# RESULTS AND DISCUSSION

Two vegetative samples were taken from weeds and wheat plants at 75 and 105 days after sowing ( DAS ) to determine the effect of sowing methods, weed control, bio-organic fertilization and their interactions on wheat and associated weeds. Combined analysis of 2004/2005 and 2005/2006 seasons was conducted. The obtained results are as follows:

## A- *Effect of sowing method treatments on:*

### 1- Weeds

Weed sprevailing in the different samples were mainly annul winter weeds , namely,Wild charad ( Beta vulgaris ) ,Sour weed ( Rumex dentatus ),Sour clover ( Melilotus indica ), Bishops weed ( ammi majus ), and Weather grass (Anagallus arvensis) ,Wild oat (Avena fatua) , Setaria glauca (Polypogon monspeliensis) It is clear from data in Table (3) that sowing method in ridges significantly surpassed in rows method. Sowing wheat in ridges decreased the weight of broad leaved, grassy and total weeds either fresh or dry weight at the two ages 75 and 105 DAS. by El Naggar **(1996) and Amjad and Anderson(2006).**

**Table ( 3 ) : Effect of sowing method treatments on fresh and dry weight of weeds ($g/m^2$)in wheat field at 75 and 105 days after sowing.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons )**

| Characters / Treatments | Broad-leaved weeds | | Grassy weeds | | Total weeds | |
|---|---|---|---|---|---|---|
| | Fresh | Dry | Fresh | Dry | Fresh | Dry |
| | **75 days after sowing** | | | | | |
| Ridges | 189.4 | 45.8 | 87.7 | 23.4 | 277.1 | 69.2 |
| Rows | 215.8 | 45.3 | 121.8 | 34.2 | 337.6 | 79.5 |
| L.S.D. at 5% | 18.1 | N.S. | 12.6 | 2.7 | 30.1 | 6.2 |
| | **105 days after sowing** | | | | | |
| Ridges | 271.1 | 87.5 | 166.2 | 74.7 | 437.3 | 162.2 |
| Rows | 320.7 | 105.2 | 206.6 | 89.9 | 527.3 | 195.1 |
| L.S.D. at 5% | 24.7 | 14.1 | 24.3 | 10.6 | 52.6 | 16.3 |

## 2- Wheat growth

Mean values of plant height; number of tillers, leaves, /$m^2$ fresh and dry weight of tillers, leaves, /$m^2$; and LAI at 75 DAS as affected by sowing methods in ridges are presented in Table ( 4 ). The greater number of tillers and leaves/$m^2$; leaves fresh weight/$m^2$; tillers and leaves dry weight/$m^2$ and LAI than sowing method in rows.

At 105 DAS sample sowing method in ridges gave mean values greater than in rows in all studied characters except for LA. The differences were significant in all studied characters except for plant height and LA at 75 and 105 DAS.

## 3- Yield and yield components:

At harvest yield and yield components were determined Table ( 5 ) show effect of sowing methods treatments on yield and yield components of wheat ( combined analysis of 2004/2005 and 2005/2006 seasons).

### A- Plant height (cm)

It is clear from data in Table ( 5 ) that there were insignificant differences between two sowing methods. Sowing method in rows surpassed in ridges in plant height.

### B- Number of tillers/$m^2$:

Data presented in the same Table show that sowing method in ridges gave number of tillers/$m^2$ higher than in rows. Results may be due to the higher distance between ridges than between rows which allow more suitable condition of space between plants.

**Table (4 ): Effect of sowing method treatments on growth characters of wheat plants at 75 and 105 days after sowing**

**(combiend analysis of 2004/2005 and 2005/2006 seassons)**

| Characters / Treatments | Plant height (cm) | Tiliers /m² | | | Leaves /m² | | | Spikes /m² | | | L. A. (cm²) | L.A.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | Weight (g) | | No. | Weight (g) | | No. | Weight (g) | | | |
| | | | Fresh | Dry | | Fresh | Dry | | Fresh | Dry | | |
| | **75 days after sowing** | | | | | | | | | | | |
| Ridges | 55.38 | 319.5 | 1292.0 | 157.0 | 896.3 | 962.1 | 127.9 | - | - | - | 204.9 | 2 .00 |
| Rows | 55.14 | 311.6 | 1294.0 | 154.3 | 878.4 | 933.7 | 124.3 | - | - | - | 205.9 | 1 .81 |
| L.S.D. at 5% | N.S. | 1.6 | N.S. | 1.2 | 2.2 | 8.0 | 2.0 | - | - | - | N.S. | 0 .05 |
| | **105 days after sowing** | | | | | | | | | | | |
| Ridges | 76.98 | 327.9 | 1924.0 | 602.4 | 848.0 | 886.2 | 175.7 | 211.3 | 942.0 | 337.2 | 276.6 | 3 .57 |
| Rows | 76.40 | 316.2 | 1859.0 | 584.7 | 836.4 | 873.4 | 171.9 | 195.6 | 883.6 | 319.1 | 278.6 | 3 .48 |
| L.S.D. at 5% | N.S. | 4.0 | 40.3 | 12.6 | 3.1 | 5.1 | 1.5 | 6.2 | 18.3 | 5.1 | N.S. | N.S |

**Table (5) : Effect of sowing methods treatments on yield and yield components of wheat.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | Plant height (cm) | No. of Tillers/$m^2$ | No. of spikes/$m^2$ | Spike length (cm) | Spike weight (g) | Weight of grains/spike (g) | 1000-grains weight (g) | Grain yield kg/fed. | Straw yield kg/fed. | Biological yield kg/fed. | Harvest index % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ridges | 91.31 | 469.4 | 304.2 | 13.4 | 3.11 | 2.05 | 49.02 | 2126 | 4628 | 6754 | 31.50 |
| Rows | 93.49 | 446.4 | 283.2 | 13.2 | 3.06 | 1.98 | 49.24 | 1923 | 4436 | 6359 | 30.30 |
| L.S.D. at 5% | N.S. | 13.3 | 5.4 | N.S | 0.04 | 0.06 | N.S. | 34 | 80 | 95 | 0.42 |

### C- Number of spikes/$m^2$:

Regarding number of spikes/$m^2$ sowing method in ridges produced 304 spikes/$m^2$ whereas in rows recorded 283 spikes/$m^2$, the differences were significant. Similar results were observed by **Tripathi *et al.*, (2002).**

### D- Spike length (cm)

There were insignificant differences between sowing methods in ridges and in rows whereas in ridges produced spikes taller than in rows.

### E- Spike weight (g)

Data in Table (5) show that sowing method in ridges significantly surpassed in rows in spike weight. It is the same trend recorded from number of spikes/$m^2$; spike length which may be due to low competition between wheat plants for water and nutrients under in ridges sowing method. **Tripathi *et al.*, (2002)** stated similar results.

### F- Weight of grains/spike (g)

Sowing method in ridges produced heavier weight of grains/spike (2.05) than in rows (1.98) and the differences were significant. It is the same trend recorded for number of spikes/$m^2$, length and weight of spike which reflected on weight of grains/spike. Similar results recorded by **Tripathi *et al.*, (2002)**.

### G- 1000-grains weight (g)

It is clear from data in the same Table that sowing method in rows surpassed in ridges by insignificant differences.

**H- Grain yield ( kg/fed. )**

Data presented in Table (5) clear that due to sowing methods in ridges produced higher yield ( 2126 kg/fed. ) than in rows (1923 kg/fed.) by significant differences. It can be concluded that the superiority of sowing method in ridges was sumition of higher attributes i.e. number of tillers/$m^2$; number of spikes/$m^2$; spike length; spike weight; weight of grains/spike which inturn on grain yield ( kg/fed. ). Results were in agreement with **Berry and Wilkes (1992); El-Naggar ( 1996 ); Samra and Dhillon, (2000); Tripathi *et al.*, (2002); Jat *et al.*, (2003b)**. Opposite trend recorded by **Gupta and Ganpat (1985).**

**I- Straw yield ( kg/fed. )**

Results in Table (5) revealed that sowing method in ridges surpassed in rows for straw yield ( kg/fed. ) by significant differences. Similar results were reported by **Samra and Dhillon, (2000); Jat *et al.*, (2003b)**.

**J- Biological yield ( kg/fed. )**

In respect to effect of wheat sowing methods on biological yield (kg/fed.) Table (5) show that sowing method in ridges produced higher biological yield/fed. 6754 kg/fed. than sowing in rows 6359 kg/fed. by significant differences. It is the same trend recorded for number of tillers; number of spikes/$m^2$; spikes weight; weight of grains/spike; grains and straw yields (kg/fed.). Results may be due to the superiority of in ridges sowing for all yield attributes recorded and the value of biological yield as the weight of all above ground wheat plants. **Singh *et al.*, (2005)** recorded

similar trend. While **Amjad and Anderson., (2006)** stated the opposite trend.

**K- Harvest index %**

Harvest index as a result of dividing grain yield on biological yield (kg/fed.), it is clear from the sameTable that sowing method in ridges significantly surpassed sowing in rows. It is the same trend recorded for both grain and biological yield per feddan.

**4- Chemical composition of wheat grains:**

**A- Protein yield ( kg/fed.)**

It is clear from data in Table ( 6 ) that sowing wheat in ridges produced protein yield ( kg/fed.) greater that sowing in rows by significant differences. These findings was in accordance with those obtained by **Amjad and Anderson (2006)** who stated that wider row spacing reduced wheat yield and increased grain protein compared to a narrow row spacing but **Pandy and Kumar., (2005)** concluded that protein content in grain were unaffected by seeding methods.

**B- Phosphorus yield ( kg/fed.)**

Data presented in the same Table show that sowing wheat in ridges surpassed sowing in rows in phosphorus yield ( kg/fed. ) by significant differences. Results are in accordance with obtained for yield, yield components and protein yield/fed.

**Table (6) : Effect of sowing methods treatments on wheat grain protein, phosphorus and potassium yield ( kg/fed) .**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Sowing methods treatments | Protein | | Phosphorus | | Potassium | |
|---|---|---|---|---|---|---|
| | % | Yield (kg/fed.) | % | Yield (kg/fed.) | % | Yield (kg/fed.) |
| Ridges | 11.75 | 249.80 | 0.293 | 6.22 | 0.863 | 18.66 |
| Rows | 11.46 | 220.37 | 0.298 | 5.73 | 0.872 | 16.76 |
| L.S.D. at 5% | N.S. | 3.90 | N.S. | 0.10 | N.S. | 0.30 |

**C- Potassium yield ( kg/fed.)**

Table ( 6 ) show the same trend recorded from protein and phosphorus yield/fed. sowing in ridges gave potassium yield 18.66 (kg/fed.) greater than sowing in rows 16.80 kg/fed.

**B- *Effect of weed control treatments on:***

**1- Weeds:**

Data presented in Table ( 7 ) showed that there were significant differences between weed control treatments due to broad leaved, grasses, total weeds as fresh and dry weights. Chemical weeded recorded the lowest weight of weeds at 75 DAS and 105 DAS, hand weeding came in the second order, control was the third. Hand weeding recorded the first order in grasses weeds at 105 DAS. Chemical weeded surpasses hand weeding in weed control percentage at both samples 75 and 105 DAS. Superiority of chemical weeded reported by **Sharma *et al.*, ( 1989 ); El-Naggar (1996); Govindra *et al.*, (2003); Jat *et al.*, (2003a), Pandey and Kumar (2005),** and **.Kironmay et al (2006)** reported that all herbicides significantly decreased weeds population . while **Mishra and Kewat (2002); Navneet *et al.*, (2003)** and **Rajvir and Sharma (2003)** recorded the excellence of hand weeding

**Table (7 ) : Effect of weed control treatments on fresh and dry weight of weeds ($g/m^2$) in wheat field at 75 and 105 days after sowing**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | Broad-leaved weeds | | Grassy weeds | | Total weeds | | Weed control % | |
|---|---|---|---|---|---|---|---|---|
| | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry |
| | **75 days after sowing :** | | | | | | | |
| Unweeded ( Control ) | 366.1 | 69.5 | 170.9 | 46.6 | 537.0 | 116.1 | 0.0 | 0.0 |
| Hand weeding | 127.2 | 33.6 | 75.6 | 21.6 | 202.8 | 55.2 | 62.1 | 51.9 |
| Chemical weeded | 114.6 | 33.6 | 68.0 | 18.3 | 182.6 | 51.9 | 65.9 | 55.1 |
| L.S.D. at 5% | 27.5 | 23.1 | 20.9 | 18.2 | 35.8 | 30.7 | | |
| | **105 days after sowing :** | | | | | | | |
| Unweeded ( Control ) | 507.3 | 149.1 | 327.2 | 136.8 | 834.5 | 285.9 | 0.0 | 0.0 |
| Hand weeding | 209.9 | 80.3 | 110.1 | 53.6 | 320.0 | 133.9 | 61.7 | 53.2 |
| Chemical weeded | 170.5 | 59.7 | 122.1 | 56.7 | 292.3 | 116.4 | 65.0 | 59.3 |
| L.S.D. at 5% | 29.8 | 25.7 | 25.6 | 27.7 | 33.4 | 34.9 | | |

## 2- Wheat growth

Data presented in Table ( 8 ) show that the differences between weed control treatments were significant due to all studied characters except for LA ($cm^2$) at 75 DAS and LAI at 105 DAS. Chemical weeded treatment produced the tallest plants at the two samples; the highest number of tillers/$m^2$; the heaviest weight either fresh or dry at 75 DAS and at 105 DAS; the highest number of leaves/$m^2$ and the heaviest fresh and dry weight of leaves at 75 and 105 DAS. The highest number of spikes/$m^2$, heaviest fresh and dry weight of spikes/$m^2$ at 105 DAS were recorded by chemical weeded treatment.

Chemical weeded treatment gave the greatest leaf area LA and leaf area index LAI at 75 DAS but hand weeding was the best treatment for LA and LAI at 105 DAS.

## 3- Yield and yield components:

### A- Plant height

Data presented in Table (9) clear that the differences between weed control treatments were insignificant for plant height. Unweeded produced the tallest plants followed by hand weeding and chemical weeded treatments. Results may be due to high competition between wheat plants and associated weeds under unweeded conditions.

### B-Number of tillers/$m^2$:

Table (9) show effect of weed control treatments on yield and yield components of wheat. Chemical weeded gave the highest number of tiller/$m^2$ followed by hand weeding treatment and the latest was unweeded, the differenced were significant. The superiority of chemical

**Table( 8 ) :Effect of weed control treatments on growth characters of wheat plants at 75 and 105 days after sowing (combiend analysis of 2004/2005 and 2005/2006 seassons)**

| Characters / Treatments | Plant height (cm) | Tillers /m$^2$ | | | Leaves /m$^2$ | | | Spikes /m$^2$ | | | L. A. (cm$^2$) | L. A. I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | Weight (g) | | No. | Weight (g) | | No. | Weight (g) | | | |
| | | | Fresh | Dry | | Fresh | Dry | | Fresh | Dry | | |
| | **75 days after sowing** | | | | | | | | | | | |
| Unweeded ( Control ) | 53.62 | 181.2 | 727.0 | 86.2 | 658.7 | 693.9 | 90.43 | - | - | - | 204.7 | 1.92 |
| Hand weeding | 55.50 | 378.7 | 1545.0 | 187.5 | 970.2 | 1030.0 | 138.40 | - | - | - | 204.9 | 1.83 |
| Chemical weeded | 56.67 | 386.8 | 1608.0 | 193.5 | 1041.0 | 1118.0 | 149.50 | - | - | - | 206.6 | 1.97 |
| L.S.D. at 5% | 1.14 | 22.3 | 28.6 | 11.3 | 12.9 | 15.4 | 14.50 | - | - | - | N.S. | 0.03 |
| | **105 days after sowing** | | | | | | | | | | | |
| Unweeded ( Control ) | 75.45 | 186.7 | 1135.0 | 348.2 | 617.8 | 637.6 | 128.6 | 135.0 | 528.9 | 190.4 | 254.4 | 3.48 |
| Handweeding | 76.87 | 382.5 | 2222.0 | 698.6 | 921.0 | 982.3 | 194.3 | 234.8 | 1074.0 | 387.5 | 305.2 | 3.54 |
| Chemical weeded | 77.75 | 397.0 | 2319.0 | 733.8 | 987.9 | 1019.0 | 199.0 | 240.6 | 1135.0 | 406.5 | 273.2 | 3.50 |
| L.S.D. at 5% | 1.14 | 42.1 | 24.1 | 12.4 | 18.2 | 52.3 | 22.1 | 23.2 | 41.9 | 17.8 | 22.8 | N.S. |

**Table ( 9) :Effect of weed control treatments on yield and yield components of wheat. ( Combined analysis of 2004/2005 and 2005/2006 seasons).**

| Characters / Treatments | Plant height (cm) | No. of tillers/$m^2$ | No. of spikes/$m^2$ | Spike length (cm) | Spike weight (g) | Weight of grains/ spike (g) | 1000-grains weight (g) | Grain yield kg/fed. | Straw yield kg/fed. | Biological yield kg/fed. | Harvest index % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unweeded ( Control ) | 93.36 | 340.1 | 195.0 | 12.89 | 2.88 | 1.85 | 47.62 | 1541 | 3228 | 4769 | 32.32 |
| Hand weeding | 93.29 | 511.6 | 339.5 | 13.36 | 3.15 | 2.07 | 49.33 | 2258 | 5089 | 7347 | 30.67 |
| Chemical weeded | 92.35 | 521.3 | 346.7 | 13.61 | 3.24 | 2.15 | 50.45 | 2275 | 4379 | 6654 | 34.19 |
| L.S.D. at 5% | N.S. | 20.7 | 4.7 | 0.32 | 0.08 | 0.06 | 2.40 | 47 | 83 | 107 | 0.53 |

weeded may be due to its effect on reducing total weed density, these findings were in harmony with those obtained by **Navneet *et al.*, (2003)**.

**C- Number of spikes/$m^2$:**

It is clear from data in Table (9) that the differences were significant between weed control treatments with the same trend of number of tillers/$m^2$. Chemical weeded produced the highest number of spikes/$m^2$ followed by hand weeding and unweeded gave the lowest number of spikes/$m^2$.

**D- Spike length (cm)**

Data in the same Table show significant differences between weed control treatments. The same trend of number of both tillers/$m^2$ and spikes/$m^2$ were recorded: chemical weeded gave the tallest spikes 13.61 cm, hand weeding was second 13.36 cm and the shortest spikes 12.89 cm from unweeded (control). **Saad El Din and Ahmed (2004)** stated that yield attributes were statistically increased as a result of controlling weeds by weed control treatments and the highest values were recorded by isoproturon herbicide.

**E- Spike weight (g)**

It is obviously from Table (9) that chemical weeded surpassed other treatments by significant differences in spike weight followed by hand weeding and the less spike weight was recorded by unweeded treatment.

**F- Weight of grains/spike (g)**

Data presented in Table (9) show significant differences between weed control treatments. Chemical weeded recorded the heaviest weight of grains/spike 2.15 g, the second treatment was hand weeding 2.07 g and the lightest was unweeded treatment 1.85 g. These results were confirmed with spike weight. **Navneet *et al.*, (2003) and Muhammed et al (2007).** stated the same findings.

**G- 1000-grains weight (g)**

It is clear from Table (9) that the heaviest 1000-grains were recorded by chemical weeded treatment followed by hand weeding and the lightest 1000 grains weight were recorded by unweeded treatment. These results may be due to the same trend of spike weight and weight of grains/spike (g) which in turn on weight of 1000-grains. Results were in accordance with those obtained by **Navneet *et al.*, (2003).**

**H- Grain yield ( kg/fed. )**

Data presented in the same Table clear that chemical weeded significantly increased grain yield/fed. than hand weeding and unweeded treatments. Chemical weeded treatment produced the greatest grain yield 2275 kg/fed.; 2258 kg/fed. from hand weeding and the smallest grain yield 1541 kg/fed. from unweeded treatment. The superiority of chemical weeded treatment recorded in yield attributes such as number of tillers/$m^2$; number of spikes/$m^2$; spike length; spike weight; weight of grains/spike and 1000-grains weight which resulted on grain yield/fed. Results were confirmed with those obtained by **Johri *et al.*, (1991), El-Naggar ( 1996);**

**Jat *et al.*, (2003b); Kulvir *et al.*, (2003); Navneet *et al.*, (2003); Saad El Din and Ahmed (2004).**

**I- Straw yield ( kg/fed. )**

Table (9) show that there were significant differences between weed control treatments in straw yield (kg/fed.). The heaviest straw yield 5089 kg/fed. produced by hand weeding treatment followed by 4379 kg/fed. chemical weeded and 3228 kg/fed. for unweeded treatment **Mishra and Kewat., (2002); Radwan *et al.*, (2002); and Kironmay et al.,(2006)** stated the same findings. Also, concluded that hand weeding gave the good control of weeds which resulting in yields higher than those obtained with isoproturon ( pre-emergence ).

**J- Biological yield ( kg/fed. )**

It is clear from data in the same Table that there were significant differences between weed control treatments. It can be arranged in descending order as follows hand weeding 7347 kg/fed.- chemical weeded 6654 kg/fed.- unweeded 4769 kg/fed, so it is the same trend pointed in straw yield/fed. **Mishra and Kewat (2002)** and **Radwan *et al.*, (2002)** found the same results.

**K- Harvest index %:**

Data presented in the same Table revealed that chemical weeded surpassed other weed control by significant differences in harvest index%. Unweeded (control) came in the second order and hand weeding was the third. It can be concluded that these results may be due to the superiority of chemical weeded in grain yield/fed. by 48 % increasing than control and by 35 % in biological yield than control treatment.

## 1- Chemical composition:

### A- Protein yield ( kg/fed. )

Results in Table ( 10 ) indicated that there were significant differences between weed control treatments as regard to chemical weeded gave the highest value of protein yield ( kg/fed. ) followed by hand weeding.

Unweeded treatment gave the lowest protein yield ( kg/fed. ). This reduction in protein yield may be due to the lowest grain yield/fed. which affected by high competition of associated weeds to wheat plants. Results were in harmony with those obtained by **Saad El Din and Ahmed., (2004)** and **Pandey and Kumar (2005).**

### B- Phosphorus yield ( kg/fed. )

Data presented in Table ( 10 ) show that phosphorus yield (kg/fed.) was significantly increased with weed control treatments compared to the unweeded treatment. Chemical weeded came in the first order, hand weeding was second and unweeded was third. Results may be attributed with those obtained in grains yield ( kg/fed.)

### C- Potassium yield ( kg/fed.)

Concerning potassium yield (kg/fed.) data reported in the same Table demonstrated the same trend of protein and phosphorus yield/fed. chemical weeded gave the highest potassium yield followed by hand weeding and unweeded is the less one.

**Table (10) : Effect of weed control treatments on wheat grain protein , phosphorus and potassium yield ( kg/fed ) .**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Weed control treatments | Protein | | Phosphorus | | Potassium | |
|---|---|---|---|---|---|---|
| | % | Yield (kg/fed.) | % | Yield (kg/fed.) | % | Yield (kg/fed.) |
| Unweeded (control) | 11.51 | 177.36 | 0.286 | 4.41 | 0.798 | 12.29 |
| Hand weeding | 11.68 | 263.73 | 0.301 | 6.79 | 0.903 | 20.39 |
| Chemical weeded | 11.62 | 264.4 | 0.299 | 6.8 | 0.903 | 20.54 |
| L.S.D. at 5% | N.S. | 5.5 | N.S. | 0.14 | N.S. | 0.42 |

## C- *Effect of bio-organic fertilization treatments on:*

### 1- Weeds:

Table (11) revealed that there were significant differences between bio-organic fertilization treatments in all studied characters. Treatment of 25 % recommended dose of organic fertilizer + 75 % of recommended dose of chemical fertilizers resulted in lowest weeds weight broad leaved, grasses and total weeds either fresh or dry at both sample dates 75 and 105 DAS. Treatment of 50 % recommended dose of bio-organic +50% chemical fertilizers came in the second order in fresh and dry weights of broad leaved weeds in both samples, also, in grasses and total weeds dry weights but chemical fertilizers at 100 % recommended dose was the second in fresh, dry weight and total weeds dry weight at 75 DAS, fresh grassy weeds, total weeds at 105 DAS these results are in harmony with those obtained by **Ghallab and Salem(2001)**.

### 2- Wheat growth:

Table ( 12 ) show that means of plant height; number, fresh and dry weights of tillers, leaves weight and spikes per $m^2$, also, LA and LAI at 75 and 105 DAS. The obtained results revealed that there were significant differences between bio-organic fertilization treatments due to all studied growth characters at 75 and 105 DAS.

**Table (11 ) : Effect of bio-organic fertilization treatments on fresh and dry weight of weeds ($g/m^2$) in wheat field at 75 and 105 days after sowing ( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | Broad-leaved weeds | | Grassy weeds | | Total weeds | |
|---|---|---|---|---|---|---|
| | Fresh | Dry | Fresh | Dry | Fresh | Dry |
| | **75 days after sowing** | | | | | |
| $F_1$ Org. 100 % | 230.7 | 50.1 | 117.2 | 31.6 | 347.9 | 81.7 |
| $F_2$ Org. 75 % + Chem. 25 % | 217.0 | 47.5 | 113.1 | 30.7 | 330.1 | 78.2 |
| $F_3$ Org. 50 % + Chem. 50 % | 186.1 | 43.6 | 101.2 | 28.1 | 287.3 | 71.7 |
| $F_4$ Org. 25 % + Chem. 75 % | 186.0 | 43.0 | 93.9 | 26.5 | 279.9 | 69.5 |
| $F_5$ Chem. 100 % | 193.1 | 43.6 | 99.6 | 27.2 | 292.7 | 70.8 |
| L.S.D. at 5% | 10.3 | 2.9 | 3.2 | 2.6 | 15.6 | 4.2 |
| | **105 days after sowing** | | | | | |
| $F_1$ Org. 100 % | 319.8 | 102.3 | 202.9 | 88.4 | 522.7 | 190.7 |
| $F_2$ Org. 75 % + Chem. 25 % | 309.7 | 99.8 | 194.5 | 85.2 | 504.2 | 185.0 |
| $F_3$ Org. 50 % + Chem. 50 % | 283.0 | 93.5 | 181.3 | 79.4 | 464.3 | 172.9 |
| $F_4$ Org. 25 % + Chem. 75 % | 278.7 | 89.8 | 174.5 | 78.5 | 453.2 | 168.2 |
| $F_5$ Chem. 100 % | 289.5 | 96.3 | 178.8 | 80.4 | 468.3 | 176.6 |
| L.S.D. at 5% | 14.1 | 3.5 | 3.7 | 3.5 | 25.5 | 7.5 |

**Table (12 ): Effect of bio-organic fertilization treatments on growth characters of wheat plants at 75 and 105 days after sowing**

**(combiend analysis of 2004/2005 and 2005/2006 seassons)**

| Characters / Treatments | Plant height (cm) | Tillers /m² | | | Leaves /m² | | | Spikes /m² | | | L. A. (cm²) | L.A.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | Weight (g) | | No. | Weight (g) | | No. | Weight (g) | | | |
| | | | Fresh | Dry | | Fresh | Dry | | Fresh | Dry | | |
| | **75 days after sowing** | | | | | | | | | | | |
| $F_1$ Org. 100 % | 54.3 | 290.8 | 1206 | 147.7 | 838.2 | 880.5 | 121.5 | - | - | - | 200.1 | 1.64 |
| $F_2$ Org. 75 % + Chem. 25 % | 54.9 | 306.8 | 1261 | 151.0 | 862.5 | 896.3 | 123.1 | - | - | - | 202.2 | 1.81 |
| $F_3$ Org. 50 % + Chem. 50 % | 55.6 | 327.7 | 1330 | 159.4 | 879.8 | 944.1 | 126.5 | - | - | - | 206.4 | 1.95 |
| $F_4$ Org. 25 % + Chem. 75 % | 55.5 | 321.1 | 1196 | 158.6 | 927.2 | 1015.0 | 130.4 | - | - | - | 206.1 | 2.07 |
| $F_5$ Chem. 100 % | 55.8 | 329.5 | 1340 | 162.0 | 918.8 | 1001.0 | 129.5 | - | - | - | 209.3 | 2.09 |
| L.S.D. at 5% | 1.1 | 24.2 | 33.6 | 11.4 | 18.7 | 16.2 | 5.1 | - | - | - | 2.8 | 0.05 |
| | **105 days after sowing** | | | | | | | | | | | |
| $F_1$ Org. 100 % | 74.5 | 289.5 | 1742 | 558.8 | 799.9 | 836.7 | 167.8 | 183.9 | 804.3 | 295.1 | 291.7 | 3.47 |
| $F_2$ Org. 75 % + Chem. 25 % | 76.3 | 308.8 | 1822 | 576.3 | 813.1 | 847.8 | 170.3 | 190.2 | 765.2 | 301.9 | 289.8 | 3.55 |
| $F_3$ Org. 50 % + Chem. 50 % | 77.1 | 329.9 | 1943 | 603.5 | 835.0 | 877.7 | 173.7 | 203.1 | 910.2 | 325.0 | 315.3 | 3.39 |
| $F_4$ Org. 25 % + Chem. 75 % | 77.7 | 339.0 | 1968 | 611.3 | 884.3 | 922.8 | 179.8 | 220.7 | 1000.0 | 358.5 | 325.5 | 3.57 |
| $F_5$ Chem. 100 % | 77.7 | 343.2 | 1985 | 618.5 | 878.9 | 914.8 | 178.0 | 207.3 | 1100.0 | 360.3 | 299.3 | 3.53 |
| L.S.D. at 5% | 1.1 | 42.3 | 35.6 | 17.8 | 13.3 | 37.7 | 3.2 | 13.6 | 61.7 | 21.4 | 14.6 | 0.11 |

## 3- Yield and yield components:

### A- Plant height:

Data presented in Table ( 13 ) show that the differences between bio-organic fertilization treatments were insignificant. The tallest plants were recorded by 100 % of recommended dose from NPK chemical fertilizers followed by treatment of 25 % recommended dose of organic fertilizer + 75 % rec. chemical fertilizers. These results are in harmony with those obtained by **Nour *et al.*, (1989)** and **Mohiuddin *et al.*, (2000)**.

### B- Number of tillers/$m^2$:

Results in the same Table indicated that there were significant differences between bio-organic fertilization treatments. The highest no. of tillers/$m^2$ were produced by 25 % rec. org. fert. + 75 % rec. chem. fert. Whereas 100 % rec. chem. fert. came in the second order and treatment of 50 % rec. org. fert. + 50 % rec. chem. fert. was the third. Results may be due to the effect of chemical fertilizers for enhancing growth at early stage and slow release of nutrients from bio-organic fertilizer at late stage of wheat life. Results were in accordance with those obtained by **Reynders and VIassak (1982); Nour *et al.*, (1989); Mikhaeel *et al.*, (1997)** and **Mohiuddin *et al.*, (2000).**

### C- Number of Spikes/$m^2$

Mean values of combined analysis concerning the average of no. of spikes/$m^2$ recorded in Table ( 13 ) show that there were the same trend of no. of tillers/$m^2$ treatment of 25 % rec. org. fert. + 75 % rec. chem. fert. produced the greatest no. of spikes/$m^2$ followed by 100 % rec. chem. fert. and the third was 50 % rec. org. fert. + 50 % rec. chem. fert. also, the

Treatment of 100 % recommended dose of NPK chemical fertilizers surpassed other treatments in plant height; number of tillers/$m^2$; fresh and dry weight of tillers/$m^2$ at 75 and 105 DAS, half recommended dose of bio-organic fertilizers plus 50 % of NPK was the second at 75 DAS while 25 % of recommended dose from bio-organic fertilizer plus 75 % recommended NPK was second at 105 DAS. Due to number of leaves/$m^2$, fresh and dry weight/$m^2$ treatment of 25 % recommended dose of bio-organic fertilizer with 75 % recommended dose of NPK came in the first order followed by treatment of 100 % recommended NPK dose. The greatest number of spikes/$m^2$ were produced by wheat plants fertilizer by 25 % recommended dose of bio-organic fertilizer and 75 % NPK, followed by full dose of NPK but 100 % recommended dose of NPK gave the heaviest fresh and dry weight of spikes/$m^2$ at 105 DAS.

With regard to LA and LAI at 75 DAS treatment of 100 % recommended dose of NPK gave the highest values ,while at 105 DAS the best result recorded by 25 % recommended dose of bio-organic fertilizer plus 75 % NPK recommended dose. Increasing growth characters of wheat plants as result of combination between bio-organic and NPK fertilizers reported by many researchers **Reynders and VIassak (1982); Nour *et al.*, (1989); Badiyala and Verma (1991); Zaghloul *et al.*, (1996); Fares (1997); Mikhaeel *et al.*, (1997); Ghallab and Salem., (2001) and Xiong *et al.*, (2005)** but others revealed the excellence of NPK chemical fertilizers alone **[El Din *et al.*, (1995) and Sushila *et al.*, (2000)].**

**Table (13 ) :Effect of bio-organig fertilization treatments on yield and yield components of wheat.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | Plant height (cm) | No. of tillers/$m^2$ | No. of spikes/$m^2$ | Spike length (cm) | Spike weight (g) | Grain weight/spike (g) | 1000-grains weight (g) | Grain yield kg/fed. | Straw yield kg/fed. | Biological yield kg/fed. | Harvest index % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $F_1$ Org. 100 % | 91.9 | 435.8 | 264.8 | 12.9 | 2.97 | 1.96 | 48.36 | 1875 | 4324 | 6199 | 30.8 |
| $F_2$ Org. 75 % + Chem. 25 % | 92.8 | 441.0 | 273.8 | 12.9 | 3.04 | 2.00 | 49.00 | 1894 | 4389 | 6283 | 30.3 |
| $F_3$ Org. 50 % + Chem. 50 % | 92.4 | 455.8 | 292.2 | 13.3 | 3.08 | 2.02 | 49.37 | 2001 | 4485 | 6486 | 31.1 |
| $F_4$ Org. 25 % + Chem. 75 % | 93.9 | 479.2 | 320.4 | 13.5 | 3.18 | 2.06 | 49.58 | 2186 | 4727 | 6913 | 31.6 |
| $F_5$ Chem. 100 % | 94.0 | 477.4 | 317.4 | 13.5 | 3.16 | 2.06 | 49.40 | 2165 | 4734 | 6899 | 31.4 |
| L.S.D. at 5% | N.S | 31.5 | 5.5 | 0.5 | 0.10 | 0.08 | N.S. | 55 | 77 | 99 | 0.7 |

differences were significant. This finding was in accordance with those obtained by **El-Din *et al.*, (1995); Zeidan and El Karmany (2001)**.

**D- Spike length (cm)**

Bio-ogranic fertilization treatments significantly affected spike length. 25 % rec. org. fert. + 75 % rec. chem. fert. treatment at the bar of 100 % rec. chem. fert. in producing the tallest spikes and treatment of 50 % rec. org. fert. + 50 % rec. chem. fert. was the second. It is clear that it is the same trend of both tillers number and spikes number per $m^2$. These results are in harmony with those obtained by **Das *et al.*, (2001)** and **Xiong *et al.*, (2005)**.

**E- Spike weight (g)**

Data presented in Table ( 13 ) show that treatment of 25 % rec. org. fert. + 75 % rec. chem. fert. produced the heaviest spike weight followed by 100 % rec. chem. fret. and 50 % rec. org. fert. + 50 % rec. chem. fert. Similar results were obtained by **Nour *et al.*, (1989)**.

**F- Grain weight/spike (g)**

Results in Table ( 13 )show the same trend of no. of tillers/$m^2$; no. of spikes/$m^2$; spike length and spike weight, there were superiority for treatment of 25 % rec. org. fert. + 75 % rec. chem. fert. with bar of 100 % rec. chem. fert. and the second was 50 % rec. org. fert. + 50 % rec. chem. fert. These results are in agreement with obtained by **Das *et al.*, (2001)**.

**G- 1000-grains weight (g)**

It is clear from data in the same Table that there were insignificant differences among 1000- grains weight between bio-organic fertilization

treatments. It can be arrange the treatments in descending order as follow 25 % rec. org. fert. + 75 % rec. chem. fert. – 100 % rec. chem. fert.-50 % rec. org. fert. + 50 % rec. chem. fert. The increase in weight of 1000-grains due to combination between bio-organic and chemical fertilizers recorded by **El-Din *et al.*, (1995); Zeidan and El Karmany (2001); Uyanoz *et al.*, (2006).**

**H- Grain yield ( kg/fed. )**

Concerning grain yield/fed. of wheat, data reported in Table ( 13 ) demonstrated that bio-organic fertilization treatments significantly affected grain yield per fed. The highest value of grain yield ( 2186 kg/fed. ) was obtained from treatment 25 % rec. org. fert. + 75 % rec. chem. fert. followed by ( 2165 kg fed. ) from 100 % rec. chem. fert. then (2001 kg/fed.) for treatment 50 % rec. org. fert. + 50 % rec. chem. fert. Results were similar with those obtained in most yield attributes i.e. no.of tillers/$m^2$; no. of spikes/$m^2$; spike weight; grain weight/spike and 1000-grains weight thus all yield attributes resulted in grain yield as kg/fed.

The superiority of combination bio-organic and chemical fertilizers for grain yield/fed. reported by **Badiyala and Verma (1991); El-Din *et al.*, (1995); Zaghloul *et al.*, (1996); Fares., (1997); Kabesh *et al.*, (1998); Mohiuddin *et al.*, (2000); Shivankar *et al.*, (2000); Das *et al.*, (2001); Ghallab and Salem (2001); Zeidan and El Karmany (2001); Radwan *et al.*, (2002)** and **Xiong *et al.*, (2005).**

**I- Straw yield ( kg/fed. )**

Straw yield (kg/fed.) significantly affected by bio-organic fertilization treatments. Treatment of 100 % rec. chem. fert. produced the

highest amount of straw yield ( 4734 kg/fed.) and treatment of 25 % rec. org. fert. + 75 % rec. chem. fert. ( 4727 kg/fed. ) was second and the third was 50 % rec. org. fert. + 50 % rec. chem. fert (4485 kg/fed.) ( Table,13). These results are in harmony with obtained by **Nour *et al.*, (1989); El-Ghany (1996); El Karmany *et al.*, (2000)** and **Shivankar *et al.*, (2000)**.

**J -Biological yield ( kg/fed. )**

It is clear from data in the same Table that trend of results in biological yield/fed. were the same trend of grain yield/fed. and the most yield attributes. Data show that treatment of 25 % rec. org. fert. + 75 % rec. chem. fert. gave the highest biological yield/fed. followed by 100 rec. chem. fert. and 50 % rec. org. fert. + 50 % rec. chem. fert. The results are in accordance with those obtained by **Nour *et al.*, (1989)** and **Radwan *et al.*, (2002)**.

**K- Harvest index %**

Data presented in Table ( 13 ) show the same trend of grain yield (kg/fed) which revealed that treatment of 25 % rec. org. fert. + 75 % rec. chem. fert. significantly surpassed other treatments followed by 100 % rec. chem. fert. and 50 % rec. org. fert. + 50 % rec. chem. fert. These results are in accordance with those obtained by **Zeidan and El Karmany (2001).**

**4- Chemical composition:**

**A- protein yield ( kg/fed. )**

Data presented in Table ( 14 ) clear that there were significant differences between bio-organic fertilization treatments for protein yield ( kg/fed. ). Treatments of 25 % rec. org. fert. + 75 % rec. chem. fert.

produced the highest protein yield ( kg/fed. ) followed by treatment of 100 % rec. chem. fert. and treatment of 50 % rec. org. fert. + 50 % rec. chem. fert. was the third.

It can be concluded that results may be due to the same trend recorded in grains yield ( kg/fed. ).Results are in harmony with those obtained by **Zaghloul *et al.*, (1996); Ghallab and Salem (2001); Zeidan and El-Karmany (2001); Xiong *et al.*, (2005)** and **Uyanoz *et al.*, (2006).**

**B- Phosphorus yield ( kg/fed. )**

It is clear from data in the same Table that treatment of 100 % rec. chem. fert. surpassed other bio-organic fertilizer treatments by significant differences due to phosphorus yield/fed. Treatment of 25 % rec. org. fert. + 75 % rec. chem. fert. recorded the second order and treatment of 50 % rec. org. fert. + 50 % rec. chem. fert. was the third. **Patel *et al.*, (1996)** concluded similar results.

**C- Potassium yield ( kg/fed. )**

Highest value for potassium yield occurred with 25 % rec. org. fert. + 75 % rec. chem. fert. treatment (18.86 kg/fed.) and the differences were significant followed by 100 % rec. chem. fert. and 50 % rec. org. fert. + 50 % rec. chem. fert. Results were in accordance with those found by

**Table (14) : Effect of bio-organic fertilization treatments on wheat grain protein, phosphorus and potassium yield ( kg/fed) .**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Bio-organic fertilization treatments | Protein | | Phosphorus | | Potassium | |
|---|---|---|---|---|---|---|
| | % | Yield (kg/fed.) | % | Yield (kg/fed.) | % | Yield (kg/fed.) |
| $F_1$ | 11.17 | 209.43 | 0.286 | 5.36 | 0.871 | 16.33 |
| $F_2$ | 11.17 | 211.55 | 0.288 | 5.45 | 0.846 | 16.02 |
| $F_3$ | 11.93 | 238.72 | 0.303 | 6.06 | 0.896 | 17.92 |
| $F_4$ | 11.86 | 259.26 | 0.298 | 6.51 | 0.863 | 18.86 |
| $F_5$ | 11.90 | 257.64 | 0.302 | 6.53 | 0.866 | 18.74 |
| L.S.D. at 5% | N.S. | 6.38 | N.S. | 0.16 | N.S. | 0.49 |

**Zaghloul *et al.*, (1996); Fares *et al.*, (1997); Shivankar *et al.*, (2000); Ahmed and Ali (2005); Uyanoz *et al.*, (2006)**

**D- *Effect of interaction between weed control treatments and sowing methods on:***

**1- Weeds:**

Table ( 15 ) show that interaction of chemical weeded x sowing method in ridges reduced fresh and dry weights weeds either broad leaved or grassy but for dry weight of broad leaved weeds at 75 DAS interaction of chemical weeded x sowing method in rows was the best.

Interaction of hand weeding x sowing method in ridges has the best effect in controlling fresh and dry weights of grassy weeds at 105 DAS. Interaction of chemical weeded and sowing method in ridges reduced total weeds of fresh and dry weights at105 DAS.

**2- Wheat growth:**

Table ( 16 ) revealed that at 75 DAS interaction between chemical weeded and sowing method in ridges produced the tallest plants; greatest number of tillers/$m^2$ and leaves/$m^2$ also, the heaviest dry weight of tillers/$m^2$ and fresh and dry weight of leaves/$m^2$. The heaviest fresh weight of tillers/$m^2$ recorded by interaction between chemical weeded and sowing in rows. Interaction between unweeded and sowing method in rows gave the highest LA but the best LAI recorded by interaction between hand weeding and sowing method in ridges.

At 105 DAS the interaction between chemical weeded and sowing method in ridges gave the tallest plants; greatest number of tillers/$m^2$, leaves/$m^2$, spikes/$m^2$; the heaviest fresh and dry weights of tillers/$m^2$,

**Table (15 ) : Effect of interaction between weed control treatment and sowing method treatments on fresh and dry weight of weeds ($g/m^2$) in wheat field at 75 and 105 days after sowing.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | | 75 days after sowing | | | | | | 105 days after sowing | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Broad-leaved weeds | | Grassy weeds | | Total weeds | | Broad-leaved weeds | | Grassy weeds | | Total weeds | |
| Sowing methods | weed control | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry |
| Ridges | Unweeded (Control) | 354.30 | 68.55 | 153.30 | 38.75 | 507.60 | 107.30 | 493.20 | 151.50 | 291.80 | 122.60 | 785.00 | 274.10 |
| Rows | | 377.80 | 70.40 | 188.30 | 54.25 | 566.10 | 124.60 | 521.30 | 146.60 | 362.40 | 150.90 | 883.70 | 297.50 |
| Ridges | Hand weeding | 112.20 | 33.60 | 57.45 | 16.80 | 169.60 | 50.40 | 171.80 | 64.05 | 94.25 | 48.40 | 266.00 | 112.40 |
| Rows | | 142.10 | 33.55 | 93.60 | 26.30 | 235.70 | 59.85 | 248.00 | 96.55 | 125.80 | 58.70 | 373.80 | 155.20 |
| Ridges | Chemical weeded | 101.60 | 35.15 | 52.25 | 14.60 | 153.80 | 49.75 | 148.10 | 46.85 | 112.50 | 53.20 | 260.60 | 100.05 |
| Rows | | 127.50 | 31.95 | 58.55 | 21.95 | 186.00 | 53.90 | 192.80 | 72.35 | 131.60 | 60.10 | 324.40 | 132.40 |
| L.S.D. at 5% | | 38.10 | 13.10 | 28.60 | 12.50 | 40.20 | 16.20 | 42.30 | 13.60 | 35.30 | 13.80 | 47.10 | 19.80 |

**Table (16): Effect of interaction between weed control treatments and sowing methods on growth characters of wheat plants at 75 and 105 days after sowing. ( combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | | Plant height (cm) | Tillers /m² | | | Leaves /m² | | | Spikes /m² | | | L. A. (cm²) | L.A.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. | Weight (g) | | No. | Weight (g) | | No. | Weight (g) | | | |
| Sowing methods | Weed control treatments | | | Fresh | Dry | | Fresh | Dry | | Fresh | Dry | | |
| | | **75 days after sowing** | | | | | | | | | | | |
| Ridges | Unweeded (Control) | 53.76 | 185.9 | 749.6 | 88.48 | 665.2 | 705.8 | 92.38 | - | - | - | 202.40 | 1.98 |
| Rows | | 53.48 | 176.6 | 704.4 | 83.92 | 652.2 | 682.1 | 88.49 | - | - | - | 207.10 | 1.87 |
| Ridges | Hand weeding | 55.26 | 379.3 | 1529.0 | 186.80 | 962.0 | 1030.0 | 138.60 | - | - | - | 205.60 | 2.09 |
| Rows | | 55.74 | 378.2 | 1561.0 | 188.20 | 962.0 | 1031.0 | 138.20 | - | - | - | 204.30 | 1.59 |
| Ridges | Chemical weeded | 57.10 | 393.3 | 1599.0 | 196.00 | 1061.0 | 1150.0 | 152.80 | - | - | - | 206.90 | 1.95 |
| Rows | | 56.10 | 380.2 | 1618.0 | 191.00 | 1021.0 | 1087.0 | 146.30 | - | - | - | 206.40 | 1.99 |
| L.S.D. at 5% | | N.S. | 31.1 | 40.3 | 15.50 | 17.2 | 21.1 | 12.90 | - | - | - | 3.40 | 0.04 |
| | | **105 days after sowing** | | | | | | | | | | | |
| Ridges | Unweeded (Control) | 75.49 | 193.0 | 1174.0 | 355.2 | 627.2 | 652.4 | 129.7 | 140.3 | 525.7 | 190.6 | 254.60 | 3.51 |
| Rows | | 75.45 | 180.5 | 1095.0 | 341.5 | 608.4 | 622.9 | 127.4 | 129.8 | 532.3 | 190.1 | 254.30 | 3.43 |
| Ridges | Hand weeding | 77.27 | 387.5 | 2243.0 | 706.8 | 918.8 | 979.1 | 196.1 | 241.3 | 1113.0 | 395.1 | 309.30 | 3.59 |
| Rows | | 76.47 | 377.6 | 2202.0 | 690.5 | 923.2 | 985.4 | 192.5 | 228.3 | 1035.0 | 380.1 | 301.10 | 3.53 |
| Ridges | Chemical weeded | 78.15 | 403.3 | 2355.0 | 745.3 | 998.1 | 1027.0 | 201.3 | 252.5 | 1187.0 | 426.0 | 266.00 | 3.57 |
| Rows | | 77.29 | 390.6 | 2283.0 | 722.4 | 977.7 | 1012.0 | 196.8 | 228.7 | 1083.0 | 387.1 | 280.40 | 3.43 |
| L.S.D. at 5% | | N.S. | 37.4 | 43.6 | 17.6 | 15.2 | 49.6 | 15.6 | 33.4 | 40.3 | 24.1 | 4.07 | N.S. |

leaves/$m^2$, spikes/$m^2$. The best LA and LAI recorded by interaction between hand weeding and sowing method in ridges reported by **Muhammed et al .,(2007).**

### 3- Yield and yield components:

Data presented in Table (17) show the effect of interaction between sowing methods and weed control treatments on yield and yield components of wheat on:

### A- Plant height (cm)

It is clear from data in Table (17) that chemical weeded for sowing in rows gave the tallest plants 93.51 cm followed by interaction of unweeded x sowing in ridges 93.48 cm. Results may be concluded to efficacy of chemical weeded and sowing in ridges in reducing weed population which in turn on well conditions for growth of wheat plants under such interaction treatment.

### B- Number of tillers/$m^2$

Table ( 17 ) show significant differences between interactions of sowing methods and weed control. Interaction of chemical weeded × sowing in ridges produced the greatest no. of tillers/$m^2$ ( 531.3) followed by hand weeding × sowing in ridges (520.1). **Navneet *et al.*, (2003)** found the same trend of results, hand weeding treatments followed by chemical weeded were equally effective in reducing the population and dry matter accumulation of grasses and broad leaf weeds and produced significantly more effective tillers, **Mishra and Kewat., (2002)** stated similar findings.

**Table (17 ) :Effect of interaction between sowing methods and weed control treatments on yield and yield components of wheat.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Treatments / Characters | | Plant height (cm) | No. of tillers/$m^2$ | No. of spikes/$m^2$ | Spike length (cm) | Spike weight (g) | Grain weight of spike (g) | 1000 grains weight (g) | Grain yield kg/fed. | Straw yield kg/fed. | Biological yield (kg/fed.) | Harvest index % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sowing methods | Weed control treatments | | | | | | | | | | | |
| Ridges | Unweeded (Control) | 93.48 | 357.0 | 202.3 | 12.94 | 2.89 | 1.86 | 47.65 | 1595.0 | 3307 | 4902 | 32.55 |
| Rows | | 93.25 | 323.3 | 187.7 | 12.84 | 2.88 | 1.83 | 47.60 | 1488.0 | 3148 | 4636 | 32.10 |
| Ridges | Hand weeding | 93.34 | 520.1 | 347.9 | 13.57 | 3.19 | 2.14 | 49.10 | 2395.0 | 5138 | 7533 | 31.75 |
| Rows | | 93.24 | 503.2 | 331.1 | 13.16 | 3.10 | 2.00 | 49.56 | 2120.0 | 5041 | 7161 | 29.60 |
| Ridges | Chemical weeded | 91.19 | 531.3 | 362.5 | 13.71 | 3.26 | 2.17 | 50.32 | 2387.0 | 5440 | 7827 | 30.70 |
| Rows | | 93.51 | 511.4 | 281.0 | 13.52 | 3.21 | 2.12 | 50.57 | 2162.0 | 5119 | 7281 | 29.70 |
| L.S.D.at 5% | | N.S. | 29.6 | 6.7 | N.S. | N.S. | 0.08 | N.S. | 67.7 | 117 | 152 | 0.70 |

**C- Number of spikes/$m^2$**

There were significant differences between interactions. The highest no. of spikes/$m^2$ recorded by chemical weeded x sowing in ridges and the second spikes number/$m^2$ produced by interaction between hand weeding and sowing in ridges. Results may be due to effect of sowing on beds which gave significantly highest grains/$m^2$ as found by **Tripathi *et al.*, (2002).**

**D- Spike length (cm)**

The differences between interactions for spike length were insignificant. The best treatment is chemical weeded x sowing in ridges followed by hand weeding x sowing in ridges (Table,17).

**E- Spike weight (g)**

Regarding spike weight interaction of chemical weeded and sowing in ridges surpassed other interactions by insignificant differences and chemical weeded x sowing in rows was the second. This trend was in harmony with those obtained in no. of spikes/$m^2$ and spike length which in turn on superiority of same interaction. Results is in accordance with **Tripathi *et al.*, (2002).**

**F- Grain weight of spikes (g):**

Data presented in Table ( 17 ) clear that interaction of chemical weeded and sowing in ridges produced the heaviest grain weight of spikes ( 2.17 g) by significant differences, interaction of hand weeding and sowing in ridges came in the second order (2.14 g). Results was in agreement with those obtained by **Tripathi *et al.*, (2002).** Similar results detected by **Navneet *et al.*, (2003)** who stated that weeding and chemical

weeded were equally effective in reducing the population and dry matter accumulation of grasses and broad leaved weeds and produced significantly more grains per spike.

**G- 1000-grains weight (g):**

There were insignificant differences between interactions of sowing methods and weed control for 1000-grains weight. Chemical weeded x sowing in rows recorded the first order and chemical weeded x sowing in ridges was the second.

**H- Grain yield ( kg/fed.):**

Data presented in Table ( 17 ) revealed that interaction of hand weeding x sowing in ridges produced the best grain yield/fed. followed by chemical weeded x sowing in ridges. The differences were significant. It can be concluded that increasing grain yield/fed. may be due to the effect of sowing in ridges for decreasing weeds either grasses or broad leaved. **Berry and Wilkes (1992)** concluded that seed bed cultivation have a significantly positive effect on yield. **Gupta and Ganpat (1985)** found increase in grain yield as a result of sowing method under hand weeding and isoproturon treatments. **Johri *et al.*, ( 1991 )** indicated that isoproturon at the recommended dose of 1 kg under sowing methods was superior to the other control methods in increasing grain yields. **Saad El Din and Ahmed (2004)** pointed superiority of chemical weeded in narrow rows which increased grain yield 33 % over unweeded control.

**I- Straw yield ( kg/fed. ):**

Interaction between chemical weeded and sowing in ridges significantly increased straw yield/fed. and gave the highest straw yield,

the second order recorded by interaction of hand weeding x sowing in ridges. It is the same trend recorded for no. of tillers/$m^2$ and all spikes attributes. Results may be due to effective of controlling weeds by sowing in ridges and chemical weeded. Similar results were reported by **Samra and Dhillon., (2000); Radwan *et al.*, (2002)** and **Jat *et al.*, (2003b).**

**J- Biological yield ( kg/fed. ):**

It is clear from data in Table ( 17 ) that the differences between interactions were significant and the greatest biological yield/fed. recorded by interaction of chemical weeded x sowing in ridges followed by hand weeding x sowing in ridges. It is the similar trend of tillers number; spikes number; spikes length and weight; grains weight/spike and straw yield/fed. Results were in accordance with obtained by **Mishra and Kewat (2002)** and **Radwan *et al.*, (2002).**

**K- Harvest index %:**

Data in the same Table show that there were significant differences between interactions due to harvest index%. Unweeded x sowing in ridges gave the highest value of harvest index followed by unweeded x sowing in rows.

**4- Chemical composition :**

**A- Protein yield ( kg/fed. )**

Data presented in Table ( 18 ) clear that interaction of sowing in ridges x hand weeding significantly surpassed other interactions and produced 286.92kg protein/fed. followed by interaction of sowing in ridges x chemical weeded 282.47 kg/fed. Results were in harmony with those obtained by **Saad El Din and Ahmed., (2004) and Pandey and**

weeded were equally effective in reducing the population and dry matter accumulation of grasses and broad leaved weeds and produced significantly more grains per spike.

**G- 1000-grains weight (g):**

There were insignificant differences between interactions of sowing methods and weed control for 1000-grains weight. Chemical weeded x sowing in rows recorded the first order and chemical weeded x sowing in ridges was the second.

**H- Grain yield ( kg/fed.):**

Data presented in Table ( 17 ) revealed that interaction of hand weeding x sowing in ridges produced the best grain yield/fed. followed by chemical weeded x sowing in ridges. The differences were significant. It can be concluded that increasing grain yield/fed. may be due to the effect of sowing in ridges for decreasing weeds either grasses or broad leaved. **Berry and Wilkes (1992)** concluded that seed bed cultivation have a significantly positive effect on yield. **Gupta and Ganpat (1985)** found increase in grain yield as a result of sowing method under hand weeding and isoproturon treatments. **Johri *et al.*, ( 1991 )** indicated that isoproturon at the recommended dose of 1 kg under sowing methods was superior to the other control methods in increasing grain yields. **Saad El Din and Ahmed (2004)** pointed superiority of chemical weeded in narrow rows which increased grain yield 33 % over unweeded control.

**I- Straw yield ( kg/fed. ):**

Interaction between chemical weeded and sowing in ridges significantly increased straw yield/fed. and gave the highest straw yield,

the second order recorded by interaction of hand weeding x sowing in ridges. It is the same trend recorded for no. of tillers/$m^2$ and all spikes attributes. Results may be due to effective of controlling weeds by sowing in ridges and chemical weeded. Similar results were reported by **Samra and Dhillon., (2000); Radwan *et al.*, (2002)** and **Jat *et al.*, (2003b).**

**J- Biological yield ( kg/fed. ):**

It is clear from data in Table ( 17 ) that the differences between interactions were significant and the greatest biological yield/fed. recorded by interaction of chemical weeded x sowing in ridges followed by hand weeding x sowing in ridges. It is the similar trend of tillers number; spikes number; spikes length and weight; grains weight/spike and straw yield/fed. Results were in accordance with obtained by **Mishra and Kewat (2002)** and **Radwan *et al.*, (2002).**

**K- Harvest index %:**

Data in the same Table show that there were significant differences between interactions due to harvest index%. Unweeded x sowing in ridges gave the highest value of harvest index followed by unweeded x sowing in rows.

**4- Chemical composition :**

**A- Protein yield ( kg/fed. )**

Data presented in Table ( 18 ) clear that interaction of sowing in ridges x hand weeding significantly surpassed other interactions and produced 286.92kg protein/fed. followed by interaction of sowing in ridges x chemical weeded 282.47 kg/fed. Results were in harmony with those obtained by **Saad El Din and Ahmed., (2004) and Pandey and**

weeded were equally effective in reducing the population and dry matter accumulation of grasses and broad leaved weeds and produced significantly more grains per spike.

**G- 1000-grains weight (g):**

There were insignificant differences between interactions of sowing methods and weed control for 1000-grains weight. Chemical weeded x sowing in rows recorded the first order and chemical weeded x sowing in ridges was the second.

**H- Grain yield ( kg/fed.):**

Data presented in Table ( 17 ) revealed that interaction of hand weeding x sowing in ridges produced the best grain yield/fed. followed by chemical weeded x sowing in ridges. The differences were significant. It can be concluded that increasing grain yield/fed. may be due to the effect of sowing in ridges for decreasing weeds either grasses or broad leaved. **Berry and Wilkes (1992)** concluded that seed bed cultivation have a significantly positive effect on yield. **Gupta and Ganpat (1985)** found increase in grain yield as a result of sowing method under hand weeding and isoproturon treatments. **Johri *et al.*, ( 1991 )** indicated that isoproturon at the recommended dose of 1 kg under sowing methods was superior to the other control methods in increasing grain yields. **Saad El Din and Ahmed (2004)** pointed superiority of chemical weeded in narrow rows which increased grain yield 33 % over unweeded control.

**I- Straw yield ( kg/fed. ):**

Interaction between chemical weeded and sowing in ridges significantly increased straw yield/fed. and gave the highest straw yield,

the second order recorded by interaction of hand weeding x sowing in ridges. It is the same trend recorded for no. of tillers/$m^2$ and all spikes attributes. Results may be due to effective of controlling weeds by sowing in ridges and chemical weeded. Similar results were reported by **Samra and Dhillon., (2000); Radwan *et al.*, (2002)** and **Jat *et al.*, (2003b).**

**J- Biological yield ( kg/fed. ):**

It is clear from data in Table ( 17 ) that the differences between interactions were significant and the greatest biological yield/fed. recorded by interaction of chemical weeded x sowing in ridges followed by hand weeding x sowing in ridges. It is the similar trend of tillers number; spikes number; spikes length and weight; grains weight/spike and straw yield/fed. Results were in accordance with obtained by **Mishra and Kewat (2002)** and **Radwan *et al.*, (2002).**

**K- Harvest index %:**

Data in the same Table show that there were significant differences between interactions due to harvest index%. Unweeded x sowing in ridges gave the highest value of harvest index followed by unweeded x sowing in rows.

**4- Chemical composition :**

**A- Protein yield ( kg/fed. )**

Data presented in Table ( 18 ) clear that interaction of sowing in ridges x hand weeding significantly surpassed other interactions and produced 286.92kg protein/fed. followed by interaction of sowing in ridges x chemical weeded 282.47 kg/fed. Results were in harmony with those obtained by **Saad El Din and Ahmed., (2004) and Pandey and**

**Table (18) : Effect of interaction between sowing methods and weed control treatments on wheat grain protein, phosphorus and potassium yield ( kg/fed) .**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Treatments | | Protein | | Phosphorus | | Potassium | |
|---|---|---|---|---|---|---|---|
| Sowing methods | Weed control | % | Yield (kg/fed.) | % | Yield (kg/fed.) | % | Yield (kg/fed.) |
| Ridges | Unweeded | 11.450 | 182.62 | 0.278 | 4.43 | 0.763 | 12.16 |
| | Hand weeding | 11.980 | 286.92 | 0.300 | 7.18 | 0.917 | 21.96 |
| | Chemical weeded | 11.834 | 282.47 | 0.301 | 7.18 | 0.911 | 21.74 |
| Rows | Unweeded | 11.580 | 172.31 | 0.294 | 4.37 | 0.834 | 12.41 |
| | Hand weeding | 11.380 | 241.25 | 0.302 | 6.4 | 0.889 | 18.85 |
| | Chemical weeded | 11.420 | 246.90 | 0.298 | 6.44 | 0.895 | 19.35 |
| L.S.D. at 5% | | N.S. | 7.70 | N.S. | 0.20 | N.S. | 0.59 |

**Kumar (2005).** It may be concluded that result may be due to the superiority of the same trend recorded for grain yield/fed.

**B- Phosphorus yield ( kg/fed. )**

Table ( 18 ) revealed that interaction of sowing in ridges x hand weeding gave the highest phosphorous yield/fed. and sowing in ridges x chemical weeded recorded the second order by significant differences. Results may be due to the same trend in grain yield/fed. **Saad El Din and Ahmed., (2004)** found similar results.

**C- Potassium yield ( kg/fed. )**

Regarding potassium yield/fed., Ther were significant differences between interaction and the same trend recorded for grain, protein and phosphorus yields/ feddan. Interaction of sowing in ridges x hand weeding recorded the highest value and sowing in ridges x chemical weeded was the second.

**E-** ***Effect of Interaction between bio-organic fertilizaion treatments and sowing methods on:***

**1- Weeds:**

Data presented in Table ( 19 ) clear that there were significant differences in fresh weight of broad leaved weeds and total weeds at 75 and 105 DAS and fresh weight of grassy weeds at 105 DAS. For dry weight of weeds the differences were significant in grassy weeds at 105 DAS. Interaction of sowing method in ridges and 25 % recommended dose of bio-organic fertilizers + 75 % recommended dose of NPK fertilizers in all studied characters except for fresh, dry weight of grassy weeds and dry weight of total weeds at 105 DAS. Interaction of sowing

**Table ( 19) : Effect of interaction between bio-organic fertilization and sowing method treatments on fresh and dry weight of weeds ($g/m^2$) in wheat field at 75 and 105 days after sowing.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | | 75 days after sowing | | | | | | 105 days after sowing | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Broad-leaved weeds | | Grassy weeds | | Total weeds | | Broad-leaved weeds | | Grassy weeds | | Total weeds | |
| Sowing methods | Bio-organic fertilization | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry |
| Ridges | $F_1$ | 220.5 | 50.8 | 101.6 | 25.3 | 322.1 | 77.0 | 288.3 | 93.5 | 180.3 | 81.4 | 468.7 | 174.4 |
| | $F_2$ | 203.1 | 47.7 | 95.3 | 24.9 | 298.4 | 72.6 | 277.6 | 89.8 | 171.8 | 87.1 | 449.5 | 186.0 |
| | $F_3$ | 174.3 | 43.6 | 82.1 | 22.8 | 254.9 | 66.4 | 261.9 | 85.1 | 156.7 | 69.2 | 418.7 | 154.2 |
| | $F_4$ | 170.2 | 42.8 | 77.8 | 21.1 | 246.4 | 63.9 | 256.8 | 83.9 | 160.7 | 71.7 | 417.6 | 155.5 |
| | $F_5$ | 180.2 | 44.0 | 83.2 | 21.9 | 263.2 | 65.9 | 270.3 | 85.5 | 161.1 | 73.4 | 413.4 | 158.8 |
| Rows | $F_1$ | 240.8 | 49.3 | 132.6 | 36.8 | 373.4 | 86.1 | 351.2 | 111.5 | 225.4 | 95.3 | 576.6 | 206.8 |
| | $F_2$ | 230.8 | 47.3 | 130.8 | 36.4 | 361.6 | 83.7 | 341.1 | 109.4 | 217.0 | 92.1 | 558.1 | 201.5 |
| | $F_3$ | 202.6 | 43.5 | 118.2 | 33.3 | 320.8 | 76.8 | 302.2 | 101.6 | 205.9 | 89.6 | 508.1 | 191.1 |
| | $F_4$ | 198.7 | 43.2 | 111.3 | 31.7 | 310.0 | 74.9 | 300.3 | 100.6 | 188.1 | 85.2 | 488.4 | 185.8 |
| | $F_5$ | 204.4 | 43.2 | 115.9 | 32.5 | 320.3 | 75.6 | 308.7 | 102.4 | 196.5 | 87.3 | 505.2 | 189.7 |
| L.S.D. at 5% | | 16.2 | N.S. | 6.5 | 3.7 | 17.9 | N.S. | 15.9 | 4.1 | 15.2 | 4.9 | 17.8 | 6.1 |

method in ridges and 50 % recommended dose of bio-organic fertilizer + 50 % recommended dose of NPK fertilizers recorded the lowest fresh, dry weights of grassy weeds and dry weight of total weeds at 105 DAS.

**2- Wheat growth:**

Data presented in Table (20) show that at 75 DAS the differences were significant for all studied characters except for plant height (cm). Interaction between sowing method in ridgesx 100 % rec. of NPK fertilization produced the greatest number of leaves/$m^2$ and the heaviest tillers dry weight. While interaction between sowing method in ridges x 75 % of rec. of NPK fertilization + 25 % bio organic fert. and gave the heaviest fresh and dry weight of leaves and LAI.Interaction of sowing in rows and 75%rec.chem. fert.+25% rec.organic fert. produced the heaviest tillers fresh weight and highest LA. The greatest no. of tillers/ $m^2$ recorded by interaction of sowing in ridges and 50% rec. chemfert. +50%rec. organic fert.

At105 DAS interactionof sowing in ridges and 100%rec. chem.. fert. came in the first order in no.of tillers / $m^2$; tillers fresh and dry weight/ $m^2$; leaves fresh weight/ $m^2$; spikes fresh and dry weight/ $m^2$. Interaction of sowing in ridges and 75%rec. chem..fert. +25%rec.organic.fert. produced the highest no. of spikes/ $m^2$and LAI. Interaction of sowing in rows and 75% rec. chem..fert. +25% rec. organic fert. produced the greater no. of leaves/ $m^2$; dry weight and LA .

**Table (20): Effect of interaction between bio-organic fertilization treatments and sowing methods on growth characters of wheat plants at 75 and 105 days after sowing .**

**( combined analysis of 2004/2005 and 2005/2006 seasons).**

| Characters / Treatments | | Plant height (cm) | Tillers /m² | | | Leaves /m² | | | Spikes /m² | | | L. A. (cm²) | L.A.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. | Weight (g) | | No. | Weight (g) | | No. | Weight (g) | | | |
| Sowing methods | Bio-organic fertilization treatments | | | Fresh | Dry | | Fresh | Dry | | Fresh | Dry | | |
| | | **75 days after sowing** | | | | | | | | | | | |
| Ridges | $F_1$ | 54.45 | 294.8 | 1199.7 | 147.3 | 849.6 | 896.7 | 124.0 | - | - | - | 203.0 | 1.77 |
| | $F_2$ | 55.08 | 312.4 | 1260.0 | 152.0 | 868.3 | 902.2 | 124.2 | - | - | - | 197.2 | 2.07 |
| | $F_3$ | 55.93 | 335.2 | 1334.0 | 162.8 | 893.0 | 945.6 | 127.8 | - | - | - | 209.6 | 1.96 |
| | $F_4$ | 55.65 | 322.7 | 1315.0 | 159.0 | 929.0 | 1039.0 | 132.1 | - | - | - | 207.0 | 2.09 |
| | $F_5$ | 55.70 | 332.5 | 1354.0 | 164.4 | 941.6 | 1027.0 | 131.6 | - | - | - | 207.9 | 1.98 |
| Rows | $F_1$ | 54.60 | 290.9 | 1229.5 | 148.1 | 826.8 | 864.3 | 119.0 | - | - | - | 197.3 | 1.51 |
| | $F_2$ | 54.80 | 301.1 | 1262.0 | 149.9 | 861.6 | 890.6 | 122.1 | - | - | - | 207.2 | 1.54 |
| | $F_3$ | 55.30 | 320.2 | 1326.5 | 155.9 | 883.1 | 942.7 | 125.2 | - | - | - | 203.3 | 1.94 |
| | $F_4$ | 55.40 | 319.5 | 1385.9 | 158.4 | 925.4 | 996.5 | 128.6 | - | - | - | 211.2 | 1.93 |
| | $F_5$ | 55.95 | 326.6 | 1326.5 | 159.6 | 895.8 | 974.8 | 126.7 | - | - | - | 210.6 | 2.04 |
| L.S.D. at 5% | | N.S. | 33.2 | 46.1 | 9.1 | 26.7 | 23.3 | 2.1 | - | - | - | 3.9 | 0.07 |
| | | **105 days after sowing** | | | | | | | | | | | |
| Ridges | $F_1$ | 74.90 | 293.9 | 1732.0 | 564.9 | 807.9 | 843.3 | 169.7 | 193.1 | 861.6 | 306.9 | 270.2 | 3.44 |
| | $F_2$ | 76.20 | 322.4 | 1864.0 | 591.0 | 819.5 | 854.5 | 171.3 | 199.5 | 903.3 | 320.4 | 272.2 | 3.59 |
| | $F_3$ | 76.90 | 339.6 | 1594.0 | 611.8 | 844.2 | 879.8 | 175.1 | 209.1 | 941.4 | 335.9 | 292.5 | 3.51 |
| | $F_4$ | 78.55 | 340.1 | 2017.0 | 615.5 | 882.3 | 916.0 | 181.3 | 227.8 | 990.4 | 355.7 | 279.0 | 3.69 |
| | $F_5$ | 78.25 | 343.5 | 2033.0 | 629.3 | 886.2 | 937.9 | 181.3 | 227.6 | 1014.0 | 367.2 | 267.9 | 3.52 |
| Rows | $F_1$ | 73.95 | 285.2 | 1753.0 | 552.8 | 791.9 | 830.2 | 165.9 | 174.7 | 746.9 | 266.7 | 272.6 | 3.50 |
| | $F_2$ | 76.25 | 295.3 | 1779.0 | 562.1 | 806.7 | 841.1 | 169.3 | 181.1 | 793.7 | 283.4 | 262.7 | 3.47 |
| | $F_3$ | 77.40 | 320.2 | 1911.0 | 595.3 | 825.7 | 875.2 | 172.9 | 197.2 | 879.0 | 315.9 | 285.5 | 3.29 |
| | $F_4$ | 77.00 | 337.8 | 1923.0 | 607.1 | 886.5 | 929.7 | 186.3 | 213.6 | 1011.0 | 361.2 | 298.1 | 3.50 |
| | $F_5$ | 77.20 | 342.9 | 1932.0 | 607.8 | 871.5 | 891.7 | 174.7 | 211.2 | 988.8 | 353.5 | 274.2 | 3.56 |
| L.S.D. at 5% | | N.S. | 60.1 | 50.3 | 24.1 | 19.8 | 39.9 | 13.8 | 15.4 | 32.9 | 19.4 | 6.6 | 0.15 |

### 3- Yield and yield components :

Table ( 21 ) show the integrated effect of sowing methods and bio-organic fertilization treatments on yield and yield components of wheat.

### A- Plant height (cm):

Data presented in Table (21) clear that the differences between interactions were insignificant and the tallest plants recorded by interaction of sowing in rows x 25 % rec. org. fert. + 75 % rec. chem. fert. ( 94.13 cm ) followed by sowing in ridges x 100 % rec. chem. fert. (93.95 cm ). Similar results recorded by **Nour *et al.*, (1989)**. **Mohiuddin *et al.*, (2000)** stated that combination of biofertilizers significantly increased wheat plant height.

### B- Number of tillers/$m^2$

Regarding no. of tillers/$m^2$ in the same Table results clear insignificantly differences between interactions. The greatest no. of tillers/$m^2$ ( 495.8 ) recorded by sowing ridges x 25 % rec. org. fert. + 75 % rec. chem. fert. and 100 % rec. chem. fert .was the second. **Mikhaeel *et al.*, (1997)** indicated that incorporation of organic manure into soil and mycorrhizal inoculation enhanced plant growth as indicated by increases in shoot dry weight and N,P uptake. **Ghallab and Salem (2001)** reported that biofertilizer (cerealine) *Azospirillum spp* in combination with NPK rates ¼ , ½ and full recommended increased growth characters of wheat plants c.v Giza 167.

### C- Number of spikes/$m^2$

Interactions of sowing methods and bio-organic fertilization treatments had significant differences. Interaction of 25 % rec. org. fert.

**Table (21 ) :Effect of interaction between bio-organic fertilization and sowing methods on yield and yield components of wheat.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Treatments / Characters | | Plant height (cm) | No. of tillers/$m^2$ | No. of spikes/$m^2$ | Spike length (cm) | Spike weight (g) | Grain weight of spike (g) | 1000-grains weight (g) | Grain yield kg/fed. | Straw yield kg/fed. | Biological yield kg/fed. | Harvest index % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sowing methods | Bio-organic fertilization | | | | | | | | | | | |
| Ridges | $F_1$ | 91.75 | 446.1 | 276.4 | 12.9 | 3.02 | 2.00 | 48.19 | 1988 | 4442 | 6430 | 31.10 |
| | $F_2$ | 92.85 | 447.7 | 284.9 | 13.0 | 3.07 | 2.02 | 49.31 | 1979 | 4512 | 6491 | 30.70 |
| | $F_3$ | 91.00 | 460.0 | 298.7 | 13.6 | 3.12 | 2.06 | 49.27 | 2076 | 4552 | 6628 | 31.60 |
| | $F_4$ | 93.70 | 495.8 | 331.0 | 13.6 | 3.16 | 2.09 | 49.17 | 2289 | 4766 | 7055 | 32.30 |
| | $F_5$ | 93.95 | 492.7 | 330.2 | 13.7 | 3.17 | 2.09 | 49.20 | 2298 | 4867 | 7165 | 32.10 |
| Rows | $F_1$ | 91.98 | 425.5 | 253.3 | 12.9 | 2.93 | 1.91 | 48.53 | 1763 | 4207 | 5970 | 29.75 |
| | $F_2$ | 92.75 | 434.2 | 262.6 | 12.9 | 3.00 | 1.98 | 48.68 | 1809 | 4265 | 6074 | 30.00 |
| | $F_3$ | 93.75 | 445.4 | 285.4 | 13.1 | 3.04 | 1.98 | 49.48 | 1927 | 4433 | 6360 | 30.60 |
| | $F_4$ | 94.13 | 462.7 | 309.8 | 13.4 | 3.17 | 2.03 | 49.98 | 2084 | 4689 | 6773 | 30.80 |
| | $F_5$ | 93.53 | 462.1 | 304.7 | 13.3 | 3.15 | 2.02 | 49.60 | 2032 | 4593 | 6625 | 30.70 |
| L.S.D. at 5% | | N.S. | N.S. | 7.7 | N.S. | N.S. | N.S. | N.S. | 78 | 109 | 140 | N.S. |

+ 75 % rec. chem. fert. and sowing in ridges produced the highest no. of spikes/$m^2$ followed by sowing in ridges x 100 % rec. chem. fert.(Table ,21) It can be concluded that results may be due to the effect of sowing in ridges for reducing weeds and the enhancing effect of combination bio-organic and chemical fertilizers on wheat plants. Results were in harmony with those obtained by **El-Din *et al.*, (1995) and Tripathi *et al.*, (2002)**.

**D- Spike length (cm):**

Table ( 21 ) show insignificant differences between interactions for spike length. Interaction of sowing in ridges x 100 % rec. chem. fert. came in the first order (13.7 cm). Interaction between sowing in ridges and (25 % rec. org. fert. + 75 % rec. chem. fert.) or (50 % rec. org. fert. + 50 % rec. chem. fert.) (13.6 cm) at the second order. Results are in harmony with those obtained by **Xiong *et al.*, (2005)**.

**E- Spike weight (g)**

It is clear from data in the same Table that interaction of ( sowing in ridges x 100 rec. chem. fert.) and ( sowing in rows x 25 % rec. org. fert. + 75 % rec. chem. fert.) at the same bar of spike weight ( 3.17 g ) and the second order recorded by ( sowing in ridges x 25 % rec. org. fert. + 75 % rec. chem. fert.) ( 3.16 g ). The differences were insignificant. Similar results were recorded by **El-Din *et al.*, (1995)**.

**F- Weight of grains in spike (g)**

There were insignificant differences between interactions (Table,21). The heaviest weight of grains in spike produced by interactions of sowing in ridges and ( 100 % rec. chem. fert.) or ( 25 % rec. org. fert. + 75 % rec. chem. fert.) 2.09 g followed by ( sowing in

ridges x 50 % rec. org. fert. + 50 % rec. chem. fert.) It is the same trend of spike length and spike weight.

**G- 1000-grains weight (g)**

Data presented in the same Table show insignificant differences between interactions. The heaviest 1000-grains ( 49.98 g ) recorded by sowing in rows x 25 % rec. org. fert. + 75 % rec. chem. fert. followed by ( sowing in rows x 100 % rec. chem. fert.)

**H- Grain yield ( kg/fed. )**

Results in Table ( 21 ) clear significant differences between interactions for grain yield ( kg/fed. ). Interaction of (sowing in ridges x 100 % rec. chem. fert.) produced highest grain yield ( 2298 kg/fed. ) and the second ( 2289 kg/fed. ) recorded by (sowing in ridges x 25 % rec. org. fert. + 75 % rec. chem. fert.). It is the same trend of spike length; spike weight; weight of grains/spike. It can be concluded that increasing grains yield/fed. may be due to reducing weeds by sowing in ridges and the effect of NPK chemical fertilizers for increasing spike weight and weight of grains in spike which in turn on grains yield/fed. Results were in accordance with those obtained by **Tripathi *et al.*, (2002); Jat *et al.*, (2003)**.

**Sushila *et al.*, (2000)** reported that application of FYM increased growth, yield and water use efficiency of wheat also, 90 kg N/ha enhanced growth and yield of wheat. **Xiong *et al.*, (2005)** concluded that NPK promoted wheat growth and increased wheat grain yield.

## I- Straw yield ( kg/fed.)

Interaction of sowing methods and bio-organic fertilization treatments had significant differences in straw yield kg /fed.(Table,21). Interaction of (sowing in ridges x 100 % rec. chem. fert. ) gave the highest straw yield/fed. followed by ( sowing in ridges x 25 % rec. org. fert. + 75 % rec. chem. fert.). It is the same trend of grain yield/fed. Results are in harmony with those obtained by **Nour *et al.*, ( 1989 )** who reported that the highest weight of stems were recorded from plants receiving mineral fertilization higher than bio-fertilized control.

## J- Biological yield (kg/fed.)

Data presented in Table ( 21 ) show significant differences due to interaction of sowing methods and bio-organic fertilization treatments in biological yield/fed. Sowing in ridges x 100 % rec. chem. fert. produced the highest biological yield/fed (7165 kg/fed.) and the second was 7055 kg/fed. which recorded by sowing in ridges x 25 % rec. org. fert. + 75 % rec. chem. fert. treatment.These findings were in accordance with those obtained by **Nour *et al.*, (1989).** It can be concluded that superiority of these interaction may be due to the same result in grain yield and straw yields/fed.. which in turn on biological yield as summation of both yields.

## K- Harvest index %

There were insignificant differences between interaction of sowing methods and bio-organic fertilization treatments in harvest index %. The highest value 32.30 % recorded by ( sowing in ridges x 25 % rec. org. fert. + 75 % rec. chem. fert.) and the second value 32.10 % from (sowing in ridges x 100 % rec. chem. fert. ).

## 4- Chemical composition:

### A- Protein yield ( kg/fed. )

The highest value for protein yield was 279. 8 kg/fed. recorded by interaction of sowing in ridges x 100 % chemical fert. and the second was sowing in ridges x 25 % rec. org. fert. + 75 % rec. chem. fert. (276. 6 kg/fed.) the differences were significant (Table,22) . Results were in accordance with obtained by **Xiong *et al.*, (2005).**

**Uyanoz *et al.*, (2006)** stated that chemical NPK fertilizers could raise wheat grain protein content, total content of amino acids and total content of essential amino acids.

### B- Phosphorus yield ( kg/fed. )

It is clear from data in the same Table that there were significant differences between interactions of sowing methods x bio-organic fertilization treatments. Interaction of ( sowing in ridges x 100 % rec. chemical fert.) produced the highest phosphorus yield/fed. followed by (sowing in ridges x 25 % rec. org. fert. + 75 % rec. chem. fert. ). **Uyanoz *et al.*, (2006)** found similar results. **Zaghloul *et al.*, (1996)** pointed that wheat plants N, P and K concentrations were highest with bio-organic fertilizers with 45 kg N/fed.

### C- Potassium yield ( kg/fed. )

Regarding to potassium yield/fed. Table ( 22 ) show the same trend in protein and P yield/fed. ( sowing in ridges x 100 % rec. chem. fert.) significantly surpassed other interactions followed by ( sowing in ridges x 25 % rec. org. fert. + 75 % rec. chem. fert. ) Results were in harmony with those obtained by **Zaghloul *et al.*, (1996)** and **Uyanoz *et al.*, (2006).**

**Table (22) : Effect of interaction between bio-organic fertilization and sowing methods treatments on wheat grain protein, phosphorus and potassium yield (kg/fed) .**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Treatments | | Protein | | Phosphorus | | Potassium | |
|---|---|---|---|---|---|---|---|
| Sowing methods | Bio-organic fertilization | % | Yield (kg/fed.) | % | Yield (kg/fed.) | % | Yield (kg/fed.) |
| Ridges | $F_1$ | 11.19 | 222.45 | 0.284 | 5.64 | 0.866 | 17.21 |
| | $F_2$ | 11.23 | 222.24 | 0.284 | 5.62 | 0.833 | 16.48 |
| | $F_3$ | 12.21 | 253.47 | 0.299 | 6.2 | 0.905 | 18.78 |
| | $F_4$ | 12.03 | 275.36 | 0.298 | 6.82 | 0.861 | 19.7 |
| | $F_5$ | 12.11 | 278.28 | 0.299 | 6.87 | 0.855 | 19.64 |
| Rows | $F_1$ | 11.15 | 196.57 | 0.288 | 5.09 | 0.875 | 15.42 |
| | $F_2$ | 11.11 | 200.97 | 0.292 | 5.28 | 0.860 | 15.55 |
| | $F_3$ | 11.65 | 224.49 | 0.307 | 5.91 | 0.888 | 17.11 |
| | $F_4$ | 11.69 | 243.60 | 0.298 | 6.21 | 0.874 | 18.21 |
| | $F_5$ | 11.69 | 237.54 | 0.306 | 6.19 | 0.877 | 17.82 |
| L.S.D. at 5% | | N.S. | 9.02 | N.S. | 0.23 | N.S. | 0.68 |

***F- Effect of interaction between weed control treatments and bio-organic fertilization treatments on:***

**1- Weeds:**

Data presented in Table ( 23 ) show that interaction of chemical weeded x (25 % recommended dose of bio-organic manure + 75 % recommended dose of chemical fertilizers) reduced fresh weight of broad leaved , grassy and total weeds at 75 DAS, also, dry weight of grassy and total weeds but interaction of hand weeding x 25 % recommended bio-organic + 75 % recommended NPK gave the lowest dry weight of broad leaved weeds DAS.

Concerning second sample at 105 DAS the lowest dry weight of broad leaved and total weeds dry weights recorded from interaction of chemical weeded x 100 % recommended dose of chemical fertilizers. Hand weeding x 100 % recommended dose of NPK reduced fresh weight of broad leaved weeds but hand weeding x 25 % recommended dose of bio-organic fertilizer + 75 % recommended dose of NPK gave the lowest dry weight of grassy these results are in agreement with those reported by **Badiyala et al (1991).**

**2- Wheat growth:**

Data presented in Table ( 24 a,b) show effect of interaction between weed control and bio-organic fertilization. Differences were significant for all studied characters Interaction of chemical weeded and 25 % recommended dose of bio-organic fertilizer + 75 % of NPK recommended dose produced the highest number of leaves/$m^2$ at75DAS.

**Table (23 ) : Effect of interaction between weed control treatment and bio-organic fertilization treatments on fresh and dry weight of weeds ($g/m^2$)in wheat field at 75 and 105 days after sowing.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | | 75 days after sowing | | | | | | 105 days after sowing | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Broad-leaved weeds | | Grassy weeds | | Total weeds | | Broad-leaved weeds | | Grassy weeds | | Total weeds | |
| Weed control | Bio-organic fertilization | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry |
| Unweeded (Control) | $F_1$ | 419.2 | 77.15 | 194.80 | 50.57 | 614.0 | 127.72 | 542.3 | 159.00 | 355.60 | 148.10 | 897.8 | 307.1 |
| | $F_2$ | 389.7 | 71.70 | 186.00 | 48.90 | 575.7 | 120.60 | 526.8 | 153.80 | 335.50 | 140.10 | 862.3 | 293.9 |
| | $F_3$ | 332.1 | 65.42 | 159.60 | 45.47 | 491.7 | 110.89 | 463.5 | 140.30 | 313.70 | 128.10 | 777.2 | 268.4 |
| | $F_4$ | 337.5 | 66.40 | 152.00 | 43.22 | 489.5 | 109.62 | 484.5 | 143.70 | 310.10 | 131.70 | 794.6 | 275.4 |
| | $F_5$ | 351.8 | 66.80 | 162.20 | 44.42 | 514.0 | 111.22 | 509.2 | 148.30 | 320.40 | 135.50 | 829.6 | 283.8 |
| Hand weeding | $F_1$ | 144.1 | 36.75 | 82.72 | 23.95 | 226.8 | 60.70 | 227.5 | 85.37 | 120.80 | 56.87 | 348.3 | 142.2 |
| | $F_2$ | 137.8 | 35.82 | 80.55 | 23.35 | 218.3 | 59.17 | 223.7 | 83.77 | 117.30 | 55.45 | 341.0 | 139.2 |
| | $F_3$ | 123.0 | 33.00 | 73.02 | 20.42 | 196.0 | 53.42 | 208.5 | 79.77 | 107.70 | 52.97 | 316.2 | 132.7 |
| | $F_4$ | 111.0 | 30.50 | 68.78 | 19.72 | 179.0 | 50.22 | 190.0 | 75.80 | 100.60 | 50.25 | 290.6 | 126.0 |
| | $F_5$ | 119.9 | 31.82 | 72.47 | 20.25 | 192.3 | 52.07 | 159.6 | 76.72 | 103.40 | 52.20 | 365.0 | 128.9 |
| Chemical weeded | $F_1$ | 128.6 | 36.27 | 73.82 | 20.20 | 202.4 | 56.47 | 179.6 | 62.27 | 132.10 | 60.07 | 311.7 | 122.3 |
| | $F_2$ | 123.4 | 34.97 | 72.65 | 19.80 | 196.0 | 54.77 | 177.6 | 61.45 | 130.40 | 59.75 | 308.0 | 121.2 |
| | $F_3$ | 108.0 | 32.32 | 68.00 | 18.22 | 176.0 | 50.54 | 174.2 | 60.50 | 122.50 | 56.97 | 296.7 | 117.4 |
| | $F_4$ | 104.9 | 32.05 | 60.73 | 16.25 | 165.6 | 48.30 | 161.2 | 57.20 | 112.60 | 53.35 | 273.8 | 110.5 |
| | $F_5$ | 105.2 | 32.07 | 64.25 | 19.90 | 169.4 | 48.97 | 159.7 | 56.80 | 88.02 | 53.17 | 247.7 | 109.9 |
| L.S.D. at 5% | | 17.4 | 5.20 | 15.60 | 4.50 | 19.7 | 7.20 | 17.2 | 6.08 | 16.40 | 6.06 | 19.6 | 9.9 |

**Table (24a ): Effect of interaction between weed control treatments and bio-organic fertilization treatments on growth characters of wheat plants at 75 days after sowing .**

**( combined analysis of 2004/2005 and 2005/2006 seasons)**

| Characters / Treatments | | Plant height (cm) | Tillers /$m^2$ | | | Leaves /$m^2$ | | | L. A. ($cm^2$) | L.A.I. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. | Weight (g) | | No. | Weight (g) | | | |
| Weed control treatments | Bio-organic fertilization treatments | | | Fresh | Dry | | Fresh | Dry | | |
| Unweeded (Control) | $F_1$ | 52.7 | 165.4 | 661.9 | 80.97 | 617.8 | 652.0 | 86.9 | 205.6 | 1.54 |
| | $F_2$ | 53.3 | 173.8 | 707.8 | 84.65 | 653.8 | 672.4 | 89.0 | 268.0 | 1.90 |
| | $F_3$ | 53.9 | 188.6 | 746.6 | 87.40 | 665.4 | 698.3 | 91.0 | 207.0 | 2.03 |
| | $F_4$ | 54.0 | 189.6 | 759.6 | 88.75 | 685.3 | 741.6 | 93.4 | 209.7 | 2.09 |
| | $F_5$ | 54.0 | 189.0 | 759.3 | 89.12 | 671.3 | 705.6 | 91.7 | 203.6 | 2.07 |
| Hand weeding | $F_1$ | 54.5 | 359.8 | 1439.0 | 178.00 | 935.2 | 980.0 | 135.7 | 188.7 | 1.70 |
| | $F_2$ | 55.2 | 376.4 | 1497.0 | 182.90 | 944.4 | 980.0 | 134.8 | 200.9 | 1.54 |
| | $F_3$ | 55.9 | 390.6 | 1618.0 | 192.20 | 952.9 | 1003.0 | 137.5 | 203.8 | 2.05 |
| | $F_4$ | 55.6 | 376.1 | 1559.0 | 188.30 | 994.0 | 1108.0 | 143.0 | 215.8 | 1.94 |
| | $F_5$ | 56.1 | 390.9 | 1612.0 | 196.30 | 983.3 | 1083.0 | 141.1 | 215.5 | 1.97 |
| Chemical weeded | $F_1$ | 55.6 | 353.4 | 1541.0 | 184.10 | 961.5 | 1009.0 | 142.1 | 205.8 | 1.69 |
| | $F_2$ | 56.1 | 370.1 | 1579.0 | 185.30 | 996.4 | 1036.0 | 145.6 | 208.0 | 1.98 |
| | $F_3$ | 57.0 | 404.1 | 1627.0 | 198.60 | 1045.0 | 1129.0 | 150.9 | 208.5 | 1.77 |
| | $F_4$ | 57.0 | 397.6 | 1647.0 | 199.00 | 1102.0 | 1204.0 | 154.8 | 201.9 | 2.17 |
| | $F_5$ | 57.4 | 408.8 | 1650.0 | 200.60 | 1101.0 | 1214.0 | 156.9 | 208.7 | 2.25 |
| L.S.D. at 5% | | 2.0 | 41.6 | 57.3 | 24.20 | 32.6 | 28.9 | 6.2 | 4.8 | 0.09 |

**Table (24b ): Effect of interaction between weed control treatments and bio-organic fertilization treatments on growth characters of wheat plants at 105 days after sowing**

**( combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Characters / Treatments | | Plant height (cm) | Tillers /m² | | | Leaves /m² | | | Spikes /m² | | | L. A. (cm²) | L.A.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No. | Weight (g) | | No. | Weight (g) | | No. | Weight (g) | | | |
| Weed control treatments | Bio-organic fertilization treatments | | | Fresh | Dry | | Fresh | Dry | | Fresh | Dry | | |
| Unweeded (Control) | $F_1$ | 73.00 | 172.3 | 1006 | 324.0 | 586.3 | 609.6 | 122.1 | 116.6 | 455.7 | 161.3 | 249.1 | 3.50 |
| | $F_2$ | 73.70 | 178.9 | 1056 | 337.0 | 600.9 | 625.2 | 125.8 | 128.3 | 495.6 | 175.3 | 234.7 | 3.53 |
| | $F_3$ | 76.20 | 191.4 | 1189 | 358.0 | 631.4 | 641.9 | 129.4 | 141.5 | 542.5 | 196.5 | 283.1 | 3.65 |
| | $F_4$ | 77.70 | 195.1 | 1194 | 355.0 | 640.5 | 661.1 | 134.6 | 147.3 | 583.1 | 211.9 | 262.4 | 3.43 |
| | $F_5$ | 76.50 | 196.0 | 1231 | 367.0 | 629.9 | 650.1 | 131.1 | 141.2 | 568.0 | 206.9 | 242.8 | 3.62 |
| Hand weeding | $F_1$ | 74.30 | 350.7 | 2114 | 670.5 | 891.6 | 939.1 | 189.0 | 214.3 | 965.0 | 344.4 | 287.6 | 3.47 |
| | $F_2$ | 77.00 | 371.5 | 2172 | 684.0 | 901.8 | 940.6 | 188.4 | 214.5 | 995.0 | 355.2 | 297.0 | 3.58 |
| | $F_3$ | 77.40 | 382.9 | 2246 | 702.5 | 918.0 | 974.5 | 192.8 | 230.1 | 1049.0 | 371.7 | 323.1 | 3.45 |
| | $F_4$ | 77.30 | 401.2 | 2268 | 709.0 | 950.5 | 1025.0 | 201.9 | 260.6 | 1197.0 | 426.8 | 321.4 | 3.70 |
| | $F_5$ | 78.20 | 406.3 | 2312 | 727.0 | 943.2 | 1031.0 | 199.3 | 254.5 | 1163.0 | 414.7 | 297.1 | 3.51 |
| Chemical weeded | $F_1$ | 76.00 | 345.5 | 2107 | 681.0 | 921.9 | 961.0 | 192.3 | 220.8 | 992.0 | 354.7 | 277.3 | 3.43 |
| | $F_2$ | 78.00 | 362.5 | 2236 | 707.0 | 936.7 | 977.6 | 196.7 | 227.3 | 1050.0 | 375.2 | 270.7 | 3.50 |
| | $F_3$ | 77.80 | 415.6 | 2396 | 750.0 | 955.5 | 1016.0 | 199.8 | 237.9 | 1138.0 | 406.8 | 260.9 | 3.41 |
| | $F_4$ | 78.30 | 420.6 | 2443 | 769.0 | 1062.0 | 1082.0 | 203.0 | 254.2 | 1222.0 | 436.7 | 284.1 | 3.65 |
| | $F_5$ | 78.40 | 427.2 | 2412 | 425.0 | 1063.0 | 1061.0 | 203.6 | 262.5 | 1274.0 | 459.4 | 273.2 | 3.50 |
| L.S.D. at 5% | | 2.07 | 73.1 | 60.8 | 30.6 | 24.6 | 41.5 | 6.4 | 36.9 | 72.3 | 36.6 | 8.0 | 0.19 |

The greatest LA $cm^2$ recorded by interaction between hand weeding and (25 % of bio-organic fertilizer + 75 % of NPK recommended dose.) at 75 DAS (Table,24a) . Interaction of chemical weeded and (25 % recommended dose of bio-organic fertilizer + 75 % recommended dose of NPK) gave the highest fresh and dry weights of tillers/$m^2$ and leaves/$m^2$ dry weight.

It is clear from Table (24b) that the highest LA recorded by interaction of hand weeding and 50 % bio-organic fertilizer and 50 % NPK. Interaction of hand weeding and 25 % bio-organic fertilizer + 75 % NPK recorded the best LAI.at 105 DAS .

**3- Yield and yield components:**

**A- Plant height (cm)**

Data presented in Table ( 25) show insignificant differences between weed control and bio-organic fertilization treatments in plant height. Interaction of ( unweeded x 25 % rec. org. fert. + 75 % rec. chem. fert.) produced the tallest plants. Results may be due to high competition between wheat plants and weeds for space and light under unweeded conditions.

**B- Number of tillers/$m^2$**

Number of tillers/$m^2$ was significantly affected by interactions of weed control and bio-organic fertilization (Table,25). Interaction of ( chemical weeded x 100 % rec. org. fert. ) produced the highest no. of tillers/$m^2$ (545) followed by ( hand weeding x 25 % rec. org. fert. + 75 % rec. chem. fert. ). **Reynders and VIassak (1982), Radics and Szalai (1987), Mohiuddin et al., (2000)** obtained similar results and concluded

**Table (25) :Effect of interaction between bio-organic fertilization and weed control treatments on yield and yield components of wheat.**

**( Combined analysis of 2004/2005 and 2005/2006 seasons ).**

| Treatments / Characters | | Plant height (cm) | No. of tillers/$m^2$ | No. of spikes/$m^2$ | Spike length (cm) | Spike weight (g) | Grain weight of spike (g) | 1000-grains weight (g) | Grain yield kg/fed. | Straw yield kg/fed. | Biological yield kg/fed. | Harvest index % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weed control treatments | Bio-organic fertilizati | | | | | | | | | | | |
| Unweeded (Control) | $F_1$ | 92.52 | 309.6 | 167.9 | 12.5 | 2.77 | 1.86 | 46.73 | 1408 | 3041 | 4449 | 31.6 |
| | $F_2$ | 92.25 | 329.2 | 186.0 | 12.6 | 2.79 | 1.80 | 47.40 | 1480 | 3125 | 4605 | 32.1 |
| | $F_3$ | 92.05 | 345.4 | 203.8 | 13.0 | 2.90 | 1.84 | 47.68 | 1607 | 3178 | 4785 | 33.5 |
| | $F_4$ | 96.50 | 361.1 | 215.1 | 13.1 | 2.97 | 1.87 | 48.23 | 1628 | 3415 | 5043 | 32.3 |
| | $F_5$ | 93.40 | 355.5 | 202.2 | 13.1 | 2.96 | 1.89 | 47.58 | 1585 | 3378 | 4963 | 31.9 |
| Hand weeding | $F_1$ | 91.90 | 493.9 | 308.9 | 13.0 | 3.07 | 2.03 | 48.63 | 2099 | 4929 | 7028 | 29.7 |
| | $F_2$ | 93.35 | 487.3 | 307.9 | 13.0 | 3.16 | 2.10 | 48.96 | 2060 | 4908 | 6968 | 29.5 |
| | $F_3$ | 93.50 | 502.4 | 330.6 | 13.4 | 3.08 | 2.04 | 49.91 | 2148 | 5030 | 7178 | 29.8 |
| | $F_4$ | 94.05 | 542.9 | 419.9 | 13.7 | 3.23 | 2.11 | 49.75 | 2551 | 5334 | 7885 | 32.2 |
| | $F_5$ | 93.50 | 531.8 | 370.0 | 13.5 | 3.18 | 2.06 | 49.46 | 2429 | 5245 | 7674 | 31.6 |
| Chemical weeded | $F_1$ | 91.10 | 503.8 | 317.8 | 13.3 | 3.09 | 2.05 | 49.73 | 2119 | 5005 | 7124 | 29.7 |
| | $F_2$ | 92.85 | 506.5 | 327.5 | 13.3 | 3.15 | 2.10 | 50.63 | 2142 | 5133 | 7275 | 29.4 |
| | $F_3$ | 91.50 | 517.7 | 342.4 | 13.7 | 3.27 | 2.17 | 50.04 | 2249 | 5246 | 7495 | 29.9 |
| | $F_4$ | 91.15 | 533.9 | 201.1 | 13.7 | 3.31 | 2.20 | 50.73 | 2379 | 5434 | 7813 | 30.3 |
| | $F_5$ | 94.95 | 545.0 | 380.1 | 13.8 | 3.35 | 2.21 | 51.18 | 2483 | 5580 | 8063 | 30.7 |
| L.S.D. at 5% | | N.S. | 50.7 | 9.5 | N.S. | N.S. | N.S. | N.S. | 96 | 134 | 172 | 1.2 |

that increasing tillering turn to reductions in weeds grasses and broad leaved.

**C- Number of spikes/$m^2$**

Table ( 25)clear that interaction of ( hand weeding x 25 % rec. org. fert. + 75 % rec. chem. fert. ) significantly surpassed other interactions and gave the greatest no. of spikes/$m^2$ (419.9) and the second value (380.1)recorded by ( chemical weeded x 100 % rec. chem. fert. ). Results are in agreement with those obtained by **El-Din *et al.*, (1995).**

**D- Spike length (cm)**

There were insignificant differences between interactions for spike length. ( chemical weeded x 100 % rec. chem. fert.) gave the tallest spikes followed by ( hand weeding x 25 % rec. org. fert. + 75 % rec. chem. fert.) (Table,25) Similar results reported by **Xiong *et al.*, (2005)**.

**E- Spike weight (g)**

Weight of spike was insignificantly affected by interaction of weed control and bio-organic fertilization treatments at found in the same Table. Interaction of chemical weeded x 100 rec. chem. fert. and sowing in rows x 25 % rec. org. fert. + 75 % rec. chem. fert. recored the first order in spike weight (3.35g) and the second (3.31g) recorded by chemical weeded x 25 % rec. org. fert. + 75 % rec. chem. fert.

**F- Grain weight of spike (g)**

Regarding to grain weight/spike interaction of (chemical weeded x 100 rec. chem. fert.) surpassed other interactions by insignificant differences.

**G- 1000-grains weight (g)**

Data presented in Table ( 25) clear the same trend recorded in spike length, weight and grain weight/spike. The heaviest 1000-grains produced by interaction of ( chemical weeded x 100 % rec. chem. fert. ) followed by chemical weeded x( 25 % rec. org. fert. + 75 % rec. chem. fert.) and the differences were non-significant.

**H- Grain yield ( kg/fed. )**

Concerning grain yield/fed. interaction of hand weeding x (25 % rec. org. fert. + 75 % rec. chem. fert.) produced the highest grain yield (2551 kg/fed.) followed by chemical weeded x 100 % rec. chem. fert. (2483 kg/fed) . The differences were significant. **Radwan et al., (2002)** stated that wheat grain dry weight was distinguished as a result of application bio-and organic fertilizers in different weed control treatments, generally, association of bio-and FYM organic fertilizers and chemical weeded or hand weeding led to significant increase in grain yield relative to control. **Xiong *et al.*, (2005)** pointed that organic fertilizer combination with chemical N, P and K could further improve wheat grain quality. Similar results reported by **El-Din *et al.*, (1995); Patel *et al.*, (1996); Fares, (1997); Mohiuddin *et al.*, (2000); Sushila *et al.*, (2000); Das *et al.*, (2001)** and **Ghallab and Salem, ( 2001 )**.

**I- Straw yield ( kg/fed.)**

Results in Table ( 25) revealed that interaction of (chemical weeded x 100 % rec. chem. fert. ) gave the highest straw yield (5580 kg/fed). and ( chemical weeded x 25 % rec. org. fert. + 75 % rec. chem. fert.). recorded the second value of straw yield ( 5434 kg/fed.). The

**Table (26): Effect of interaction between bio-organic fertilization and weed control treatments on wheat grain protein, phosphorus and potassium yield ( kg/fed) .**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Treatments | | Protein | | Phosphorus | | Potassium | |
|---|---|---|---|---|---|---|---|
| Weed control treatments | Bio-organic fertilization | % | Yield (kg/fed.) | % | Yield (kg/fed.) | % | Yield (kg/fed.) |
| Unweeded | $F_1$ | 11.04 | 155.4 | 0.280 | 3.94 | 0.799 | 11.24 |
| | $F_2$ | 11.24 | 166.3 | 0.284 | 4.20 | 0.772 | 11.42 |
| | $F_3$ | 11.82 | 189.9 | 0.291 | 4.85 | 0.835 | 13.41 |
| | $F_4$ | 11.73 | 190.9 | 0.285 | 4.63 | 0.796 | 12.95 |
| | $F_5$ | 11.76 | 186.4 | 0.289 | 4.58 | 0.791 | 12.53 |
| Hand weeding | $F_1$ | 11.04 | 231.7 | 0.288 | 6.04 | 0.916 | 19.22 |
| | $F_2$ | 11.13 | 229.3 | 0.288 | 5.93 | 0.890 | 18.33 |
| | $F_3$ | 12.11 | 260.2 | 0.311 | 6.60 | 0.925 | 19.86 |
| | $F_4$ | 12.11 | 308.9 | 0.308 | 7.85 | 0.885 | 22.57 |
| | $F_5$ | 12.05 | 292.6 | 0.311 | 7.55 | 0.902 | 21.90 |
| Chemical weeded | $F_1$ | 11.44 | 242.2 | 0.291 | 6.17 | 0.897 | 19.00 |
| | $F_2$ | 11.15 | 238.8 | 0.293 | 6.27 | 0.877 | 18.78 |
| | $F_3$ | 11.87 | 266.9 | 0.306 | 6.88 | 0.928 | 20.87 |
| | $F_4$ | 11.76 | 279.7 | 0.302 | 7.18 | 0.909 | 21.62 |
| | $F_5$ | 11.9 | 295.4 | 0.307 | 7.62 | 0.906 | 22.49 |
| L.S.D. at 5% | | N.S. | 11.0 | N.S. | 0.28 | N.S. | 0.84 |

## G- - *Effect of Interaction between sowing methods, weed control and bio-organic fertilization treatments on :*

### 1- Weeds:

It clear from Table ( 27 ) that at 75DAS interaction of sowing method in ridges x hand weeding x 25 % bio-organic fert. +75% rec. chem. fert recorded the lowest weight of fresh and dry weight of broad leaved and dry weight of total weeds. Interaction of sowing in ridges x chemical weeded and 100% rec.chem, fert. gave the lowest dry weight of grassy weeds and fresh weight of total weeds . Sowing in ridges x chemical weeded x 25% rec.organic fert.+75% rec. chem. fert. recordedthe lowest fresh weight of grassy weeds.

At105DAS datd revealed that interaction of sowing method in ridges x chemical weeded x 100% rec. chem.. fert. recorded the lowest fresh , dry weight of broad leaved and total weeds .Interaction of sowing in ridges x hand weeded x 25% rec.organic fert.+75% rec. chem. fert. gave the lowest fresh and dry weight of grassy weeds. ( Fig 1 and Fig 2, respectively ).

### 2- Wheat growth:

Table (28a) revealed that at 75 DAS interaction between sowing method in ridges x chemical weeded x 100 % rec. of NPK gave the heaviest fresh, dry weight of tillers and leaves/$m^2$, number of leaves and but the best LA recorded by interaction between sowing method in ridges x hand weeding x 100 % rec. of NPK. The tallest plants gave in interaction between sowing method in ridges x chemical weeded x 50 % rec. of bio-organic fert. + 50 % rec. of NPK.

**Table ( 27 ) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on fresh and dry weight of weeds ( g/m$^2$) in wheat field at 75 and 105 days after sowing.**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Treatments | | | 75 days after sowing | | | | | | 105 days after sowing | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sowing methods | Weed control | Bio-organic fertilization | Broad leaved weeds | | Grassy weeds | | Total weeds | | Broad leaved weeds | | Grassy weeds | | Total weeds | |
| | | | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry | Fresh | Dry |
| Ridges | Unweeded | $F_1$ | 415.0 | 78.6 | 185.1 | 43.0 | 600.1 | 121.6 | 528.2 | 161.7 | 318.5 | 135.2 | 846.5 | 296.9 |
| | | $F_2$ | 379.1 | 70.7 | 169.5 | 40.6 | 548.7 | 111.3 | 496.7 | 153.6 | 296.5 | 127.2 | 793.2 | 280.8 |
| | | $F_3$ | 316.0 | 63.8 | 138.6 | 37.6 | 454.6 | 101.5 | 464.0 | 144.2 | 266.7 | 106.8 | 730.8 | 251.0 |
| | | $F_4$ | 319.8 | 79.1 | 130.1 | 35.2 | 449.9 | 99.4 | 469.8 | 146.5 | 287.3 | 120.8 | 757.1 | 267.3 |
| | | $F_5$ | 341.6 | 65.5 | 143.3 | 37.1 | 484.9 | 102.7 | 507.2 | 141.1 | 289.9 | 123.2 | 797.1 | 274.6 |
| | Hand weeding | $F_1$ | 131.1 | 36.5 | 62.7 | 18.8 | 193.8 | 55.3 | 180.5 | 68.0 | 100.5 | 52.9 | 281.0 | 119.4 |
| | | $F_2$ | 123.6 | 36.2 | 61.6 | 18.5 | 185.3 | 54.7 | 178.7 | 66.7 | 97.5 | 49.7 | 276.2 | 116.4 |
| | | $F_3$ | 108.4 | 33.4 | 55.5 | 15.6 | 163.9 | 49.2 | 168.2 | 63.2 | 91.8 | 47.2 | 260.1 | 110.4 |
| | | $F_4$ | 93.6 | 29.5 | 51.7 | 15.0 | 145.3 | 44.5 | 163.4 | 60.5 | 89.6 | 45.1 | 253.0 | 105.6 |
| | | $F_5$ | 104.4 | 32.2 | 55.5 | 15.8 | 160.0 | 48.0 | 168.1 | 61.8 | 91.7 | 48.5 | 259.8 | 110.3 |
| | Chemical weeded | $F_1$ | 115.3 | 37.2 | 57.0 | 16.6 | 172.4 | 53.8 | 156.4 | 49.2 | 122.0 | 57.6 | 278.4 | 106.9 |
| | | $F_2$ | 106.7 | 36.1 | 54.6 | 15.5 | 161.2 | 51.7 | 157.6 | 49.3 | 121.5 | 57.5 | 279.1 | 106.8 |
| | | $F_3$ | 94.1 | 33.6 | 52.2 | 13.6 | 146.3 | 48.5 | 153.6 | 47.9 | 111.8 | 53.5 | 265.4 | 101.4 |
| | | $F_4$ | 97.2 | 34.6 | 47.1 | 13.1 | 144.3 | 47.7 | 137.4 | 44.6 | 105.3 | 49.1 | 242.8 | 93.7 |
| | | $F_5$ | 94.5 | 34.0 | 50.2 | 12.8 | 131.2 | 46.8 | 135.7 | 43.2 | 101.7 | 48.4 | 237.4 | 91.6 |
| Rows | Unweeded | $F_1$ | 423.4 | 75.6 | 204.6 | 58.1 | 628.0 | 133.7 | 576.2 | 156.4 | 392.8 | 161.0 | 969.0 | 317.3 |
| | | $F_2$ | 403.3 | 72.7 | 202.5 | 57.1 | 602.8 | 129.8 | 556.9 | 154.1 | 374.5 | 153.2 | 931.4 | 307.3 |
| | | $F_3$ | 348.2 | 67.0 | 180.5 | 53.2 | 528.8 | 120.2 | 463.1 | 136.4 | 360.8 | 149.5 | 823.9 | 285.9 |
| | | $F_4$ | 355.2 | 68.6 | 173.9 | 51.2 | 529.1 | 119.8 | 499.2 | 141.0 | 333.0 | 142.7 | 832.3 | 283.8 |
| | | $F_5$ | 362.0 | 68.0 | 180.1 | 51.6 | 542.1 | 119.7 | 511.3 | 145.2 | 351.1 | 147.9 | 862.4 | 293.1 |
| | Hand weeding | $F_1$ | 157.1 | 36.9 | 102.7 | 29.1 | 259.9 | 66.0 | 274.5 | 102.7 | 141.2 | 62.3 | 415.8 | 165.1 |
| | | $F_2$ | 151.9 | 35.4 | 99.4 | 28.2 | 251.3 | 63.6 | 268.8 | 100.8 | 137.2 | 61.1 | 406.0 | 162.0 |
| | | $F_3$ | 137.6 | 32.5 | 90.5 | 25.0 | 228.1 | 57.6 | 248.7 | 96.3 | 123.7 | 58.7 | 372.4 | 155.1 |
| | | $F_4$ | 128.4 | 31.5 | 85.9 | 24.4 | 214.3 | 55.9 | 216.7 | 91.1 | 111.5 | 55.4 | 328.3 | 146.5 |
| | | $F_5$ | 135.3 | 31.4 | 89.4 | 24.7 | 224.8 | 56.1 | 231.2 | 91.7 | 115.2 | 55.8 | 346.4 | 147.5 |
| | Chemical weeded | $F_1$ | 141.9 | 35.3 | 90.6 | 23.8 | 232.5 | 59.1 | 202.8 | 75.3 | 142.3 | 62.5 | 345.1 | 137.8 |
| | | $F_2$ | 140.2 | 33.8 | 90.6 | 24.0 | 230.9 | 58.7 | 197.6 | 73.6 | 139.3 | 62.0 | 336.9 | 135.7 |
| | | $F_3$ | 122.0 | 31.0 | 83.8 | 21.5 | 205.8 | 52.5 | 194.9 | 73.1 | 133.2 | 60.4 | 327.9 | 133.0 |
| | | $F_4$ | 112.7 | 29.5 | 74.4 | 19.3 | 187.1 | 48.8 | 185.1 | 69.8 | 120.0 | 57.6 | 304.9 | 127.4 |
| | | $F_5$ | 116.0 | 30.1 | 78.3 | 21.0 | 198.8 | 51.1 | 183.7 | 70.4 | 123.3 | 57.9 | 307.1 | 128.4 |
| L.S.D. at 5% | | | 20.9 | 7.3 | 17.9 | 6.4 | 23.7 | 10.3 | 15.2 | 8.5 | 19.1 | 8.6 | 23.5 | 11.0 |

**Table (28a ) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on growth characters of wheat plants after 75 days after sowing . (Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Treatments | | | Plant height (cm) | Tillers /m² | | | Leaves /m² | | | L.A. (cm²) | L.A.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sowing methods | Weed control | Bio-organic fertilizatio | | No. | Weight (g) | | No. | Weight (g) | | | |
| | | | | | Fresh | Dry | | Fresh | Dry | | |
| Ridges | Unweeded | $F_1$ | 53.6 | 168.4 | 676.4 | 83.2 | 626.1 | 656.6 | 88.7 | 202.2 | 1.89 |
| | | $F_2$ | 53.1 | 176.5 | 725.5 | 87.9 | 656.1 | 679.0 | 89.2 | 191.0 | 2.27 |
| | | $F_3$ | 54.1 | 194.7 | 771.8 | 89.8 | 676.9 | 717.2 | 93.2 | 221.2 | 2.03 |
| | | $F_4$ | 54.3 | 198.0 | 785.3 | 90.0 | 692.4 | 763.6 | 95.7 | 199.8 | 1.85 |
| | | $F_5$ | 53.9 | 192.3 | 789.2 | 91.3 | 674.6 | 712.7 | 93.4 | 189.9 | 1.89 |
| | Hand weeding | $F_1$ | 54.3 | 359.7 | 1420.5 | 175.2 | 935.0 | 998.7 | 137.2 | 190.4 | 1.87 |
| | | $F_2$ | 55.1 | 381.4 | 1505.0 | 181.2 | 931.1 | 972.3 | 134.4 | 195.8 | 1.97 |
| | | $F_3$ | 55.9 | 395.2 | 1612.5 | 195.4 | 949.3 | 985.3 | 136.3 | 200.3 | 2.05 |
| | | $F_4$ | 55.3 | 368.9 | 1505.0 | 185.6 | 1004.5 | 1109.7 | 143.9 | 218.8 | 2.32 |
| | | $F_5$ | 55.6 | 391.6 | 1605.5 | 196.9 | 990.8 | 1089.4 | 141.5 | 222.5 | 2.26 |
| | Chemical weeded | $F_1$ | 56.1 | 356.3 | 1502.0 | 183.3 | 987.6 | 1035.0 | 146.2 | 216.6 | 1.56 |
| | | $F_2$ | 56.7 | 379.4 | 1551.5 | 187.1 | 1017.8 | 1055.2 | 147.5 | 204.9 | 2.00 |
| | | $F_3$ | 57.8 | 415.9 | 1618.5 | 203.4 | 1052.0 | 1134.3 | 154.0 | 207.4 | 1.81 |
| | | $F_4$ | 57.5 | 414.8 | 1658.5 | 201.4 | 1090.2 | 1246.1 | 157.0 | 202.5 | 2.13 |
| | | $F_5$ | 57.6 | 413.8 | 1669.5 | 205.0 | 1160.2 | 1281.1 | 159.9 | 203.5 | 2.29 |
| Rows | Unweeded | $F_1$ | 52.4 | 162.4 | 647.5 | 78.7 | 609.6 | 647.4 | 85.0 | 209.0 | 1.19 |
| | | $F_2$ | 53.3 | 171.3 | 690.2 | 81.5 | 651.4 | 665.8 | 87.3 | 204.6 | 1.54 |
| | | $F_3$ | 53.7 | 182.5 | 721.6 | 85.0 | 653.9 | 679.4 | 88.9 | 193.0 | 2.03 |
| | | $F_4$ | 53.7 | 181.3 | 734.0 | 87.4 | 678.3 | 719.7 | 91.1 | 219.6 | 2.34 |
| | | $F_5$ | 54.1 | 185.7 | 729.0 | 86.9 | 668.0 | 698.6 | 90.1 | 209.4 | 2.24 |
| | Hand weeding | $F_1$ | 54.7 | 359.9 | 1462.0 | 180.9 | 935.4 | 961.3 | 134.2 | 187.6 | 1.54 |
| | | $F_2$ | 55.4 | 371.5 | 1490.0 | 184.6 | 957.9 | 987.6 | 135.3 | 206.1 | 1.11 |
| | | $F_3$ | 56.0 | 386.0 | 1623.0 | 189.1 | 956.4 | 1023.0 | 138.8 | 207.2 | 2.06 |
| | | $F_4$ | 55.9 | 383.4 | 1614.0 | 191.0 | 983.9 | 1106.0 | 142.2 | 212.9 | 1.57 |
| | | $F_5$ | 56.6 | 390.3 | 1619.0 | 195.8 | 976.6 | 1078.0 | 141.1 | 208.6 | 1.67 |
| | Chemical weeded | $F_1$ | 55.1 | 350.5 | 1580.5 | 184.9 | 935.5 | 984.4 | 141.2 | 196.0 | 1.82 |
| | | $F_2$ | 55.7 | 360.8 | 1607.0 | 183.8 | 975.7 | 1018.0 | 140.1 | 211.2 | 2.00 |
| | | $F_3$ | 56.3 | 392.2 | 1636.0 | 193.9 | 1039.0 | 1125.0 | 147.9 | 209.6 | 1.73 |
| | | $F_4$ | 56.6 | 393.9 | 1637.0 | 196.7 | 1114.0 | 1164.0 | 152.7 | 201.3 | 2.21 |
| | | $F_5$ | 57.2 | 403.8 | 1632.0 | 196.3 | 1042.0 | 1147.0 | 149.5 | 214.0 | 2.22 |
| L.S.D. at 5% | | | N.S. | 58.3 | 67.1 | 34.3 | 46.7 | 40.7 | 7.3 | 6.8 | 0.13 |

**Table ( 28b) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on growth characters of wheat plants at 105 days after sowing . (Combined analysis of 2004/2005 and 2005/2006 seasons).**

| Treatments | | | Plant height (cm) | Tillers /m² | | | Leaves /m² | | | Spikes /m² | | | L.A. (cm²) | L.A.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sowing methods | Weed control | Bio-organic | | No. | Weight (g) | | No. | Weight (g) | | No. | Weight (g) | | | |
| | | | | | Fresh | Dry | | Fresh | Dry | | Fresh | Dry | | |
| Ridges | Unweeded | $F_1$ | 74.1 | 177.0 | 1022 | 331 | 600 | 621.1 | 123.6 | 118.3 | 465.0 | 163.3 | 256.9 | 3.30 |
| | | $F_2$ | 73.3 | 183.9 | 1095 | 345 | 614 | 640.7 | 128.9 | 135.4 | 509.6 | 178.7 | 239.1 | 3.80 |
| | | $F_3$ | 75.1 | 201.3 | 1253 | 369 | 647 | 662.1 | 131.8 | 150.5 | 547.5 | 200.9 | 287.2 | 3.51 |
| | | $F_4$ | 77.8 | 203.5 | 1253 | 358 | 644 | 675.0 | 134.0 | 152.5 | 561.5 | 208.0 | 248.6 | 3.63 |
| | | $F_5$ | 77.0 | 199.6 | 1253 | 372 | 631 | 663.2 | 130.6 | 145.2 | 545.0 | 202.5 | 241.2 | 3.42 |
| | Hand weeding | $F_1$ | 74.1 | 356.1 | 2108 | 679 | 894 | 949.4 | 192.1 | 229.2 | 1066.5 | 381.0 | 297.9 | 3.48 |
| | | $F_2$ | 76.0 | 387.0 | 2196 | 696 | 895 | 940.9 | 188.2 | 224.0 | 1076.5 | 380.9 | 292.1 | 3.57 |
| | | $F_3$ | 77.1 | 201.3 | 2271 | 708 | 911 | 951.4 | 191.9 | 227.7 | 1085.5 | 381.5 | 324.9 | 3.51 |
| | | $F_4$ | 78.7 | 392.6 | 2274 | 707 | 954 | 1019.6 | 204.8 | 265.3 | 1179.0 | 419.4 | 327.9 | 3.63 |
| | | $F_5$ | 78.8 | 406.4 | 2370 | 744 | 941 | 1034.6 | 203.6 | 260.7 | 1160.5 | 412.7 | 304.1 | 3.60 |
| | Chemical weeded | $F_1$ | 76.5 | 348.7 | 2067 | 685 | 930 | 959.5 | 193.5 | 231.8 | 1053.5 | 376.4 | 255.9 | 3.55 |
| | | $F_2$ | 77.8 | 396.5 | 2301 | 731 | 950 | 981.9 | 196.8 | 238.7 | 1124.0 | 401.6 | 285.4 | 3.41 |
| | | $F_3$ | 78.5 | 422.3 | 2405 | 758 | 976 | 1026.1 | 201.6 | 249.4 | 1191.0 | 425.5 | 265.5 | 3.51 |
| | | $F_4$ | 79.1 | 424.7 | 2524 | 781 | 988 | 1053.5 | 205.1 | 265.8 | 1231.5 | 439.9 | 265.1 | 3.81 |
| | | $F_5$ | 78.9 | 424.6 | 2478 | 771 | 1087 | 1116.0 | 209.8 | 277.1 | 1339.5 | 486.4 | 258.3 | 3.56 |
| Rows | Unweeded | $F_1$ | 71.9 | 167.7 | 990 | 317 | 572 | 598.1 | 120.6 | 115.0 | 446.5 | 159.4 | 241.4 | 3.71 |
| | | $F_2$ | 74.2 | 174.0 | 1018 | 330 | 588 | 609.8 | 122.7 | 122.1 | 481.7 | 171.8 | 230.3 | 3.26 |
| | | $F_3$ | 77.2 | 181.6 | 1125 | 347 | 616 | 621.7 | 127.1 | 132.6 | 537.6 | 192.2 | 279.0 | 3.19 |
| | | $F_4$ | 77.6 | 187.0 | 1136 | 352 | 637 | 647.3 | 135.2 | 142.2 | 604.7 | 216.0 | 276.3 | 3.23 |
| | | $F_5$ | 76.1 | 192.5 | 1209 | 363 | 629 | 637.9 | 131.6 | 137.3 | 591.0 | 211.3 | 244.4 | 3.81 |
| | Hand weeding | $F_1$ | 74.6 | 345.4 | 2120 | 513 | 890 | 929.5 | 186.0 | 199.5 | 863.5 | 307.8 | 277.5 | 3.47 |
| | | $F_2$ | 76.4 | 356.1 | 2149 | 672 | 909 | 940.3 | 188.6 | 205.1 | 923.0 | 329.6 | 301.9 | 3.59 |
| | | $F_3$ | 77.9 | 370.5 | 2222 | 694 | 925 | 997.9 | 193.8 | 232.4 | 1013.5 | 362.0 | 321.4 | 3.38 |
| | | $F_4$ | 75.8 | 409.9 | 2263 | 712 | 947 | 1031.5 | 199.1 | 256.1 | 1215.5 | 434.3 | 314.9 | 3.77 |
| | | $F_5$ | 77.6 | 406.3 | 2255 | 710 | 945 | 1029.4 | 195.1 | 248.4 | 1165.5 | 416.8 | 290.2 | 3.44 |
| | Chemical weeded | $F_1$ | 75.4 | 342.4 | 2148 | 678 | 914 | 963.0 | 191.1 | 209.9 | 931.0 | 333.0 | 298.8 | 3.32 |
| | | $F_2$ | 78.3 | 355.9 | 2171 | 684 | 924 | 973.4 | 196.6 | 216.2 | 976.5 | 348.8 | 256.0 | 3.59 |
| | | $F_3$ | 77.2 | 408.8 | 2387 | 742 | 936 | 1007.5 | 198.5 | 226.5 | 1086.0 | 388.0 | 256.3 | 3.31 |
| | | $F_4$ | 77.6 | 416.5 | 2362 | 757 | 1075 | 1560.7 | 200.9 | 242.7 | 1213.5 | 433.5 | 303.1 | 3.51 |
| | | $F_5$ | 78.0 | 429.8 | 2346 | 750 | 1040 | 1007.8 | 197.5 | 248.0 | 1210.5 | 432.6 | 288.0 | 3.43 |
| L.S.D. at 5% | | | N.S | 10.4 | 87.2 | 42.3 | 35 | 171.5 | 78.3 | 89.2 | 39.5 | 51.3 | 11.4 | 0.26 |

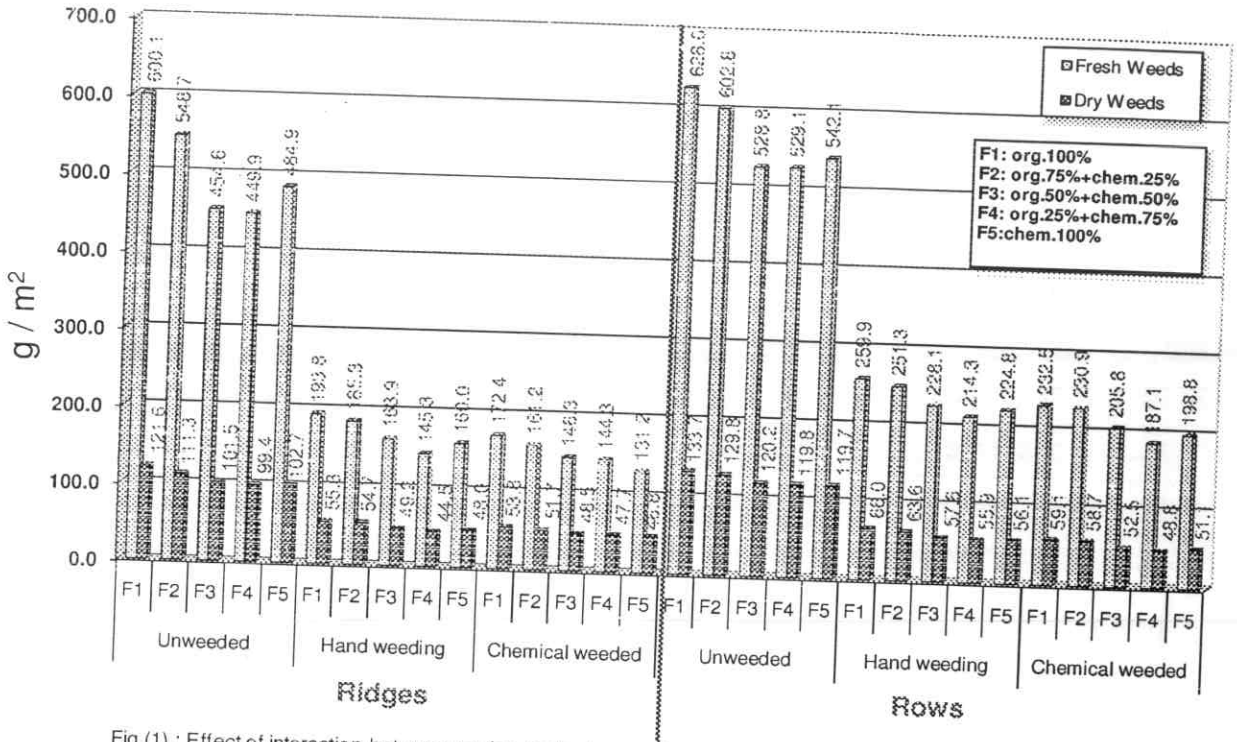


Fig.(1) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on fresh and dry weight of weeds ( g/m²) in wheat field at 75 days after sowing.
(Combined analysis of 2004/2005 and 2

*ults discussion*

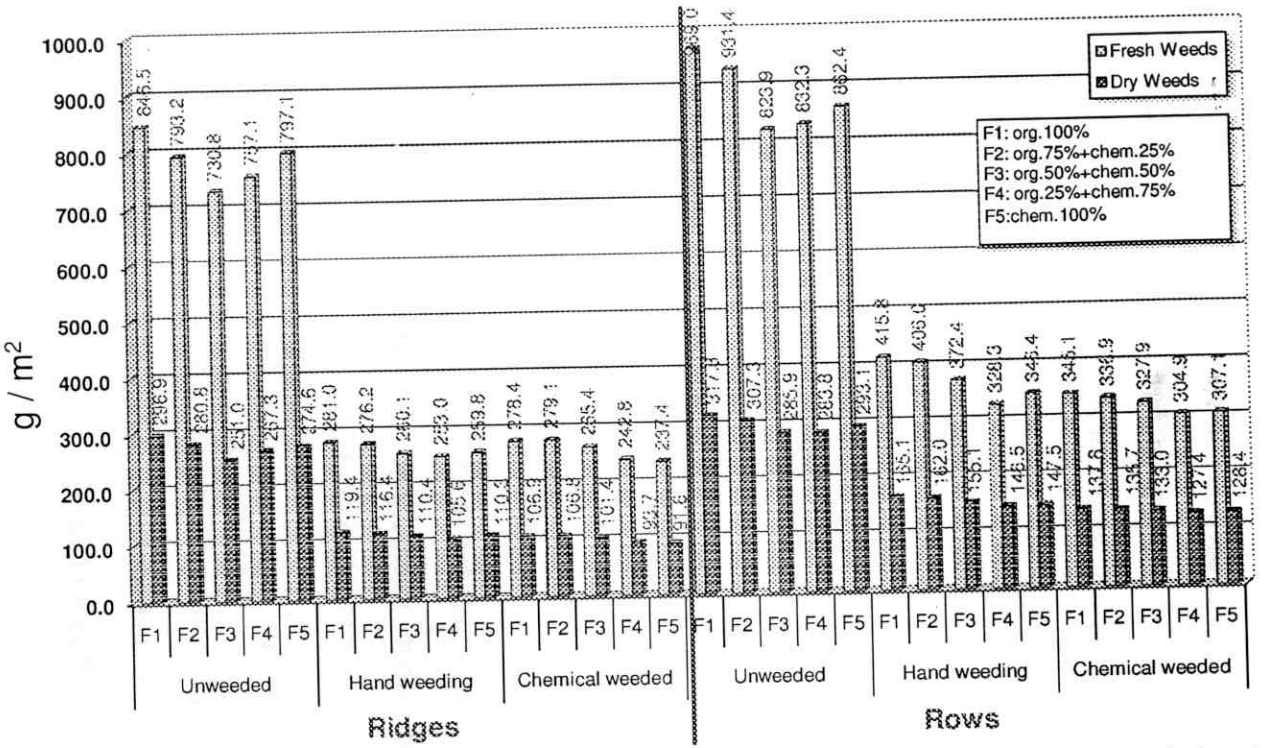


Fig.(2) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on fresh and dry weight of weeds ( g/m²) in wheat field at 105 days after sowing.



*Results discussion*

At 105 DAS (Table,28b) interaction between sowing method in ridges x chemical weeded x 100 % rec. of NPK gave the greatest number of leaves/ $m^2$ and spikes/$m^2$ also, the heaviest dry weight of leaves and spikes / $m^2$ . Interaction between sowing method in ridges x chemical weeded x 25 % rec. of bio-organic fert. + 75 % rec. of NPK.gave the tallest plants; fresh and dry weight of tillers and the best LAI .Interaction of sowing in rows x chemical weeded x 100% rec.chem. fert. gave the greatest no. of tillers /$m^2$ .Interaction of sowing in rows x chem.. weeded x 25 % rec. of bio-organic fert. + 75 % rec. of NPK gave the heaviest weight of fresh leaves/$m^2$ . Interaction between sowing method in ridges x hand weeding x 25 % rec. of bio-organic fert. + 75 % rec. of NPK gave the highest LA.

**3- Yield and yield components:**

**A- Plant height ( cm )**

Data presented in Table ( 29 ) show that interaction between (sowing in ridges x unweeded x 25 % rec. org. fert. + 75 % rec. chem. fert.) surpassed other interactions by insignificant differences and produced the tallest plants ( 96.6 cm ).

**B- Number of tillers/$m^2$**

Interaction of (sowing in ridges x chemical weeded x 100 % rec. chem. fert.) produced the highest number of tillers/$m^2$ ( 567.7/$m^2$ ) the differences were significant (Table29) .

**C- Number of spikes/$m^2$**

There were significant differences between interactions from the same Table and the greatest no. of spikes/$m^2$ ( 403.3 ) were recorded from

**Table (29 ) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on wheat yield and yield components.**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Treatments | | | Plant height (cm) | No. of tillers/m$^2$ | No. of spikes/m$^2$ | Spik length (cm) | Spike weight (g) | Grain weight/ spike (g) | 1000 grain weight (g) | Grain yield (kg/fed) | Straw yield (kg/fed) | Biological yield (kg/fed) | Harvest index % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sowing methods | Weed control | Bio-organic fertilization | | | | | | | | | | | |
| Ridges | Unweeded | $F_1$ | 93.3 | 323.4 | 169.5 | 12.6 | 2.78 | 1.80 | 46.76 | 1451 | 3095 | 4546 | 31.9 |
| | | $F_2$ | 91.1 | 348.1 | 194.9 | 12.6 | 2.79 | 1.81 | 48.34 | 1522 | 3186 | 4708 | 32.3 |
| | | $F_3$ | 91.3 | 365.4 | 215.5 | 13.1 | 2.94 | 1.87 | 47.92 | 1671 | 3178 | 4849 | 34.4 |
| | | $F_4$ | 96.6 | 381.6 | 224.1 | 13.2 | 2.98 | 1.88 | 47.77 | 1682 | 3537 | 5219 | 32.3 |
| | | $F_5$ | 94.9 | 366.7 | 207.8 | 13.2 | 2.94 | 1.92 | 47.48 | 1649 | 3539 | 5188 | 31.8 |
| | Hand weeding | $F_1$ | 90.8 | 504.9 | 328.5 | 13.0 | 3.17 | 2.13 | 48.52 | 2290 | 5066 | 7355 | 31.1 |
| | | $F_2$ | 95.3 | 486.2 | 318.5 | 13.0 | 3.23 | 2.14 | 48.87 | 2179 | 4946 | 7126 | 30.5 |
| | | $F_3$ | 92.1 | 503.4 | 324.2 | 13.8 | 3.15 | 2.12 | 49.34 | 2181 | 4999 | 7180 | 30.3 |
| | | $F_4$ | 95.2 | 562.3 | 388.9 | 14.0 | 3.25 | 2.19 | 49.27 | 2721 | 5374 | 8096 | 33.6 |
| | | $F_5$ | 93.1 | 543.8 | 379.6 | 13.9 | 3.16 | 2.12 | 49.61 | 2605 | 5305 | 7910 | 33.0 |
| | Chemical weeded | $F_1$ | 90.7 | 509.9 | 331.4 | 13.3 | 3.12 | 2.10 | 49.31 | 2223 | 5168 | 7389 | 30.1 |
| | | $F_2$ | 92.1 | 508.9 | 341.4 | 13.5 | 3.20 | 2.13 | 50.74 | 2236 | 5436 | 7643 | 29.3 |
| | | $F_3$ | 89.6 | 526.3 | 356.6 | 14.0 | 3.29 | 2.19 | 50.56 | 2376 | 5481 | 7857 | 30.2 |
| | | $F_4$ | 89.3 | 543.8 | 380.1 | 13.6 | 3.27 | 2.20 | 50.49 | 2463 | 5388 | 7851 | 31.3 |
| | | $F_5$ | 93.4 | 567.7 | 403.3 | 14.0 | 3.42 | 2.24 | 50.55 | 2640 | 5758 | 8399 | 31.4 |
| ROWS | Unweeded | $F_1$ | 91.7 | 295.9 | 166.4 | 12.4 | 2.76 | 1.80 | 46.71 | 1365 | 2988 | 4353 | 31.4 |
| | | $F_2$ | 93.3 | 310.4 | 177.1 | 12.6 | 2.81 | 1.80 | 46.46 | 1438 | 3065 | 4504 | 31.9 |
| | | $F_3$ | 92.8 | 325.4 | 192.2 | 12.9 | 2.87 | 1.82 | 48.44 | 1544 | 3225 | 4724 | 32.7 |
| | | $F_4$ | 96.4 | 290.7 | 206.2 | 13.0 | 2.91 | 1.86 | 48.72 | 1574 | 3293 | 4862 | 32.3 |
| | | $F_5$ | 91.8 | 344.2 | 196.6 | 13.1 | 2.99 | 1.87 | 47.68 | 1517 | 3217 | 4734 | 32.0 |
| | Hand weeding | $F_1$ | 93.0 | 482.9 | 289.4 | 13.0 | 2.97 | 1.94 | 48.74 | 1909 | 4792 | 6702 | 28.4 |
| | | $F_2$ | 91.4 | 488.3 | 297.4 | 13.0 | 3.10 | 2.05 | 49.06 | 1941 | 4870 | 6812 | 28.5 |
| | | $F_3$ | 95.0 | 504.8 | 337.0 | 13.1 | 3.02 | 1.97 | 50.47 | 2116 | 5062 | 7178 | 29.4 |
| | | $F_4$ | 92.9 | 523.5 | 371.3 | 13.4 | 3.22 | 2.04 | 50.24 | 2381 | 5294 | 7676 | 30.9 |
| | | $F_5$ | 93.8 | 519.8 | 360.5 | 13.2 | 3.20 | 2.01 | 49.31 | 2254 | 5185 | 7440 | 30.3 |
| | Chemical weeded | $F_1$ | 91.2 | 497.8 | 304.2 | 13.3 | 3.07 | 2.01 | 50.16 | 2016 | 4842 | 6858 | 29.4 |
| | | $F_2$ | 93.6 | 504.1 | 313.5 | 13.2 | 3.10 | 2.08 | 50.53 | 2048 | 4861 | 6909 | 29.6 |
| | | $F_3$ | 93.4 | 509.1 | 328.3 | 13.4 | 3.24 | 2.16 | 49.54 | 2123 | 5013 | 7136 | 29.7 |
| | | $F_4$ | 93.0 | 524.0 | 352.2 | 13.9 | 3.35 | 2.21 | 50.98 | 2297 | 5480 | 7777 | 29.4 |
| | | $F_5$ | 96.2 | 522.3 | 357.0 | 13.7 | 3.29 | 2.18 | 51.82 | 2326 | 5402 | 7728 | 30.0 |
| L.S.D. at 5% | | | N.S. | 71.5 | 13.4 | N.S. | N.S. | N.S | N.S | 136 | 189 | 244 | 1.7 |

interaction of sowing in ridges x chemical weeded x 100 % rec. chem. fert.Results may be in turn to the best effect of sowing in ridges and chemical weeded for reducing weeds both grasses and broad leaved, and easily soluble of N,P,K nutrients from 100 % rec. chem. fert.

**D- Spike length ( cm )**

It is clear from data in Table ( 29 ) that the tallest spikes 14 cm produced by interaction of (sowing in ridges x chemical weeded x 100 % rec. chem. fert.) but the differences were insignificant.

**E- Spike weight ( g )**

Regarding to spike weight the heaviest spike ( 3.42 g ) produced by interaction of ( sowing in ridges x chemical weeded x 100 % rec. chem. fert. ). The differences were insignificant.

**F- Grain weight/spike ( g )**

Data presented in Table ( 29 ) revealed that there were insignificant differences between interactions. Interaction of sowing in ridges x chemical weeded x 100 % rec. chem. fert. recorded the heaviest grain weight/spike ( 2.24 g ). It is the same trend of no. of tillers/$m^2$; no. of spikes/$m^2$; spike length; spike weight which reflected on grain weight/spike.

**G- 1000-grain weight**

It is clear from data in the same Table that the heaviest 1000-grains produced by interaction of sowing in rows x chemical weeded x 100 % rec. chem. fert. followed by sowing in rows x chemical weeded x 25 % rec. org. fert. + 75 % rec. chem. fert. The differences were insignificant. It

can be concluded that results may be due to the best effect of 100 % rec. chem. fert. and effect of chemical weeded in reducing both broad leaves and grassy weeds growing with wheat plants.

**H- Grain yield ( kg/fed. )**

There were significant differences between interactions in grain yield/fed.( Table 29 and Fig. 3 ). The highest grain yield 2721 kg/fed. produced by interaction between sowing in ridges x hand weeding x 25 % rec. org. fert. + 75 % rec. chem. fert. The second grain yield ( 2640 kg/fed. ) recorded by interaction of sowing in ridges x chemical weeded x 100 % rec. chem. fert. **Nour *et al.*, (1989)** pointed that the highest weight of grains, stems and biological yield were recorded from plants receiving mineral fertilization higher than bio-fertilized control. **Patel *et al.*, (1996)** concluded that in a field trial wheat grain yield increased with up to 90 kg N + 45 kg $P_2O_5$ / ha and was increased when seed was inoculated with bio-fertilizers. **Mohiuddin *et al.*, (2000)**. stated that combination of biofertilizers at low NPK fertilizer levels significantly increased yield attributes, grain and straw yield. **Das *et al.*, (2001)** cleared that the application of biofertilizers and growth regulators, with the chemical fertilizers as integrated nutrient management system increased average grain yield. **Ghallab and Salem., (2001)** studied the effect of chemical and bio-fertilizers on wheat cv Giza 167 and concluded that the highest yield was obtained with the highest NPK ( full recommended ) combined with both biofertilizers cerealine ( *Azospirillum spp* ) and Nemales ( *Serratia spp* ). and **Radwan *et al.*, (2002)** revealed that association of biofertilizer with composted FYM and chemical herbicide application or

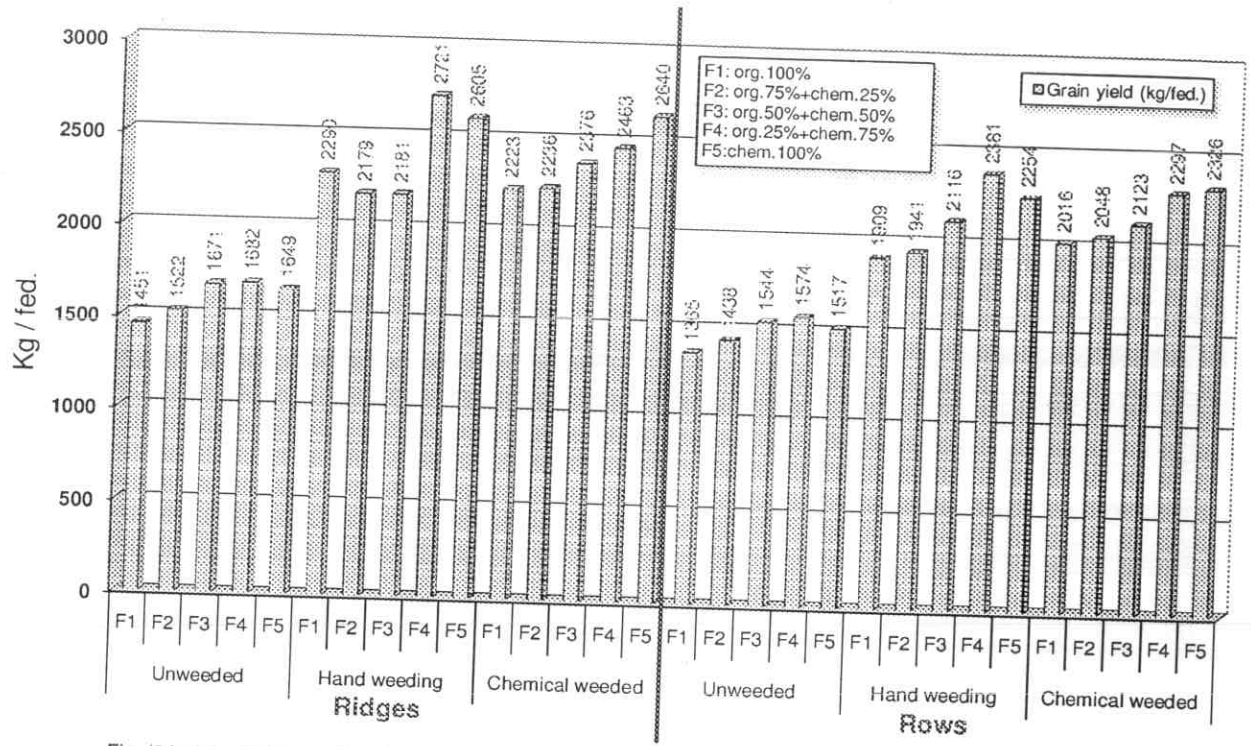


Fig. (3 ) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on wheat grain yield (Kg / fed.).
(Combined analysis of 2004/2005 and 2005/2006 seasons)

hand weeding led to a significant increase in grain, straw and bio-logical yield of wheat relative to the control.

**I- Straw yield ( kg/fed. )**

Concerning straw yield/fed. ( Table 29 and Fig. 4) interaction of sowing in ridges x chemical weeded x 100 % rec. chem. fert. recorded the greatest straw yield 5758 kg/fed. followed by sowing in ridges x chemical weeded x 50 % rec. org. fert. + 50 % rec. chem. fert. (5481 kg/fed.).

**J- Biological yield ( kg/fed. )**

Data presented in Table ( 29 and Fig. 5) cleared that interaction of sowing in ridges x chemical weeded x 100 % rec. chem. fert. significantly surpassed other interactions, produced 8399 kg/fed. followed by 8096 kg/fed. for sowing in ridges x hand weeding x 25 % rec. org. fert. + 75 % rec. chem. fert. It is the same trend recorded in no. of tillers/$m^2$; spike attributes i.e. no. of spikes/$m^2$; spike length; spike weight; grain weight/spike; grain and straw yields/fed. which resulted on biological yield/fed. Results were in accordance with those obtained by **Nour *et al.*, (1989); Mikhaeel *et al.*, (1997)** and **Radwan *et al.*, (2002).**

**K- Harvest index %**

The highest value of harvest index % recorded by interaction of sowing in ridges x unweeded x 50 % rec. org. fert. + 50 % rec. chem. fert. (34.4%) and the second was sowing in ridges x hand weeding x 25 % rec. org. fert. + 75 % rec. chem. fert. (33.6%).

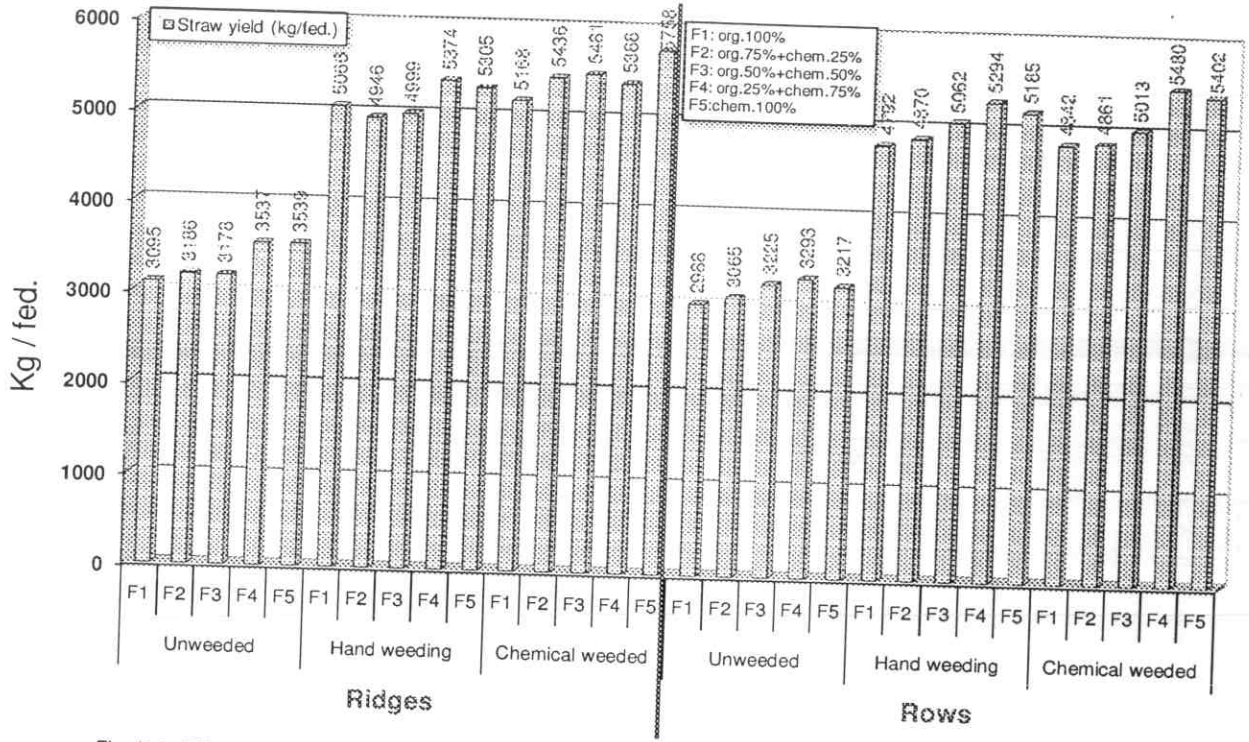


Fig. (4 ) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on wheat Straw yield (Kg / fed.).
(Combined analysis of 2004/2005 and 2005/2006 seasons)

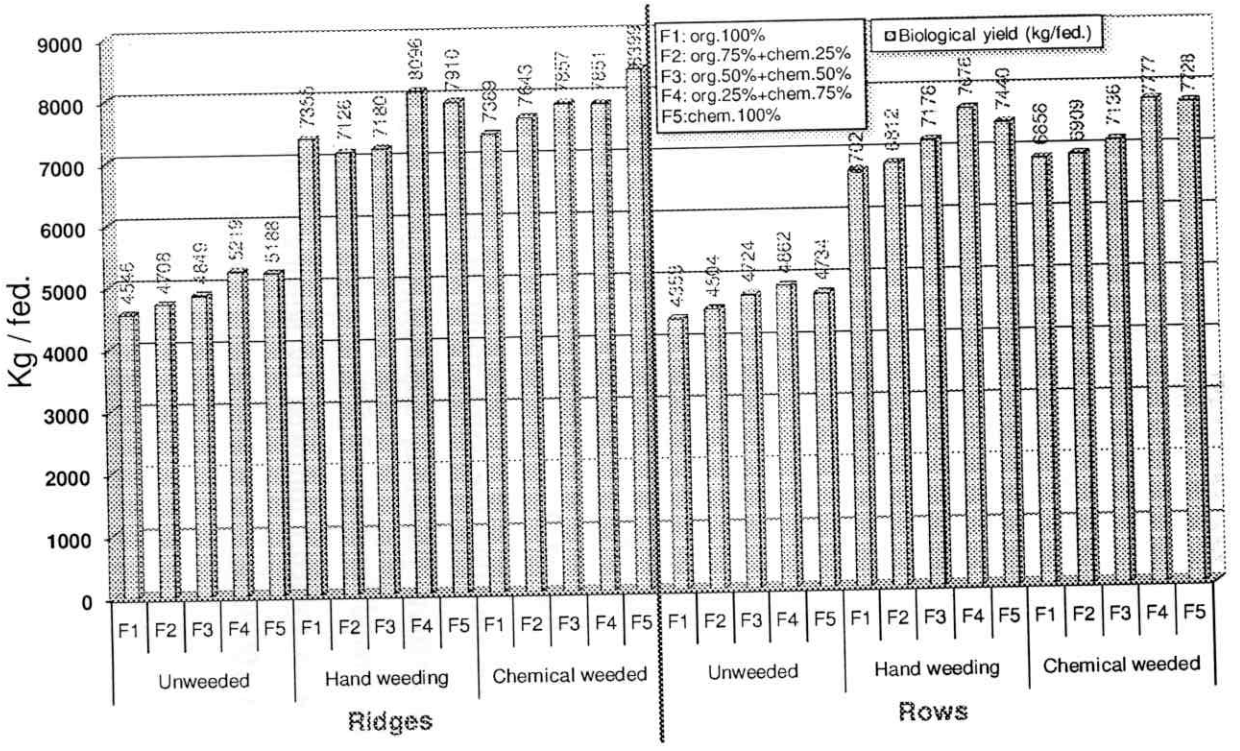


Fig. (5 ) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on wheat biological yield (Kg / fed.).
(Combined analysis of 2004/2005 and 2005/2006 seasons)

**4- Chemical composition:**

**A- Protein yield ( kg/fed. )**

Data presented in Table ( 30 ) and Fig. 6 show that interaction between sowing method in ridges x hand weeding x 25 % rec. organic fertilization + 75 % rec. chemical fertilization produced the highest protein yield 363.4 kg/fed. followed by 323.5 kg/fed. from sowing method in ridges x x hand weeding x 100 % rec. fertilization.

**B- Phosphorus yield ( kg/fed. )**

Regarding to phosphorus yield/fed. interaction of sowing method in ridges x hand weeding x 25 % rec. organic fert. + 75 % rec. chemical fert. recorded the first order 8.464 kg/fed. by significant differences and the second order recorded by sowing method in ridges x chemical weeded x 100 % rec. chemical fert. ( 8.080 kg P/fed., Table 30 ).

**C- Potassium yield ( kg/fed. )**

Table ( 30 ) revealed the same trend recorded for phosphorus yield/fed. For potassium yield/fed., superiority of interaction sowing method in ridges x hand weeding x2 5 % rec. organic fert. + 75 % rec. chemical fert. (24.65 kg/fed.) followed by sowing method in ridges x chemical weeded x 100 % rec. chemical fert. ( 23.98 kg/fed. ).

**Table (30) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on wheat grain protein, phosphorus and potassium yield (kg/fed) .**

**(Combined analysis of 2004/2005 and 2005/2006 seasons)**

| Treatments | | | Protein | | Phosphorus | | Potassium | |
|---|---|---|---|---|---|---|---|---|
| Sowing methods | Weed control | Bio-organic fertilization | % | Yield (kg/fed.) | % | Yield (kg/fed.) | % | Yield (kg/fed.) |
| Ridges | Unweeded | $F_1$ | 10.98 | 159.3 | 0.274 | 3.975 | 0.778 | 11.28 |
| | | $F_2$ | 11.04 | 168.0 | 0.273 | 4.157 | 0.732 | 11.44 |
| | | $F_3$ | 11.85 | 198.0 | 0.282 | 4.712 | 0.810 | 13.53 |
| | | $F_4$ | 11.73 | 197.2 | 0.280 | 4.709 | 0.750 | 12.62 |
| | | $F_5$ | 11.67 | 192.4 | 0.281 | 4.633 | 0.747 | 12.31 |
| | Hand weeding | $F_1$ | 11.16 | 255.5 | 0.285 | 6.526 | 0.931 | 21.32 |
| | | $F_2$ | 11.39 | 248.2 | 0.286 | 6.233 | 0.906 | 19.74 |
| | | $F_3$ | 12.59 | 274.6 | 0.308 | 6.717 | 0.935 | 20.39 |
| | | $F_4$ | 12.36 | 336.3 | 0.311 | 8.462 | 0.906 | 24.65 |
| | | $F_5$ | 12.42 | 323.5 | 0.310 | 8.075 | 0.911 | 23.73 |
| | Chemical weeded | $F_1$ | 11.44 | 254.3 | 0.293 | 6.513 | 0.890 | 19.78 |
| | | $F_2$ | 11.27 | 252.0 | 0.295 | 6.597 | 0.862 | 19.28 |
| | | $F_3$ | 12.19 | 289.6 | 0.307 | 7.294 | 0.971 | 23.07 |
| | | $F_4$ | 12.02 | 296.0 | 0.305 | 7.512 | 0.927 | 22.83 |
| | | $F_5$ | 12.25 | 323.4 | 0.306 | 8.080 | 0.908 | 23.98 |
| Rows | Unweeded | $F_1$ | 11.1 | 151.5 | 0.286 | 3.904 | 0.821 | 11.21 |
| | | $F_2$ | 11.44 | 164.5 | 0.295 | 4.243 | 0.813 | 11.69 |
| | | $F_3$ | 11.79 | 182.0 | 0.301 | 4.647 | 0.860 | 13.28 |
| | | $F_4$ | 11.73 | 184.6 | 0.290 | 4.564 | 0.842 | 13.25 |
| | | $F_5$ | 11.85 | 179.2 | 0.298 | 4.520 | 0.835 | 12.66 |
| | Hand weeding | $F_1$ | 10.93 | 208.7 | 0.291 | 5.556 | 0.901 | 17.20 |
| | | $F_2$ | 10.87 | 211.0 | 0.290 | 5.630 | 0.875 | 16.99 |
| | | $F_3$ | 11.62 | 245.8 | 0.315 | 6.561 | 0.915 | 19.36 |
| | | $F_4$ | 11.85 | 282.1 | 0.306 | 7.285 | 0.865 | 20.59 |
| | | $F_5$ | 11.67 | 263.0 | 0.312 | 7.032 | 0.893 | 20.12 |
| | Chemical weeded | $F_1$ | 11.44 | 230.7 | 0.289 | 5.827 | 0.905 | 18.24 |
| | | $F_2$ | 11.04 | 226.1 | 0.291 | 5.961 | 0.892 | 18.27 |
| | | $F_3$ | 11.56 | 245.4 | 0.305 | 6.476 | 0.885 | 18.79 |
| | | $F_4$ | 11.5 | 264.1 | 0.299 | 6.868 | 0.891 | 20.46 |
| | | $F_5$ | 11.56 | 268.8 | 0.309 | 7.187 | 0.905 | 21.05 |
| L.S.D. at 5% | | | N.S. | 15.6 | N.S. | 0.400 | N.S. | 1.19 |

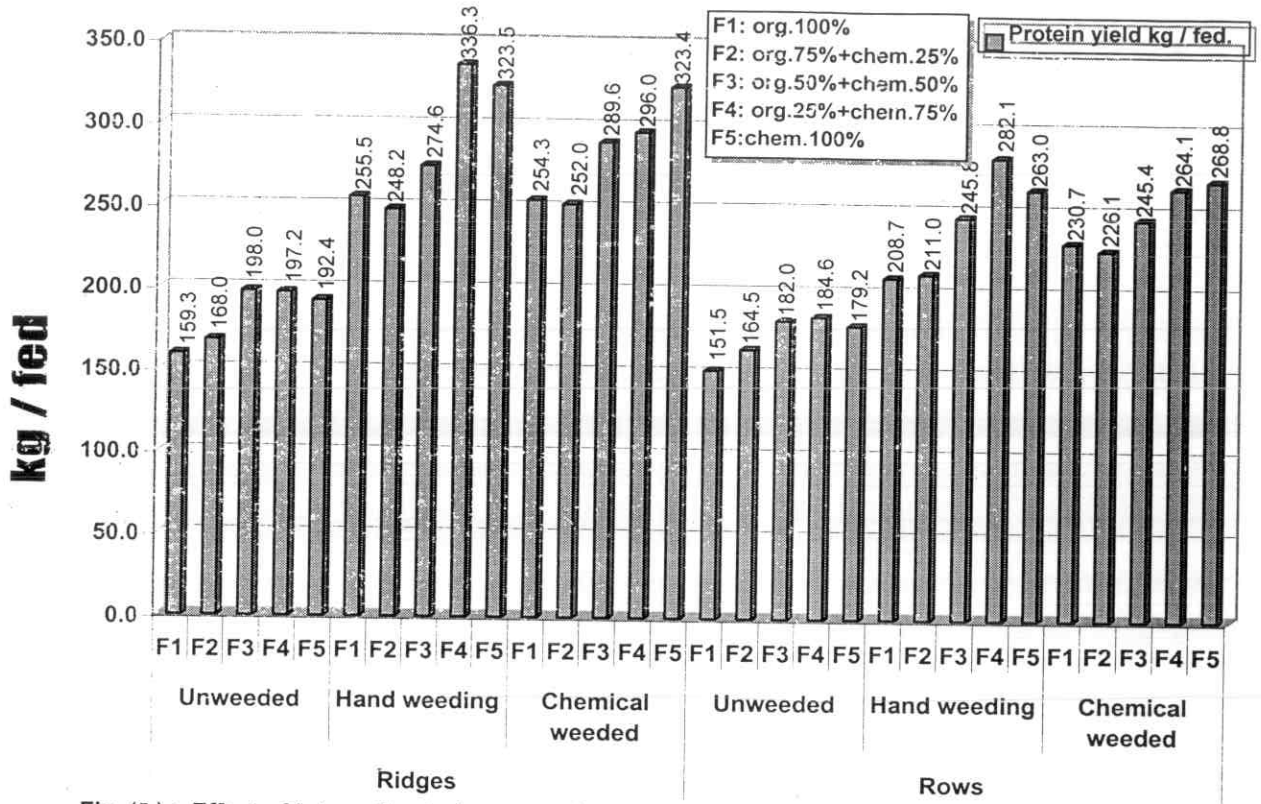


Fig. (6 ) : Effect of interaction between sowing methods, weed control and bio-organic fertilization treatments on wheat grain protein yield ( kg/fed) .
(Combined analysis of 2004/2005 and 2005/2006 seasons)