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# INFLUENCE OF MINERAL FERTILIZERS ON ONIONS QUALITY

*The article presents the results of research of onion cultivation under drip irrigation using different methods of application and doses of mineral fertilizers. Posted onion quality indicators depending on the methods of application and doses of mineral fertilizers. Found that when mineral fertilizers applied locally then such qualitative indicators as dry matter, the amount of sugars, sucrose, nitrates increase, and vitamin C content decreases.*

***Keywords:*** *onion, mineral fertilizers, drip irrigation, production quality.*

**Introduction**. Onions – a valuable vegetable crop, which plays an important role in human nutrition. Its nutritional value is that it is rich in carbohydrates and nitrogenous substances. There is high content of dry matter from 7 to 21% in onion, carbohydrates present in onion as sugars (from 4 to 14%). Among the sugars are sucrose, fructose and maltose. Also onions contain proteins – high-nitrogen organic compounds which are polymers of amino acids. They are essential substances without which life, growth and development of the organism are impossible. Onion is rich in amino acids such as arginine, histidine, valine, leucine, isoleucine, lysine, methionine and phenylalanine, the content of which reaches 500 mg per 100 g of crude material. Energy value of onion rather low, which is an advantage in the diet. Priceless is the beneficial properties of this wonderful vegetable for patients with diseases of digestive system. If you use this vegetable as food decreases blood sugar and cholesterol levels, blood pressure normalized, reduces the risk of blood clots and atherosclerosis, derived heavy metals and toxins from the body and blood. Onion is especially recommended during the spring beriberi. The content of vitamin C in the follicle reaches 10 mg/100 g [1, 2].

Farming practices used in the cultivation of onions not only affect the yield, but also its quality, resulting in the improvement or deterioration of its chemical composition. Favorable conditions for the formation of bulbs and accumulation in them plastic substances – high humidity and soil, and during the ripening bulb – high temperature and dryness of the soil. With increased wet bulb accelerates growth and dry matter concentration decreases [3, 4].

Mineral fertilizers also contribute to the accumulation of chemicals in all varieties of onions.

The aim of our research is to develop elements of technology of cultivation of onion using fertilizers and trace elements, to determine their effect on the chemical composition of the bulbs.

**The materials and methods of research**. The study was conducted at the Experimental Station of the Dnepropetrovsk Institute of Vegetables and Melons NAAS of Ukraine during 2011–2012, in ordinary black leached humus. Humus horizon 40–45 cm, humus content is about 3.6% (in Turin). The technology of cultivation common for the northern steppe of Ukraine. The study was conducted in accordance with the basic methods of conducting field experiments [5, 6, 7].

Area of accounting field – 10 $m^2$. Repeated four times. Accounting was carried out on 10 plants. Studies were conducted with onion varieties Batyr. In terms of differential drip irrigation (80–75 % HB to form bulbs and 70–65 % HB to lodging pen), at the density of 1 million plants / ha was studied following methods and doses of fertilizer: in autumn scattered dose $N_{90}P_{135}K_{90}$ and locally in the spring at a dose $P_{45}K_{30}$ with two feedings with the $N_{15}$ and two micronutrient foliar application negligent Reakom at a dose of 3 l / ha at 5–6 leaf stage and on early bulbs formation stage. Control was an option without fertilizer.

**The results of research**. Nitrogen content in the soil at the beginning of the growing season on average for two years was higher on option with the introduction of chemical fertilizers in autumn scattered, due to the higher dose of fertilizers (2.7 mg/100 g soil), which exceeded the indicators of the control variant and variant of fertilizer locally 0.8 and 0.4 mg/100g soil,

respectively. The highest nitrogen content in the soil at the end of the growing season on average for two years also received a variant of the scattered and fertilizer was 1.9 mg/100 g soil, which exceeded the control version 0.4 mg/100 g soil and was at variant of fertilizer locally. Most plants use nitrogen from the beginning to the end of the growing season was also in the variant of the scattered and fertilizer was 0.8 mg/100 g soil (Table 1).

*Table1*

**Content of $NO_3$ in the soil in areas of onion varieties Batyr first year growing in the depth 0–25 cm, mg/100 g soil**

| Fertilizer | 2011 | | 2012 | | Average 2 years | |
|---|---|---|---|---|---|---|
| | At the beginning of vegetation | At the end of vegetation | At the beginning of vegetation | At the end of vegetation | At the beginning of vegetation | At the end of vegetation |
| Without Fertilizer (control) | 1,5 | 1,4 | 2,3 | 1,6 | 1,9 | 1,5 |
| Scattered $N_{90}P_{135}K_{90}$ (etalon) | 2,4 | 1,7 | 3,0 | 2,2 | 2,7 | 1,9 |
| Locally $N_{30}$*$P_{45}K_{30}$ | 2,3 | 1,8 | 2,3 | 1,8 | 2,3 | 1,8 |

**Note. There were two feeding with N15 and two foliar micronutrient by chelated fertilizer Reakom at a dose of 3 l / ha at 5-6 leaf stage and the early formation of the bulb stage.*

Analyzing the data obtained during the two years about contents of phosphorus in the soil can be seen that from beginning to end the of vegetation of onion $P_2O_5$ accumulation was observed in all variants except of fertilizing variants scattered where $P_2O_5$ content by the end of the growing season was reduced to 0.7 mg/100 g soil which let us suggest that plants mainly consume $P_2O_5$ contained in the soil (Table 2).

*Table 2*

**Content $P_2O_5$ in the soil in areas of onion varieties Batyr first year growing in the depth 0–25 cm mg/100 g soil**

| Fertilizer | 2011 | | 2012 | | Average 2 years | |
|---|---|---|---|---|---|---|
| | At the beginning of vegetation | At the end of vegetation | At the beginning of vegetation | At the end of vegetation | At the beginning of vegetation | At the end of vegetation |
| Without Fertilizer (control) | 27,8 | 30,6 | 27,7 | 29,1 | 27,8 | 29,9 |
| Scattered $N_{90}P_{135}K_{90}$ (etalon) | 35,6 | 37,5 | 41,1 | 37,8 | 38,4 | 37,7 |
| Locally $N_{30}$*$P_{45}K_{30}$ | 34,1 | 36,7 | 38,0 | 36,3 | 36,1 | 36,5 |

**Note. There were two feeding with N15 and two foliar micronutrient by chelated fertilizer Reakom at a dose of 3 l / ha at 5-6 leaf stage and the early formation of the bulb stage.*

The content of potassium in the soil, on average for two years, declining from the beginning to the end of the onion vegetation on all variants of fertilization. Potassium was used by plants most on variant with application of fertilizers and locally was 4.3 mg/100 g, which is higher than the rate control and etalon 1.5 and 1.1 mg/100 g, respectively (Table 3).

*Table 3*

**Content of $K_2O$ in the soil in areas of onion varieties Batyr first year growing in the depth 0–25 cm mg/100 g soil**

| Fertilizer | 2011 | | 2012 | | Average 2 years | |
|---|---|---|---|---|---|---|
| | At the beginning of vegetation | At the end of vegetation | At the beginning of vegetation | At the end of vegetation | At the beginning of vegetation | At the end of vegetation |
| Without Fertilizer (control) | 37,7 | 36,6 | 33,5 | 28,9 | 35,6 | 32,8 |
| Scattered $N_{90}P_{135}K_{90}$ (etalon) | 42,3 | 39,8 | 36,5 | 32,5 | 39,4 | 36,2 |
| Locally $N_{30}P_{45}K_{30}$ | 43,3 | 37,9 | 40,5 | 37,3 | 41,9 | 37,6 |

**Note. There were two feeding with N15 and two foliar micronutrient by chelated fertilizer Reakom at a dose of 3 l / ha at 5-6 leaf stage and the early formation of the bulb stage.*

The research 2011–2012, found that fertilization improves yield and accumulation of chemicals in the onion variety Batyr. On variants with fertilizer content of matter, total sugar, sucrose, vitamin C and nitrate significantly higher than the control variant.

During the years of research higher rates of dry matter, sugars and nitrates (not to exceed the MCL, 90 mg/kg), we got on the areas of fertilizer locally, while the content of ascorbic acid was lower on this variant than on the control and etalon variants.

In 2011, the research indexes of dry matter in the variant with fertilizer locally exceeded, control variant at 0.78% and the benchmark – 0.4%, rates amounts of sugars also exceeded the control and etalon options for 0.37% and 0.31% accordingly. The content of sucrose in areas of local fertilizer variant exceeded control variant for 0.36% and the etalon – for 0.24%. However, addition of NPK fertilizers has led to a reduction of ascorbic acid. The content of vitamin C in the version with a local fertilizer exceeded control option for 0.54 mg%, but was below the etalon option for 0.18 mg% (Table 4).

*Table 4*

**Influence of application methods and doses of mineral fertilizers on onion varieties Batyr biochemical indicators of quality**

| Application methods and doses | 2011 | | | | | 2012 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Dry matter, % | Sugars (%) | | Vitamin C, mg% | nitrates, mg/kg | Dry matter, % | Sugars (%) | | Vitamin C, mg% | nitrates, mg/kg |
| | | Sum of sugars, % | saccharose, % | | | | Sum of sugars, % | saccharose, % | | |
| Without Fertilizer (control) | 10,96 | 8,02 | 5,39 | 8,02 | 66 | 13,36 | 9,34 | 6,65 | 6,62 | 74 |
| Scattered $N_{90}P_{135}K_{90}$ (etalon) | 11,34 | 8,08 | 5,51 | 8,74 | 74 | 14,45 | 9,34 | 6,83 | 6,75 | 79 |
| Locally $N_{30}*P_{45}K_{30}$ | 11,74 | 8,39 | 5,75 | 8,56 | 76 | 14,53 | 9,85 | 7,21 | 5,82 | 77 |

**Note. There were two feeding with N15 and two foliar micronutrient by chelated fertilizer Reakom at a dose of 3 l / ha at 5-6 leaf stage and the early formation of the bulb stage.*

In 2012, the research observed the same trend. Dry matter content was higher at the variant with the local fertilizer and was 14.53%, up 1.17% over the control variant and 0.08% over etalon. Content of sugar in the local variant of fertilizing was 9.85%, which is higher than the rate of control variant and the etalon variant is 0.51%. Index of sucrose is also higher than the control

variant for 0.38% and 0.56% for the etalon. Thus, the content of ascorbic acid on the variant with the local fertilizer was lower than in the control variant for 0.8 mg% and the etalon – for 0.94 mg%. A similar pattern of reduction of ascorbic acid in onion by addition of NPK noted in studies of the Leningrad Region in 1959 [3].

**Conclusions**. The performed investigations showed that the developed dose of applying fertilizer locally can improve the quality indicators such as dry matter content, the amount of sugar, sucrose. Simultaneously, this will affect nitrate indexes at the low level (nitrate content not exceeding permissible concentration). Locally fertilizing promotes more vigorous plant growth, reduce fertilizer and water flow rate per unit of output. Fertilizing Local enhances drought resistance of crops, reduces crop shortfall, makes a positive effect on deposition of nutrients. Water consumption per unit of production by local application of fertilizer is reduced by 10–15%.

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### *Анотація*


***Готвянська А.С.***

***Вплив мінеральних добрив на якість продукції цибулі ріпчастої***

*У статті висвітлено результати досліджень вирощування цибулі ріпчастої в умовах краплинного зрошення при використанні різних способів внесення і доз мінеральних добрив. Подано якісні показники цибулі ріпчастої залежно від способів внесення і доз мінеральних добрив. Встановлено, що при внесенні мінеральних добрив локально такі якісні показники, як суха речовина, сума цукрів, сахароза, нітрати зростають, а вміст вітаміну С знижується.*



***Ключові слова:*** *цибуля ріпчаста, мінеральні добрива, краплинне зрошення, якість продукції.*


### *Аннотация*


***Готвянская А.С.***

***Влияние минеральных удобрений на качество продукции лука репчатого***

*В статье отражены результаты исследований выращивания лука репчатого в условиях капельного орошения при использовании разных способов внесения и доз минеральных удобрений. Подано качественные показатели лука репчатого в зависимости от способов внесения и доз минеральных удобрений. Установлено, что при внесении минеральных удобрений локально такие качественные показатели, как сухое вещество, сумма сахаров, сахароза, нитраты возрастают, а содержание витамина С снижается.*



***Ключевые слова:*** *лук репчатый, минеральные удобрения, капельное орошение, качество продукции.*