Influence of growth stimulators and foliar spraying of application on onion yield

Geries, L.S.M.[2]; A.A. E. Mohamed[1]; E. Hafez[1] and Lamiaa. M. Beshta[2]

[1]Agron. Dep., Fac. of Agric., Kafr-elsheikh univ.; Kafr-elsheikh; Egypt.
[2] Onion Res. Dept., Field Crops Res. Inst., ARC, Egypt.

Abstract: This study was conducted at the Farm of tawulah Village, Qallin, at North delta of Egypt, during 2015 - 2016 and 2016 - 2017 seasons, to study the effect of some growth regulators and time of application on the plant growth, yield and yield components of onion variety Behary red (*Allium cepa*, L.). The experiments were set out in a split-plot-design with four replications, eight growth regulator treatment, i.e., control (spray with water), cytokinins, gibberellins, nepthalene acetic acid, cytokinins+ gibberellins, cytokinins+ nepthalene acetic acid, gibberellins+ nepthalene acetic acid and cytokinins+ gibberellins+ nepthalene acetic acid were arranged at random in the main plots, three foliar spraying, i.e., once spray at 50, once spray at 70 as well as twice spray at 50 and 70 DAT (days after transplanting) were arranged at random in sub-plot. The results showed that, foliar spraying with the combination of cytokinins+ gibberellins+ nepthalene acetic acid recorded the highest values for growth attributes i.e., leaf length and number of green leaves, most studied traits comparing to other treatment, except culls yield. while foliar spraying at 50 and 70 days after transplanting, recorded the highest values for vegetative growth character and onion yield with best quality.
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Key words: Onion, transplanting date, growth regulators - foliar spraying

Introduction

Onion, (*Alluim cepa, L.*) is of an outstanding importance among the other crops in Egypt on account of its great value as an exportable commodity. It ranks fourth in this aspect after cotton, rice and citrus. It is grown in Egypt as winter, summer crop and as an interpolated crop for mature dry bulbs and, to some extent, for the green bunch. More than 70 % of the winter crop is shipped all over the world especially to European countries, which are generally the chief recipients.

Glycogenesis frequency of Turkish onion cultivars has not yet been evaluated. For this reason, the present study aims to obtain haploid plants via flower bud or ovary culture supplemented with plant growth regulators by combining auxin (2,4 D) and cytokinin (BAP) in two Turkish onion cultivars.

Materials And Methods

Two successive field experiments were carried out during both winter seasons of 2014/2015 and 2015/2016 at a Private Farm in Nashart Village, Qallin, Kafr Elsheikh Governorate, at North Delta Egypt, to study the effect of some growth regulators and time of foliar spraying application on plant growth, yield and yield components of onion variety Behary red. Mechanical and chemical analysis of the experimental sites in the first and second seasons according to **Piper (1950) And Jackson (1967**.

The preceding crop was cotton in the two seasons. Every experiment included 24 treatments, which were the combinations between eight growth regulator treatment and three time of spraying. Nitrogen fertilizer was added into two portions, half being applied after 30 DAT, while the remaining portion was applied after 60 DAT.

In both seasons, the seed of onion cultivar were sown in the nursery on 15th October and 15th November, while transplanting took place after 50 to 60 days of sowing on 15th December, 1st and 15th January in both seasons. Each experimental plot area was 10.5 m2 (included 6 ridges, 60 cm width with 3.5 meter long for each). A split plot design with four replicates was used in this study. The main plots were designated for eight growth regulator treatment, i.e., control (spray with water), cytokinins, gibberellins, nepthalene acetic acid, cytokinins+ gibberellins, cytokinins+ nepthalene acetic acid, gibberellins+ nepthalene acetic acid and cytokinins+ gibberellins+ nepthalene acetic acid, whereas time of spraying once spray at 50, once spray at 70 as well as twice spray at 50and70 days after transplanting (DAT) were randomly distributed in sub – plots.

Statistical analysis: All data collected were subjected to stander Statistical analysis following the proceeding described by **Gomez and Gomez (1984)** using **ANOVA** technique by computer software program **(COSTAT)**. Indicate the significant at 5% level of probability, respectively.

Results And Discussion

1- Leaf length (cm):

Leaf length of onion as influenced by bio-stimulators, date of foliar spraying treatments and their interactions at different sampling dates (90 and 120 day after transplanting "DAT") in 2015/16 and 2016/17 seasons are presented in Table (1).

Data in Table (1) showed that the eight treatments had a significant effect on leaf length at 90 and 120 DAT in both seasons. The highest values of leaf length were obtained with cytokines + gibberellins + naphthalene acid treatment at 90 and 120 DAT (54.88 and 55.05 cm) and (66.11 and 65.64 cm) at 90 and 120 day after transplanting in both seasons, respectively. But the lowest values of leaf length were obtained with control treatment (47.91 and 47.71 cm) and (59.03 and 58.54 cm)) at 90 and 120 day after transplanting in the two seasons, respectively. This finding agreed to the report of **Saleh (1989) and Yadagiri and Gupta (2017**).

Concerning foliar date, there were high significant between foliar spraying onion plants at 50 and 70 DAT the highest value were (70.15 and 69.51 cm) of leaf length was recorded with 120 DAT, but foliar spraying onion plants at 50 DAT gave the lowest values (42.84 and 42.93 cm) of leaf length was recorded with 90 DAT, at different sampling dates in 2015/2016 and 2016/2017 seasons, respectively. This finding agreed to the report of **Saleh (1989).**

Table (1): Leaf length (cm) of onion plants as influenced by bio-stimulators, foliar date and their interaction at 90 and 120 DAT in 2015/2016 and 2016/2017 seasons.

Treatment	2015/2016		2016/2017	
	90	120	90	120
	DAT			
Bio-Stimulators (A):				
Control (spray with water)	47.91 h	59.03 h	47.71 h	58.54 h
Cytokinins	51.28 e	62.13 e	50.92 e	61.64 e
Gibberellins	49.03 g	60.15 g	49.53 g	60.39 g
Nepthalene acetic acid	50.27 f	61.02 f	50 f	60.42 f
Cytokinins+ Gibberellins	53.23 c	64.10 c	52.92 c	63.99 c
Cytokinins+ Nepthalene acetic acid	54.02 b	65.23 b	54.17 b	64.78 b
Gibberellins+ Nepthalene acetic acid	52.10 d	63.23 d	52.76 d	63.30 d
Cytokinins+ Gibberellins+ Nepthalene acetic acid	54.88 a	66.11 a	55.05 a	65.64 a
F-test	**	**	**	**
Number spraying (B):				
50 DAT	42.84 c	53.20 c	42.93 c	53.12 c
70 DAT	54.02 b	64.52 b	53.79 b	64.39 b
50 +70 DAT	57.91 a	70.15 a	58.17 a	69.51 a
F-test	**	**	**	**
Interaction:				
AxB	Ns	NS	NS	NS

**, N. S indicate P > 0.01 and not significant, respectively. Means of each factor designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

There was no significant difference on leaf length in the two growing seasons due to the interaction between bio-stimulators and foliar date (Table 1).

2- Number of green leaves per plant (cm):

Number of green leaves as affected by bio-stimulators, foliar date and their interaction during at 90 and 120 DAT in 2015/2016 and 2016/2017 seasons are shown in Tables (2).

Data in Table (2) show that the number of green leaves, was affected significantly by different of bio-Stimulators treatments. However, the highest number of green leaves (8.13 and 8.09) produced with cytokinins+ gibberellins+ nepthalene acid treatment, the lowest values was obtained with control (spraying with water) at 90 and 120 DAT during two seasons, respectively. Similar findings were reported by **Ashwin and Dhumal (2017)**.

Application of foliar date treatment resulted in a significant increase in number of green leaves per plant in the two seasons (Table 6). Number of green leaves per plant increased from (4.78, 5.35, 4.79 and 5.35) in foliar date at 50 DAT to (8.50, 9.06, 8,54 and 9.10) with foliar date at 50 and 70 DAT as an average of sampling date in both seasons, respectively. These findings are similar in same points to the results of **Ashwin and Dhumal (2017)**.

Table (2): Number of green leaves per plant as influenced by bio-stimulators, foliar date and their interaction at 90 and 120 DAT in 2015/2016 and 2016/2017 seasons.

Treatment	2015/2016		2016/2017	
	90	120	90	120
	DAT			
Bio-Stimulators (A):				
Control (spray with water)	5.83 h	6.38 h	5.70 h	6.38 h
Cytokinins	6.66 e	7.13 e	6.73 e	7.21 e
Gibberellins	5.97 g	6.55 g	6.16 g	6.67 g
Nepthalene acetic acid	6.21 f	6.82 f	6.31 f	6.61 f
Cytokinins+ Gibberellins	7.07 c	7.69 c	6.98 c	7.51 c
Cytokinins+ Nepthalene acetic acid	7.39 b	7.94 b	7.41 b	8.08 b
Gibberellins+ Nepthalene acetic acid	6.83 d	7.4 d	6.96 d	7.46 d
Cytokinins+ Gibberellins+ Nepthalene acetic acid	7.54 a	8.13 a	7.60 a	8.09 a
F-test	**	**	**NS**	**NS**
Foliar Date (B):				
50 DAT	4.78 c	5.35 c	4.79 c	5.35 c
70 DAT	6.79 b	7.34 b	6.86 b	7.29 b
50 +70 DAT	8.50 a	9.06 a	8.54 a	9.10 a
F-test	**	**	**	**
Interaction:				
AxB	**	**	**	**

**, N. S indicate $P < 0.05$, $P > 0.01$ and not significant, respectively. Means of each factor designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Table (3): Number of green leaves per plant as affected by the interaction between bio-stimulators and foliar date at 90 and 120 DAT in 2014/2015 season.

Bio-Stimulators	90			120		
	DAT					
	Foliar Date					
	50	70	50+70	50	70	50+70
Control (spray with water)	3.66 t	5.9 lm	7.95 fg	3.69 x	6.47 p	8.45 h
Cytokinins	4.75 q	6.85 k	8.38 d	5.63 u	7.18 m	8.88 e
Gibberellins	3.84 s	6.01 j	8.08 ef	4.59 w	6.81 o	8.58 g
Nepthalene acetic acid	4.25 r	6.18 l	8.22 e	4.85 v	6.86 n	8.72 f
Cytokinins+ Gibberellins	5.31 o	7.14 i	8.78 b	5.47 s	7.7 k	9.28 c
Cytokinins+ Nepthalene acetic acid	5.63 n	7.63 h	8.93 ab	6.17 r	8.22 j	9.34 b
Gibberellins+ Nepthalene acetic acid	5.07 p	6.84 j	8.59 c	5.78 t	7.34 l	9.28 d
Cytokinins+ Gibberellins+ Nepthalene acetic acid	5.75 mn	7.8 g	9.08 a	6.21q	8.3 i	9.84 a

Means followed by a common letter are not significantly different at the 5% level, according to DMRT.

Table (5): Number of green leaves per plant as affected by the interaction between bio-stimulators and foliar date at 90 and 120 DAT in 2015/2016 season.

Bio-Stimulators	90			120		
	DAT					
	Foliar Date					
	50	70	50+70	50	70	50+70
Control (spray with water)	3.72 q	5.94 k	7.98 ef	4.21 p	6.45 l	8.48 fg
Cytokinins	4.82 n	6.64 i	8.44 c	5.48 n	7.21 j	8.94 d
Gibberellins	3.96 p	6.07 j	8.12 de	4.60 o	6.80 l	8.62 ef
Nepthalene acetic acid	4.38 o	6.32 j	8.28 cd	4.71 o	6.34 k	8.78 de
Cytokinins+ Gibberellins	5.42 m	7.35 h	8.82 b	5.63 m	7.57 i	9.35 c
Cytokinins+ Nepthalene acetic acid	5.67 l	7.68 g	8.98 b	6.21 l	8.19 h	9.84 b
Gibberellins+ Nepthalene acetic acid	5.12 mn	6.92 i	8.66 b	5.76 mn	7.42 i	9.2 c
Cytokinins+ Gibberellins+ Nepthalene acetic acid	5.78 l	7.87 fg	9.26 a	6.25 l	8.37 gh	9.64 a

Means followed by a common letter are not significantly different at the 5% level, according to DMRT.

Data in Table (3) show that the interaction between by bio-stimulators, foliar date was significant in at different sampling dates (90 and 120 day after transplanting "DAT") in 2015/16 and 2016/17 seasons. The data of Tables (4 and 5) show that, number of green leaves per plant was increased in all plots which foliar spraying with cytokinins+ gibberellins+ nepthalene acid treatment at 50 and 70 DAT compared all other treatments.

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