7	43.1	394.9	43.2
3- Afir broadcast on raised beds at 75 cm width	457.6	47.6	428.8	46.1
4- Afie drill at 15 cm apart rows (AD)	371.9	48.0	385.6	50.0
5- Afir drill on raised beds at 50 cm width (ADB)	372.9	50.3	408.5	51.2
6- Afir drill on raised beds at 75 cm width	427.7	51.5	416.4	51.8
LSD at 5%	**35.49**	**1.81**	**39.4**	**1.33**
Weed control treatments				
1- Turnex	436.4	45.75	392.9	45.91
2- Ecopart t+ Illoxan	445.3	46.98	428.1	47.19
3- Ecopart + Topik	427.1	47.99	438.7	48.18
4- Hand weeding twice	397.3	51.40	424.9	49.12
5- Unweeded treatment	341.4	42.96	322.1	43.77
LSD at 5%	**27.66**	**2.94**	**32.1**	**1.93**

Table (5): Effect of sowing methods and weed control treatments on straw yield (ton/fed.) and grain yield (ard./fed.) and grain protein in 2010/2011 and 2011/2012 seasons.

Treatments	Seasons					
	2010/2011			2011/2012		
	Straw yield	Grain yield	Grain Protein	Straw yield	Grain yield	Grain Protein
Sowing methods						
1- Afir broadcast (AB)	4.33	16.13	12.4	4.80	17.17	12.5
2- Afir broadcast on raised beds at 50 cm width(ABB)	4.41	17.22	13.0	5.29	17.77	13.2
3- Afir broadcast on raised beds at 75 cm width	4.87	18.02	13.5	5.81	18.92	13.3
4- Afie drill at 15 cm apart rows (AD)	5.29	19.48	12.8	6.05	19.31	13.1
5- Afir drill on raised beds at 50 cm width (ADB)	4.64	19.48	13.5	5.18	20.75	13.3
6- Afir drill on raised beds at 75 cm width	4.31	20.55	13.8	4.29	21.39	13.9
LSD at 5%	**1.24**	**1.03**	**0.49**	**0.03**	**1.45**	**0.64**
Weed control treatments						
1- Turnex	4.87	18.05	13.4	5.42	18.40	13.6
2- Ecopart t+ Illoxan	4.67	18.05	13.7	5.42	18.40	13.5
3- Ecopart + Topik	5.01	19.05	13.7	5.71	20.30	13.8
4- Hand weeding twice	3.94	19.85	14.0	4.09	20.75	14.0
5- Unweeded treatment	4.87	15.84	10.9	5.42	16.44	11.0
LSD at 5%	**0.37**	**1.08**	**0.44**	**0.38**	**0.86**	**13.6**

3.1.3.Effect of the interaction between sowing methods and weed control treatments on weeds

Data in Table (6) showed that the interaction between sowing methods and weed control treatments was significant on dry weight of annual weeds (g/m^2) in Afir broadcast on beds at 75 cm in the two seasons. Sowing methods Afir drill and broadcast on beds at 75 cm width with Ecopart + Topik and twice hand weeding gave the highest reduction of grassy, broad- leaved and total weeds compared with unweeded treatment in both seasons.

The average values in the two seasons for sowing method Afir drill on beds at 75 cm width with Ecopart + Topik and hand weeding twice were (36.3 and 12.2), (17.5 and 11.0) and (54.0 and

Table (6): Effect of the interaction between sowing methods and weed control treatments on dry weight of weeds g/m^2 of grassy, broad-leaved and total weeds of wheat in 010/2011 and 2011/2012 seasons.

Treatments		Seasons					
		2010/2011			2011/2012		
		Grassy weeds	Broad-leaved weeds	Total weeds	Grassy weeds	Broad-leaved weeds	Total weeds
1-Afir broadcast (AB)	1-Turnex	134.3	110.7	245.0	98.0	81.7	179.7
	2-Ecopart+Illoxan	108.7	83.7	192.4	91.3	71.0	162.3
	3-Ecopart+Topik	91.7	75.7	167.4	77.3	61.0	138.3
	4-Hand weeding twice	21.3	25.0	46.3	18.7	23.3	42.0
	5-Unweeded treat.	355.0	288.7	643.7	355.7	274.3	630.0
2-Afir broadcast on raised beds at 50 cm width (ABF)	1-Turnex	111.7	76.3	188.0	85.0	62.3	147.3
	2-Ecopart+Illoxan	86.3	68.7	155.0	73.3	55.7	129.0
	3-Ecopart+Topik	75.0	54.3	129.3	64.7	43.3	108.0
	4-Hand weeding twice	25.0	24.3	49.3	24.0	15.7	39.7
	5-Unweeded treat.	277.0	241.7	518.7	257.3	204.7	462.0
3- Afir broadcast on raised beds at 75 cm width	1-Turnex	85.0	55.9	140.9	75.0	52.0	127.0
	2-Ecopart+Illoxan	70.3	42.7	113.0	60.7	40.7	101.4
	3-Ecopart+Topik	54.7	28.3	83.0	44.3	24.3	68.6
	4-Hand weeding twice	31.0	18.7	49.7	30.7	20.7	51.4
	5-Unweeded treat.	220.7	155.0	375.7	200.7	158.0	358.7
4-Afir drill at 15 cm apart rows (AD)	1-Turnex	106.3	84.3	190.6	95.0	73.3	168.3
	2-Ecopart+Illoxan	91.7	75.0	166.7	81.7	61.3	143.0
	3-Ecopart+Topik	88.3	63.7	152.0	73.7	50.0	123.7
	4-Hand weeding twice	16.0	23.7	39.7	12.7	32.0	44.7
	5-Unweeded treat.	336.7	258.7	595.4	314.7	233.3	548.0
5-Afir drill on raised beds at 50 cm width (ADF)	1-Turnex	88.0	73.0	161.0	79.7	58.3	138.0
	2-Ecopart+Illoxan	74.3	56.0	130.3	65.7	44.0	109.7
	3-Ecopart+Topik	66.2	38.7	104.9	53.7	43.3	97.0
	4-Hand weeding twice	13.0	11.0	24.0	9.0	16.7	25.7
	5-Unweeded treat.	227.0	179.3	406.3	237.0	186.7	423.7
6- Afir drill on raised beds at 75 cm width	1-Turnex	76.3	47.0	123.3	66.70	34.0	100.7
	2-Ecopart+Illoxan	64.3	34.7	99.0	56.0	24.3	80.3
	3-Ecopart+Topik	42.0	17.7	59.7	30.7	17.3	48.0
	4-Hand weeding twice	9.3	13.0	22.3	15.0	9.0	24.0
	5-Unweeded treat.	178.0	131.3	309.3	159.0	134.7	293.7
LSD 0.05		32.4	36.6	22.0	23.1	37.6	264.6

18.3g) for two weed control treatments and (grassy, broad-leaved and total weeds), respectively, while the values of sowing method Afir broadcast on beds at 75 cm width were (49.5and 30.8), (26.3 and 19.7) and (76.2 and 51.0 g) for Ecopart + Topik and hand weeding, respectively. These results are in agreement with Umed *et al*. (2009) and Syed *et al*. (2009).

3.2. Effect of weed control treatments on

3.2.1. Dry weight of weeds (g/ m^2)

The results given in Table (2) showed that all weed control treatments reduced significantly the dry weight of grassy, broad-leaved and total weeds (g/m^2) in both seasons. Hand weeding twice (30, 45 days after sowing -DAS) and Ecopart at 250 cm^3/fed+ Topik at 140 g/fed gave the highest reduction of the dry weight in the two seasons and the two weed control treatments for grassy recorded (93.50, 92.85 % and 76.82, 74.87 %), broad- leaved recorded (95.93, 94.29 % and 76.58, 80.55 %) and total weeds recorded (89.21, 93.79 and 45.37 %, 78.31%) respectively, compared with unweeded treatments. The lowest effect obtained by Ecopart at 250 cm^3/fed +Illoxan at 1L/fed and Turonex at 1l/fed compared with unweeded treatment in both seasons. Ecopart + Illoxan and Turonex decreased the dry weight of grassy, broad- leaved and total weeds by (69.39, 71.47 and 65.23, 66.72%), (70.75,75.66 and 60.58,70.05%) and (42.87,73.24% and 36.90, 68.08%) in the first and second seasons compared with unweeded treatment, respectively. The treatment of Turneix at 1l/fed was the little efficiency in weed control the grassy, broad-leaved and total weeds in both seasons compared with other herbicides. Hand weeding and application of Ecopart at 250 cm^3/fed+Topik at 140 g/fed were a good measure for eradicating weeds during early growth period or during seedling. These results are in agreement with Walia *et al.* (1998), Brar *et al.* (1999), Bhullar and Walia (2004) and Rathod and Vadodaria (2004).

3.2.2. Yield and yield components

The obtained data indicated the effect of weed control treatments on growth yield and yield components of wheat. Tables (3, 4 and 5) clarify that in the first season, plant height, spike length, spike weight, the number of spikes/m^2, 1000-grains weight, straw yield (ton/fed), grain yield (ardeb/fed.) and grain protein were significantly affected by weed control treatments.

The greatest values of the above traits were obtained by hand weeding twice at 30,45 days after sowing, Ecopart+Topik and Ecopart+Illoxan. These treatments gave the highest values in grain yield (19.85, 19.05 and 18.05 ardeb/fed) in the first season and (20.75, 20.30 and 18.40 ardeb/fed.) in the second season compared with unweeded treatment for the three weed control treatments, respectively. In the same trends, the hand weeding twice and Ecopart + Topik had increased number of spikes/m^2 and 1000-grains weight (16.37 and 25.10 %) and (19.65 and 11.71%) in 2010/11 season and (31.91 and 36.20 %) and (12.22 and 10.07%) in 2011/12 season compared with unweeded treatment, respectively. The effectiveness of Ecopart + Topik and Ecopart+Illoxan might be attributed to the fact that hand weeding twice was most likely more efficient in the eradication and growth stunting of the weeds than the other herbicidal treatments. It is argued that Ecopart + Topik and Ecopart+Illoxan effectively reduced the weed population which led to better utilization of available resources during photosynthesis and resulted in the storage of the maximum amount of photosynthesis in grains, thus giving maximum 1000-grain weight. These results are in agreement with those by Fakkar (2005). Yasin *et al*. (2010) found that clodinafop (Topic-15 WG) at 37 g. a.i. ha^{-1} produced relatively less weed biomass, more plant height, number of spike bearing tillers, number of grains per spike, 1000-grain weight and grain yield (4.20 t ha^{-1}). The same was found by Khan *et al*. (2011) and Muhammad *et al*. (2011).

3.3.3. Effect of the interaction between sowing methods and weed control treatments on yield and yield components

The results in Tables (7 and 8) indicated that the interaction between sowing methods and weed control treatments was significant on plant height in both seasons and spike weight in the second season only. Interaction between sowing methods and weed control treatments was non significant on the number of spikes/m^2 and 1000- grain weight in both seasons. But, Afir drill and broadcast on beds at 75 cm width with (Ecopart + Topik) and hand weeding twice gave the highest average of the

Table (7): Effect of the interaction between sowing methods and weed control treatments on plant height (cm) and spike weight (g) in 2010/11 and 2011/12 seasons.

Treatments		Seasons 2010/2011 Plant height	2010/2011 Spike weight	2011/2012 Plant height	2011/2012 Spike weight
1-Afir broadcast (AB)	1-Turnex	109.7	3.23	108.3	3.00
	2-Ecopart+Illoxan	113.7	3.50	113.7	3.37
	3-Ecopart+Topik	114.7	3.30	114.3	3.07
	4-Hand weeding twice	112.3	3.23	110.0	3.33
	5-Unweeded treat.	115.3	2.80	114.7	2.60
2-Afir broadcast on raised beds at 50 cm width (ABF)	1-Turnex	117.3	3.00	117.3	3.23
	2-Ecopart+Illoxan	112.3	3.10	114.0	3.13
	3-Ecopart+Topik	113.0	3.07	113.0	3.37
	4-Hand weeding twice	112.3	2.60	108.7	2.83
	5-Unweeded treat.	113.0	2.10	110.0	2.53
3- Afir broadcast on raised beds at 75 cm width	1-Turnex	113.7	3.00	114.3	3.37
	2-Ecopart+Illoxan	114.3	2.70	113.0	3.20
	3-Ecopart+Topik	108.3	3.33	114.0	3.37
	4-Hand weeding twice	105.3	3.10	112.3	3.30
	5-Unweeded treat.	117.7	2.40	113.3	2.73
4-Afir drill at 15 cm apart rows (AD)	1-Turnex	119.0	3.10	115.7	3.00
	2-Ecopart+Illoxan	117.7	3.30	115.0	3.30
	3-Ecopart+Topik	120.3	3.40	119.3	3.37
	4-Hand weeding twice	116.7	3.03	116.3	3.23
	5-Unweeded treat.	109.3	2.63	116.0	2.50
5-Afir drill on raised beds at 50 cm width (ADF)	1-Turnex	117.0	3.23	116.3	3.13
	2-Ecopart+Illoxan	118.7	3.07	117.3	3.17
	3-Ecopart+Topik	119.7	3.40	121.0	3.63
	4-Hand weeding twice	121.7	3.13	111.0	3.13
	5-Unweeded treat.	119.7	2.30	114.3	2.10
6- Afir drill on raised beds at 75 cm width	1-Turnex	118.0	3.00	115.7	2.77
	2-Ecopart+Illoxan	116.0	3.17	119.0	3.47
	3-Ecopart+Topik	115.7	3.23	116.0	3.63
	4-Hand weeding twice	117.0	2.97	119.0	3.40
	5-Unweeded treat.	111.7	2.13	117.7	2.73
LSD 0.05		6.9	NS	7.1	0.53

number of spikes/m^2 (443. and 332.2) and (488.7 and 437.3), 1000-grain weight (52.4 and 53.6) and (47.7 and 50.5g) and grain yield (21.97 and 22.52) and (19.42 and 19.93 ardeb /fed.) in both seasons for the two sowing methods with two weed control treatments. These results are in agreement with those reported by El-Afandy (2006).

3.4. Residue analysis.

From Figs (1-7) and (Table 9), the High Performance Liquid Chromatography (HPLC) did not record signal to the three herbicides used (not detected).

These three herbicides (Isoproturon, Pyraflufen–ethyl and clodinafop-propargyl**)** degraded into the wheat plants and the (HPLC) could not read any values. However, (HPLC) recorded signal to one herbicide (diclofop- methyl) which was lower than the maximum residue Limits (MRL). These results are in agreement with those obtained by Ramesh and Beena (2008), Singh *et al.* (2008). Mitwaly (2012) found that the residues of clodinafop-propargyl and isoproturon were not detected in the soil after 150 days from application at the recommended rates.

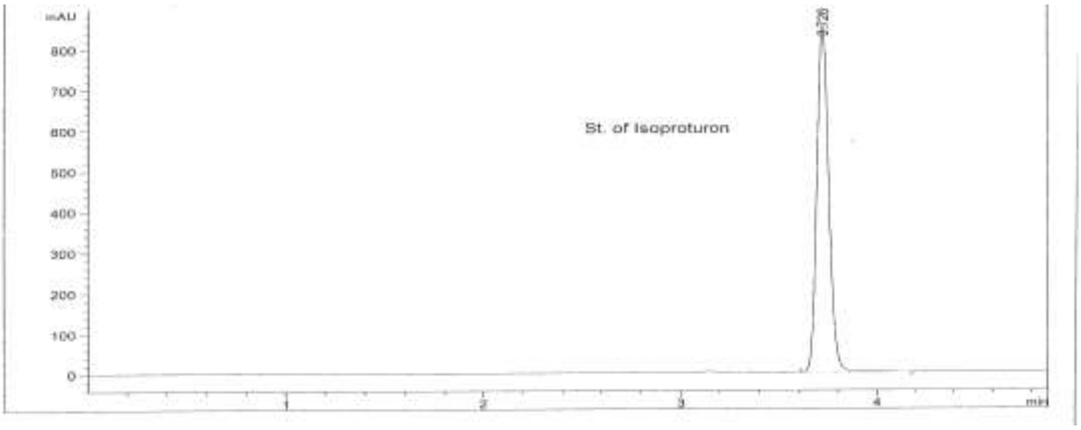
Table (8): Effect of the interaction between sowing methods and weed control treatments on No. of spikes /m^2 and 1000- grain weight (g) in 2010/11 and 2011/12 seasons.

Treatments		seasons			
		2010/2011		2011/2012	
		No. of spikes/ m^2		1000-grain weight	
1-Afir broadcast (AB)	1-Turnex	365.3	332.0	41.8	36.5
	2-Ecopart+Illoxan	499.3	381.3	39.3	38.9
	3-Ecopart+Topik	410.7	437.3	38.7	39.6
	4-Hand weeding twice	366.7	418.7	50.9	41.8
	5-Unweeded treat.	313.3	298.7	37.2	36.6
2-Afir broadcast in furrows at 50 cm width (ABF)	1-Turnex	430.7	360.0	40.2	41.3
	2-Ecopart+Illoxan	417.3	433.3	42.7	43.4
	3-Ecopart+Topik	422.7	438.7	47.2	45.7
	4-Hand weeding twice	377.3	421.3	46.4	45.5
	5-Unweeded treat.	370.7	321.3	39.0	40.0
3- Afir broadcast in furrows at 75 cm width	1-Turnex	474.7	380.0	45.8	45.2
	2-Ecopart+Illoxan	492.0	471.0	48.2	47.0
	3-Ecopart+Topik	493.3	484.0	47.3	48.1
	4-Hand weeding twice	440.0	434.7	41.5	49.4
	5-Unweeded treat.	388.0	374.7	45.2	40.6
4-Afir drill at 15 cm apart rows (AD)	1-Turnex	388.0	388.0	49.3	48.7
	2-Ecopart+Illoxan	422.7	421.3	49.4	50.5
	3-Ecopart+Topik	364.0	408.0	50.3	50.4
	4-Hand weeding twice	388.0	418.7	52.3	52.6
	5-Unweeded treat.	296.7	292.0	38.8	47.9
5-Afir drill in furrows at 50 cm width (ADF)	1-Turnex	480.0	445.3	47.2	51.7
	2-Ecopart+Illoxan	441.2	417.3	50.2	51.2
	3-Ecopart+Topik	437.3	412.0	52.3	52.5
	4-Hand weeding twice	381.3	442.7	53.3	52.3
	5-Unweeded treat.	336.0	325.3	48.4	48.3
6- Afir drill in furrows at 75 cm width	1-Turnex	480.0	452.3	50.0	51.9
	2-Ecopart+Illoxan	449.3	444.0	52.1	52.1
	3-Ecopart+Topik	434.7	452.0	51.9	52.8
	4-Hand weeding twice	430.7	413.3	54.0	53.2
	5-Unweeded treat.	344.0	320.3	49.5	49.2
LSD 0.05		NS	NS	NS	NS

Table (9): Residues for isoproturon, pyraflufen–ethyl, clodinafop-propargyl and diclofop-methyl in wheat grains.

Sample No.	Herbicides	Residual (ppm)	MRL(mg/kg)
Sample (1)	isoproturon	*Not detected (ND)	0.05
Sample (2)	pyraflufen– ethyl	Not detected (ND)	0.02
	clodinafop-propargyl	Not detected (ND)	0.05
Sample (3)	pyraflufen– ethyl	Not detected (ND)	0.02
	diclofop- methyl	0.09 ppm	0.10

- **Not detected: Below detection limit 0.01 ppm for isoproturon, 0.01 ppm for pyraflufen– ethyl and 0.02 ppm for clodinafop-propargyl.**



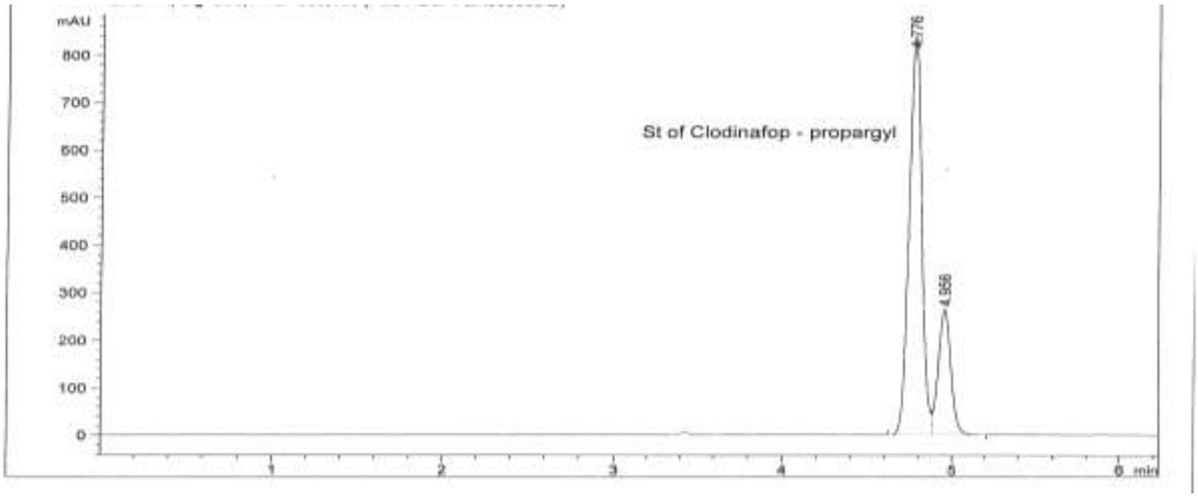


Fig. (2): Standard of clodinafop-propargyl.

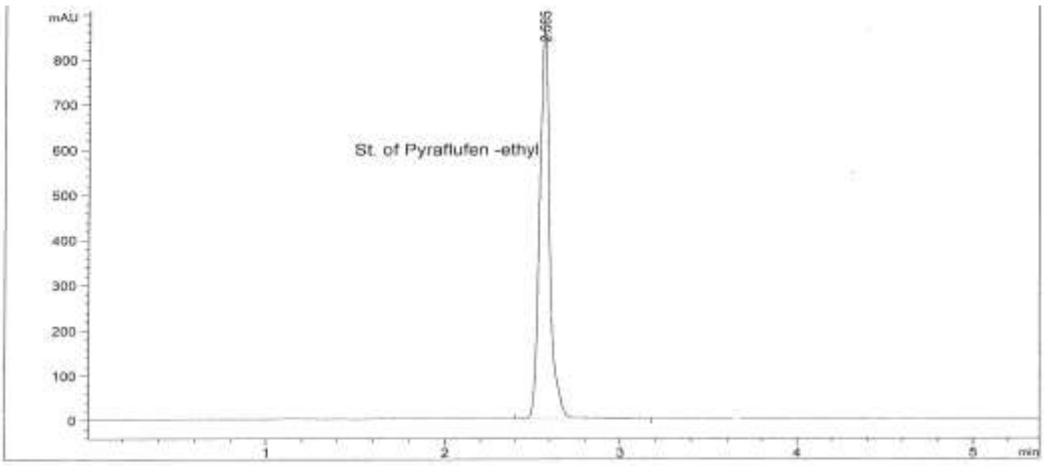


Fig. (3): Standard of pyraflufen-ethyl.

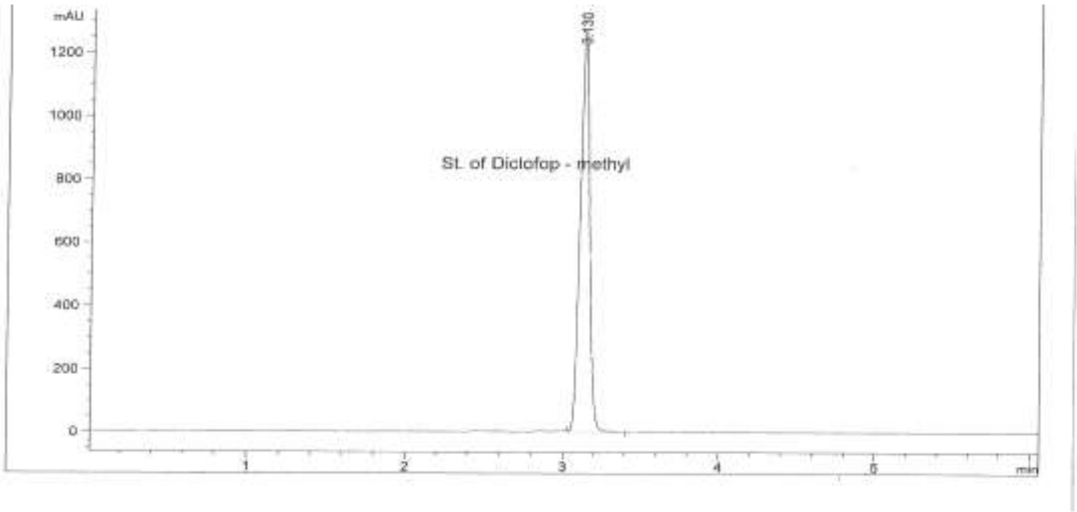


Fig. (4): Standard of diclofop-methyl.

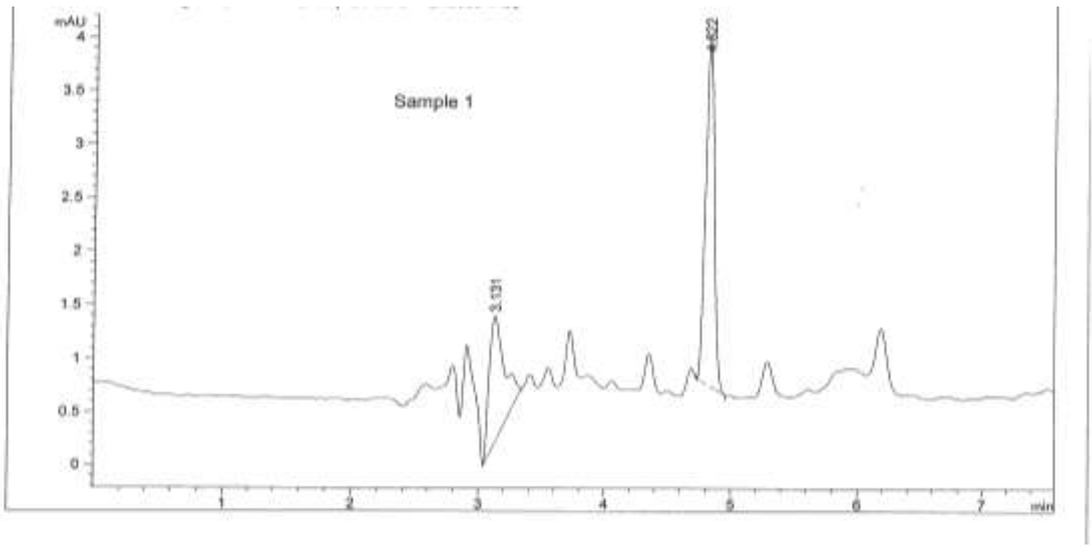


Fig. (5): Standard of isoproturon in wheat grains.

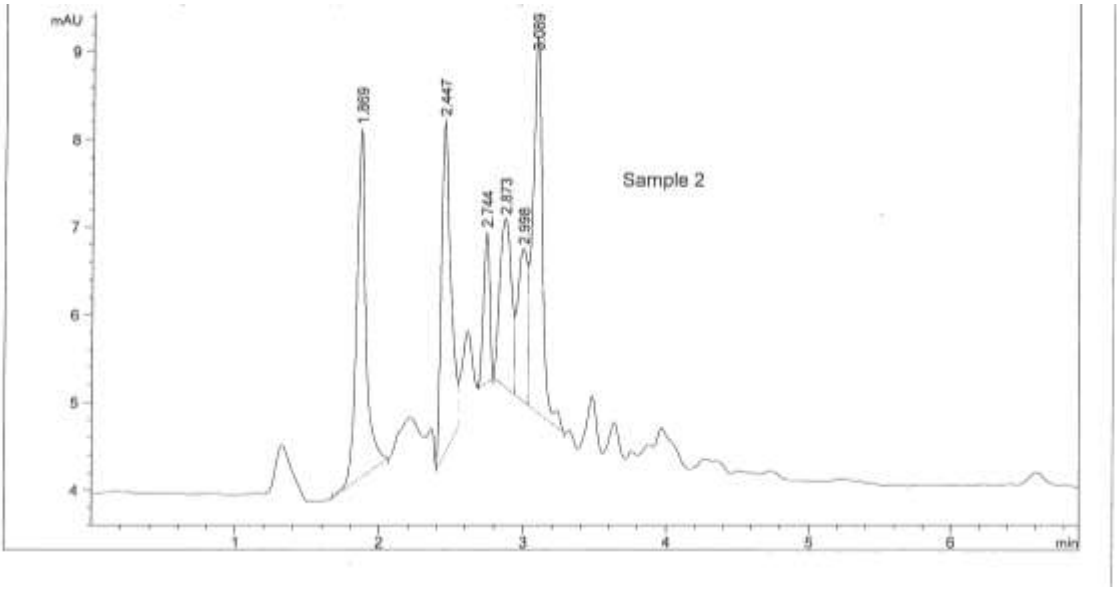


Fig. (6): Standard of clodinafop-propargyl + pyraflufen-ethyl in wheat grains.

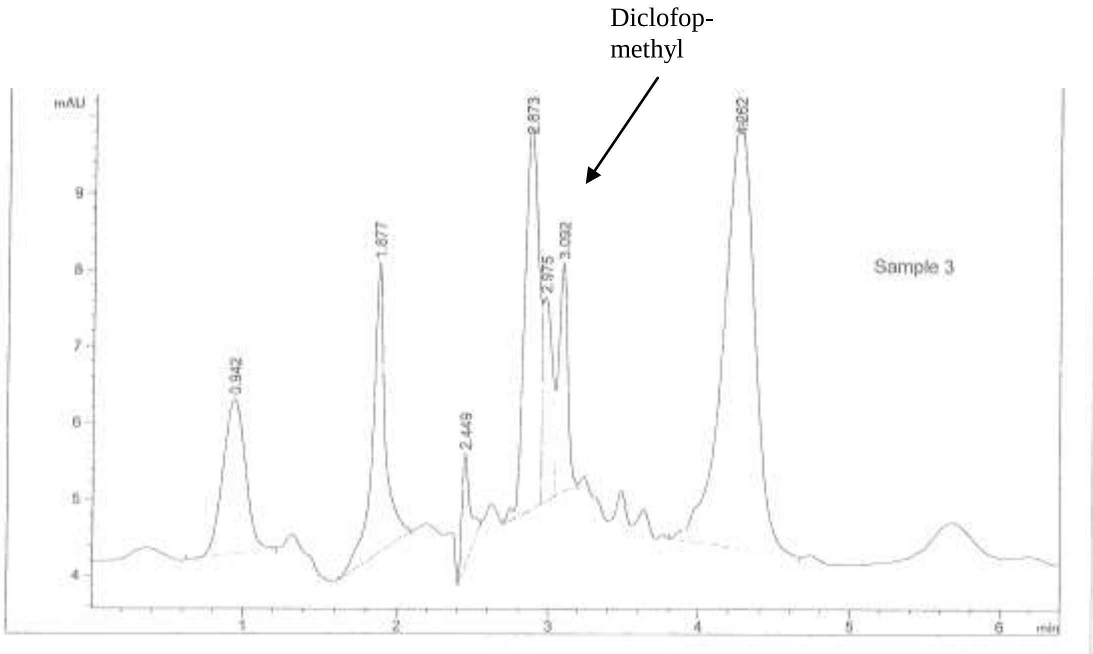


Fig. (7) Standard of Diclofop- methyl + pyraflufen-ethyl in wheat grains.

Table (10): Effect of the interaction between sowing methods and weed control treatments on economic analysis in 2010/2011 and 2011/2012 seasons.

Sowing methods	Weed control treatments	seasons							
		2010/2011	2011/2012	2010/2011	2010/2011	2011/2012	2011/2012	2010/2011	2011/2012
		Gross income L.E		Total cost L.E		Net income L.E		Profitability (%)	
1-Afir broadcast	1-Turnex	7039.83	8875.00	4060	4135	2979.83	4740.00	73.39	114.63
	2-Ecopart+Illoxan	7898.50	9625.00	4070	4165	3828.50	5460.00	94.07	131.09
	3-Ecopart+Topik	8263.83	9708.33	4090	4185	4173.83	5523.33	102.05	131.98
	4-Hand weeding twice	7636.67	9366.67	4130	4225	3506.67	5141.67	84.91	121.70
	5-Unweeded treatment	4913.17	6666.67	3930	3985	983.17	2681.67	25.02	67.29
Mean		**7150.40**	**8848.33**	**4056**	**4139**	**3094.40**	**4709.33**	**75.89**	**113.34**
2-Afir broadcast on raised beds at 50 cm width	1-Turnex	7579.83	9525.00	4160	4200	3419.83	5325.00	82.21	126.79
	2-Ecopart+Illoxan	8102.67	10183.33	4170	4230	3932.67	5953.33	94.31	140.74
	3-Ecopart+Topik	8318.50	10108.33	4190	4250	4128.50	5858.33	98.53	137.84
	4-Hand weeding twice	8005.50	10225.00	4230	4290	3775.50	5935.00	89.26	138.34
	5-Unweeded treatment	5360.33	6791.67	4030	4050	1330.33	2741.67	33.01	67.70
Mean		**7473.37**	**9366.67**	**4156**	**4204**	**3317.37**	**5162.67**	**79.46**	**122.28**
3-Afir broadcast on raised beds at 75 cm width	1-Turnex	7893.50	10025.00	4160	4200	3733.50	5825.00	89.75	138.69
	2-Ecopart+Illoxan	8678.17	10775.00	4170	4230	4508.17	6545.00	108.11	154.73
	3-Ecopart+Topik	9018.83	10925.00	4190	4250	4828.83	6675.00	115.25	157.06
	4-Hand weeding twice	8769.67	10766.67	4230	4290	4539.67	6476.67	107.32	150.97
	5-Unweeded treatment	5413.33	7341.67	4030	4050	1383.33	3291.67	34.33	81.28
Mean		**7954.70**	**9966.67**	**4156**	**4204**	**3798.70**	**5762.67**	**90.95**	**136.54**

Table (10): cont.

Sowing methods	Weed control treatments	seasons							
		2010/2011	2011/2012	2010/2011	2010/2011	2011/2012	2011/2012	2010/2011	2011/2012
		Gross income L.E		Total cost L.E		Net income L.E		Profitability (%)	
4-Afir drill at 15 cm apart rows	1-Turnex	8379.67	10533.33	4095	4150	4284.67	6383.33	104.63	153.82
	2-Ecopart+Illoxan	8751.83	11141.67	4105	4180	4646.83	6961.67	113.20	166.55
	3-Ecopart+Topik	9078.83	11708.33	4125	4200	4953.83	7508.33	120.09	178.77
	4-Hand weeding twice	8795.33	11133.33	4165	4240	4630.33	6893.33	111.17	162.58
	5-Unweeded treatment	5040.83	7091.67	3965	4000	1075.83	3091.67	27.13	77.29
Mean		**8009.30**	**10321.67**	**4091**	**4154**	**3918.30**	**6167.67**	**95.25**	**147.80**
5-Afir drill on raised beds at 50 cm width	1-Turnex	9281.83	10908.33	4195	4300	5086.83	6608.33	121.26	153.68
	2-Ecopart+Illoxan	9119.33	11516.67	4205	4330	4914.33	7186.67	116.87	165.97
	3-Ecopart+Topik	9450.33	11808.33	4225	4350	5225.33	7458.33	123.68	171.46
	4-Hand weeding twice	8988.50	11200.00	4265	4390	4723.50	6810.00	110.75	155.13
	5-Unweeded treatment	5571.50	7341.67	4065	4150	1506.50	3191.67	37.06	76.91
Mean		**8482.30**	**10555.00**	**4191**	**4304**	**4291.30**	**6251.00**	**101.92**	**144.63**
6-Afir drill on raised beds at 75 cm width	1-Turnex	8853.83	11058.33	4195	4300	4658.83	6758.33	111.06	157.17
	2-Ecopart+Illoxan	9481.83	12075.00	4205	4330	5276.83	7745.00	125.49	178.87
	3-Ecopart+Topik	9648.17	12241.67	4225	4350	5423.17	7891.67	128.36	181.42
	4-Hand weeding twice	9123.00	11541.67	4265	4390	4858.00	7151.67	113.90	162.91
	5-Unweeded treatment	5643.67	8075.00	4065	4150	1578.67	3925.00	38.84	94.58
Mean		**8550.10**	**10998.33**	**4191**	**4304**	**4359.10**	**6694.33**	**103.53**	**154.99**

3.5. Economic analysis

Table (10) shows the total cost, calculated as a fixed cost (land preparation, sowing, post sowing activities, fertilization, irrigation, insect control, harvesting and rental per feddan) and random cost for one hand hoeing, two hand hoeings, one hand hoeing + one hand weeding, two hand weeding and using of herbicides, respectively. The range of the total cost for all treatments (3930 - 4265) in 2010/11 and (3985- 4390) in 2011/12. The price of grain yield (ardeb./fed.) was 385 and 500 L.E and straw yield was 185 and 250 L.E in the first and the second seasons, respectively. The average of gross income for feddan of wheat yield ranged from 4913.17 L.E/fed. (Unweeded treatment (AB)) to 9648.17 (Iuqopart+Topik and Afir drill in raised beds at 75 cm width) in the first seasons, 6666.67 L.E./fed (Unweeded treatment (AB)) to 12241.67 L.E./fed (Iuqopart+Topik and Afir drill on beds at 75 cm width) with interaction between Afir drills and untreated and at BFI and BSI as lower and higher values in second seasons. The net incomes of wheat yield/fed reached about 5423.17 L.E. /fed with (Iuqopart+Topik & Afir drill on raised beds at 75 cm width). While, the lowest values with Unweded treatment (AB) were about (983.17 L.E. /fed.), in the first season (7891.67 L.E. /fed.) with (Iuqopart+Topik & Afir drill on raised beds at 75 cm width) in the second season. While, the lowest values with Unwedded treatment (AB) were about 2681.67 L.E. /fed..

The benefit/cost ratios for wheat yield/fed reached about 128.36 % /fed with (Iuqopart+Topik & Afir drill on raised beds at 75 cm width). While, the lowest values with Unweded treatment (AB) were about (25.02%/fed.), in the first season and in the second 181.42%/fed. with (Iuqopart+Topik and Afir drill in raised beds at 75 cm width). While, the lowest values with Unweded treatment (AB) were about 67.29% /fed.. These results are in agreement with obtained by Fakkar and Amin (2012). Tthey found that the economic evaluation of sowing method Afir hills on raised beds with hand hoeing twice increased gross income, net income and profitability.

4. REFERENCES

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تعظيم إنتاجيه محصول القمح عن طريق تحسين بعض طرق الزراعة ومعاملات الحشائش

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ملخص

أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بشندويل محافظة سوهاج خلال موسمي الزراعة 2011/2010 و 2012/2011 لدراسة تأثير ستة طرق زراعة (عفير بدار وعفير بدار علي مصاطب بعرض 50 سم وعفير بدار علي مصاطب بعرض 75 سم وعفير تسطير على مسافة 15 سم بين السطور ، عفير تسطير علي مصاطب بعرض 50 سم وعفير تسطير علي مصاطب بعرض 75 سم) وخمس معاملات لمقاومة حشائش هى (تيورنيكس بمعدل 1.5 لتر /فدان بعد شهر من الزراعة و ايكوبارت بمعدل 250 سم3/فدان بعد شهر من الزراعة +ايلوكسان بمعدل 1لتر/فدان بعد شهر من الزراعة و ايكوبارت +توبيك بمعدل 140 جم/فدان بعد شهر من الزراعة ونقاوة يدوية مرتين و بدون معاملة (كنترول) على نمو الحشائش وصفات النمو و المحصول و مكوناته في صنف القمح جيزة 168. أستخدم تصميم القطع المنشقة مرة واحدة.

أظهرت النتائج أن طريقه الزراعة عفير تسطير وعفير بدارعلي مصاطب بعرض 75 سم كانت أفضل الطرق في مكافحه الحشائش حيث أعطت اقل وزن جاف للحشائش الحولية الضيقة والعريضة والوزن الكلي للحشائش في الموسمين علي التوالي. كما أعطت كل من طرق الزراعة عفير تسطير وعفير بدار علي مصاطب بعرض 75 سم اعلي المتوسطات لكل من ارتفاع النبات و طول السنبلة ووزن السنبلة وعدد السنابل /م 2 ووزن الـ 1000 حبه ونسبه البروتين ومحصول الحبوب(إردب/فدان) والقش (طن/فدان) في الموسمين.

أنقصت معاملات مكافحه الحشائش معنويا الوزن الجاف للحشائش ضيقه وعريضة الأوراق والحشائش الكلية في الموسمين مقارنه بالكنترول. قلل استخدام مبيد الحشائش ايكوبارت+ مبيد توبيك والنقاوة اليدوية مرتين الوزن الجاف للحشائش ضيقه وعريضة الأوراق والحشائش الكلية كما أعطيا زيادة في طول النباتات وطول ووزن السنبلة وعدد السنابل/م 2 ووزن الـ 1000 حبه ونسبه البروتين ومحصول الحبوب(اردب/فدن) والقش (طن/فدان) مقارنه بالكنترول في الموسمين.

أثر التفاعل بين كل من طرق الزراعة ومعاملات مقاومة الحشائش معنويا على الوزن الجاف لكل أنواع الحشائش وكذلك طول النبات في الموسمين ووزن السنبلة فى الموسم الثاني. أعطت طريقه الزراعة عفير تسطير وعفيربدار على مصاطب بعرض 75 سم مع مبيد ايكوبارت +توبيك و النقاوة اليدوية مرتين اعلي المتوسطات في عدد السنابل/م 2(443.3 و332.2) و(488.7 و 437.3) ووزن ال100حبه (52.4 و 53.6 جم) و (47.7 و50.5 جم) ومحصول الحبوب (21.97 و 22.52 إردب/فدان) و (19.42 و 19.93 إردب/فدان) لكل من طريقتي الزراعة ومعاملات مقاومة الحشائش فى الموسمين على التوالى .

تبين من تحليل متبقيات المبيدات تحت الدراسة فى الحبوب أن الثلاثة مبيدات وهى (تيورنكس وايكوبارت وتوبيك) لم يكن لها أثر متبقى فى الحبوب بينما وجد أثر متبقى لمبيد ايلوكسان بمقدار (ppm0.09) وهى تحت الحد المسموح به فى الحبوب.

اظهر التحليل الاقتصادي أن نسبة الربح/التكاليف لمحصول الحبوب كانت حوالي 128.36 و 181.42٪ /فدان باستخدام مبيد ايكوبارت + مبيد توبيك مع طريقه الزراعة عفير تسطير علي مصاطب بعرض 75 سم في الموسم الأول والثاني علي التوالي. بينما أعطت معامله المقارنة مع طريقه الزراعة العادية عفير تسطير اقل المتوسطات وذلك بحوالي 25.02 و 67.29 ٪ /فدان في الموسم الأول والثاني علي التوالي. أعطت طريقه الزراعة عفيرتسطير علي مصاطب بعرض 75 و50 سم واستخدام مبيد ايكوبارات + توبيك اعلي زيادة في إجمالي الدخل والعائد الصافي وهامش الربح /التكلفة والربحية الاقتصادية في الموسمين.

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