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SUMMARY

Six field experiments were carried out at the Experimental Farm of Sakha Agricultural Research Station, Agricultural Research Center, during the two successive seasons of 1999/ 2000 and 2000/ 2001, using Sakha 61 wheat cultivar. The experiments were conducted to study the effect of three preceding summer crops, three tillage systems and five weed control treatments on weeds, wheat growth, wheat grain yield and its components and grain chemical composition.

Each experiment included fifteen treatments, which were the combinations between three tillage systems; i.e., zero tillage (control), chisel plowing, moldboard plowing and five weed control treatments; namely, Arelon (50%) at 1.25 l/fad., Arina (39%) at 1.35 l/fad., Grasp (10 %) at one l/fad + Sinal (10%) at 40 cc/fad., handweeding (twice) at 45 and 60 days after sowing and untreated control. The herbicidal treatments were applied at 3 - 4 leaf stage of wheat, except for Grasp, which was applied at 4 - 5 leaf stages.

A split-plot experimental design, with four replications, was used in all experiments. The three tillage systems were assigned to the main plots and the five weed control treatments to the sub-plots. The area of each sub-plot was 21 m². In each season, three experiments were sown after cotton (*Gossypium barbadense*, L.), after maize (*Zea mays* L.) and after rice (*Oryza sativa* L.). In each year, a combined analysis for the three experiments, which were sown after cotton, maize and rice, was carried out to obtain the effect of the preceding summer crops.

STUDIED CHARACTERS: -

1. Weed measurements:

The associated weeds were pulled by hand from two random quadrates of 0.5 x 0.5m area. Weeds were classified, counted and the following traits were recorded at three sampling dates (60,75 and 90 days after sowing):

Number of grassy weeds /m², number of broadleaf weeds /m², number of total annual weeds /m², fresh weight of grassy weeds (g/m²), fresh weight of broadleaf weeds (g/m²), fresh weight of total annual weeds (g/m²), dry weight of grassy weeds (g /m²), dry weight of broadleaf weeds (g/m²) and dry weight of total annual weeds (g /m²).

Grown weeds in a random square meter per sub-plot were weighed at 60, 75 and 90 days after sowing. Weed samples were dried to a constant weight in a forced air oven at 70 °C to determine the dry weed weights.

2. Growth attributes:

Growth attributes were determined on intervals of 15 days, samples of wheat plants were collected at two sampling dates 60 and 75 days after sowing to estimate the following characters:

-Dry matter production per unit area (m²), leaf area index, plant height (cm) and number of tillers /m².

3. Grain yield and its components: -

At harvest time, the following characters were recorded: -

Plant height (cm), number of spikes /m², spike length (cm), number of spikelets/spike, number of grains /spike, spike weight (g), grain weight /spike (g), 1000-grain weight (g), grain yield (ardab/fad), straw yield (ton/fad) and biological yield (ton/fad).

4. Chemical composition of wheat grain samples: -

Grain protein content, grain ash content, grain fat content, grain fiber content and grain moisture content were determined from grain samples randomly taken from grain yield of each sub-plot.

The obtained results can be summarized as follows:

I. Wheat planted after cotton:

I.1. Effect of tillage systems, weed control treatments and their interaction on annual weeds:

The effects of tillage systems were significantly reduced by using moldboard plow on number of weeds/m², fresh and dry weights at the three sampling dates in both seasons, except that no significant differences were obtained between the three tillage systems for number of broadleaf weeds/m² at 60 days after sowing (in the first season) and number of total annual weeds /m² at 60 days after sowing in the second season. While, dry weight of grasses was not significant in the first season at all growth stages.

Sinal + Grasp or Arina, followed Arelon and handweeding (twice) significantly reduced the number of weeds/m² and fresh and dry weights, compared to weedy check.

The interaction between tillage systems and weed control treatments significantly decreased the number of broadleaf weeds/m² at 75 days after sowing in the first season. While, in the second season, it gave the highest effect on the number of total annual weeds /m² at 60 days after sowing, number of broadleaf weeds/m² and number of annual weeds /m² at 75 days after sowing, beside the number of total annual weeds/m² at 90 days after sowing. However, such interaction significantly decreased the fresh weight of weeds (broadleaf and total annual of weeds) at all sampling dates in both seasons. While, fresh weight of grasses was not significantly affected at all sampling dates in both seasons. The results revealed that moldboard plowing, with the application of Sinal + Grasp or Arina, gave the highest reduction in the number and fresh and dry weights of total annual weeds in the two seasons.

I.2.Effect of tillage systems, weed control treatments and their interaction on wheat growth:

In both seasons, dry matter accumulation/m², leaf area index, plant height and number of tillers/m² were significantly increased by using moldboard plowing, where it exceeded chisel plowing and zero tillage at all samples.

The effect of weed control treatments was highly significant on studied characters. The highest effect was obtained by the application of Sinal and Grasp, followed by Arina, Arelon and handweeding, compared with the check treatment.

The effect of interaction between tillage systems and weed control treatments on leaf area index, plant height and number of tillers/m² was significant at 75 days after sowing in both seasons. Sinal + Grasp was superior to Arina and Arelon by using moldboard plowing.

I.3.Effect of tillage systems, weed control treatments and their interaction on grain yield and its components:

The moldboard plowing significantly affected the grain yield of wheat and its components and was superior to zero tillage in both seasons, except that, in both seasons, no significant differences were detected in spike length and straw yield, in the second season, and biological yield in the first season among the three tillage treatments..

A significant effect of various herbicides and handweeding was obtained on grain yield and its components in both seasons. The highest grain yield was obtained by using Arina, followed by Sinal + Grasp, compared to weedy check in both seasons.

The interactions were significant between tillage systems and weed control treatments for plant height, grain number /spike, grain weight /spike

1000-grain weight and grain yield in both seasons. Superiority of Arina was recorded with moldboard plowing, which gave the highest value in both seasons.

I.4.Effect of tillage systems, weed control treatments and their interaction on chemical composition of wheat grains:

Grain protein, grain ash and grain fiber contents were highly significantly influenced by moldboard plowing in both seasons, compared with chisel plowing and zero tillage.

Arina, followed by Sinal + Grasp highly significantly affected grain protein content, grain ash content and grain fiber content in both seasons.

The interaction was highly significant between tillage systems and weed control treatments for grain protein content and grain ash content in both seasons. The highest percentage of grain contents was recorded with moldboard plowing and the application of Arina, compared with the weedy check.

II.Wheat planted after maize:

II.1.Effect of tillage systems, weed control treatments and their interaction on annual weeds:

Tillage with moldboard plowing significantly reduced the number of weeds/m² and fresh and dry weights of weeds at the three sampling dates in both seasons, compared with chisel plowing and zero tillage.

The unweeded control significantly increased the number and fresh and dry weights of grasses and broadleaf and total annual weeds at the three sampling dates in both seasons, as compared to the application of Sinal and Grasp, followed by Arina, Arelon and handweeding.

The interaction was significant between tillage systems and weed control methods and it gave the highest effect on the number of broadleaf weeds/m² at 75 days after sowing in the first season. While, in both seasons, the highest effect was that on the number of total annual weeds /m² at 75 days after sowing, and the number of total annual weeds /m² at 90 days after sowing. Also, it significantly affected the fresh weight of weeds (broadleaf and total annual weeds) at all samples in both seasons, except for the total annual weeds, where no significant effect was observed at 75 days after sowing in the second season. While, fresh and dry weights of grasses were not significantly influenced at all samples in the two seasons. But, dry weight of broadleaf and total annual weeds was significantly affected at 60 days after sowing in the two seasons. Hence, moldboard plowing with the application of Sinal + Grasp or Arina gave the highest reduction in total annual weeds.

II.2. Effect of tillage systems, weed control treatments and their interaction on wheat growth:

The effect of tillage systems was significant on dry matter accumulation/m², leaf area index, plant height and number of tillers/m² by plowing with moldboard plow, compared with chisel plow and zero tillage at all samples in the two seasons.

The effect of weed control treatments was highly significant on dry matter accumulation/m², leaf area index, plant height and number of tillers/m². The highest values at all samples were obtained by the application of Sinal and Grasp, followed by Arina, Arelon and handweeding, compared to the check in the two seasons.

The interactions were significant between the tillage systems and weed control treatments for dry matter accumulation/m², leaf area index, plant

height and number of tillers/m² in both seasons. Sinal + Grasp was superior to Arina and Arelon by using moldboard plowing.

II.3. Effect of tillage systems, weed control treatments and their interaction on grain yield and its components:

The effect of various tillage systems on grain yield and its components was significant in both seasons. The results showed that moldboard plowing significantly increased the grain yield, plant height at harvest, number of spikes /m², grain number/spike, grain weight /spike and 1000-grain weight, compared with chisel plow and zero tillage in the two seasons.

The effect of selective herbicides and handweeding on grain yield and its components was highly significant in both seasons. Arina, Sinal + Grasp and Arelon produced the highest grain yield components, followed by handweeding in the two seasons. While, straw and biological yields were not significantly affected only in the first season.

The interaction was highly significant between tillage systems and weed control treatments in both seasons for plant height at harvest, grain number/spike, grain weight/spike, 1000-grain weight and grain yield. While, it was not significant for spike length, number of spikelets /spike and straw and biological yields in both seasons. Hence, Arina recorded the highest values with moldboard plowing in both seasons.

II.4. Effect of tillage systems, weed control treatments and their interaction on chemical composition of wheat grains:

There were highly significant differences between the three tillage systems for grain fat, grain protein, grain ash and grain fiber contents in both seasons, except for grain moisture content in the two seasons.

The weed control treatments highly significantly affected these characters in both seasons. The application of Sinal and Grasp, followed by Arina, Arelon and handweeding significantly increased such traits, compared to the check.

The interaction was significant between tillage systems and weed control treatments for grain protein content in the two seasons. The highest percentage of grain protein was recorded with moldboard plowing and the application of Sinal + Grasp, compared with the weedy check

III. Wheat planted after rice:

III.1. Effect of tillage systems, weed control treatments and their interaction on annual weeds:

The effects of tillage systems were significant on the number of weeds/m² and fresh and dry weights of weeds at the three sampling dates in both seasons, except for the number of broadleaf weeds and grasses /m², which was not significant in the first season. In general, significant reductions were obtained in the number of weeds/m² and fresh and dry weights of weeds (grasses and broadleaf and total annual weeds) by using moldboard plow, compared with chisel plow and zero tillage in both seasons.

Results indicated considerable effects of weed control treatments on the studied characters of grasses and broadleaf and total annual weeds. The effects were significant and true during the three sampling dates in the two

seasons. Sinal + Grasp, followed by Arina and Arelon significantly reduced the number and fresh and dry weights of weeds, compared to the weedy check.

The interaction between tillage systems and weed control treatments gave the highest effect on the number of grasses/m² at 60 days after sowing in both seasons. Also, in the second season, it gave the highest effect on the number of total annual weeds /m² at 60 days after sowing. In the mean time, it significantly decreased the fresh weight of weeds (broadleaf and total annual weeds) at all samples in both seasons. The dry weights of broadleaf, weeds were significantly reduced at all sampling dates in both seasons. While, the effect was significant on dry weight of grasses and total annual weeds at 60 days after sowing in both seasons. However, it was not significant at 75 and 90 days after sowing in both seasons. Whereas, the fresh weight of grasses was not significantly affected at all samples (in both seasons) and the total annual weeds at 90 days after sowing in both seasons. The results revealed that moldboard plowing, with the application of Sinal + Grasp or Arina, gave the highest reduction in the number of total annual weeds.

III.2.Effect of tillage systems, weed control treatments and their interaction on wheat growth:

Data indicated that the studied growth characters per unit area were significantly increased; namely, dry matter accumulation/m², leaf area index, plant height and number of tillers/m², by plowing with moldboard plow, compared with chisel plow and zero tillage.

The effect of weed control treatments was highly significant on dry matter accumulation/m², leaf area index, plant height and number of tillers/m². The highest values, at the two samples, were obtained by the

application of Sinal + Grasp, followed by Arina, Arelon and handweeding, compared with the check.

Dry matter accumulation was significantly influenced by the interaction between the tillage systems and the selective herbicide at 75 days after sowing, in the first season, and 60 days after sowing in the second season. Also, the interaction between tillage systems and weed control methods gave the highest significant effect on the number of tillers /m² in both seasons at the two samples. While, it was significant only in the second season for leaf area index at the two samples. On the other hand, plant height was not significantly influenced by the interaction between weed control treatments and tillage systems in both seasons, except at 75 days after sowing in the first season. The results recorded by the application of Sinal + Grasp was superior in case of using moldboard plowing because it was more effective on growth attributes than the check.

III.3.Effect of tillage systems, weed control treatments and their interaction on grain yield and its components:

The moldboard plowing significantly affected plant height at harvest, grain number/spike, grain weight /spike and grain yield and it was superior to chisel plow and zero tillage in both seasons, except for spike length and number of spikelets/spike, where no significant effect was observed in the first season and 1000-grain weight in the second season.

Handweeding twice and herbicide application significantly increased the above mentioned characters over those given by weedy check in both seasons. Sinal + Grasp significantly increased all characters, followed by Arina in both seasons.

Significant interactions were obtained between the two tested factors in both seasons for plant height, grain weight /spike, 1000-grain weight and

grain yield in the two seasons. While, number of spikes/m², spike length, number of spikelets/spike and straw and biological yields were not significantly affected in the two seasons. Hence, Arina recorded the highest value with moldboard plowing in both seasons.

III.4. Effect of tillage systems, weed control treatments and their interaction on chemical composition of wheat grains:

The effect of tillage systems was highly significant on the studied characters in both seasons. Moldboard plowing was significantly higher in grain protein and fiber and ash contents than chisel plow and zero tillage in both seasons.

Significant increases were recorded by the application of Sinal + Grasp, followed by Arina, Arelon and handweeding, compared to the check. The weed control treatments highly significantly affected these characters in both seasons, except for grain fat content in the two seasons.

The interaction was significant between tillage systems and weed control treatments for grain protein, grain ash and grain fiber contents in the two seasons. While, the interaction was not significant between tillage systems and weed control treatments for grain moisture and grain fat contents in the two the seasons. The highest percentage of grain protein was recorded with moldboard plowing and the application Arelon, compared with the other weed control treatments and the weedy check in both seasons.

IV. Preceding summer crops: -

IV.1. Effect on annual weeds:

The effect of preceding crops was highly significant on the number of weeds/m² and fresh and dry weights of weeds at three sampling dates in both seasons. However, fresh and dry weights of broadleaf weeds were not significantly affected in both seasons at all samples. The lowest numbers of weeds/m² and fresh and dry weights of weeds (grasses and broadleaf and total annual weeds) were obtained by sowing wheat after cotton in both seasons.

IV. 2. Effect on wheat growth:

The effect of preceding crops was highly significant on the studied characters per unit area; namely, dry matter accumulation/m², leaf area index, plant height and number of tillers/m² at the two samples in both seasons. Wheat plants sown after cotton produced higher values of dry matter accumulation/m², leaf area index, plant height and number of tillers/m² than after maize and rice.

IV. 3. Effect on grain yield and its components:

The effect of preceding crops was highly significant on grain yield and its components; namely, grain number /spike, grain weight /spike and 1000-gain weight in both seasons. Wheat plants grown after cotton produced higher values of grain yield components than after maize and rice.

IV. 4. Effect on chemical composition of wheat grains:

The effect of preceding crops was highly significant on grain protein and fiber contents in both seasons. Chemical composition after cotton was more significant than that after maize and rice.

Conclusion

To obtain the maximum grain yield from Sakha 61 wheat cultivar, it might be grown after cotton, using the moldboard plow and the application of Grasp + Sinal or Arina herbicides.