Agronomy Department

PHYSIOLOGICAL AND AGRONOMICAL EVALUATION OF SOME WHEAT CULTIVARS TREATED WITH HUMIC ACID, AMINO ACIDS AND NITROGEN FERTILIZATION UNDER NEWLY RECLAIMED SANDY SALINE SOIL CONDITIONS

BY

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SUMMARY

Two field experiments were carried out at the experimental Station Farm of Kalabsho and Zayian district, Faculty of Agriculture, Mansoura University, Egypt, during the two successive winter seasons of 2013/2014 and 2014/2015 to study the effect of foliar application with humic acid, amino acids under nitrogen fertilizer levels on the growth, physiological, yield components, yield and chemical characters of three bread wheat cultivars grown in newly reclaimed sandy saline soil conditions.

Experiments were arranged in a strip-split plot design with three replications. Studied wheat cultivars *i.e.* Shaka 93, Gemiza 9 and Giza 168 were assigned in the main plots. Foliar spraying treatments *i.e.* spraying with water, spraying with humic acid in the form of Actosol at rate of 5 ml Actosol/liter water in each spraying, spraying with amino acids in the form of Amino-Cat at rate of 5 ml Amino-Cat/liter water in each spraying and spraying with mixture of Actosol and Amino-Cat at rate of 5 + 5 ml/liter water, respectively in each spraying in sub plots. Application of nitrogen fertilizer levels *i.e.*166, 214 and 262 kg N/ha in sub-sub plots.

STUDIED CHARACTERS

A- Earliness characters:

1. Number of days to 50% heading (day).

2- Number of days to 50% flowering (day).

B- Growth and physiological characters:

1- Total leaf area/plant (cm^2).

2- Dry weight of plant (g).

3- Crop growth rate (CGR) (g/week).

4-Relative growth rate (RGR) (g/g/week).

5- Net assimilation rate (NAR) (g/m^2/week).

6- Flag leaf area (cm^2).

7- Plant height (cm).

8- Stem diameter (cm).

9- Number of tillers/plant.

C- Yield and its components

1- Number of spikes/m^2.

2- Spike length (cm).

3- Number of spikelets/spike.

4- Number of grains/spike.

5- Grains weight/spike (g).

6- Thousand grains weight (g).

7- Grain yield (t/ha).

8- Straw yield (t/ha).

D- Chemical characters:

- **In flag leaf**

1- Chlorophyll a (mg/g fresh weight):

2- Chlorophyll b (mg/g fresh weight).

3- Total chlorophylls (mg/g fresh weight).

4- Carotenoids (mg/g fresh weight).

5-Proline content (mg/g fresh weight).

6-Total phenols (mg/100 g fresh weight).

7-Sodium percentage.

8-Potassium percentage.

9-Calcium percentage.

- **In grains**

1- Crud protein percentage.

2- Total carbohydrates percentage.

The most important results obtained from this investigation can be summarized as follows:

1- Cultivars performance:

Number of days to 50% heading and to 50% flowering significantly affected by different wheat cultivars. The earlier in heading and flowering were resulted from Shaka 93 cultivar in both seasons.

It could be noticed that there were significant differences in most of growth and physiological on studied wheat cultivars in both seasons. Giza 168 cultivar caused a significant increase in characters *i.e.* total leaf area/plant, dry weight of plant after 75 and 95 DFS, relative growth rate, flag leaf area and plant height in both seasons, except net assimilation rate (in the first season). Gemiza 9 cultivar gives the highest values of stem diameter and number of tillers/plant in both seasons.

Regarding to yield components *i.e.* number of spikes/m^2, spike length, number of grains/spike, grains weight/spike and thousand grains weight were significantly differed in studied wheat cultivars. It could be concluded that, Gemiza 9 cultivar produced highest number of spikes/m^2 in both seasons. While, Giza 168 cultivar significantly surpassed on other studied cultivars of spike length, number of grains/spike, grains weight/spike, thousand grains weight (g) in both seasons. It worthy to mentioned that Giza 168 cultivar significantly surpassed in grain yield (4.809 and 5.729 t/ha) without significant differences between him and Gemiza 9 cultivar in straw yields (8.775 and 9.414t/ha) in the first and second seasons, respectively.

Giza 168 cultivar caused a significant increase in chlorophyll a content in both season and total chlorophylls content (in the second season). Gemiza 9 cultivar gives the highest values of carotenoids content, sodium percentage and total carbohydrates percentage in both seasons, except chlorophyll b content (in the second season). Whereas, Shaka 93 cultivar caused a significant increase in proline content and calcium and protein percentages in both seasons, except total phenols content, potassium percentage (in the second season).

2. Effect of foliar spraying treatments:

Foliar spraying with mixture of humic acid and amino acids significantly surpassed other foliar spraying treatments *i.e.* humic acid or amino acids and the control treatment and recorded highest values earliness characters *i.e.* numbers of days to 50% heading and 50% flowering in both seasons.

Foliar spraying treatments caused a significant effect on most growth and physiological characters in both seasons. Foliar spraying with mixture of humic acid and amino acid induced the highest values of total leaf area/plant, dry weight of plant after 75 and 95 DFS, net assimilation rate, flag leaf area, plant height, stem diameter and number of tillers/plant in both seasons, except relative growth rate (in the first season).

Regarding to effect of foliar spraying on yield and its components, it was significant in both seasons. It was observed spraying with mixture of humic acid and amino acids produced highest means of all yield components characters in both seasons. Foliar spraying with mixture of humic acid and amino acids produced highest grain (4.607 and 5.157 t/ha) and straw (8.166 and 8.829 t/ha) in the first and second season, respectively. While, foliar spraying with humic acid only came in the

second rank. However, lowest values of for these characters were recorded the control treatment.

From obtained results, most chemical characters under study *i.e.* (chlorophyll a, chlorophyll b, total chlorophyll , carotenoids contents, proline content, total phenols content, potassium , calcium , sodium , crude protein and total carbohydrates percentages) significantly affected by foliar spraying treatments in both seasons. The highest averages of these characters were resulted from foliar spraying wheat plants with the mixture of Actosol and Amino-Cat at the rates of 5 + 5 ml/liter water in the first and second season, respectively.

3. Effect of nitrogen fertilizer levels:

With respect to effect of nitrogen fertilizer levels all growth, physiological, yield components, yield chemical characters results clearly indicated a significant effect in both seasons. Most studied characters gradually increased as a result of increasing nitrogen fertilizer levels increased from 166 to 214 and 262 kg N/ha in both seasons. It was evident that increasing nitrogen fertilizer levels up to 262 kg N/ha increased most studied characters, except total phenols content and decrease of sodium percentage in both seasons. On the contrary, lowest values of these characters were obtained from plots that received lowest nitrogen fertilizer levels (166 kg N/ha), except sodium percentage in both seasons.

4. Effect of interactions:

Results indicated that there was a significant effect due to the interaction between studied cultivars X foliar spraying on growth and physiological characters *i.e.* leaf area/plant, plant dry weight after 75 and 95 DFS, stem diameter (in the second season) and plant height (in both seasons). This interaction effect on yield components and yield *i.e.* number of spikes/m^2, thousand grains weight (in the first season), grains

weight/spike (in the second season), grain yield t/ha and straw yield t/ha (in both season). Lastly effect on chemical characters *i.e.* total chlorophylls content, proline content, total phenols content and calcium percentage (in the first season), chlorophyll a content, chlorophyll b content , carotenoids content and total carbohydrates percentage (in the second season).

Regarding to the interaction effect between cultivars X nitrogen fertilizer levels. Results showed a significant effect on earliness characters *i.e.* number of days to 50% heading and number of days to 50% flowering (in the second season), and effected on growth and physiological characters *i.e* RGR, flag leaf area, plant height (in the first season) and number of tiller/plant (in the second season). Results showed a significant effect on yield components and yield *i.e* number of spikes/m^2 (in the first season), grain and straw yields t/ha (in both seasons). Lastly effect on chemical characters *i.e.* chemical characters *i.e.* total chlorophylls content, proline content, total phenols content, sodium percentage, total carbohydrates percentage (in the first season), chlorophyll a content, chlorophyll b content and carotenoids content (in the second season).

The interaction effect between foliar spraying X nitrogen fertilizer significantly affected on days to 50% flowering (in the first season), and effect on growth and physiological characters *i.e.* dry weight of plant (g) after 75 and 95 DFS, RGR, plant height (in both seasons), flag leave area (in the second seasons), stem diameter and number of tillers/plant (in the first season), and effect on yield components and yield *i.e.* grains weight/spike (in the first season), number of spikelets/spike, number of grains/spike, grain and straw yields t/ha (in both seasons). Lastly effect on chemical characters *i.e.* chlorophyll b content, carotenoids content (in the first season), chlorophyll a content, total chlorophylls content and potassium percentage (in the second seasons).

As regards the interaction among wheat cultivars X foliar spraying X nitrogen fertilizer levels, results revealed a significant effect on number of days to 50% flowering (in the first season), and effect on growth and physiological characters *i.e.* flag leaf area, stem diameter, number of tillers/plant (in the first season) and plant height(in the second seasons), and effect on yield components and yield *i.e* number of spikelets/spike, number of grains/spike (in the first season), grain and straw yields t/ha (in both seasons). Lastly effect on chemical characters *i.e.* chlorophyll a content, chlorophyll b content, calcium percentage (in the first season), sodium percentage (in the second season), total chlorophylls and carotenoids (in both seasons).

Conclusion

It could be stated that foliar spraying of Giza 168 cultivar with mixture of humic and Amino acids 5 + 5 ml/liter water beside increasing nitrogen fertilizing rate up to 262 kg N/ha and produced the best grain and straw yields characteristics under newly reclaimed sandy saline soil conditions of North Nile Delta, Egypt.