Current Trends in Natural Sciences
Vol. 8, Issue 16, pp. 81-86, 2019
Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521
Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

RESEARCH ON THE EFFECTS OF DIFFERENT TECHNOLOGY SEQUENCES ON THE SHALLOTS GROWTH AND DEVELOPMENT

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Current Trends in Natural Sciences

Abstract
The aim of this paper was to observe the influence of different technological factors on the growth and development of shallots (Allium ascalonicum). We choose to study this variety due to their antioxidant, anti microbial and nutritional properties. It was set up a bifactorial experience (A factor: planting distance – with 3 graduations and factor B: irrigation method – with 2 graduations), resulting 6 experimental variants. Parameters such as plant height and leaf number on the plant were monitored for 3 months (April to June). The results were compared and we noticed that irrigation on the gutters favors the height growth of the shallot, but do not influence the number of leaves formed on the plant. The lower the density, the higher the number of roots / plant. The irrigation has positively influenced the weight of bulbs and increased crop productivity irrespective of planting density. It is recommended to cultivate the shallots at planting distances of 25-30 cm between the rows, irrigated on gullies when atmospheric conditions are inadequate to culture.

Keywords: growth and development parameters, shallots (Allium ascalonicum), technology sequences

1. INTRODUCTION

Shallots, *Allium ascalonicum*, are closely related to multiplier onions, but smaller, and have unique culinary value. (The term 'multiplier' means that the bulbs multiply freely producing several lateral bulbs). At maturity, shallot bulbs resemble small onions.

Shallots can be successfully produced wherever onions are grown. However, most shallots are produced in Europe, particularly France (http://www.omafra.gov.on.ca).

In 2017 the production of dried onions in Romania was 115841 kg / ha, and the cultivated area was 31692 ha. There is no data on the production of shallots or on the surfaces cultivated with shallot in Romania (http://www.fao.org). In contrast, the production declared in Europe in 2017 on shallots and green onions was 415296 tonnes, harvested from an area of 18332 ha.

In 2018 a single organization of onions, shallots, garlic, leeks and other 8 aliases, fresh or chilled, was registered at MADR in Bihor County (http://www.madr.ro).

The onion is well known in French and Asian cuisine (Ye et al., 2013), but is also known for its medicinal properties (Leelarungrayub et al., 2006). Numerous studies have shown that they possess antioxidant properties (Leinarungrayub et al., 2006), antibacterial (Yin et al., 1999), including against Helicobacter pilori (Adeniyi and Anyiam, 2004) and antifungal (Amin and Kapadnis, 2005) blood composition (Owoyele et al., 2004). *Allium ascalonicum*, possesses numerous therapeutic effects and health-enhancing properties such as cancer prevention (Pandurangan et al., 2016). The

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aqueous extract of *A. ascalonicum* made by Reza, et al., in 2011 had the most anti-growth activity on the cancer cell lines.
Irrigation of onion crops is the main measure of improving the water regime in the soil and has the effect of significantly increasing production and ensuring its superior quality (Popandron, 2012). Irrigation has resulted in a very significant increase in onion production irrespective of fertilization or biological material (Butuza et al., 2016). In 2010 Răduică and Popescu has proved that shallots are influenced by fertilization technology.
For the onion crops are recommended to be set up using the five-row sowing scheme (40 + 25 + 25 + 25 + 25 cm) on a terrain layered with 140 cm crown width (Bălaşa, 1957).

2. MATERIALS AND METHODS

The research method used was randomized blocks. A bifactorial experience with 3x2 onions was mounted, totaling 6 experimental variants. 14 plants were used for each variant in three rehearsals and a total of 252 onion plants. From 3 to 3 days we watered the first 3 layers and the other three did not have irrigation.
The experimental factors were the following:
• Factor A - planting distance with 3 graduations:
• a1 - 25/15 (333 333 plants / ha)
• a2 - 30/15 (285,714 plants / ha)
• a3 - 40/15 (222 222 plants / ha)
• Factor B - watering method with 2 graduations:
• b1-irrigation on the gutters
• b2-irrigated
As a biological material, we used local populations of shallot bulbs.

Figure 1. Allium ascalonicum

The experience was set up in April 2018 in the free field. We planted the bulbs on April 15, so that the plants will be protected from the late frost. The plants rose on 24.04.2018.
Repeat manual batches (between rows with the blade) were performed to avoid rising of the rows and to favor the maturation of the bulbs. They were harvested in July by snatching and were left on the field for a week to dry.
In this experiment the following observations and determinations were made: plant height, leaf / plant number, plant bulb weight, bulb diameter to determine the shape index, number of roots and length, mean bulb weight and number of "hearts".

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3. RESULTS AND DISCUSSIONS

We determined the growth rate in height and the number of leaves of plants by performing weekly measurements.

Table 1. Medium plant height (cm)

Variant	Date								
	28-apr.	5-may	12-may	19-may	26-may	2-iun.	9-iun.	16-iun.	23-iun.
V1	8.28	16.74	24.95	34.14	49.05	54.1	56.05	56.94	54.85
V2	7.8	17.12	25.12	31.33	42.53	45.34	50.52	49.86	41.6
V3	8.09	17.9	26.73	33.48	45.4	49.24	51.14	53.2	49.36
V4	9.72	18.79	27.1	35.28	47.3	52.17	54.44	54.86	47.64
V5	9.01	15.62	24.85	34.72	46.4	52.07	56.25	58.6	54.31
V6	8.98	18.87	27.21	35.09	44.98	52.13	55.7	55.12	46.09

Table 1 shows that the lowest height value was recorded in the non-irrigated V2 variant and the highest planting density in most days of measurements.
We can see that irrigation on the gullies favors plant height growth for all densities studied.
The next character studied was the number of leaves per plant (Table 2).

Table 2. Medium number of leaves/plant

Variant	Data								
	28-apr.	5-may	12-may	19-may	26-may	2-iun.	9-iun.	16-iun.	23-iun.
V1	13.2	21.16	26.83	30.58	31.66	28.41	29.25	23.5	24.25
V2	14.2	18.81	22.54	24.16	25.63	21.27	25.5	23.27	20.1
V3	12.09	20.8	24	29	28.8	25.18	27.9	27.81	23.81
V4	15.54	21.18	25.81	30.36	31.27	24.72	30	26.91	25.18
V5	11	13.83	18.16	21.75	22.41	20.75	22.66	25.33	23.83
V6	15.72	21.72	25.54	31.72	29	27.36	30.54	31.91	25

Irrigation did not favor the increase in leaf counts in most days of measurements.
For the raised layers of shallots not irrigated, the number of leaves were higher than those that were irrigated by ditches.
V5 irrigated had the lowest average number of leaves.
As we can see, the density of planting does not decisively influence the number of leaves formed on the plant.
The bulb form index was determined based on the dimensions of the longitudinal and transverse diameters (Table 3).
The onion bulb has different shapes and is appreciated by the shape index given by the relation: If = ΦL / ΦT = Φ longitudinal / Φ transversal, so we have bulbous globules where If = 1, bulbous bulbous bulb If <1, bulb elongated If> 1.

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According to this relationship and the measurements we made, we found that the harvested onion has flattened bulbs.

Table 3. Form indix

Variant	Longitudinal diameter (mm)	Cross-sectional diameter (mm)	Form index
V1	34.54	37.58	0.91
V2	37.07	42.96	0.86
V3	34.82	37.17	0.93
V4	33.43	39.35	0.84
V5	36.26	44.44	0.81
V6	35.14	40.16	0.87

It can not be said that irrigation and planting density had a major influence on the longitudinal and transverse diameters of the bulbs.The following characters were the number and length of the roots.

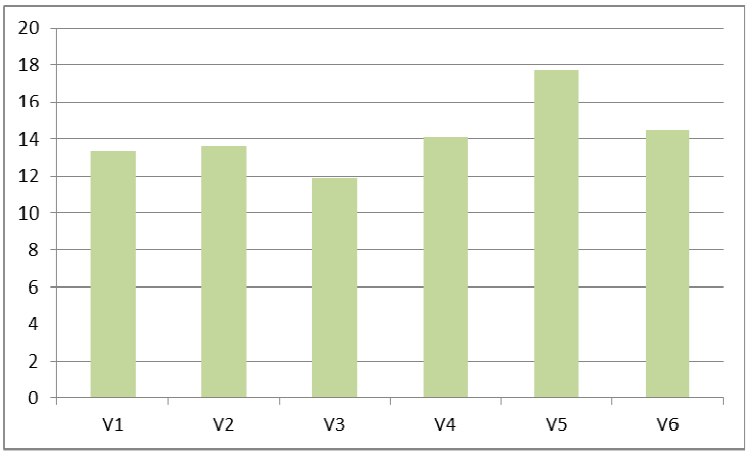

Figure 2. Number of roots/plant

Regarding the number of roots / plants (figure 2) it is observed that the lowest value of this character was recorded in variant V3, the highest value for variant V5, the latter having a better water supply and nutritive elements of plants.
The number of roots was inversely influenced by planting density. A greater number of roots / plants correspond to a lower planting density.
Regarding the length of the roots (figure 3) it is observed that the lowest value of this character was recorded in the variant V6, and the highest in the variant V5.
We will determine the average weight of the bulbs before planting and after harvesting to determine the productivity ratio (table 4).
It is noted that irrigation has positively influenced the increase of crop productivity irrespective of the density of culture.
The lowest value of the average weight of the harvested bulbs was recorded in the V6 variant, and the highest in the V1 variant.
Irrigation has positively influenced the weight gain of bulbs.

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The number of exterior, interior and number of hearts was determined. There are no differences between the variants studied, in terms of the number of inner (2) and outer (4) sheets, the storage capacity being unaffected.

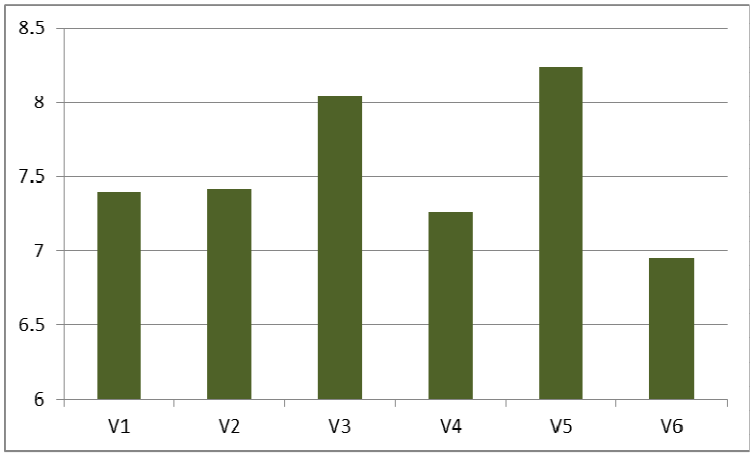

Figure 3. Roots length

Table 4. Bulb weight indices

Variant	Bulbs medium weight before planting (g)	Bulbs medium weight at harvesting (g)	Productivity ratio %
V1	5.95	1224	205
V2	9.14	689	75
V3	4.97	963	193
V4	8.43	880	104
V5	8.07	769	95
V6	9.23	661	72

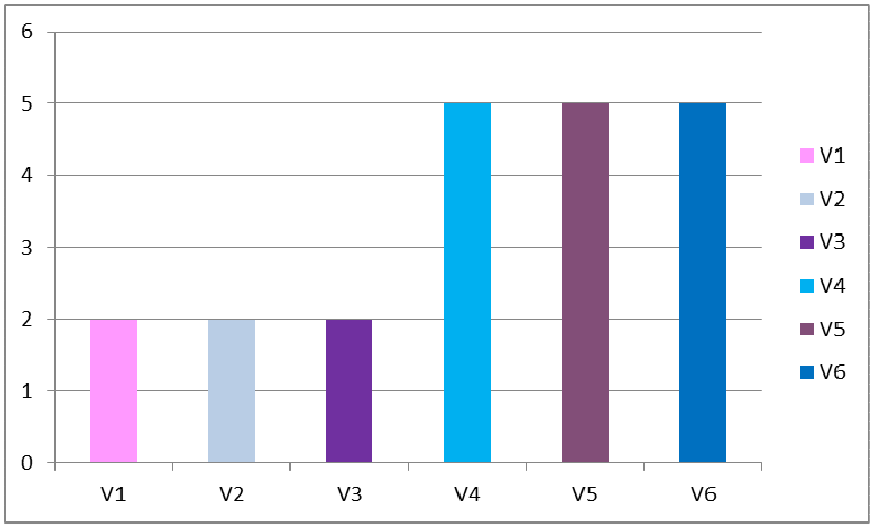

Figure 4. Number of indoor buds

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From Figure 4 we can see that the small planting distance has negatively influenced the number of generative zones (hearts), compared to the other variants that were planted at greater distances.

4. CONCLUSIONS

Irrigation on the gutters favors the height growth of the shallot.
Irrigation and planting density do not decisively influence the number of leaves formed on the plant.
It can not be said that irrigation and planting density have had a major influence on the longitudinal and transverse diameters of the bulbs. The shallots harvested has flattened bulbs for all variants.
The number of roots was inversely influenced by planting density. The lower the density, the higher the number of roots / plant.
It is noted that irrigation has positively influenced the weight of bulbs and increased crop productivity irrespective of planting density.
There are no differences between the variants studied. from the point of view of the number of inner and outer sheets, the storage capacity being the same.
The small planting distance has negatively influenced the number of generative areas (hearts), compared to the other variants that were planted at greater distances. This is especially important for green onion consumption.
It is recommended to cultivate the shallots at planting distances of 25-30 cm between the rows, irrigated on gullies when atmospheric conditions are inadequate to culture.

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