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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network



RESEARCH ARTICLE

BIOSCIENCE RESEARCH, 2020 17(3): 2025-2031.

OPEN ACCESS

Effect of bulbles size, nitrogen fertilizer and humic acid on the fresh yield of onion (*Allium cepa* L.)

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The study was conducted at the vegetable research field , horticulture and landscape design , college of agriculture and forestry , Mosul University at the growing season 2017/2018 , to study the Effect of bulbles size , nitrogen fertilizer and humic acid on the fresh yield of onion (*Allium cepa* L.) , under Nineveh conduction using the bubbles local variety karbalai . The tow size of bulbs were used (larg and small), and nitrogen fertilizer were, 240 kg N/hectare, 120 N/hectare + 2 g/l humic acid, 8 kg N/hectare + 3 g/l humic acid and humic acid at 5g/l. Result of the study showed that the large size of bulbest gave a significantly value in number of leaves per plant and percentage of bolting bulbs , application of nitrogen at 120 kg per hectare + 3g /L. of humic acid gave a higher mean value in number of leaves per plant and dry weight of plant . Wherever, the interaction between the large sizes with the 8 kg N per hectare +3 g/L. Humic acid gave a significantly mean value in the total fresh yield per hectare.

Keywords: Bulb size , Humic acid , Onion , Nitrogen fertilizer

INTRODUCTION

Onion *Allium cepa* L. belongs to Alliaceae family, it's one of important vegetable crops in Iraq, which is cultivate in a wide region compared with the other vegetable crops. Onion used as fresh yield. The crop is grown for consumption in green state and as mature bulbs in Iraq almost all sicy dishes contain onion as one of the important ingredient used for culinary purposes. Onion are extensively used as condiment in the preparation of curry, chutney and pickle. A pound of onion contain Protein 6 g, Fats 0.9 g, Carbohydrate 44 g, Calcium 137 mg, Phosphorous 188 mg, Iron 2.1 mg, Thiamine 0.15mg, Riboflavin 0.1 mg, Niacin 0.6mg and Ascorbic acid 38 mg. (Thomson and Kelly 1982) . Nitrogen constitutes about 5 to 6% of soil organic matter by weight and it is added to the soil both in symbiotic and non-symbiotic forms from the atmosphere. Hence, it plays a vital role in all living tissues of the plant. No other element has such an effect on promoting vigorous

plant growth as has N. Abundant protein tends to increase the size of the leaves, and accordingly, brings about an increase in carbohydrate synthesis.

Today the world going towards application of the new technology (Organic farming) in order to overcome constraints and enhance the productivity. Humic substance represent 65-70% of the organic matter in many soils, these compounds are produced by the decomposition of plant tissue and are predominantly derived from lignified cell walls. In addition, Humic acid has been claimed to promote plant growth by increasing cell membrane permeability, oxygen uptake, respiration and photosynthesis nutrient uptake and root cell elongation (Bohme and Thi Lue, 1997; Nardi et al. 2002). Nitrogen (N) rates from 125 to 150 kg_{ha}-1 have been reported in several studies as being adequate for onion growth (Sharma et al., 2003; Singh and Singh, 2000) . There have been reports, however, of N

rates as high as 200 kg_{ha}⁻¹ resulting in significant yield increases over lower rates (Al-Moshileh, 2001). Mineral fertilizers are one of the main factors that materially set up onion growth and production. The organic farming aims to maintain human health, and protect the environment (Holkha *et al.*, 2004) Onion bulbs and leaves are rich in minerals like Ca, K and P (Ullah *et al.*, 2005). Beyhan (2007) indicated in his report there was a significant increasing quadratic effect on yield from increasing N fertilizer from 0 to 336 kg_{ha}⁻¹ with an R² of 0.926. Maximum calculated yield was at 263 kg_{ha}⁻¹ N fertilizer; however, the yield at this rate did not differ. Yaso and Abdel-Razzak (2007) and Al-Fraihat (2009) refilled in their work that increasing nitrogen and sulphur application rates significantly enhanced plant height, number of green leaves/plant and weight of plant and bulb at different stages of onion growth total yield, marketable yield, culls yield, percentage of marketable, doubles and bolters as well as total soluble solids (TSS%) were also increased with increasing the rates of nitrogen and sulphur up to 200 kg N/ha and 100 kg S/ha in both seasons, respectively; whereas the lowest percentage of pickles yield was recorded with the highest level of nitrogen and sulphur fertilizers. In general, the application of 200 kg N/ha + 100 kg S/ha increased the total and marketable yield of onion bulbs of Giza 20 cultivar grown under similar conditions of this work. Ansari *et al.*, (2009) indicated in his studied that when use to size sets based, small < 1.5 cm in diameter and large diameter =1.5 -2.5 cm a number of criteria were measured at harvest, following the growth of these different sized bulbs, several of which showed significant differences in plant height, leaves number per plant the percentage of double bulbs, bulb diameter, neck diameter, bulb fresh weight.

Tekalign *et al.* (2012) found that nitrogen fertilization decreased bulb dry matter content by about 4% over the control. Nitrogen at rate of 115 or 138 kg N/ha resulted in about 2.9% rotting of the bulbs. Al-Rashidi (2014) showed in his study The application of fertilizers significantly increased diameter and height of onion bulb. The highest increment in diameter and height of bulb (15, 14.2 %) were recorded with FYM, and mineral fertilizer In the first season (11.8,17.3 %) were recorded with mineral fertilizer, and FYM in the second season. The results indicated that onion bulb weight, yield/feddan. Increased significantly with fertilizers application. The highest rate of increase

in bulb weight (24.2 and 50.5%) were recorded with FYM, followed by mineral fertilizer (48.8 and 19.3%) in the two years, respectively. The application of fertilizer significantly increased yield bulb/ feddan. The highest increment of yield (57.1 and 44.6%) were recorded with mineral fertilizer while the increment in yield of bulb (44.7, 27.7, 27.6, 28.4, 22.4 and 22.1 %) were recorded with mineral fertilizer+ FYM, mineral fertilizer + fish-meal fertilizer, and FYM. within the seasons, respectively. The addition of 5g/L micronite decreased all the measured characters for all treatments where foliar application was used. Compared with the treatments without using foliar application. The use of organic for onion production can be recommended to reduce mineral fertilizer without reducing the productivity this won save the high cost. Moradi (2015) revealed that nitrogen fertilizer as urea levels (0, 150 and 300 kg/ha) increased the fresh and dry weight, volume and bulb diameter of onion. The highest nitrate concentrations resulting from urea rate of 300 kg/h. Onion plants take up large amounts of three primary nutrients, *i.e.* nitrogen, phosphorus and potassium (Hafez & Kobata, 2012; Gharib *et al.* 2016). El-Hadidi *et al.* (2016) indicated in his research the application of the highest level of nitrogen fertilizer (150 kg N fed-1) produced the highest values of yield, quality and nutrients uptake characters of onion in the season. Messele (2016) showed in his research revealed that the application of nitrogen showed significant effects in most of studied characters while P fertilization and the interaction effect N and P did not. Application of 50 kg N ha⁻¹ increased plant height and leaf length by about 10.46 and 5.82%, respectively, over the check. Number of leaves increased by about 8.59% in response to the application of 50 kg N ha⁻¹ over the control. Leaf diameter and bulb length were not influenced by N fertilization. Phosphorus fertilization and its interaction with N did not significantly affect onion plant height, leaves number and length. Application of 75kg ha⁻¹ increased bulb length by about 22.28%, respectively, over the control. Application of 50 kg N ha⁻¹ increased the average bulb weight by 46.2%. The results of this experiment indicated that the application of 50kgN per ha increased the total and marketable bulb yield about 46.2 and 60.4 % respectively over the control (1.43and 0.001t/ha respectively). Hafez and Geris (2018) showed in there studied that the vegetative growth was positive influenced, also yield its components, quality and storability of onion were related to the

medium rate of nitrogen (100 kg N fed.-1). Furthermore, foliar spraying with humic acid at the rate of 1 kg fed.-1 led to a significant increment in the most of vegetative growth characteristics, as well as total bulb yield and its components, bulb quality. Esho and Jassim (2018) indicated in their study that the application of N.P. fertilizer showed significant at 120 kg/ha. Gave a higher value in leaf length, weight of onion and total yield /ha.

The aim of this study was Effect of bulb size, nitrogen fertilizer and humic acid on the fresh yield of onion (*Allium cepa* L.) Under conduction of Nenevah government /Iraq.

MATERIALS AND METHODS

The study was conducted at the vegetable research field , horticulture and landscape design , college of agriculture and forestry , Mosul University at the growing season 2017/2018 , to study the Effect of bulb size , nitrogen fertilizer and humic acid on the fresh yield of onion (*Allium cepa* L.) , under nenevah conduction using the bubbles local variety karbalai . The two size of bulbs were used (large 0.24 , the diameter 28.281 mm , and small 0.110 the diameter 18.572 mm) , and nitrogen fertilizer were , 240 kg N/hectare , 120 N/hectare + 2 g/l humic acid , 8 kg N/hectare + 3 g/l humic acid and humic acid at 5g/l , the experiment contained 8 treatment (2x4) for each replicate . The bulbs were planting in row at 19/11/2017 at rows and 10 cm within the rows, the area of the plot contained two rows, as 40 bulbs per plot. Data collection was , plant height (cm) , number of leaves /plant , fresh and dry weight for leaves g/plant , neck length(cm), the percentage of flowering plant , number of single bulb for double plant /plant according to the formulae :- Number of single bulbs for sample /plot The mean of single bulb for double bulbs = -----

The number of double plant /plot

White Bulb weight (g) , bulb diameter (cm) , weight of the whole plant (g) and the total yield ton/hectare. Factorial experiment in a randomized complete blocks design with three replicates was applied. Data analyzed statistically according to (SAS , 2017) program .

RESULTS AND DISCUSSION

Effect of bulbest size :

Table (1) showed the effect of bulbest size on the characters of onion during growing season 2018/2019 , the table showed that the size of

bulbest significant effected on the number of leaves per plant and the percentage of the bolting plant , the large size gave the heights value in this characters which were 15.250 and 40.208 respectively . The same result was according to Ansari *et al.*, (2009) when he used the set size on the vegetative growth and the yield. Many researches showed in their researches that bulb set girth and plant density was effects on growth , yield and quality of onion , and the greatest yield tons per hectare was obtained by large set when grown at 10 cm intra- row spacing three rows ridges , also plants produced from large bulbs produced the height vegetative growth whilst those from small bulbs recorded the least growth (Dudhat *et al.*, 2010 ; Addai and Anning ,2015 ; Adlan *et al.*, 2018) .

Effect of fertilizer levels :

Application of nitrogen fertilizer significantly affected on the number of leaves per plant, dry weight of the plant, and the percentage of plant bolting (table 2), which were, 14.983, 0.443, and 36.667 respectively. the increasing of leaves per plant , this could be attributed to the increase in the vegetative growth of the onion plants through the effect of nitrogen level in the synthesis of the different components of protein through increased production of carbohydrate in the plant system , bolting in onion plants exposed to low temperature for more 40 days , bolting is triggered in response to exposure to conditions such as sufficient low temperature or nitrogen limited supply which induce flowers to emerge before bulb are growing to flower initiation , this increase could be attributed to the fact that nitrogen levels is one of the important building blocks of amino acids where they link together and form proteins and make metabolic processes required for plant growth . Similar result was also reported by many of research's (Assefa *et al.* 2013; Moradi ,2015 ; El-Hadidi *et al.* 2016 ; Messele , 2016 ; Gharib *et al.*, 2016 ; Hafez and Geris , 2018 ; and Esho and Jssim , 2018 ; Negasi *et al.* 2018). In the other hands , there level of fertilizers N , and N with humic acid was not effected significant on the fresh weight , number of bolting bulb for double bulbs plant , diameter of bulb , the total weight for plant and total fresh weight at probability 0,05.

Table 1: Effect of bulbest size on the onion traits at growing season 2018 / 2019.*

Bulbest size (g)	Plant height (cm)	No. of leaves /plant	Fresh weight (g/plant)	Dry weight (g/plant)	Length of neck (cm)	Bolting bulbs (%)	No. of single bulb for double plant	Weight of white bulb(g)	Length of head (bulb) (cm)	Total weight for plant (g/plant)	Total fresh weight (ton/hectare)
Large (0.242 cm)	39.025 a	15.250 a	0.254 a	0.179 a	7.366 a	40.208 a	2.833 a	7.694 a	30.535 a	0.109 a	45.04 a
Small (0.110)	37.183 a	10.625 b	0.375 a	0.362 a	6.575 a	17.917 b	3.167 a	5.452 a	25.843 a	0.127 a	61.77 a

Means with the same letters no significant differences according to Duncan's multiple range test at probability 0.05

Table 2: Effect of fertilizer levels on the onion traits at growing season 2018 / 2019.*

Fertilizer levels	Plant height (cm)	No. of leaves /plant	Fresh weight (g/plant)	Dry weight (g/plant)	Length of neck (cm)	Bolting Bulbs (%)	No. of single bulb for double plant	Weight of white bulb(g)	Length of head (bulb) (cm)	Total weight for plant (g/plant)	Total fresh weight (ton /hectare)
1	43.233 a	14.133 ab	0.244 a	0.179 b	8.233 a	26.250 ab	3.833 a	7.830 a	29.273 a	0.218 a	45.610 a
2	38.983 ab	14.983 a	0.375 a	0.543 ab	6.883 ab	30.000 ab	2.500 a	7.213 a	28.498 a	0.090 a	50.530 a
3	38.050 ab	12.650 ab	0.199 a	0.139 b	7.399 a	36.667 a	2.500 a	6.868 ab	28.717 a	0.094 a	55.905 a
4	32.150 b	9.983 b	0.453 a	0.220 b	5.367 b	23.333 b	3.167 a	4.383 b	26.267 a	0.072 a	61.580 a

Means with the same letters no significant differences according to Duncan's multiple range test at probability 0.05.

Table 3: Effect of interaction between the bulbest size and fertilizer levels on the onion traits at growing season 2018 / 2019.*

Bulbest size	Fertilizer levels	Plant height (cm)	No. of Leaves /plant	Fresh weight (g/plant)	Dry weight (g/plant)	Length of neck (cm)	Bolting bulbs (%)	No. of single bulb for double plant	Weight of White bulb(g)	Length of head (bulb) (cm)	Total weight for plant (g/plant)	Total fresh weight (ton/ hectare)
Large (0.242cm)	1	43.600 a	14.600 ab	0.265 a	0.220 b	9.200 a	33.333bc	3.000 ab	8.393 ab	28.900 a	0.138a	16.75b
	2	40.133 ab	18.600 a	0.265 a	0.199 b	6.800ab	38.333ab	2.333a	9.387 a	32.387 a	0.113a	32.99ab
	3	38.000ab	15.000ab	0.218 a	0.158 b	7.467ab	53.333a	2.333a	7.677ab	32.350a	0.093a	77.49a
	4	34.367 ab	12.800a-c	0.289 a	0.137 b	6.000 b	35.833bc	3.667a	5.320bc	28.503 a	0.092a	52.94 ab
Small (0.110cm)	1	42.867a	13.667ab	0.222a	0.138b	7.267ab	19.167cd	4.667a	7.267a-c	29.647a	0.297a	74.47a
	2	37.833ab	11.367bc	0.484a	0.886a	6.967ab	21.666b-d	2.667a	5.040bc	24.610a	0.067a	68.070a
	3	38.100ab	10.300bc	0.178a	0.121b	7.333ab	20.000cd	2.667a	6.060a-c	25.083a	0.094a	34.32ab
	4	29.933b	7.167c	0.617a	0.303b	4.733b	10.833d	2.667a	3.447c	24.030a	0.051a	70.22a

Means with the same letters no significant differences according to Duncan's multiple range test at probability 0.05.

The interaction between the bulb size and fertilizer levels:

Table (3) showed the interaction between the bulb size and the fertilizer level, it appears in this table that the interaction between the large size of bulb and 240 kg N per hectare gave the highest value for the plant height, length of bulb neck and fresh total yield which was superior than the other treatment. The interaction between the large size of bulb and 120 kg N/hectare +2 g/L of humic acid was affected significantly on the number of leaves per plant and the weight of white bulb which were 18.600 and 9.387 a high mean value respectively. The interaction between the 8 kg N/hectare +3 g/L of humic acid gave a higher value in the percentage of bolting bulb and fresh total yield per hectare. In the other hand the interaction between the small size of bulb and 120 kg N/hectare + 2 g/L of humic acid gave a significant effect on the dry weight of the plant. This result was according to the effect of Humic substance represent 65-70% of the organic matter in many soils, these compounds are produced by the decomposition of plant tissue and are predominantly derived from lignified cell walls. In addition, Humic acid has been claimed to promote plant growth by increasing cell membrane permeability, oxygen uptake, respiration and photosynthesis nutrient uptake and root cell elongation (Bohme and Thi Lue, 1997; Nardi *et al.*, 2002). And this increase could be attributed to the fact that nitrogen levels is one of the important building blocks of amino acids where they link together and form proteins and make metabolic processes required for plant growth. Magdi and Mohamed (2009) indicated that the yield and quality of onion were significantly influenced by fertilizer types. Hafez and Geries (2018) showed in their study that the vegetative growth was positive influenced, also yield its components, quality and storability of onion were related to the medium rate of nitrogen and foliar spraying with humic acid led to a significant increment in the most of vegetative growth characteristics, as well as total bulb yield and its components, bulb quality. Ibraheem *et al.*, (2019) recorded in their study that the humic acid led to a significant increase in most growth and yield studied characters for the summer squash.

CONCLUSION

Application of nitrogen fertilizer with humic acid can be recommended to enhance the

growing vegetative and the fresh total yield of onion plant. Using the large size of bulb gave a best result in characters of fresh onion plant.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

ACKNOWLEDGEMENT

The author is very grateful to the University of Mosul /College of Agriculture and Forestry for their provided facilities, which helped to improve the quality of this work.

AUTHOR CONTRIBUTIONS

Researcher E.abdel. Jasim carried out the study according to the design used, and collected and took data and tabulated them in tables in order to conduct statistical analysis and interpret the results. Thanks from the researcher to the teaching staff MM. Salih at Tal Afar University, Department of Agricultural Crops to conduct statistical analysis according to Excel and SAS software.

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