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Two field experiments were carried out at El-Gemmeza Agric. Exper. Sta., El-Gharbia governorate, Middle Delta, during 1997/98 and 1998/1999 seasons to study the effects of some tillage treatments and 3 herbicides on the growth and yield of wheat (cv. Gemmeza 3) and on the spread of weeds in wheat plots.

Tillage treatments were: No-till (as a control), chisel plowing (16-18 cm), moldboard plowing (18-20 cm), subsoiling + chisel plowing and subsoiling + moldboard plowing.

The weed control treatments were: Arelon 50% at 1.25 L/fad, Granstar 75% at 8 g/fad, and Grasp 10% at 1.25 L/fad in addition to unweeded check.

Herbicides were applied at 35 days after emergence for Grasp and after 20 days for Arelon and Granstar. The spray volume was 200 L/fad.

A strip-plot design with 4 replications was used. The 5 tillage treatments were the strip plots and the 4 weed control treatments were distributed randomly in the sub-plots. The sub-plot area was 10.5 $m^2$.

The preceding crop was maize in both seasons. The soil was clay in texture and contained 1.3-1.5% O.M. and has a pH value of 7.8-8.0 . Disc harrowing was applied following each of the tillage treatments except for the control. Sowing date was 28$^{th}$ Nov. in the first season and 29$^{th}$ Nov. in the second one.

Calcium superphosphate (15.5% $P_2O_5$) was applied at 150 kg/fad before sowing and during seedbed preparation.

Nitrogen fertilizer at 75 kg N/fad was applied in the form of Ammonium Nitrate (33.5% N) in two split applications before the first and second irrigations.

The results of the combined analysis of both seasons could be summarized as follows :

## I. Effect of Tillage Treatments, Methods of Weed Control and Their Interaction on Growth Characters of Wheat :

I.1. Dry matter accumulation (g/0.05 $m^2$) at 60 DFS was not significantly affected by tillage or weed control treatments in the combined average of both seasons. The interaction between tillage and herbicidal application significantly affected this trait. The highest value was recorded by combining subsoiling + moldboard plowing with Arelon.

I.2. Dry matter accumulation (g/0.05 $m^2$) at 120 DFS was significantly affected by tillage and weed control treatments as well as their interaction. The best treatment was that including subsoiling + moldboard plowing followed by moldboard plowing (alone). Arelon was the best herbicide affecting this trait. Combining Arelon with subsoiling + moldboard plowing produced the maximum value, being 95.78 g/0.05 $m^2$ as against 69.45 g/0.05 $m^2$ for the check treatment.

I.3. L.A.I. at 60 as well as at 120 DFS was significantly affected by both tillage practices and weed control treatments and their interaction. The maximum L.A.I. was obtained by combining moldboard plowing +

Arelon at both growth stages, being 5.89 and 7.93 at 60 and 120 DFS, respectively in the combined average.

I.4. Plant height at 60 and 120 DFS responded significantly to tillage systems, weed control treatments and their interaction. The combined analysis of both seasons showed that subsoiling + moldboard plowing combined with Grasp (at 60 DFS) and with Arelon (at 120 DFS) produced the tallest plants. The maximum plant height was 26.92 and 98.41 cm at 60 and 120 DFS, respectively.

## II. Effect of Tillage Treatments, Methods of Weed Control and Their Interaction on Yield and its Components :

II.1. Number of spikes/$m^2$ was significantly affected by tillage practices, herbicidal treatments and their interaction. The greatest number of spikes/$m^2$ was 606.63 which was produced by subsoiling + moldboard plowing + Arelon in the combined 2 seasons average compared with 395.38 spikes/$m^2$ for the check treatment.

II.2. The combined analysis showed a significant response for 1000-kernel weight to tillage practices, herbicides and their interaction. The best treatment was that including subsoiling + moldboard plowing combined with Arelon, with an average value of 66.19 g. The lowest grain index was 51.85 g which was recorded by chisel plowing under the unweeded control.

II.3. Number of spikelets per spike was significantly affected by tillage practices in the second season as well as in

the combined average. Also herbicidal application significantly affected this trait in the combined average only, whereas in both seasons the differences in this trait were below the level of significance. The highest number of spikelets/spike was 21.12 in the combined average which was produced by the most intensive tillage treatment (subsoiling + moldboard plowing) in combination with Arelon. On the other hand, chisel plowing combined with the unweeded check produced the lowest spikelets/spike, being 18.81 .

II.4. In the first season as well as in the combined average spike length was significantly affected by tillage treatments, methods of weed control and their interaction. The combined data revealed that the maximum spike length was 11.84 cm, which was produced by subsoiling + moldboard plowing combined with Arelon, compared with the minimum spike length of 9.81 cm of the check treatment (no-till + unweeding).

II.5. Tillage treatments as well as herbicidal application and their interaction significantly affected number of grains/spike. The intensive tillage including subsoiling + moldboard plowing as well as moldboard plowing were the best treatments and significantly surpassed the other three systems in affecting kernels/spike. Number of kernels/spike produced by these 2 treatments reached 50.18 and 49.28 in the combined average, respectively. The interaction between moldboard plowing + Arelon produced the highest kernels/spike, being 53.15 in the combined average compared with the lowest value of 36.12 for the check treatment.

II.6. Subsoiling + moldboard plowing significantly surpassed the other 4 tillage systems in affecting spike weight. Also, Arelon was the best herbicide. Combining subsoiling + moldboard plowing with Arelon produced the maximum spike weight in the combined average, being 4.40 g as against the lowest value of 3.20 g of the check treatment (no-till + unweeding).

II.7. Grain weight/spike significantly responded to tillage systems in the second season as well as in the combined average. Subsoiling + moldboard plowing, moldboard plowing and subsoiling + chisel plowing were significantly superior to the check (no-till) and chisel plowing treatment in affecting this trait.

Also, Arelon was the best herbicide and significantly surpassed the other herbicides in the combined analysis.

The interaction between tillage and herbicidal treatment significantly affected this trait in the first season and the combined average. The maximum grain weight/spike was recorded by moldboard plowing + Arelon, being 3.14 g in the combined data and the lowest value was 2.20 g of the check treatment.

II.8. Grain yield was significantly affected by tillage, herbicides and their interaction in both seasons and the combined average. The best treatment was the most intensive one (subsoiling + moldboard plowing) which significantly surpassed the 4 other systems. Moldboard plowing, subsoiling + moldboard plowing and chisel plowing did not significantly differ in their effect on grain yield in both seasons. Also Arelon as well as Grasp were superior in their effect on grain yield without significant difference

between them. The interaction between tillage and herbicides indicated that the highest grain yield was produced by combining the most intensive tillage treatment (subsoiling + moldboard plowing) with Arelon in both seasons. This treatment recorded a grain yield of 3160 kg/fad in the combined average.

II.9. Straw yield/fad was significantly affected by tillage, herbicides and their interaction in both seasons and their combined average. The two seasons average showed the superiority of the most intensive tillage system which significantly surpassed the 4 rest treatments.

Also, Arelon was superior in affecting straw yield (without significant differences compared with Grasp).

The maximum straw yield was 5.95 t/fad in the combined data, which was recorded by subsoiling + moldboard plowing with Arelon, and the lowest straw yield was 3.58 t/fad of chisel plowing + unweeding.

II.10. Plant height at harvest was not significantly affected by tillage systems in both seasons and their combined average. Herbicides had significant effect on plant height in the first season only. No significant effect was detected for tillage x herbicides in both seasons on plant height at harvest.

## III. Effect of Tillage Treatments, Methods of Weed Control and Their Interaction on the Spread of Weeds in Wheat :

III.1. Number of weeds/$m^2$ at 60 DFS was significantly reduced by intensive tillage and herbicidal application. The combined data indicated the

superiority of intensive tillage which was superior to the other systems and reduced weed population by 45.83% compared with the check.

Also, Arelon was the best herbicide and reduced 64.94% of the total weeds number at 60 DFS compared with the unweeded check.

The significant interaction indicated the superiority of subsoiling + moldboard plowing combined with Arelon which contained only 4.38 weed plants/$m^2$ compared with 23.13 weed plants/$m^2$ for the check treatment.

III.2. Also at 90 DFS, the intensive tillage system significantly reduced weed plants by 41.85% compared with no-till on the two seasons average.

Also, Arelon was the best herbicides at 90 DFS and significantly reduced 43.48% of the weed population compared with the unweeded treatment.

The significant interaction indicated the superiority of subsoiling + moldboard plowing combined with Arelon which reduced weed density by 63.41% compared with the check treatment.

III.3. Similarly, at 120 DFS intensive tillage significantly surpassed the other 4 systems and Arelon was the best herbicide in depressing weed population. The combined analysis indicated that subsoiling + moldboard plowing reduced weeds number by 41.31% compared with no-till. Also, Arelon application significantly reduced weed population by 61.93% compared with unweeding at 120 DFS.

The significant interaction indicated the superiority of chisel plowing and Arelon as well as the intensive tillage

with Arelon in depressing 68.71% of the weed population of the check treatment.

III.4. Tillage systems significantly affected fresh weight of weeds ($g/m^2$) at 60 DFS. Intensive tillage reduced weeds fresh weight by 12.77% compared with no-till in the two seasons average.

Also, Arelon application reduced 54.31% of the total weeds fresh weight ($g/m^2$) compared with the unweeded check.

The significant interaction indicated the superiority of subsoiling + chisel plowing combined with Arelon which reduced the fresh weight of total weeds at 60 DFS by 70.31% compared with the check treatment on the 2 seasons average.

III.5. Tillage treatments, herbicides and their interaction significantly affected fresh weight of total weeds ($g/m^2$) at 90 DFS.

Subsoiling + moldboard plowing significantly surpassed the 4 other systems, and Arelon was significantly superior to the other 2 herbicides in depressing weeds. The significant interaction between the 2 experimental factors showed that the intensive tillage (subsoiling + moldboard plowing) combined with Arelon reduced fresh weight of total weeds by 52.95% at 90 DFS compared with the check treatment on the average of both seasons.

III.6. Similarly, at 120 DFS, intensive tillage was significantly the most effective treatment in depressing weeds expressed as fresh weight of total weeds. Also, Arelon was the best herbicide.

The combined analysis showed that combining the most intensive tillage with Arelon reduced weeds fresh weight by 51.24% compared with the control treatment.

III.7. All tillage practices significantly reduced dry weight of total weeds ($g/m^2$) at 60 DFS when compared with no-till treatment. Subsoiling + moldboard plowing reduced 18.27% of the weed density of no-till in the combined data. Also Arelon was the best herbicide compared with Grasp and Granstar.

The significant interaction between the 2 experimental factors indicated the superiority of subsoiling + moldboard plowing in combination with Arelon, where a reduction of 61.20% in dry weight of total weeds was produced compared with unweeding.

III.8. Similarly, at 90 DFS, modlboard plowing in general, and when preceded by subsoiling, in particular, were the most effective tillage practice in reducing weed density. Also, Arelon was the best herbicide.

The significant interaction between both experimental factors indicated the superiority of subsoiling + moldboard plowing combined with Arelon when it reduced 61.31% of the total weeds dry weight of the check treatment combined over both seasons.

III.9. Tillage practices, herbicidal treatments and their interaction significantly affected total weeds dry weight at 120 DFS on both seasons.

The combined analysis showed the superiority of the intensive tillage and Arelon application. The significant interaction showed that subsoiling + moldboard plowing in combination with Arelon reduced weed density by

69.69% compared with the check treatment (no-till + unweeding).

## IV. Effect of Tillage Treatments on Soil Properties at Harvest :

IV.1. Tillage treatments did not significantly affect soil bulk density averaged over the 3 soil depths in both seasons. However, the lowest bulk density was observed with the most intensive soil treatment, but without significant differences when compared with the other treatments.

Bulk density significantly increased with the increase in soil depth.

The significant tillage x soil depth interaction indicated that the lowest bulk density was recorded by subsoiling + moldboard plowing at 0-10 cm soil depth in 1997/98 season, being 1.26 $g/cm^3$. In 1998/99 season, the same treatment as well as chisel plowing at 0-10 cm depth recorded the lowest bulk density being 1.23 $g/cm^3$.

IV.2. Soil porosity % was affected by tillage treatments in the first season where the most intensive tillage practice increased porosity % compared with the check treatment (no-till).

Porosity % significantly reduced with the increase in soil depth. The significant interaction between tillage and soil depth indicated that the greatest porosity % was 52.33% in 1997/98 season, obtained by subsoiling + moldboard plowing at 0-10 cm depth,