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Response of some onion varieties for mineral, bio and nano fertilizers under upper Egypt conditions.

By

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SUMMARY

Two field experiments were conducted at the Experimental Farm of Shandaweel Agricultural Research Station, Sohag, (ARC), during 2016/2017 and 2017/2018 seasons. These experiments were conducted to study the effect of fertilization with mineral, bio, humic and nano fertilization on yield, quality and storability of some onion varieties under Sohag Governorate conditions.

Experiment I

Effect of mineral, bio, humic and nano fertilization on yield, quality and storability of some onion varieties.

The experiment was laid out in a split plot arrangement with three replicates. The main plots were devoted for onion varieties (Shandaweel 1, Giza 6 Mohassan and Giza 20), while the sub plots were devoted for the combination between the different fertilizer treatments:

- 1- Without fertilization (control).
- 2- 120, 45, 50 kg/fed NPK (100% of recommended NPK).
- 3- Biofertilizers (Nitrobin+Phosphorin+Potassium)+ humic acid.
- 4- Biofertilizers + humic acid + nano ZnO.
- 5- 75% NPK + biofertilizers + nano ZnO.
- 6- 50% NPK + biofertilizers + nano ZnO.
- 7- 75% NPK + humic acid + nano ZnO.
- 8- 50% NPK + humic acid + nano ZnO.
- 9- 75% NPK + biofertilizers + humic acid + nano ZnO.
- 10- 50% NPK + biofertilizers + humic acid + nano ZnO.

The obtained results could be summarized as follows:

A. Vegetative growth characteristics:

Giza 20 variety attained the highest values of plant height in both seasons at 90 and 120 days, while Shandaweel 1 variety attained the lowest values at 90 days in the second season and at 120 days in both seasons.

Application of 75% NPK + biofertilizer + humic + nano-ZnO achieved the highest values of plant height at 90 days in the second season and at 120 days in both seasons. Control treatment (without fertilization) appeared the lowest values of plant height at 90 days, in both seasons, and at 120 days in the second season.

The highest means of number of leaves/plant and neck diameter were recorded for Giza 20 variety, while the lowest means were recorded for Shandaweel 1 variety at 90 and 120 days, in both seasons.

The highest means of number of leaves/plant and neck diameter were obtained under the treatment of 75% NPK + bio-fertilizer + humic + nano-Zno.

The highest means of bulb diameter were recorded for Shandaweel 1, while the lowest means were recorded for Giza 20 at 90 and 120 days, in both seasons.

The highest means of bulb diameter were obtained under the treatment of 75% NPK + biofert. + humic + nano-ZnO at 90 days in the second season and at 120 days, in both seasons, while the treatment of 75% NPK + humic + nano-ZnO appeared the highest values of bulb diameter at 90 days, in the first season.

The lowest means of bulbing ratio were recorded for Shandaweel 1 variety, while the highest means were recorded for Giza 20 variety, these result were true at 90 and 120 days, in both seasons.

Fertilization treatments significantly affected bulbing ratio at 90 and 120 days in the first season only. The lowest means of bulbing ratio in the this season were obtained under biofert.+ humic and under no fertilization at 90 and 120 days, respectively.

Shandaweel 1 variety attained the highest values of plant fresh weight and plant dry weight at 90 days in both seasons, while Giza 6 Mohassan recorded the lowest values at 90 days, in the 2nd season.

The treatments of 75% NPK+ biofert. + humic + nano-ZnO appeared the highest values of plant fresh weight and plant dry weight at 90 days, while the treatment of 100% NPK appeared the highest values at 120 days, in both seasons.

B. Bulb yield and its components:

The highest means of average bulb weight, total yield/fed, exportable yield/fed and local marketable yield/fed were obtained for Giza 20 variety while, the lowest means were recorded for Giza 6 Mohassan variety, in both seasons.

Application of 75% NPK + biofert. + humic + nano-ZnO appeared the highest means of average bulb weight, total yield/fed and exportable yield/fed, in both seasons.

The highest values of average bulb weight, total yield/fed and exportable yield/fed, were obtained by planting of Giza 20 variety under 75% NPK + biofert. + humic + nano-ZnO, in both seasons.

The highest values of local marketable yield/fed, were obtained by planting of Giza 20 variety under 75% NPK + humic + nano-ZnO, in both seasons.

C. Bulb quality:

Shandaweel 1 variety attained the highest means of bulb diameter while, Giza 20 attained the lowest values, in both seasons.

Application of 100% NPK appeared the highest means of bulb diameter, while the treatment of no fertilization appeared the lowest means in both seasons.

The highest means of shape index% were obtained for Giza 20 variety, while the lowest means were recorded for Shandaweel 1 variety, in both seasons.

The highest means of shape index % were achieved under the treatment of no fertilization, in both seasons, while the lowest means were recorded under the treatments of 75% NPK + humic + nano-ZnO, and 75% NPK + biofert. + nano-ZnO in the first and second seasons, respectively.

Giza 6 Mohassan variety attained the lowest values of double bulbs% in 1st season while, Shandaweel 1 variety recorded the lowest values in 2nd season. Giza 20 variety attained the highest means of double bulbs%, in both seasons.

The treatment of 50% NPK + humic + ZnO appeared the lowest values of double bulbs% in 1st season while, the treatment of no fertilization appeared the lowest values in 2nd season. Application of 75% NPK + biofert. + nano-ZnO appeared the highest values of double bulbs% in both seasons. Shandaweel 1 variety appeared the lowest means of bolters% in both seasons.

The lowest means of bolters% were recorded by the treatments of 50%NPK + biofert. + nano-ZnO in 1st season or 75%NPK + bio fert. + nano-ZnO in 2nd season. The treatment of biofert.+ humic showed the highest means of bolters% in the 1st season while, the treatment of 50% NPK + humic + nano-ZnO showed the highest means in the 2nd season.

Giza 20 variety attained the highest means of dry matter% and TSS%, while, Shandaweel 1 variety attained the lowest means, in both seasons.

The highest means of dry matter% were obtained under the treatments of no fertilization, in the first season and under 50% NPK + biofert. + nano-ZnO, in the second seasons.

The highest means of TSS% were recorded under the treatment of no fertilization in both seasons, while the lowest means were obtained under the treatments of 75% NPK + humic + nano-ZnO, in the first season and under 50% NPK + humic + nano-ZnO in the second season.

D. Storability:

The lowest means of total loss% at 60 and 180 days of storage were recorded for Giza 20, in both seasons.

The lowest means of total loss% at 60 and 180 days of storage were recorded under the treatment of no fertilization in both seasons.

Shandaweel 1 variety attained the lowest means of total loss % at 120 days of storage, in both seasons.

The lowest means of total loss% were recorded under no fertilization in the 1st season while, the lowest means in the 2nd season were recorded under the treatment of 50% NPK + biofert. + nano-ZnO.

Experiment 2

Onion yields, quality and storability as influenced by potassium fertilization and spraying with micronutrients.

The experimental design was split plot with three replications The main plots were devoted to rates of mineral potassium fertilizer, (25, 50, 75 and 100 Kg K/fed). While, the sub plots were devoted to the treatments of foliar spraying with chelated

micronutrients compound (after 30 days from transplanting, after 30 and 45 days from transplanting, and after 30, 45 and 60 days from planting). The obtained results could be summarized as follow:

A. Vegetative growth characteristics:

Application of potassium at rate of 100 kg/fed appeared the highest values of plant height at 90 days in the second season, and at 120 days, in both seasons, whilst application of 75 kg/fed of potassium appeared the highest values at 90 days in the first season.

The lowest values of plant height were obtained by using 25 kg/fed of potassium at 90 days in both seasons, and at 120 days in the second season.

Application of K fertilization at rate of 100 kg/fed appeared the highest means of No. of leaves/plant at 90 days in both seasons and at 120 days in the second season. The lowest means of No. of leaves/plant were recorded by using of 25 kg K/fed at 90 and 120 days in both seasons.

Spraying three times with micro nutrients recorded the highest means of plant height and No. of leaves/plant, while spraying one time with micro nutrients appeared the lowest means, at 90 and 120 days, in both seasons.

The highest means of neck diameter at 90 days were recorded by application of 100 kg K in the first season or by application of 50 kg K in the second season, while the lowest means were obtained by 25 kg K fertilization treatment in the first season or by 75 kg K fertilization treatments in the second season.

At 120 days, the highest means of neck diameter were recorded by application of 25 kg K/fed, while the lowest means were recorded by application of 100 kg K/fed., in both seasons.

Spraying three times with micro nutrients recorded the highest means of neck diameter, at 90 and 120 days, in both seasons. While spraying one time with micro nutrients recorded the lowest means, at 90 days in the 1st season and at 120 days, in both seasons.

The highest means of bulb diameter were obtained by K fertilizer application at rate of 100 kg/fed, while the lowest means were recorded by application of 25 kg K, at 90 and 120 days in both seasons.

Spraying two times with micro nutrients appeared the highest means of bulb diameter at 90 days in the 1st season, while spraying three times appeared the highest means at 90 days in the 2nd season and at 120 days in both seasons. The lowest means of bulb diameter were recorded by spraying one time at 90 and 120 days in both seasons.

The lowest means of bulbing ratio were obtained by application of K fertilization at rate of 100 kg/fed at 90 or 120 days in both seasons.

Spraying two times with micro nutrients appeared the lowest means of bulbing ratio at 90 days, while spraying one time with micro nutrients recorded the lowest means at 120 days, in both seasons.

Application of 100 kg K appeared the highest means of plant fresh weight at 90 days in the 2nd season and at 120 days in both seasons. The lowest means of plant fresh weight were recorded by application of 25 kg K/fed, at 90 and 120 days, in both seasons.

Spraying with micro elements three times appeared the highest means of plant fresh weight, while spraying one time recorded the lowest means at 90 and 120 days, in both seasons.

Application of 100 kg K/fed appeared the highest means of plant dry weight at 90 and 120 days in the 1st season, and at 120 days in the 2nd season; while the lowest means were recorded by application of 25 kg K/fed at 90 and 120 days in both seasons.

Spraying three times with micro nutrients achieved the highest means of plant dry weight at 90 and 120 days in the 1st season and at 90 days in the 2nd season. The lowest means of plant dry weight were recorded by spraying one time with micro nutrients, at 90 and 120 days in both seasons.

B. Bulb yield and its components:

The highest means of average bulb weight, total yield/fed and exportable yield/fed were obtained by application of 100 kg K/fed., while the lowest means were obtained by application of 25 kg K/fed, in both seasons.

Spraying three times with micronutrients appeared the highest means of average bulb weight, while spraying one time recorded the lowest means, in both seasons.

The highest means of total yield/fed and exportable yield/fed were obtained by spraying three times with micronutrients, while the lowest means were recorded by spraying two times with micro nutrients in the 1st season or by spraying one time in the 2nd season.

Application of K fertilization at rate of 100 kg/fed. and spraying three times with micro nutrients appeared the highest values of average bulb weight, total yield/fed and exportable yield/fed, in both seasons.

Rates of K fertilization significantly affected local marketable yield/fed in the 2nd season only, where application of 25 kg K/fed recorded the highest means of local marketable yield /fed, while application of 75 kg K/fed. recorded the lowest means in the same season.

Spraying with micro nutrients treatments significantly affected local marketable yield /fed in first season only, where spraying two times with micronutrients appeared the highest values, while spraying three times with micro nutrients appeared the lowest values.

C. Bulb quality:

Application of 100 kg K appeared the highest means of bulb diameter, while application of 25 kg K recorded the lowest means, in both seasons.

The highest means of bulb diameter were obtained by spraying three times with micro nutrients, while the lowest means were recorded by spraying one time with micro nutrients, in both seasons.

The highest values of bulb diameter were obtained from the combination between the application of 100 kg K and spraying with micronutrients three time, in both seasons

Data revealed that K fertilization rates significantly affected bulb length in the 1st season only. In the 1st season application of 25 kg K appeared the highest means of bulb length, while application of 100 kg K appeared the lowest means.

Spraying with micro elements treatments significantly affected bulb length in the 1st season only. Spraying three times with micro elements appeared the highest means

of bulb length in both seasons, while spraying two times, in the first season or one time in the second seasons.

Application of 25 kg K recorded the highest means of shape index in both seasons, while the lowest means were recorded by application of 100 kg K in the 1st season or application of 75 kg K in the 2nd season.

The highest means of shape index were appeared by spraying the micronutrients one time, while the lowest means were recorded by spraying the micro elements two times, in both seasons.

Application of K fertilization at rate of 100 kg/fed appeared the lowest means of small bulb %, while application of 25 kg K appeared the highest means, in both seasons.

The lowest means of small bulb% and double bulbs% were recorded by spraying three times, while the highest means were recorded by spraying with micro elements one time, in both seasons.

The lowest means of bolters% were recorded by K fertilizer application at rate of 100 kg /fed, while the highest means were recorded by K fertilizer application at rate of 25 kg/fed and 75 kg/fed, in the first and second seasons, respectively.

The lowest means of bolters% were obtained by spraying three times with micronutrients in both seasons, while the highest means were obtained by spraying two times or one time, in the first and second seasons, respectively.

The highest means of dry matter% and TSS% were obtained by application of 100 kg K/fed, while the lowest means were recorded by K fertilizer application at rate of 25 kg/fed, in both seasons.

Spraying three times with micro elements gave the maximum means of dry matter% and TSS%, while spraying one time gave the minimum means, in both seasons.

Application of 100 kg K/fed and spraying three times with micronutrients appeared the highest values of dry matter% in both seasons, and TSS% in the second season.

D. Storability:

The lowest means of total loss % at 60 and 120 days of storage were recorded by using of 100 kg K/fed in both seasons.

SUMMARY

Spraying three times with micronutrients gave the lowest means of total loss% at 60 days of storage, in the first season, and at 120 days of storage in both seasons.

Application of 100 kg K/fed appeared the lowest values of total loss% at 180 days of storage, in both seasons.

Spraying three times with micronutrients appeared the lowest means of total loss% at 180 days of storage, in the first season, while spraying one time appeared the lowest values at 180 days of storage in the second seasons.