EFFECT OF SEEDING RATES AND COMPETITIVENESS OF GRASSY AND BROAD LEAF WEEDS ON YIELD AND YIELD COMPONENTS OF WHEAT (TRITICUM AESTIVUM L.)

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Abstract

One field experiment was conducted in 2000/01 and 2001/02 winter seasons at the Agricultural Experiments and Research Station, Faculty of Agriculture, Cairo University at Giza to study the competitiveness effect of grassy and broad leaf and total annual weeds under two seeding rates on wheat yield. A split plot design with four replications was used, where wheat seeding rates were distributed randomly in the main plots and weed interference treatments were allocated in the sub-plot. Weed interference treatments were weed free, broad leaf weeds, grassy weeds and total weeds competition.

Wheat seeding rate of 100 kg/fed. increased wheat grain yield by 31.3 and 7.9% in 2000/01 and 2001/02 seasons, respectively as compared to that obtained by the seeding rate of 70 kg/fed. Grassy, broad leaf weeds and their total biomass were negatively correlated with wheat grain yield through the decline of number of grain per spike, number of spikes/m² and 1000-grain weight. Losses in terms of wheat-grain yield due to broad leaf, grassy and total weed biomass were 29.9, 41.1 and 54.3% in 2000/01 season and 27.3, 34.2 and 44.9% in 2001/02 season as compared to the weed free treatment.

Simple correlation matrix showed that the dry weight of total weeds, grassy weeds and broad leaf weeds biomass were negatively correlated with wheat yield. Where correlation coefficients (r) were -0.820, -0.672 and -0.504, respectively over the two seasons. The yield was positively correlated with number of spikes/m² (0.9), 1000-grain weight (0.854), number of spikelets/spike (0.792) and weight of spike (0.504). This study showed that grassy weeds were more aggressive in their competitiveness effect than broad leaf weeds on wheat yield and its components. Thus, to improve wheat productivity, the decision maker should take in consideration the weed type during planning strategy for weed control in wheat to prevent weed competition and minimize herbicidal application.

INTRODUCTION

Weeds are a major constraint that affect wheat yield. The reduction of wheat grain yield was shown as 44-60% by weeds as reported by Dallas and John, (1992). Wild oat (Avena fatua) is one of the major grasses and can cause large yield losses in winter cereals (Elliott et al. 1979). The losses in wheat grain yield varied in the ranges
27% to 72% due to densities of *A. fatua*. (Farahbakhsh, *et al.*, 1987). Wild oats (*Avena fatua*) and annual rye grass (*Lolium rigidum*) are serious and widespread weeds in cereal crops in Western Australia (Pearce and Holmes 1976).

Zimdahl (1980) revealed that in order to improve the decision making process of weed control in wheat, a greater knowledge about weed biology and weed interference is required. Wilson and Peters (1982) reported that the main interference effect of *Avena fatua* and other grassy weeds on wheat yield appear in a reduced number of fertile tillers due to shoot interference which occur as a result of shading effects of tall-growing *A. fatua* plants.

Harker and Blackshow (1991) revealed that wheat yield suffer severely from the heavy infestation of grassy weeds especially *Phalaris* *spp*, *Avena* *spp*, and *Lolium* *spp* and broad leaf weeds as *Melilotus* *spp* and *Medicago* *spp*. The most important difference between competed species was due to their capacity to intercept the sunlight. Ibrahim and El-khanagry (1994) reported that wheat plant height decreased as a result of wild oats competition. Hassanein *et al.*, (1999) reported that polynomial regression and economic analysis referred that there was a negative relationship between weed density and wheat yield and number of spikes/m², where weed density of 50-60 *Phalaris* weeds / m² decreased wheat yield by 1.22 t/ha as compared to zero level of weed density accompanied with decreasing in the profitability. Hassanein *et al.*, (2005) indicated that wheat yield losses due to annual weed competition are estimated at 20% and 38.8% in the presence of 50 and 100 weed / m², respectively.

McNamara (1972) and Radford *et al.*, (1980) mentioned that the increase of seed rate reduced the wild oat population and increased crop yield. Moss (1985) reported that in the absence of weed competition, crop seed rate had little or no effect on crop yield. With high weed infestation, higher crop seed rates gave the crop a competitive advantage and this resulted in higher yield than at lower seed rates. Skorda and Efthimiadis (1985) revealed that an increase in wheat seed rate increased grain yield and reduced the total wild oat weight. The yield increase obtained through the herbicide application was higher with lower seed rates than with the higher one. Management of crop density may become increasingly important when the growers are planning a control strategy.

Gail *et al.*, (1996) reported that annual broadleaf weeds are economically important pests of Nebraska winter wheat. Weeds are estimated to reduce Nebraska winter wheat yields by 10 percent each year. They also mentioned that proper seedbed preparation, adequate fertilizer, high quality crop seed, careful variety selection, and proper rate, date, and depth of seeding are important factors for improving wheat yields. Failure to account for the competitive relationship between weeds and crops...
can result in yield losses even though the field is weed-free at the end of the season. Hassanein et al., (2005) reported that removal of all annual weeds significantly increased wheat grain yield. The losses due to weeds/wheat competition for all season ranged between 19.8 – 89.4% compared to weed free for all season due to various densities and species of weeds. The best grain yield was obtained by the removal of weeds for all season.

The objective of this study was to investigate the effect of seeding rates and competitiveness of grassy and broad leaf weeds on wheat yield and yield components.

**MATERIALS AND METHODS**

One field experiment was carried out in 2000/01 and repeated in 2001/02 winter seasons at the Agricultural Experiments and Research Station, Faculty of Agriculture, Cairo University at Giza, Egypt to estimate the competitiveness effect of grassy, broad leaf and total annual weeds species on wheat yield under two seeding rates.

A split-plot design with four replications was used. Wheat seeding rates (70 and 100 kg/fed.) were distributed randomly in the main plots. Meanwhile, weed competition treatments were allocated in the sub-plot. The sub-plot area was 10.5 m² (3 x 3.5 m). Weed competition treatments were as follow:

1- No weed competition, where all annual weeds (grassy and broad leaf weeds were hand removed continuously as needed.

2- Broad leaf weeds competition, where all grassy weeds were hand removed continuously as needed.

3- Grassy weeds competition, where all broad leaf weeds were hand removed continuously as needed.

4- Total annual weed competition (without any weed removal).

Wheat grains cv. Sakha 69 were sown by broadcast method on November 15th and 19th in the first and second seasons, respectively. Nitrogen (75 kg/fed.) was added in the form of ammonium nitrate (33% N) in two equal doses before first and second irrigations in the two seasons. Phosphorus (35 kg/ha) was added in the form of calcium phosphate (15%) in one dose with soil tillage.

One sample was taken at 110 days after sowing from one square meter from each plot to estimate the dry weight of grassy and broad leaf weeds (g/m²). Wheat plants were collected randomly from one square meter from each plot prior harvest to estimate plant length (cm), number of spikes per m², number of spikelets per spike (average of 10 spikes), weight of wheat spike, g (average of 10 spikes), number of grains/spike (average of 10 spikes), and 1000-grain weight (g). Harvest was carried
out in May 20th and 25th in the first and second seasons, respectively. Where all plots were harvested and wheat yield was estimated as ton / fed.

Statistical analysis: All data was subjected to analysis of variance according to Snedecor and Cochran, (1967) and least significant differences test (L.S.D) was used for the comparison between means. Homogeneity test between seasons was negative, therefore combined analysis could not be done and every season was statistical analyzed and presented separately.

Correlation study: Simple correlation matrix was carried out for the two seasons to investigate the relationships between dry weight of different weed categories and wheat yield as well as between yield and its components according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

1-Effect of seeding rates and weed competition on weed species:

It should be noted that the experimental site was heavily infested by both grassy and broad leaf weed species. The most abundant weed species included Avena fatua, A. sterilis, Phalaris paradoxa and P. minor (as annual grassy weeds) and Ammi majus, Rumex dentatus, Beta vulgaris, Sonchus oleraceus and Raphanus raphanistrum (as broad leaf weeds). The rate of weed infestation in the experimental site was estimated by 2.13 and 3.09 t/fed. dry weight of total annual weeds in the weedy check in the two seasons, respectively as shown in Table (1).

Seeding rate of 100 kg/fed significantly reduced dry weight of weeds as compared to seeding rate of 70 kg/fed in 2000/01 season, where it reduced dry weight of grassy, broad leaf and total annual weeds by 15.0, 18.8 and 16.9%, respectively. These results suggest that increasing seeding rate can regulate partially weed / wheat competition in favor to wheat plant. Yehia et al. (1993) found that increasing seeding rate from 119 kg/ha to 214 kg/ha decreased the fresh weight of wild oat by 54.1 %.

All studied weed competition types significantly reduced dry weight of weed species during both seasons. At no weed competition plots, where all annual weeds were hand removed, the dry weight of grassy, broad leaf and total annual weeds were reduced by 92.2, 91.2 and 91.9%, respectively in 2000/01 and by 90.6, 91.2 and 90.8%, respectively in 2001/02 as compared to weedy check.

At broad leaf competition plots, removal of grassy weeds reduced dry weight of grassy and total annual weeds by 89.1 and 45.3%, respectively in 2000/01 and by 89.3 and 41%, respectively in 2001/02. Meanwhile, it increased dry weight of broad leaf weed species by 11.2% in second season and did not increase it in first season.
Table 1. Dry weight of grasses, broad leaf and total annual weeds (g/m²) as affected by seeding rates and types of weed competition during 2000/01 and 2001/02 seasons

<table>
<thead>
<tr>
<th>Variables</th>
<th>2000/2001 season</th>
<th>2001/2002 season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grasses</td>
<td>Broad leaf</td>
</tr>
<tr>
<td>Seeding rates (S)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 kg / fed</td>
<td>160</td>
<td>159</td>
</tr>
<tr>
<td>100 kg / fed</td>
<td>136</td>
<td>129</td>
</tr>
<tr>
<td>Types of weed competition (W)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No weed competition</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>Broad leaf weeds competition</td>
<td>28</td>
<td>251</td>
</tr>
<tr>
<td>Grassy weeds competition</td>
<td>287</td>
<td>42</td>
</tr>
<tr>
<td>Total annual weeds competition</td>
<td>258</td>
<td>250</td>
</tr>
<tr>
<td>Sowing rates X Types of weed competition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 kg / fed X No weed competition</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>70 kg / fed X Broad leaf weeds competition</td>
<td>22</td>
<td>269</td>
</tr>
<tr>
<td>70 kg / fed X Grassy weeds competition</td>
<td>318</td>
<td>49</td>
</tr>
<tr>
<td>70 kg / fed X Total annual weeds competition</td>
<td>283</td>
<td>298</td>
</tr>
<tr>
<td>100 kg / fed X No weed competition</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>100 kg / fed X Broad leaf weeds competition</td>
<td>33</td>
<td>232</td>
</tr>
<tr>
<td>100 kg / fed X Grassy weeds competition</td>
<td>255</td>
<td>36</td>
</tr>
<tr>
<td>100 kg / fed X Total annual weeds competition</td>
<td>233</td>
<td>222</td>
</tr>
</tbody>
</table>

LSD for Sowing rates (S) 20.0 18.5 29.6 NS NS NS
LSD for Weed competition (W) 49.0 30.1 61.1 60.8 81.0 96.3
LSD for interaction of (S) X (W) NS NS NS NS NS NS

At grassy weeds competition plots, hand removal of broad leaf weeds reduced dry weight of broad leaf and total annual weeds by 83.1 and 35.2%, respectively in 2000/01 and by 78.5 and 28.5%, respectively in 2001/2002. Meanwhile, it increased dry weight of grassy weeds by 11.1 and 18.1% in the two seasons, respectively.

II - Wheat yield and yield components as affected by seeding rates and weed competition treatments:

In 2000/01, data in table (2) reveal that seeding rate significantly affected number of spikes/m², weight of spike, 1000-grain weight and wheat grain yield. Where seeding rate of 100 kg/fed increased number of spikes/m² by 8.9% and wheat grain yield by 16.1%. Meanwhile it decreased weight of spike by 4.5% and the 1000-grain weight by 2.6% as compared to seeding rate of 70 kg/fed. However, seeding rate did not affect plant length, number of grains per spike or number of spikelets / spike significantly.
Table 2. Wheat growth, yield and yield components as affected by seeding rates and types of weed competition during 2000/01 season

<table>
<thead>
<tr>
<th>Variables</th>
<th>Plant length (cm)</th>
<th>Number of grains per spike</th>
<th>Number of spikes per m²</th>
<th>Number of spikelets per spike</th>
<th>Weight of spike (g)</th>
<th>1000-grain weight (g)</th>
<th>Wheat grain yield t/fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeding rates (S)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 kg / fed</td>
<td>114.7</td>
<td>55.5</td>
<td>380.3</td>
<td>21.32</td>
<td>2.55</td>
<td>45.76</td>
<td>1.971</td>
</tr>
<tr>
<td>100 kg / fed</td>
<td>114.5</td>
<td>53.9</td>
<td>414.1</td>
<td>20.87</td>
<td>2.43</td>
<td>44.95</td>
<td>2.268</td>
</tr>
<tr>
<td>Types of weed competition (W)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No weed competition</td>
<td>112.5</td>
<td>63.3</td>
<td>544.0</td>
<td>23.53</td>
<td>3.38</td>
<td>53.60</td>
<td>3.100</td>
</tr>
<tr>
<td>Broad leaf weeds competition</td>
<td>114.5</td>
<td>57.2</td>
<td>417.5</td>
<td>21.60</td>
<td>2.54</td>
<td>45.43</td>
<td>2.172</td>
</tr>
<tr>
<td>Grassy weeds competition</td>
<td>116.6</td>
<td>52.1</td>
<td>335.0</td>
<td>20.25</td>
<td>2.18</td>
<td>41.15</td>
<td>1.796</td>
</tr>
<tr>
<td>Total annual weeds competition</td>
<td>114.7</td>
<td>46.1</td>
<td>292.3</td>
<td>19.00</td>
<td>1.86</td>
<td>40.29</td>
<td>1.449</td>
</tr>
</tbody>
</table>

| Sowing rates X Types of weed competition |                  |                           |                         |                             |                   |                      |                       |
| 70 kg / fed X No weed competition | 112.5            | 46.5                      | 523.0                   | 23.95                       | 3.48              | 54.00                | 2.850                 |
| 70 kg / fed X Broad leaf weeds competition | 113.0            | 58.3                      | 389.0                   | 21.62                       | 2.57              | 45.65                | 2.040                 |
| 70 kg / fed X Grassy weeds competition | 116.7            | 53.0                      | 308.0                   | 20.30                       | 2.24              | 42.37                | 1.690                 |
| 70 kg / fed X Total annual weeds competition | 114.6            | 46.4                      | 301.0                   | 19.40                       | 1.89              | 40.72                | 1.290                 |
| 100 kg / fed X No weed competition | 112.5            | 62.1                      | 565.0                   | 23.10                       | 3.27              | 52.60                | 3.350                 |
| 100 kg / fed X Broad leaf weeds competition | 114.1            | 56.2                      | 446.0                   | 21.57                       | 2.50              | 44.90                | 2.300                 |
| 100 kg / fed X Grassy weeds competition | 116.5            | 51.2                      | 362.0                   | 20.20                       | 2.12              | 41.45                | 1.960                 |
| 100 kg / fed X Total annual weeds competition | 114.9            | 45.9                      | 283.0                   | 18.60                       | 1.83              | 39.85                | 1.600                 |
| LSD for Sowing rates (S) | NS               | NS                        | 21.58                   | NS                          | 0.10              | 1.19                 | 0.300                 |
| LSD for Weed competition (W) | 2.15             | 1.55                      | 35.88                   | 1.26                        | 0.11              | 2.75                 | 0.280                 |
| LSD for interaction of (S) X (W) | NS               | NS                        | NS                      | NS                          | NS                | NS                   | NS                    |

Results of 2001/02 season reveal that seeding rate significantly affected number of grains/spike, number of spikelets/spike, weight of spike, 1000-grain weight and wheat grain yield. Where seeding rate of 100 kg/fed increased number of spikes/m² by 5.2% and wheat grain yield by 7.9%. Meanwhile it decreased number of grains/spike by 7.2%, number of spikelets/spike by 5.2%, spikes weight by 12.9% and the 1000-grain weight by 3.7% as compared to seeding rate of 70 kg/fed, as shown in Table (3).

Data of both seasons reveal that all studied weed competition treatments significantly affected wheat yield and its components. Weed competition of all annual weeds recorded the highest reduction for wheat yield and yield components, followed by grassy weeds competition. Results also reveal that grassy weed species were more competitive and have higher effect on wheat yield and yield components compared to broad leaf weeds competition.

Removing of all annual, broad leaf and grassy weeds increased number of grains per spike by 37.0, 23.8 and 12.8% in 2000/01 and by 28.9, 20.3 and 13.9% in 2001/02, respectively as compared to weed competition of total annual weeds. In the
same respect, these types of weed competition increased number of grains/m² by 86.1, 42.8 and 14.6% in 2000/01 and by 104.5, 76.0 and 32.6% in 2001/02; and increased number of spikelets/spike by 23.8, 13.7 and 6.6% in 2000/01 and by 23.8, 11.3 and 5.6% in 2001/02 and increased weight of spike by 81.7, 36.6 and 17.2% in 2000/01 and by 82.2, 46.0 and 22.7% in 2001/02; and increased 1000-grain weight by 31.5, 12.8 and 4.0% in 2000/01 and by 36.1, 20.6 and 7.8% in 2001/02, respectively.

Table 3. Wheat growth, yield and yield components as affected by seeding rates and types of weed competition during 2001/02 season

<table>
<thead>
<tr>
<th>Variables</th>
<th>Plant length (cm)</th>
<th>Number of grains per spike</th>
<th>Number of spikes per m²</th>
<th>Number of spikelets per spike</th>
<th>Weight of spike (g)</th>
<th>1000-grain weight (g)</th>
<th>Wheat grain yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeding rates (S)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>70 kg / fed</td>
<td>106.7</td>
<td>52.0</td>
<td>358.1</td>
<td>20.65</td>
<td>2.40</td>
<td>44.53</td>
<td>1.889</td>
</tr>
<tr>
<td>100 kg / fed</td>
<td>106.6</td>
<td>48.3</td>
<td>376.3</td>
<td>19.57</td>
<td>2.09</td>
<td>42.88</td>
<td>2.039</td>
</tr>
<tr>
<td>Types of weed competition (W)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No weed competition</td>
<td>102.9</td>
<td>55.8</td>
<td>489.8</td>
<td>22.6</td>
<td>2.97</td>
<td>51.24</td>
<td>2.675</td>
</tr>
<tr>
<td>Broad leaf weeds competition</td>
<td>106.2</td>
<td>52.1</td>
<td>421.5</td>
<td>20.31</td>
<td>2.38</td>
<td>45.38</td>
<td>1.945</td>
</tr>
<tr>
<td>Grassly weeds competition</td>
<td>108.8</td>
<td>49.3</td>
<td>317.5</td>
<td>19.28</td>
<td>2.00</td>
<td>40.56</td>
<td>1.760</td>
</tr>
<tr>
<td>Total annual weeds competition</td>
<td>108.8</td>
<td>43.3</td>
<td>239.5</td>
<td>18.25</td>
<td>1.63</td>
<td>37.64</td>
<td>1.475</td>
</tr>
<tr>
<td>Sowing rates X Types of weed competition</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>70 kg / fed X No weed competition</td>
<td>102.3</td>
<td>58.6</td>
<td>464.5</td>
<td>22.95</td>
<td>3.29</td>
<td>51.90</td>
<td>2.570</td>
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<tr>
<td>70 kg / fed X Broad leaf weeds competition</td>
<td>106.4</td>
<td>53.8</td>
<td>419.0</td>
<td>20.8</td>
<td>2.49</td>
<td>46.25</td>
<td>1.868</td>
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<tr>
<td>70 kg / fed X Grassly weeds competition</td>
<td>109.5</td>
<td>50.4</td>
<td>306.0</td>
<td>20.05</td>
<td>2.09</td>
<td>41.30</td>
<td>1.680</td>
</tr>
<tr>
<td>70 kg / fed X Total annual weeds competition</td>
<td>108.8</td>
<td>45.2</td>
<td>243.0</td>
<td>18.8</td>
<td>1.75</td>
<td>38.65</td>
<td>1.438</td>
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<tr>
<td>100 kg / fed X No weed competition</td>
<td>103.5</td>
<td>53.1</td>
<td>515.5</td>
<td>22.25</td>
<td>2.65</td>
<td>50.58</td>
<td>2.780</td>
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<td>100 kg / fed X Broad leaf weeds competition</td>
<td>106.0</td>
<td>50.5</td>
<td>424.0</td>
<td>19.83</td>
<td>2.72</td>
<td>44.50</td>
<td>2.022</td>
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<tr>
<td>100 kg / fed X Grassly weeds competition</td>
<td>108.2</td>
<td>48.1</td>
<td>329.0</td>
<td>18.5</td>
<td>1.92</td>
<td>39.83</td>
<td>1.840</td>
</tr>
<tr>
<td>100 kg / fed X Total annual weeds competition</td>
<td>108.9</td>
<td>41.3</td>
<td>236.0</td>
<td>17.7</td>
<td>1.52</td>
<td>36.63</td>
<td>1.512</td>
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<tr>
<td>LSD for Sowing rates (S)</td>
<td>NS</td>
<td>0.42</td>
<td>NS</td>
<td>1.06</td>
<td>0.14</td>
<td>1.46</td>
<td>0.095</td>
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<tr>
<td>LSD for Weed competition (W)</td>
<td>3.84</td>
<td>1.31</td>
<td>27.42</td>
<td>1.01</td>
<td>0.21</td>
<td>1.80</td>
<td>0.160</td>
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<tr>
<td>LSD for interaction of (S) X (W)</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

Finally, these types of weed competition (removing of all annual, broad leaf and grassy weeds) increased wheat grain by 113.9, 49.9 and 23.9% in 2000/01 and by 81.4, 31.9 and 19.3% in 2001/02, respectively as compared to weedy competition of all annual weeds.

III. Correlation between all studied traits and wheat grain yield:

Correlation between dry weight of grasses and broad leaf weed species (t/fed) and wheat grain yield (t/fed) was statistically significant and negative at 5% level and very strong with grassy weeds (-0.672) than with broad leaf weeds (-0.504) as shown in Table (4). This mean that grassy weeds were more aggressive in their competition.
to wheat than broad leaf weeds. Al-Marsafy et al., (1996) indicated that the losses in wheat yield due to grassy weeds (wild oats and Phalaris mixture) reached about 44%, meanwhile the losses in yield attributed to Phalaris spp. ranged from 40-50%.

Correlation between dry weight of total annual weeds and wheat grain yield recorded the highest value, where it negatively affected wheat grain yield by (-0.820) at 5% level.

Also, correlation study reveal also that the yield increases due to type of weed competition were positively contributed to the increases in the weight of spike (0.84), number of spikelets per spike (0.792), number of grains per spike (0.792), 1000-grain weight (0.854) and number of spikes / m² (0.901). Ibrahim and El-khanagry (1994) indicated that wheat plant height and number of wheat spikes per plant decreased as a result of wild oats competition.

Table 4. The relationship between all studied traits and wheat grain yield (simple correlation) for the two seasons

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dry weight of weeds (g/m²)</th>
<th>Weight of spike (g)</th>
<th>Plant length (cm)</th>
<th>No. of spikelets/ spike</th>
<th>No. of grains/ spike</th>
<th>1000-grain weight (g)</th>
<th>No. of spikes per m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry weight of broad leaf weeds (g/m²)</td>
<td>0.041</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry weight of total annual weeds (g/m²)</td>
<td>0.757*</td>
<td>0.681*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight of spike (g)</td>
<td>-0.710*</td>
<td>-0.432*</td>
<td>-0.799*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant length (cm)</td>
<td>0.150</td>
<td>-0.074</td>
<td>0.061</td>
<td>-0.156</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of spikelets/ spike</td>
<td>-0.679*</td>
<td>-0.404</td>
<td>-0.755*</td>
<td>0.854*</td>
<td>0.098</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of grains/ spike</td>
<td>-0.686*</td>
<td>-0.434</td>
<td>-0.782*</td>
<td>0.927*</td>
<td>0.044</td>
<td>0.838*</td>
<td></td>
</tr>
<tr>
<td>1000-grain weight (g)</td>
<td>-0.755*</td>
<td>-0.394</td>
<td>-0.806*</td>
<td>0.942*</td>
<td>-0.249</td>
<td>0.875*</td>
<td>0.862*</td>
</tr>
<tr>
<td>Number of spikes/ m²</td>
<td>-0.802*</td>
<td>-0.402</td>
<td>-0.846*</td>
<td>0.849*</td>
<td>-0.194</td>
<td>0.763*</td>
<td>0.829*</td>
</tr>
<tr>
<td>Wheat grain yield (ton / feddan)</td>
<td>-0.672*</td>
<td>-0.504*</td>
<td>-0.820*</td>
<td>0.840*</td>
<td>-0.175</td>
<td>0.792*</td>
<td>0.757*</td>
</tr>
</tbody>
</table>

Relative contributor: 86.4%

r² = 0.864  Coefficient of determination  * mean significance at 5% level

The correlation between total annual weeds and wheat grain yield, weight of spike, number of spikelets per spike number of grain per spike, 1000-grain weight and number of spikes / m² were highly statistically significant. Hassanein et al, (1999) reported that polynomial regression was negative between weed density and yield and number of spikes/m². Also, Hassanein et al, (2005) reported that removal of all weeds significantly increased wheat grain yield and the losses due to weeds / wheat competition for all season ranged between 19.8 – 89.4% compared to weed free due to various densities and species of weeds.

IV. Yield losses due to weed infestation:

Results in Table (5) show that increasing seeding rate from 70 to 100 kg per feddan increased wheat grain yield by 31.3 and 7.9% in 2000/01 and 2001/02.
seasons, respectively. This may be due to increasing wheat canopy and consequently improved wheat inter-specific competition with weeds. McNamara (1972) and Moss (1985) mentioned that higher crop seeding rates gave the crop competitive advantage against weeds than lower seeding rates. The increase in tillering results in quicker canopy closure, which suppresses wild oats. Skorda and Efthimiadis (1985) revealed that the increase in wheat seeding rate increased wheat grain yield and reduced wild oat.

Potential yield losses of wheat due to total annual weed competition were estimated by 53.3 and 44.9% under 2.184 and 3.094 t/fed dry weight of weeds, where correlation factor between total annual weeds and wheat yield was (-0.82) over the two seasons. Wheat losses due to grassy weeds competition was higher than to broad leaf weeds, where 1.382 and 2.214 t/fed dry weight of grassy weeds caused yield reduction estimated by 42.1 and 34.2 percent and 1.169 and 1.826 t/fed dry weight of broad leaf weeds reduced wheat yield by 29.9 and 27.3 percent in 2000/01 and 2001/02 seasons, respectively. Gail et al. (1996) reported that annual broadleaf weeds are economically important pests in winter wheat, where it reduced wheat yield by 10% each year.

Table 5. Wheat grain yield as affected by seeding rates, types weed competition and their interaction in 2000/2001 and 2001/2002 seasons

<table>
<thead>
<tr>
<th>Variables</th>
<th>2000/2001 season</th>
<th>2001/2002 season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dry weight of weeds t/fed</td>
<td>Wheat grain yield t/fed</td>
</tr>
<tr>
<td>Seeding rates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 kg/ fed</td>
<td>1.338</td>
<td>1.971</td>
</tr>
<tr>
<td>100 kg/ fed</td>
<td>1.113</td>
<td>2.588</td>
</tr>
<tr>
<td>LSD at 5%</td>
<td>0.124</td>
<td>0.300</td>
</tr>
<tr>
<td>Types of weed competition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No weed / wheat competition for all season</td>
<td>0.173</td>
<td>3.100</td>
</tr>
<tr>
<td>Broad leaf weeds / wheat competition for all season</td>
<td>1.169</td>
<td>2.172</td>
</tr>
<tr>
<td>Grassly weeds / wheat competition for all season</td>
<td>1.382</td>
<td>1.796</td>
</tr>
<tr>
<td>All annual weeds / wheat competition for all season</td>
<td>2.124</td>
<td>1.449</td>
</tr>
<tr>
<td>LSD at 5%</td>
<td>0.257</td>
<td>0.280</td>
</tr>
<tr>
<td>Interaction of seeding rates and types of weed competition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No weed / wheat competition with 70 kg seed/ fed</td>
<td>0.144</td>
<td>2.85</td>
</tr>
<tr>
<td>Broad leaf weeds / wheat competition with 70 kg seeds/ fed</td>
<td>1.224</td>
<td>2.04</td>
</tr>
<tr>
<td>Grassly weeds / wheat competition with 70 kg seeds/ fed</td>
<td>1.544</td>
<td>1.69</td>
</tr>
<tr>
<td>All annual weeds / wheat competition with 70 kg seeds / fed</td>
<td>2.441</td>
<td>1.29</td>
</tr>
<tr>
<td>No weed / wheat competition with 100 kg seed / fed</td>
<td>0.204</td>
<td>3.35</td>
</tr>
<tr>
<td>Broad leaf weeds / wheat competition with 100 kg seeds / fed</td>
<td>0.114</td>
<td>2.3</td>
</tr>
<tr>
<td>Grassly weeds / wheat competition with 100 kg seeds / fed</td>
<td>0.219</td>
<td>1.9</td>
</tr>
<tr>
<td>All annual weeds / wheat competition with 100 kg seeds / fed</td>
<td>1.911</td>
<td>1.6</td>
</tr>
<tr>
<td>LSD at 5%</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>
In general, the highest yield reduction (57.7 and 44.1%) was obtained with total weeds biomass competition (2.441 and 3.224 t/fed dry weight) in 2000/01 and 2001/02 seasons, respectively. In this respect, Dallas and John, (1992) reported that the reduction of wheat grain yield resulted by weeds in the range from 44 to 60%.

From the previous results we can consider that the dry weight of total weeds as well as grassy and broad leaf weeds need special programs for weed control in wheat and decision makers should consider this as a part of integrated crop management in improving wheat productivity.

REFERENCES


تأثير معدلات التقاویا والقدرة التنافسية للحشائش ضيقة
وعريضة الأوراق على محصول الفمح ومكوناته

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2- قسم بحوث الفلورا والتصنيف النباتي - معهد بحوث النباتين - مركز البحوث الزراعیة - الجبیرة.


أوضح التمنی أن التقاوی بجد 100 كجم/ ف أدى إلى زيادة محصول الحبوب بنسبة 31.3 و 77.9% في موسم الدراسة على التربیة بالمقارنة بالمدخل المنخفض 70 كجم/ ف.

كما أوضح الدراسة الارتباط السالب لمنافسة الحشائش ضيقة الأوراق وعريضة الأوراق والحولية الكلیة ومحمول الحبوب من خلال تقلیل عدد الحبوب في السبیلة وعدد المسائل في المتر السبیلі ووزن الالف حبة. وكان الفقد في محصول الحبوب والنتائج من منافسة الحشائش عريضة الأوراق وضيقة الأوراق والحولیة الكلیة 29.9 و 41.1 و 53.3% على التربیة في موسم 2000/2001 ومقدار 27.3 و 24.2 و 44.9% في موسم 2001/2002 بالمقارنة بالقطع الحالية من منافسة الحشائش.

أظهرت الدراسة الارتباط المتعدد أن الوزن الجاف للحشائش الجبیرة الكلیة والضيقة الأوراق وعريضة الأوراق يرتبط ارتباطًا منلباً مع محصول الحبوب حيث كانت معاملات الأرتباط: 0.820, 0.722, 0.640, 0.540, و 0.440 على التربیة (متوسط المواسم). كما ارتبط محصول الحبوب ارتباطًا ايجابیاً مع عدد المسائل في المتر السبیلی (0.910) و وزن الالف حبة (0.854) و عدد الستراتیلیسات في السبیلیة (0.993) و وزن السبیلیة (0.994).

أوضح التجربة أن الحشائش ضيقة الأوراق كانت أكثر تأثیرًا في قدراتها التنافسیة من حيث خصخص محصول الحبوب ومكوناته مقارنة بالقدرة التنافسیة للحشائش عريضة الأوراق. إذا فإن هذه الدراسة تدعو إلى ملء الفارق في الاعتبار أنواع الحشائش السائدة من الفضاء المعرّضة لضيقة الأوراق عند وضع استراتيجية لمقاومة الحشائش في حقول القمح لتفادي منافسة الحشائش للفمح مما يقلل من استخدام السمیدات ويزيد أنتاجية محصول الفمح.