# EFFECT OF PRECEDING CROPS, TILLAGE SYSTEMS AND WEED CONTROL METHODS ON YIELD AND YIELD COMPONENTS OF WHEAT

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## ABSTRACT

Field experiments were carried out at Giza Experimental Research Station, in 2010/2011 and 2011/2012 seasons, to investigate the effect of preceding crop and wheat tillage system under some weed control methods on wheat yield and its components. Strip plot design with three replications was used The main plots were allocated to three preceding crops (sesame, maize and cowpea), while sub -plots were occupied with the following tillage systems, tillage and no-tillage weed control methods included, hand weeding twice at 30 and 45 days after sowing (DAS) and application of herbicides (sinal + puma super) were devoted to the sub–sub plots, on growth, yield and yield components and protein yield of wheat cultivar Sids 12. Data revealed that the highest values of yield and yield attributes was obtained when wheat was sown after cowpea followed by maize, whereas the lowest productivity indicators were recorded when sown after sesame. The results indicated that all characters were significantly affected by preceding crop in both seasons, except spike length, number of spikelts/spike and weight of 1000 grains in the first season and number of spikelts/spike in the second season. The effect of two tillage systems on growth, yield and its components of wheat were observed in both seasons and revealed that the tillage systems had significant effects on most characters studied of wheat in both seasons. Results showed generally that, the chemical weed control for broad leaved or grassy weeds was more efficient than hand weeding control. The lowest values of dry weeds were recorded from sinal combined with puma super followed by hand weeding treatment, while the highest values for these character were obtained with unwedded methods. The interaction between preceding crops, tillage systems and weed control methods significantly affected number of spikes/$m^2$ ,weight of grains/spike ,grain yield/fed and dry weight of weeds g/$m^2$ in both seasons.

**Keywords**: *Triticum aestivum* L., yield and its components, preceding crops, tillage system, weed control treatments.

## INTRODUCTION

Wheat (*Triticum aestivum*, L.) is the one of the most important cereal crops in Egypt and the world. In Egypt, there is a large gap between wheat production and the total human consumption. Therefore, efforts are made to minimize gap between consumption and product by increasing grain yield /area and extending cultivated wheat area. Tillage systems influence physical, chemical, and biological properties of soil and have a major impact on soil productivity and sustainability. Conventional tillage practices may adversely affect long-term soil productivity due to erosion and loss of organic matter in soils .Sustainable soil management can be practiced through conservation tillage (including no-tillage), high crop residue return, and crop rotation. Weeds are considered a major problem in wheat field that cause great losses in grain yield because weed compete directly with plant for light moisture, carbon dioxide and soil nutrients.

Therefore weed control is one of the essential cultural practices for raising the yield and quality of wheat plants. Many investigators indicated that preceding crops showed great effect on wheat yield and its components. **Mohamed. (1994)** and **Badr.(1999)** showed that growing wheat after legume crops or cotton increased grains weight/spike, number of grains/spike, 1000-grain weight, grain yield, straw yield, grain protein content and protein yield than that after maize or sorghum. **Dahy. (2005)** noticed that preceding crops (sesame, peanut and sunflower) had significant effects on plant height, number of grains/spike, weight of grains/spike, 1000-grain weight, grain yield and straw yield/fed of wheat. **Abd EL-Zaher *et al*. (2009)** indicated that yield, yield components and protein yield of wheat recorded the highest values when wheat was sown after soybean followed by cotton and recorded the lowest values when sown after maize .Tillage is described as the practice of modifying the state of the soil in order to provide favorable conditions to crop growth .Several experiments have been conducted at different parts of the world during the last decade to compare the effect of tillage and no-tillage systems, **Abd El-All *et al.* (1996)** concluded that all estimated characters of wheat were greater with performing tillage compared with no-tillage. Also, **Haikel (2001)** reported that the highest grain yield of wheat was obtained from different tillage systems compared with no-tillage, and **Ibrahim *et al* .(2004)** found that all estimated characters of wheat were greater with performing tillage compared with no-tillage. **Mekky *et al.* (2007)** indicated that tillage systems required energy for tillage irrespective from the interference from other studied factors which include mouldboard or chisel with rotary plowing caused reduction of total weeds by 26 % and 29 % and improvgrain yield by 4% and 3.4% for farmer treatment in the same respective .Weeds are among the limiting factors on wheat production, causing a grain yield reduction. Weed control in such crop become a problem especially under heavy weed infestation. The reduction in wheat grain yield by weeds is between 44- 60%, **(Elain** and **El-Meshad, 1994** and **El-Maghraby *et al*., 1995), Abu-Hamdeh and Al widyan (2000), Al- Hashem *et al*., 2001** and **Shaban *et al*., 2009)** found that, the average reduction in wheat yield due to the competition broad leaved weeds was 23.4% whereas, the average reduction in wheat yield due to grassy weeds was 38.5% and **Hala, Kandil and Ibrahim, (2011)** stated that the highest values of all herbicides on growth, yield and chemical composition were attained when applying sinal 10 Sc herbicide and was the best for controlling broad- leaved weeds, Therefore, the present work was to study how to maximize the productivity of wheat by using some summer preceding crops and examine different tillage systems and the optimal weed management.

## MATERIALS AND METHODS

A field experiment was carried out at Giza Agricultural Research Station farm, El-Giza Governorate during 2010/2011 and 2011/2012 growing seasons to study the effect of preceding crop and wheat tillage system under weed control method on wheat cultivar Sids 12 yield and its components. Strip plot design with three replications was used as follows: The main plots were allocated to three preceding crops sesame (Shandweel 3), maize (variety T.W.C 310) and cowpea (variety Cream), while sub-plots were occupied with the two tillage systems (tillage and no-tillage), weed control treatments (control no weeding ) hand weeding twice at 30 and 45 days after sowing (DAS) and herbicides (sinal + puma super) were devoted to the sub–sub plots. Nitrogen fertilizer was given in the form of ammonium nitrate (33.5 % N) at the rate of 70 kg N/fed and added in two equal doses, before the first and the second irrigation. Phosphorus fertilizer was applied at the rate of 30 kg

$P_2O_5$/fed as calcium super phosphate (15.5% $P_2O_5$) during grain bed preparation. Potassium fertilizer was applied at the rate of 48 kg $k_2o$/fed. in the form of potassium sulphate (48% $k_2O$) in two equal portions. Seeds of wheat was sown on November 15th and 20 th in both seasons respectively. The first half was added at planting and the second one after 21 days from sowing on 22th and 25th November. in the two season, respectively. Seeds were drilled on dry soil at the rate of 50 kg/fed in 2010/2011 and 2011/2012 season. Harvesting date was May 21th and 26th in first and second seasons, respectively.

The soil texture of the experimental area was clay loam. Physical and Chemical analysis of the soil before preceding crop is recorded in Tables 1,a and 1,b

**Table (1-A):** Physical properties of the soil.

| **Physical analysis** | **2010 / 2011** | **2011 /2012** |
|---|---|---|
| **Coarse sand %** | 1.37 | 1.40 |
| **Fine sand %** | 31.15 | 31.80 |
| **Silt %** | 26.60 | 26.77 |
| **Clay %** | 40.88 | 39.90 |
| **Soil texture** | Clay loam | Clay loam |

**Table (1-B)**: Chemical analysis of the soil before and after preceding crops under study in bot seasons

| | After preceding crops | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cowpea | | Maize | | Sesame | | Before preceding | |
| | 2010/2011 | 2010/2011 | 2010/2011 | 2010/2011 | 2010/2011 | 2010/2011 | 2010/2011 | 2010/2011 |
| N ppm | 1.42 | 1.55 | 1.12 | 1.17 | 1.15 | 1.26 | 2.84 | 2.75 |
| P ppm | 1.75 | 1.83 | 3.22 | 3.30 | 3.70 | 3.93 | 3.46 | 3.40 |
| K ppm | 139.19 | 1 139.25 | 1 136.35 | 136.17 | 129.60 | 129.25 | 135.90 | 135.78 |

*Available N, P and K were determined according to **Black (1965).**

## Data recorded:-

### *A-Wheat*

At harvest, plant samples were taken at random from each sub-plot to determine the following characters of wheat

1- Number of spikes/$m^2$: counted randomly in one square meter in each plot.
2- Plant height (cm) :the average height of ten randomly chosen plants from each plot and measured from ground level to the spikes tip,.
3- Spike length(cm) 4-Number of spikelets/ spike.
5- Number of grains / spike.
6- Grains weight / spike (g) : it was estimated from 10 plant randomly chosen main spikes from each plot.
7- 1000-grain weight (g): average weight of 1000-grain randomly taken from each plot.
8- Grain yield (ardab/ fed): was determined on whole plot basis converted to aradab (ardab = 150 kg ) .
9- Straw yield (ton / fed): it was calculated by subtracting grain yield from the total yield for each plot and converted to ton / fed
10- Protein yield (kg/fed) was calculated by multiplying (grain yield/ fed x protein %).

B- ***Weeds.***

It was carried out at DAS (days after sowing). Weeds were hand pulled from one square meter of each plot and were identified and classified into broad and

grassy annual weeds according to **Tackholm (1964).** They were air dried for 3 days and then dried in an oven at 70% $C^0$ until completely dried.
The following weed control methods were applied:

**A-Unwedded** *(control)*

**B-Hand** weeding twice at 30 and 45 days after sowing (DAS).

**c**-Sinal *(Metosulam),N-(2,6-dichloro-3–methylphenl). 3-5-7, dimethoxhonamide* 10 % SC at the rate of 40 cm / fed (4 gm a.i) applied after 21 days from sowing (post- emergence ) followed by Puma super (fenoxaprop), (+--)-2-(4-(6-chloro---2-benzoxazolyl) phenoxy) propanoic acid 7.5% EW at the rate of 0.5 cm/fed applied after 45 days from sowing. *(Post- emergence)*

as a chemical control methods .The following traits were recorded at weight of total annual weeds g/$m^2$ .

***Statistical analysis.***

The data were statistically analyzed according to **Sendecor and cocharn .(1980)** and treatment means were compared by the least significant differences (LSD) at 5% level of probability.

## RESULTS AND DISCUSSIONS

***Effect of preceding crop:-***

Date presented in Table (2) indicated that all characters were significantly affected by preceding crop in both seasons, except spike length, number of spikelet's/spike and weight of 1000 grains in the first season and number of spikelet's/spike in the second season. Results indicated that when wheat plants grown after cowpea, gave the highest values followed by those after maize, while the lowest values were after sesame. This was true for plant height, spike length, number of spike/$m^2$, number of spikelet's/spike, number of grains/spike, spike grain weight, 1000 grains weight and dry weight of weeds g/$m^2$ in both seasons.

On the other hands, the superiority of plant height and wheat grain yield /fed which preceded by cowpea may be attributed to the favorable effect of nitrogen in the metabolic processes and physiological activities of epistemic tissue, which responsible for cell division and elongation in addition to formation of plant organs.

**Table (2):** Effect of proceeding crop on growth, yield and yield components of wheat during 2010/2011 and 2011/2012 seasons.

| Characters | No of spikes /$m^2$ | Plant height (cm) | Spike length (cm) | No of Spikelets/ Spike | No of gains/ spike | Spike grain weight (g) | Weight of 1000 grains (g) | Grain yield/ fed (arad.) | Straw yield /fed (ton) | Protein yield kg/fed | Dry weight of weeds (g/$m^2$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Preceding crops** | **2010 / 2011 season** | | | | | | | | | | |
| **Sesame** | 344.29 | 94.29 | 11.47 | 18.42 | 47.43 | 2.43 | 43.82 | 19.91 | 4.38 | 248.25 | 549.84 |
| **Maize** | 349.42 | 94.93 | 11.56 | 18.18 | 47.57 | 2.39 | 44.05 | 20.07 | 4.48 | 254.41 | 525.79 |
| **Cowpea** | 364.84 | 95.14 | 11.38 | 18.32 | 47.71 | 2.55 | 44.44 | 20.32 | 4.57 | 262.02 | 494.60 |
| **L.S.D 5%** | 2.90 | 0.45 | NS | NS | 0.19 | 0.15 | NS | 0.13 | 0.13 | 3.14 | 7.22 |
| **Preceding crops** | **2011 / 2012 season** | | | | | | | | | | |
| **Sesame** | 354.65 | 94.16 | 11.59 | 18.54 | 47.55 | 2.51 | 43.94 | 20.16 | 4.41 | 249.41 | 533.18 |
| **Maize** | 361.16 | 94.85 | 11.72 | 18.30 | 47.72 | 2.44 | 44.15 | 20.31 | 4.51 | 255.84 | 502.06 |
| **Cowpea** | 373.12 | 94.94 | 11.97 | 18.41 | 47.92 | 2.63 | 44.56 | 20.56 | 4.60 | 263.29 | 464.15 |
| **L.S.D 5%** | 2.70 | 0.24 | 0.18 | NS | 0.25 | 0.15 | 0.60 | 0.17 | 0.10 | 2.15 | 6.60 |

Moreover, residues of cowpea may increase organic matter of the soil and improve the physical, chemical and biological characters of the soil, which could increase wheat yield and its attributes. Similar findings were obtained by **Mohamed. (1994).** Grain yield/fed had the same trend of the previous characters in both seasons as shown in Table (2). The increase in wheat yield and straw yield/fed grown after cowpea was estimated to to 2.06 % and 4.34 % in the first season and 1.98 % and 4. 31% in second seasons, respectively as compared those grown after sesame. These increasing may be due to effect of cowpea residues as a legume crop which increase levels of soil nitrogen, and improve growth of wheat plants and may be also attributed to their effect nitrogen fixation. These findings are in harmony with those of obtained by **Dahy. (2005)**

Data presented in Table (2) indicated that protein yield/fed was related to grain yield/fed of wheat as influenced by the preceding crops. Significant effect of the preceding crop was detected with regard to grain protein yield/fed (kg) in both seasons. Growing wheat after cowpea produced the highest grain protein yield/fed and was estimated to 5.55% and 5.58 % followed by that preceded by maize which was 2.48% and 2.43%, while the lowest value was achieved by sesame in both seasons, respectively. The superiority effect of cowpea crop as a preceding crop for protein yield/fed in grain wheat may be attributed to high residue of nitrogen into the soil. This result are in agreement with those reported by **Badr. (1999).**

***2- Effect of tillage systems***

The results in Table (3) revealed that tillage systems had significant effects on plant height, number of spikes /$m^2$, number of spikelets/spike, 1000 grain weight, protein yield/fed, grain yield/fed and dry weight of weeds g/$m^2$ in both seasons, while the effect on spike length, number of grains /spike, weight of grain/spike and straw yield/fed was insignificant in both seasons. The highest grain yield was recorded after tillage and was estimated (20.23 and 20. 46 ardab/fed) in the first and second seasons respectively. On the other hand the reverse trend was true for wheat plants when grown without tillage (19.96 and 20.23 ardab/fed) in both seasons, respectively. The data revealed that, the highest values for the plant height, number of spikes/ $m^2$ number of spikelets/ spike ,number of grains/ spike, 1000- grain weight, straw yield /fed and dry weight of weeds were a achieved when wheat plants were grown with tillage system, while, the lowest values for some respective characters were obtained when wheat plants were no tillage system.

**Table (3): Effect of tillage systems on growth, yield and yield components of wheat during 2010/2011 and 2011 / 2012 seasons**

| characters | No of spikes/ $m^2$ | Plant height (cm) | Spike length (cm) | No of spikelets/ spike | No of gains/ spike | Spike grain weight (g) | Weightof 1000 grains (g) | Grain yield /fed (ardab) | Straw yield /fed (ton) | Protein yield kg/fed | Dry weight of weeds g/$m^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010/2011 season** | | | | | | | | | | | |
| Control | 340.41 | 92.19 | 11.13 | 18.02 | 46.73 | 2.32 | 43.42 | 18.49 | 4.32 | 241.36 | 871.17 |
| Herbicide | 363.90 | 96.62 | 11.79 | 18.40 | 48.07 | 2.58 | 44.58 | 20.65 | 4.57 | 261.16 | 394.14 |
| Hand weeding | 354.35 | 95.54 | 11.95 | 18.50 | 47.91 | 2.47 | 44.31 | 21.16 | 4.54 | 262.16 | 304.92 |
| L.S.D at 5 % | 2.58 | 3.24 | 0.75 | 0.40 | 1.15 | 0.13 | 0.91 | 0.64 | 0.20 | 2.96 | 5.84 |
| **2011/2012 season** | | | | | | | | | | | |
| Control | 348.75 | 92.09 | 11.24 | 18.17 | 46.88 | 2.37 | 43.53 | 18.71 | 4.35 | 242.88 | 842.50 |
| Herbicide | 376.03 | 96.40 | 11.92 | 18.50 | 48.26 | 2.68 | 44.71 | 20.84 | 4.60 | 262.03 | 368.59 |
| Hand weeding | 364.14 | 95.46 | 12.13 | 18.58 | 48.06 | 2.53 | 44.41 | 21.49 | 4.57 | 262.64 | 288.30 |
| L.S.D at 5 % | 3.36 | 3.15 | 0.90 | 0.15 | 1.11 | 0.15 | 1.15 | 0.75 | 0.18 | 4.45 | 6.40 |

These results may be attributed to soil changes in the physical properties by tillage operations. It has been found that soil tillage has major influence on water intake, storage and evaporation from the soil by plant roots and microbial activity which influences soil aeration, moisture and temperature. These factors in turns contribute to the quantity and the quality of the crop grown. The soil without tillage was more compacted which reflected an sail aeration and the lowest uptake of nutrients. Similar trends were observed by **Abu-Hamdeh and Al-Hashem *et al*. (2001)** and **Mekky *et al*. (2007)** who reported that all tillage treatments increased grain yield and its components.

*3- **Effect of weed control treatments:-***

Weed assessment show that, predominated weed species in the experimental site in the first season and second season were *chenopodium album*, a*mmi majus*, *Medicago polymorpha*, *Sonchus oleraceus* and *Malva* spp, as annual borad –leaved weeds, and *Avena* spp and *Setaira glauca* as annual grassy weeds.

Data in Table (4) show that, in general, the chemical weed control by mixture sinal + puma super was more efficient than hand weeding control. The chemical weed control and hand weeding reduced dry weight of weeds by 65.0% and 54.76 % of total annual weeds in the first season and the chemical weed control and hand weeding was 56.45 % and 65.73 % in second season, respectively compared the control.

**Table (4):** Effect of weed control methods on yield and yield components of wheat during 2010/2011 and 2011/2012 seasons

| characters | No of spikes/ $m^2$ | Plant height (cm) | Spike length (cm) | No of Spikelets/spike | No of gains/ spike | Spike grain weight (g) | Weight of 1000 grains (g) | Grain yield /fed (ardab) | Straw yield /fed (ton) | Protein yield kg/fed | Dry weight of weeds ($g/m^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tillage systems** | 2010 / 2011 season | | | | | | | | | | |
| **no-tillage** | 350.49 | 94.53 | 11.63 | 18.22 | 47.54 | 2.46 | 44.00 | 19.96 | 4.45 | 254.25 | 555.12 |
| **tillage** | 355.28 | 95.05 | 11.61 | 18.39 | 47.60 | 2.45 | 44.21 | 20.23 | 4.50 | 255.54 | 491.69 |
| **L.S.D 5%** | 3.75 | 0.46 | NS | 0.14 | NS | NS | 0.13 | 0.19 | NS | 1.16 | 6.85 |
| | 2011 / 2012 season | | | | | | | | | | |
| **no-tillage** | 359.78 | 94.40 | 11.77 | 18.32 | 47.71 | 2.50 | 44.10 | 20.23 | 4.49 | 255.16 | 517.82 |
| **tillage** | 366.17 | 94.90 | 11.74 | 18.51 | 47.75 | 2.53 | 44.33 | 20.46 | 4.52 | 256.54 | 481.77 |
| **L.S.D 5%** | 4.22 | 0.37 | NS | 0.18 | NS | NS | 0.15 | 0.11 | NS | 0.90 | 6.16 |

The superiority of chemical control might be due to the selective herbicidal efficiency for both sinal and puma super for controlling annual weeds, which decreased weed competition with wheat plants and consequently improved building metabolites, which inturn improved grain yield. These results are in harmony with those obtained by **Malik *et al*. (2005)** .

Table (4) shows that weight of weeds $g/m^2$ (broad leaved and grassy weeds) included *Avena* spp. and *Ammi majus* by using chemical control gave the lowest values comparing with using hand weeding in the first season, however in the second season the reverse was observed. Chemical and mechanical weed control methods had a significant effect on number of spikes/$m^2$, plant height, spike length, number of spiklets/ spike, number of grains / spike, spike grain weight, 1000- grain weight, straw yield/ fed , protein yield kg / fed and grain yield ardab/ fed in both seasons. The application of sinal (metosulam) followed by puma super gave the highest all characters in the first and second season,

respectively as compared with un weeded treatment. This may be attributed to the improvements of some yield attributes due to decreasing weed competition and improving weed control efficiency. These results are in accordance with those reported by various workers including **Malik *et al*. (2005)** , **Dahy (2005)** and **Hala, kindle and Ibrahim (2011).**

***-Interaction effects:-***

***4-A-Preceding crops and tillage systems:-***

Results in Table (5) revealed that number of spikes/$m^2$, spike length, grain yield/fed and straw yield/fed were significantly affected by the interaction between preceding crops and tillage systems in both seasons.

In general, these characters were significantly higher with tillage after these preceding crops. Also, data show that, when wheat was sown after cowpea with tillage systems gave higher numbers of spikes/$m^2$ of **368.27** and **376.60** and grain yield/fed of **20.53** and **20.76** ardab/fed in the first and second season, respectively, and were always greater as compared with other treatments. These results may be attributed to the residual of N form biological $N_2$ fixation by cowpea as a preceding crop; Similar results were obtained by **Dahy .(2005) and Abd El-Zaher *et al*. (2009)**.

The interaction between preceding crops and tillage systems had a significant effect on dry weight of weeds in both seasons .The lowest dry weight of weeds was obtained by using as a cowpea preceding crop with tillage system. Which decreased dry of weeds by 6.74 and 4.94 % with than using preceding crop maize was 2.37 and 13.04 % in the first season, whereas was 7.90 and 8.72 % with sesame, while the preceding crop maize was 5.34 and 14.95 % in the second season as compared with cowpea (no-tillage and tillage system) . These results agreed with those obtained by **Dahy (2005).**

**Table (5): Effect of the interaction between preceding crops and tillage systems on yield and yield components of wheat during 2010/ 2011and 2011/2012 seasons.**

| Preceding crops | Tillage systems | No. of spikes/$m^2$ | | Spike length (cm) | | Grain yield/fed (ardab.) | | Straw yield /fed (ton) | | Dry weight of weeds g/$m^2$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2010/ 2011 | 2011/ 2012 | 2010/ 2011 | 2011/ 2012 | 2010/ 2011 | 2011/ 2012 | 2010/ 2011 | 2011/ 2012 | 2010/ 2011 | 2011/ 2012 |
| Seasme | No-tillage | 337.06 | 348.91 | 11.37 | 11.51 | 19.69 | 19.98 | 4.33 | 4.38 | 578.82 | 544.88 |
| | Tillage | 351.51 | 360.38 | 11.58 | 11.68 | 20.13 | 20.34 | 4.43 | 4.43 | 472.76 | 473.99 |
| Maize | No-tillage | 352.97 | 360.79 | 11.67 | 11.82 | 20.10 | 20.35 | 4.53 | 4.56 | 552.92 | 530.14 |
| | Tillage | 346.07 | 360.53 | 11.45 | 11.63 | 20.04 | 20.26 | 4.44 | 4.46 | 516.76 | 501.47 |
| Cowpea | No-tillage | 361.42 | 369.64 | 11.86 | 12.01 | 20.10 | 20.37 | 4.49 | 4.53 | 539.79 | 501.85 |
| | Tillage | 368.27 | 376.60 | 11.81 | 11.94 | 20.53 | 20.76 | 4.64 | 4.77 | 449.40 | 426.46 |
| L.S.D 5% | | 6.10 | 5.20 | 0.22 | 0.30 | 0.83 | 0.77 | 0.40 | 0.35 | 6.65 | 7.24 |

**4-B- preceding crops and weed control treatments.**

Date presented in Table (6) showed that plant height, number of spikelts/spike, number of grains/spike and grain yield/fed were significantly affected by the interaction between preceding crops and weed control methods in both seasons. Wheat plants preceded by cowpea and weed control methods with application of sinal plus puma super recorded the highest values of number of grains/spike (48.20 and 48.48) and grain yield (20.92 and 21.08 ardab/fed) in first and second seasons, respectively, whereas, the lowest value was obtained from unwedded treatment when preceding crop was sesame.

Results in Table (6) indicated that the interaction between preceding crops and weed control treatments had a significant effect on dry weight of weeds at 90 days after from sowing in both seasons. The application of sinal + puma

super combination with preceding crop cowpea gave the best control for dry of weeds, compared to the other treatments in both seasons .Such treatments reduced the dry weight of weeds g/$m^2$ by using 9.56 , 11.88 % and 6.77 , 5.21 % in the first and second seasons, with sesame and maize respectively, 30.0 , 15.07 % and 18.4, 22.0 % was hand weeding compared with unwed treatment in first and second season, with sesame and maize respectively .

**Table (6): Effect of interaction between preceding crops and weed control methods on yield and yield components of wheat during 2010/2011and 2011/2012 seasons.**

| Tillage systems | Preceding crops | Plant height (cm) | | No. of sp ikelts/spike | | No. of grains/ spike | | ain yield/fed (ardab) | | Dry weight of weeds g/$m^2$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011/20 | 2010/20 | 2011/20 | 2010/20 | 2011/20 | 2010/20 | 2011/20 | 2010/20 | 2011/20 | 2010/20 |
| **Sesame** | Control | 91.47 | 91.40 | 18.21 | 18.36 | 46.61 | 46.52 | 18.33 | 46.61 | 893.40 | 921.34 |
| | Herbicide | 94.97 | 94.86 | 18.46 | 18.55 | 48.03 | 47.87 | 20.45 | 48.03 | 314.31 | 401.07 |
| | Hand weeding | 96.44 | 96.23 | 18.59 | 18.70 | 40.03 | 47.89 | 20.95 | 40.03 | 391.82 | 411.08 |
| **Maize** | Control | 92.58 | 92.47 | 17.80 | 17.97 | 46.93 | 46.79 | 18.58 | 46.93 | 846.81 | 859.00 |
| | Herbicide | 95.60 | 95.54 | 18.31 | 18.45 | 48.29 | 48.14 | 20.57 | 48.29 | 383.65 | 327.12 |
| | Hand weeding | 96.61 | 96.53 | 18.42 | 18.49 | 47.96 | 47.79 | 21.07 | 47.96 | 375.73 | 370.26 |
| **Cowpea** | Control | 92.54 | 92.41 | 18.07 | 18.18 | 47.10 | 46.89 | 18.57 | 47.10 | 787.30 | 833.18 |
| | Herbicide | 96.06 | 95.95 | 18.42 | 18.46 | 48.48 | 48.20 | 20.92 | 48.48 | 266.94 | 280.35 |
| | Hand weeding | 96.81 | 96.44 | 18.47 | 18.56 | 48.19 | 48.05 | 21.46 | 48.19 | 338.22 | 307.29 |
| L.S.D 5% | | 1.01 | 0.88 | 0.28 | 0.50 | 0.17 | 0.55 | 1.15 | 1.25 | 9.57 | 11.08 |

**4-c-Tillage systems and weed control methods.**

Data presented in Table (7) recorded that the interaction between tillage systems and weed control methods had significant effects on plant height, number of spikes/$m^2$, weight of grain /spike and grain yield/fed in both seasons. Resulted when wheat plants were sown by tillage system and weed controlled by applied sinal combined with puma super or by hand weeding methods. The lowest values for those characters were obtained with no- tillage and unwedded treatment.

Results in Table (7) indicated that chemical and mechanical weed control treatment significantly reduced dry weight of weedy at 90 days after sowing in both seasons.

The application of sinal + Puma super combination with tillage gave the best control for dry weight of weedy g/$m^2$ compared with the other treatment. These results may be due to the selective herbicidal efficiency for both sinal and puma super for controlling annual weeds. Such treatments reduced the dry weight of weeds by 62.14 % and 67.38 % as compared with un weeded treatment in 2010/11 and 2011/2012 seasons, respectively. Moreover, the use of hand weeding gave 62.70% and 63.09% as compared with un weeded treatment in both seasons with treatment no-tillage, respectively .Significantly decreased dry weight of weeds by 63.88% and 61.59 % as compared with un-weeded treatment in both seasons , respectively .Moreover, the use of hand weeding gave 48.09 % and 44.51 % as compared with un-weeded treatment in the first and second seasons, respectively. These results are in line with those obtained by **Mekky *et al*.(2007) and Hala , Kindle and Ibrahim ( 2011 ).**

**Table (7): Effect of interaction between tillage systems and weed control treatments on yield and yield components of wheat during 2010 /2011 and 2011/2012 seasons.**

| Tillage systems | Weed Control treatments | Plant height cm)( | | No. of spikes/$m^2$ | | Weight of grains/ Spike (g) | | Grain yield/fed (ardab) | | Dry weight Of weeds g/$m^2$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011/2( | 2010/2( | 2011/20 | 2010/20 | 2011/2( | 2010/2( | 2011/2( | 2010/2( | 2011/20 | 2010/20 |
| No-tillage | Control | 91.66 | 91.58 | 330.17 | 338.33 | 2.30 | 2.35 | 18.23 | 18.51 | 981.63 | 916.36 |
| | Herbicide | 95.90 | 95.82 | 378.90 | 391.77 | 2.74 | 2.83 | 21.21 | 21.39 | 317.60 | 298.95 |
| | Hand weeding | 96.02 | 95.81 | 342.39 | 349.25 | 2.35 | 2.40 | 20.46 | 20.80 | 366.11 | 338.15 |
| Tillage | Control | 92.73 | 92.61 | 350.65 | 359.18 | 2.35 | 2.39 | 18.76 | 18.90 | 760.72 | 768.64 |
| | Herbicide | 95.18 | 95.09 | 348.90 | 360.30 | 2.42 | 2.53 | 20.08 | 22.19 | 292.20 | 277.65 |
| | Hand weeding | 97.23 | 97.00 | 366.31 | 379.03 | 2.59 | 2.65 | 21.86 | 20.28 | 422.16 | 399.03 |
| L.S.D 5% | | 0.82 | 0.67 | 4.50 | 4.74 | 0.25 | 0.46 | 1.66 | 1.54 | 11.14 | 9.00 |

## 4-e-Effect of preceding crop, tillage system and weed control treatments on weeds.

The effect of preceding crop, tillage systems and weed control methods on dry weight of broad –leaved and annual grasses at 90 days from sowing in 2010/2011 and 2011/2012 seasons are presented in Table (8).

**Table (8): Effect of interaction between preceding crops, tillage systems and weeds control methods on yield and yield components of wheat during 2010/2011 and 2011/2012 seasons.**

| Preceding Crops | Tillage system | Weed control treatment | Plant height (cm) | | N o. of spikes $m^2$ | | No. of grains/ spike | | Weight of grains/spike | | Grain yield/ fed ((ardab) | | Dry weight of weeds g/$m^2$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2010/ 2011 | 2011/ 2012 | 2010/ 2011 | 2011/ 2012 | 2010/ 2011 | 2011/ 2012 | 2010/ 2011 | 2011/ 2012 | 2010/2 011 | 2011/2 012 | 2010/ 2011 | 2011/ 2012 |
| Sesame | No-tillage | Control | 91.08 | 91.00 | 308.46 | 321.22 | 46.31 | 46.41 | 2.21 | 2.25 | 17.88 | 18.31 | 1036.04 | 951.12 |
| | | Herbicide | 95.48 | 95.35 | 376.87 | 392.67 | 48.38 | 48.53 | 2.76 | 2.83 | 21.17 | 21.35 | 333.67 | 309.36 |
| | | Hand weeding | 95.94 | 95.77 | 325.85 | 332.86 | 47.50 | 47.66 | 2.29 | 2.36 | 20.02 | 20.28 | 367.76 | 329.93 |
| | Tillage | Control | 91.85 | 91.80 | 352.78 | 362.09 | 46.74 | 46.80 | 2.32 | 2.36 | 18.79 | 18.89 | 681.97 | 742.50 |
| | | Herbicide | 94.46 | 94.37 | 332.73 | 341.82 | 47.36 | 47.52 | 2.36 | 2.58 | 19.72 | 19.86 | 280.91 | 257.93 |
| | | Hand weeding | 96.95 | 96.70 | 369.02 | 377.24 | 48.27 | 48.39 | 2.63 | 2.69 | 21.88 | 22.28 | 455.40 | 421.52 |
| Maize | No-tillage | Control | 92.31 | 92.22 | 351.82 | 359.38 | 47.07 | 47.25 | 2.39 | 2.42 | 18.51 | 18.69 | 930.09 | 876.37 |
| | | Herbicide | 95.08 | 95.04 | 343.39 | 351.20 | 48.09 | 48.21 | 2.41 | 2.51 | 20.58 | 20.76 | 300.56 | 284.10 |
| | | Hand weeding | 96.61 | 96.54 | 363.71 | 371.79 | 47.87 | 48.08 | 2.47 | 2.49 | 21.21 | 21.60 | 409.63 | 403.95 |
| | Tillage | Control | 92.85 | 92.72 | 328.85 | 341.81 | 46.51 | 46.61 | 2.25 | 2.30 | 18.64 | 18.75 | 912.58 | 910.42 |
| | | Herbicide | 96.12 | 96.05 | 373.28 | 388.83 | 48.19 | 48.36 | 2.54 | 2.59 | 20.57 | 20.87 | 353.68 | 344.51 |
| | | Hand weeding | 96.61 | 96.52 | 336.08 | 353.96 | 47.70 | 47.83 | 2.29 | 2.34 | 20.92 | 21.17 | 392.50 | 379.68 |
| Cowpea | No-tillage | Control | 91.58 | 91.52 | 330.21 | 334.38 | 46.44 | 46.58 | 2.29 | 2.37 | 18.29 | 18.52 | 978.76 | 921.60 |
| | | Herbicide | 97.15 | 97.08 | 416.42 | 431.43 | 48.74 | 49.04 | 3.04 | 3.14 | 21.88 | 22.07 | 318.67 | 303.38 |
| | | Hand weeding | 95.50 | 95.11 | 337.62 | 343.10 | 47.51 | 47.67 | 2.28 | 2.36 | 20.14 | 20.51 | 321.93 | 280.56 |
| | Tillage | Control | 93.49 | 93.30 | 370.30 | 373.65 | 47.34 | 47.62 | 2.47 | 2.52 | 18.85 | 19.07 | 687.60 | 653.00 |
| | | Herbicide | 94.97 | 94.87 | 340.69 | 350.26 | 47.67 | 47.91 | 2.38 | 2.43 | 19.96 | 20.10 | 242.02 | 230.50 |
| | | Hand weeding | 98.12 | 97.78 | 393.82 | 405.90 | 48.58 | 48.72 | 2.85 | 2.93 | 22.78 | 23.11 | 418.58 | 395.88 |
| L.S.D 5% | | | 2.42 | 1.25 | 7.80 | 8.22 | 1.18 | 0.93 | 0.59 | 0.66 | 1.40 | 1.19 | 12.66 | 15.67 |

The combined effect of the triple interaction A X B X C i.e., the preceding crop, tillage system and weed control methods indicated that when wheat was preceded by cowpea on tillage system and hand weeding was associated with

highest grain yield in both seasons. Similar effect was evident in case of plant height and weight of grains/spike .Although differences in the of number of spikes/$m^2$ and number of grains/spike was significant, they were inflexed by the triple interaction individually . However ,their values ranked higher ,thus it second that superiority of grain yield /fed when wheat was preceded by cowpea grown on ploughed and weeds were contorted by hand weeding was due to the favorable effects of all yield components traits.

On other hands, the combined interaction effects were associated with lowest values for all traits of growth yield and yield components when wheat was preceded by sesame on no- tillage system and wheat was left unwedded for another part. Most positive effect on weed eradication was obtained when cowpea preceded wheat and grown on triaged land and treated with herbicides whereas, most infection with week accrued when was preceded with sesame on no- tillage and left untreated with any method of weed control. Finally it can be concluded that maximum production of wheat could by detected when grown after cowpea with tillage system and weed chemical controlled. These results are in harmony with those obtained by **Abd El-Zaher (2002).** and **Hala, kindle and Ibrahim (2011).**

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**تأثير المحاصيل السابقة ونظم الخدمة المز رعية وطريقة مقاومة الحشائش على مكونات وإنتاجية محصول القمح**

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**قسم بحوث التكثيف المحصول –معهد بحوث المحاصيل الحقلية –مركز البحوث الزراعية -الجيزة**

***المعمل المر كزى لبحوث الحشائش –مركز البحوث الزراعية –الجيزة**

أجريت تجربة حقلية بمحطة التجارب والبحوث الزراعية بالجيزة موسمي ٢٠١٠/٢٠١١ ، ٢٠١١/٢٠١٢م لدراسة تأثير المحاصيل السابقة (سمسم – ذرة – لوبيا العلف ) ونظم الخدمة المزرعية (حراثة – بدون حراثة) وطرق مقاومة الحشائش (بدون مقاومة - نقاوة يدوية- مقاومة كيماوية) على المحصول ومكوناته ومحتوى البروتين للقمح صنف سدس ١٢ وقد استخدم التصميم الشرائحى فى قطع منشقة فى ثلاث مكررات

**وأشارت النتائج إلى:**

- أدت زراعة القمح بعد لوبيا العلف إلي الحصول علي اعلي القيم لصفات النمو والمحصول ومكوناته وكذلك محصول بروتين الحبوب للفدان ثم المنزرعة بعد الذرة بينما أدت زراعة القمح بعد السمسم إلى الحصول على اقل القيم لتلك الصفات خلال موسمي الزراعة.
- وأدى استخدام نظام الخدمة المز رعية (حراثة) إلى زيادة معنوية لكل من طول النبات ، عدد السنابل/م٢ وعدد السنيبلات /السنبلة ووزن الـ ١٠٠٠ حبة ومحصول الحبوب و البروتين في كلا الموسمين ما عدا طول السنبلة وعدد حبوب السنبلة ووزن حبوب السنبلة ومحصول القش في كلا الموسمين.
- أدى استخدام المبيد السينال + بوما سوبر إلى الحصول على أعلى كفاءة تحكم في الحشائش العريضة أو الضيقة الأوراق بمقارنة بالنقاوة اليدوية وتم الحصول على أعلى الصفات لمحصول القمح بإضافة مبيد السينال + بوما سوبر يليهما النقاوة اليدوية بينما اقل القيم للصفات تم الحصول عليها عند استخدام المعاملة (بدون مقاومة ). وأثر التفاعل بين المحاصيل السابقة ونظم الخدمة المز رعية وطرق مقاومة الحشائش معنويا علي عدد السنابل / م$^{٢}$ ووزن حبوب السنبلة ومحصول الحبوب للفدان والوزن الجاف للحشائش/م$^{٢}$ في كلا الموسمين.