J. Product. & Dev., 28(3): 175- 187 (2023)

INFLUENCE OF GA3, DRY YEAST AND SOME PK-FERTILIZER ON GROWTH AND SEED YIELD OF ONION (*Allium cepa* L.)

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ABSTRACT

This experiment was conducted during the two successive seasons of 2019/2020 and 2020/2021 at a Private Farm of Dammas District, Dakahlia Governorate, Egypt to investigate the effect of GA_3 concentrations, dry yeast, phosphorus and potassium as foliar spraying on onion bulb cv. Giza 20 Mohassan for increasing growth and seed yield of onion.

The experimental was included 9 treatments with three replicates as follows:
Control (without any addition),GA3 at 50 ppm ,GA3 at 100 ppm., dry yeast at 4/g/l + phosphoric acid, 16% P_2O_2 + potassium silicate, 32% K_2O), 8 g/L (dry yeast + phosphoric acid, 16% P_2O_2 + potassium silicate, 32% K_2O), 12 g/L (dry yeast + phosphoric acid, 16% P_2O_2 + potassium silicate, 32% K_2O), GA3 at 50 ppm + 4g/L (dry yeast + phosphoric acid, 16% P_2O_2 + potassium silicate, 32% K_2O), GA3 at 50 ppm + 8 (dry yeast + phosphoric acid, 16% P_2O_2 + potassium silicate, 32% K_2O), and GA3 at 50 ppm + 12 (dry yeast + phosphoric acid, 16% P_2O_2 + potassium silicate, 32% K2O).

A randomized complete block design (RCBD) with three replicates was used.

Results revealed that spraying with GA_3 at 100 ppm, being the most effective on growth, seed yield of onion, seed germination percentage (%). followed by the treatment of GA3 at 50 ppm + dry yeast at 8/g/l + phosphoric acid + potassium silicate).

Conclusively: it can be concluded that GA_3 at the concentration of 100 ppm and 50 ppm with the triple foliar application treatment of dry yeast + phosphoric acid + potassium silicate, being the most effective treatments on growth and seed yield of onion .

Key words:GA3, dry yeast, PK fertilizer, growth,seed yield, onion

INTRODUCTION:

Onion (*Allium cepa* L.) is one of the most important spices, as well as vegetable crops in the world. Onion belongs to the family Alliaceae is one of the most widely cultivated vegetable and spice crops in the world.

Many attempts were taken in the recent past to augment the seed yield and to improve the quality of onion seed and overcome the cytoplasmic male sterility (Naamni *et al.,* 1980).

The growth regulators are considered as key factors in vegetable growth, flowering, fruit setting and seed production in plant, but a few researchers carried out experiments involving growth regulators as influencing for in onion seed production and overcome male sterility. From most experiments were conducted in various parts of the world, it is revealed that GA_3 at various concentrations had a remarkable effect on plant height, number of flowers per umbel, umbel diameter and seed production of onion (El-Habbasha *et al.*,1985).

Gibberellin is such an organic compound that has gibbane skeleton and that stimulate cell division or cell elongation or both. As well as, it plays key role in fruit setting and flowering (Devi *et al.*, 2018).

The onion umbel contains perfect flowers with mature pollen and receptive stigma present at the sometime. Production of onion seed is based on systems of cytoplasmic and genic male sterility (Tinna, 2019).

Plants, need all nutrients in different ratios for their growth, development stages, flowering and seed production, Nutrients such as, phosphorus is an important nutrient and contribute to increase seed yield (Fekry, 2009), as well as potassium plays an important role in increasing translocation of photosynthetic assimilates and water use efficiency (Abd El-Al *et al.,* 2005). In addition, potassium can improve the growth,and yield of plants (Negi *et al.,* 2022).

Bio-stimulants are biologically active compounds that in hence metabolism and promote plant development when applied in small quantities. Bio-stimulants contain microelements, hormones, enzymes, proteins, vitamins, amino acids, and other compounds (El-Morsy *et al.*,2011).

Dry yeast is a natural bio-substance suggested to be useful stimulatory, nutritional and protective functions. Many investigators and researchers pointed out that foliar spray with dry yeast increased plant growth, seed yield of some vegetable crops (Fawzy *et al.*,2010, Farrag *et al.,* 2016, Ali, 2017, Abdel-Rahim *et al.*,2019 and Kanimarani, 2020).

The objectives of the present investigations were to elucidate the effect of GA_3, dry yeast, phosphorus and potassium applications as foliar spray on onion bulb for increasing the growth and seed yield of onion.

MATERIALS AND METHODS

The present experiment was conducted during the two successive seasons of 2019/2020 and 2020/2021 at the Farm of Dammas district, Dakahlia Governorate, Egypt to investigate the effect of GA_3 concentrations, dry yeast, phosphorus and potassium foliar spraying on onion bulb cv. Giza 20 Mohassan for increasing growth and seed yield of onion.

Physical and chemical analysis of the investigated soil and irrigation water were carried out according to Black *et al.*, (1982) and the values are tabulated in Table (1) and irrigation water analysis are shown in Table (2).

Table (1): Physical and chemical of analysis of soil used in the experiment study.

Characters		Values
Physical analysis :		
Coarse sand	(%)	3.37
Fine sand	(%)	15.97
Silt	(%)	33.86
Clay	(%)	46.80
Textural class		Clay loam
***Chemical analysis*:**		
Organic matter (%)		1.4
Available N ppm		81.43
Available P ppm		19.17
Exchangeable K ppm		279.67
E.C. M mhos/cm at 25 °c		4.10
pH		7.4

Table (2): The analysis of irrigation water>

Analysis	Values
Total salts (ppm)	810.35
Ca^{++} (mg/L)	11.79
Mg^{++} (mg/L)	14.81
No^{++} (mg/L)	7.8
K^{+} (mg/L)	1.93
SO_4^{--} (mg/L)	4.11
$H\ CO_3^{-}$ (mg/L)	2.85
EC Electric Conductivity) (dS/m)	0.61

In this study, the onion bulbs were used as experimental materials. The weight of the bulbs required for each treatment was made uniform by weighing before planting.

The onion bulbs were planted at 20 and 23 of October, 2019 and 2020 seasons, respectively.This experimental was included 9 treatments with three replications as follows:

1- Control (without any addition)
2- GA_3 at GA3 at 50 ppm.
3- GA_3 at GA3 at 100 ppm.
4- (dry yeast at 4 g/L + phosphoric acid, 16% P_2O_5+ potassium silicate, 32% K_2O).
5- (dry yeast at 8 g/L + phosphoric acid, 16% P_2O_5 + potassium silicate, 32% K_2O).
6- (dry yeast at 12 g/L + phosphoric acid, 16% P_2O_5 + potassium silicate, 32% K_2O).
7- GA_3 at 50 ppm + dry yeast at 4 g/l + phosphoric acid, 16% P_2O_5 + potassium silicate, 32% K_2O).
8- GA_3 at 50 ppm + dry yeast at 8 g/L + phosphoric acid, 16% P_2O_5 + potassium silicate, 32% K_2O).
9- GA_3 at 50 ppm + dry yeast at 12 g/L + phosphoric acid, 16% P_2O_5 + potassium silicate, 32% K_2O).

A randomized complete block design (RCBD) with three replicates was used.

The plot area was 7.2 m^2 (4 ridges of 3 m long and 0.6 m width), bulbs were planted on one side of ridge at 20 cm a part and medium bulbs of uniform size (6-7 g) were planted at a depth of 2.5 cm.

Active dry yeast were dissolved in water followed by adding sugar at ratio 1 : 1 and kept for 12hours for activation and reproduction of yeast before application on the plants. Onion plants were sprayed with the yeast culture, phosphorus and potassium, as well as gibberellic acid three times during the growth period, the first was after one month from the bulbs emergence, the second was after two weeks of the first and the third was applied after two weeks of the second one.

The other cultural procedures of growing onion were practiced as usually followed in the commercial production of seed onion yield.

Data recorded:

Plant growth characters:

Five plants were randomly selected from each plot at two months from planting and data were recorded on individual plant basis from the selected plant in respect of the maximum plant height/(cm), maximum

number of leaves per plant, plant fresh weight and plant dry weight (g) and chlorophyll pigment.(Cottenie *et al.,* 1982)

Seed yield:

At harvest time, the data were recorded, i.e. weight of seeds per plant (g), seed yield per feddan (kg/feddan), and thousand seed weight (g).

Statistical analysis:

The obtained data were statistically analyzed according to Snedecor and Cochran (1980) at compare the mean of treatments by the least significant differences (LSD) at 5% probability and using SAS program (SAS, 2004).

RESULTS AND DISCUSSION:

Plant growth characters:

Data presented in Tables (3 and 4) show that all foliar spraying tested treatments had significant effect on the various studied of vegetative growth characters of onion plants, in both growing seasons of 2019/2020 and 2020/2021.

The combined effect of GA_3 at 50 ppm and dry yeast at 12 g/L + phosphoric acid, 16% P_2O_5 + potassium silicate, 32% K_2O) resulted in a significant increment on plant height, number of leaves, plant fresh weight and plant dry weight of onion plants and chlorophyll pigmant in both growing seasons. followed by GA3 at 50 ppm + 8 g/L dry yeast + phosphoric acid + potassium silicate, GA3 at 50 ppm + 4 g/L dry yeast + phosphoric acid + potassium silicate, GA3 at 100 ppm and GA3 at 50 ppm, respectively.

Meanwhile, the lowest values of vegetative growth parameters of onion plants were obtained as a result of control treatment (without any addition with GA_3 or other treatments).

Devi *et al.,* (2018) concluded that gibberellin is such an organic compound that has gibbane skeleton and that stimulate cell division or cell elongation or both and thus increased the plant growth parameters. Moreover, Bidwell (1979) demonstrated that phosphorus plays an important role and a vital role in the enzyme system for the energy transform in photosynthesis and respiration and then increased the plant growth.

In Dry yeast is a natural bio-stimulant that have many elements, hormones, vitamins and amino acids which encourage the cells of plant and bio-processes to increase the plant growth characters (Fawzy, 2010). As well as, Ivanov (2001) and Abou El-Salehein *et al.,* (2008) pointed out

that potassium plays an important role in increasing translocation of photosynthetic assimilates and water use efficiency and then increased plant growth.

These results are in agreement with those recorded by El-Habbasha *et al*., (1985) , Asgharzadeh (2014) and Devi *et al.*, (2018) who working on GA_3, Abdul Ghaffoor *et al*.(2003) and Arisha *et al*. (2017) on potassium, Ibraheim (2010) on phosphorus, and Abdel-Rahim *et al.*, (2019) who working on dry yeast.

Seed yield:

Results in Table (5) indicated that GA_3, dry yeast, phosphorus and potassium fertilizers significantly increased seed yield of onion as a result of GA_3, dry yeast, phosphorus and potassium and their combination.

The treatment of GA3 at 100 ppm, being the most effective in highest seed yield of onion plants and its components, i.e. seed weight/ plant, seed yield/ feddan and thousand seed weight followed by the treatments of GA3 at 50 ppm + 8 g/L (dry yeast + phosphoric acid + potassium silicate) and GA3 at 50 ppm + 4 g/L dry yeast + phosphoric acid + potassium silicate, respectively.

These results are true in both growing seasons. The obtained results may be due to the increases in plant growth parameter (Table,3) and flowering trials, then increased the seed yield of onion plants.

These results are agreement with those reported by Rashid (2010), Elsiddig *et al.* (2015) and Devi *et al.*, (2018); Edmeades (2002), Ali, (2017); and Negi *et al.*, (2022), with foliar application of GA_3; dry yeast; P and K- fertilizers, respectively.

Conclusively,: it can be concluded that GA_3 at the concentration of 100 ppm and 50 ppm with the triple foliar application treatment of dry yeast at 8 g/l+ phosphoric acid + potassium silicate at the rate of being the most effective treatment on growth, and seed yield of onion .

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تأثير حمض الجبريلليك ، الخميرة الجافة وبعض السماد الفوسفوري البوتاسي علي نمو ومحصول بذور البصل

نبيلة مصطفي شعبان ، عصام حسين أبوالصالحين ، محمود محمد الحمادي ، علي عبدالحميد حسان
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أجريت تجربة حقلية خلال موسمين ناجحين ٢٠١٩/٢٠٢٠ ، ٢٠٢٠/٢٠٢١ في مزرعة خاصة بقرية دماص ، محافظة الدقهلية ، مصر لدراسة تأثير تركيزات حمض الجبريلليك والرش بالخميرة الجافة والفوسفور والبوتاسيوم علي أبصال البصل صنف جيزة ٢٠ محسن لزيادة النمو ومحصول البذور .

إشتملت التجربة عل ٩ معاملات في ثلاث مكررات كمايلي:

المقارنة (بدون أية إضافات) ، حمض الجبريلليك عند ٥٠ جزء في المليون ، حمض الجبريلليك عند ١٠٠ جزء في المليون ، الخميرة الجافة عند ٤ جرام / لتر +حمض الفوسفوريك + سليكات البوتاسيوم ، الخميرة الجافة عند ٨ جرام / لتر +حمض الفوسفوريك + سليكات البوتاسيوم ، الخميرة الجافة عند ١٢ جرام / لتر +حمض الفوسفوريك + سليكات البوتاسيوم ، حمض الجبريلليك عند ٥٠ جزء في المليون + الخميرة الجافة عند ٤ جرام / لتر +حمض الفوسفوريك + سليكات البوتاسيوم ، حمض الجبريلليك عند ٥٠ جزء في المليون + الخميرة الجافة عند ٨ جرام / لتر +حمض الفوسفوريك + سليكات البوتاسيوم ، حمض الجبريلليك عند ٥٠ جزء في المليون + الخميرة الجافة عند ١٢ جرام / لتر +حمض الفوسفوريك + سليكات البوتاسيوم.

صممت التجربة بنظام القطاعات الكاملة العشوائية في ثلاث مكررات .

أوضحت النتائج أن حمض الجبريلليك عند ١٠٠ جزء في المليون ، كان الأكثر فعالية علي نمو ، ومحصول بذور البصل . كانت هذه النتيجة متبوعة بمعاملة حمض الجبريلليك عند تركيز ٥٠ جزء في المليون + الخميرة الجافة عند ٨ جرام / لتر +حمض الفوسفوريك + سليكات البوتاسيوم

التوصية: يمكن أن نوصي بأن : معاملة حمض الجبريلليك عند تركيز ٥٠ جزء في المليون + الخميرة الجافة عند ٨ جرام / لتر +حمض الفوسفوريك + سليكات البوتاسيوم يمكن استخدامها للحصول علي أعلي نمو ومحصول بذور لنباتات البصل .