Ukrainian Journal of Ecology

Ukrainian Journal of Ecology, 2022, 12(5), 12-19, doi: 10.15421/2022_369

ORIGINAL ARTICLE

Varietal productivity of winter garlic depending on the application of organic fertilizers

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Received: *28 April, 2022; Manuscript No: UJE-22-62084;* ***Editor assigned:*** *30 April, 2022, PreQC No: P-62084;* ***Reviewed:*** *13 May, 2022, QC No: Q-62084;* ***Revised:*** *21 May, 2022, Manuscript No: R-62084;* ***Published:*** *28 May, 2022.*

Purpose: The purpose of the research was to study the influence of organic fertilizers (vermicompost) on varietal productivity and biochemical parameters of winter garlic in the Western Forest-Steppe.

Methods: Field, analytical and statistical.

Results: It has been established that winter garlic plants develop more intensively with the application of organic fertilizer vermicompost and weather, climatic conditions of cultivation. The phase of technical ripeness of winter garlic plants occurs in the third decade of June with a growing season of 128-142 days. The study of the dynamics of the root system of garlic throughout the growing season shows that the number of root hairs on the plant is from 44.8 pcs. up to 48.1 pcs. in the variant without fertilizer, then in the variant with vermicompost -46.5 pcs. up to 51.3 pcs. The leaf surface area on the 60th day after the beginning of spring regrowth in the variant with the application of vermicompost in variety Kharkiv violet was 77.6 cm^2. In the Liubasha variety, the leaf surface area was 90.7 cm^2 on the vermicompost application variant, and the Spas variety was 80.5 cm^2, respectively. On the 90th day after the beginning of spring regrowth, the difference between the variants on the area of the leaf surface decreased, due to the biological characteristics of plants and the period of technical features. In the control variant (without fertilizers) the leaf surface area of Kharkiv Violet was 64.1 cm^2, in the variant with vermicompost -81.1 cm^2. A similar pattern is observed in the varieties Liubasha and Spas. Thus, in the variety Liubasha in the variant with the application of vermicompost the leaf surface area was 97.3 cm^2, in the variety Spas -90.7 cm^2, respectively. Increasing the weight of garlic plants depends on the application of vermicompost. Thus, in the control variant of winter garlic Kharkiv violet the average weight of the bulb was 35.2 g, and in the variant with the introduction of vermicompost - 38.4 g, which is 3.2 g more. In the variety Liubasha this indicator was 47.3 and 52.7 g, and in the variety Spas -38.6 and 40.3 g, respectively. Yields of bulbs in the variety Kharkiv violet for the application of vermicompost was 15.2 t/ha, which is 10.9% higher than the control, the variety Liubasha -19.6 t/ha or 24.3%, respectively, the variety Spas -17.2 t/ha, which exceeded the variant without fertilizers by 2.8 t/ha or 19.4%, respectively.

Vermicompost affects the formation of garlic bulbs, and the yield of standard bulbs, in the Spas variety marketability is 79.6%, which is 2.1% higher than the control variant (variety Kharkiv violet), variety Liubasha -80.3%, which is 2.8% higher. The qualitative composition of winter garlic cloves depends on environmental factors, growing season and elements of cultivation technology. Increased dry matter content in the products was observed in varieties with the variant of organic fertilizer vermicompost from 37.52 to 43.2%, sugar from 2.4% to 2.5%, ascorbic acid -from 10.2 to 11.4 mg/100 g of crude substance.

Keywords: Winter garlic, variety, growth, development, biohumus, bulb, productivity.

Introduction

Today, the issue of food security in Ukraine is very acute, due to rising energy prices, high cost of manufactured products and, consequently, reduced production. The formation of high levels of yield of cultivated crops with appropriate quality indicators is impossible without creating an optimal background of plant nutrition, provided by the use of fertilizers (Domaratskyi et al., 2020).

Manure is the most effective organic fertilizer for vegetable crops, including winter garlic, but it is catastrophically lacking due to the sharp decline in livestock. Therefore, on a par with traditional organic fertilizers (manure on different types of litter: straw and peat), there is a need to find alternative sources of organic matter in the soil, which would not only promote high yields but also maintain high biological activity of the root layer and provide improving soil regimes and maintaining soil fertility (Kravchuk et al., 2019; Powell et al., 2020).

One of the ways to solve the problem of increasing yields and, accordingly, economic efficiency in the cultivation of winter garlic is the mandatory inclusion in the technological process of organo-mineral fertilizers with a high content of essential macro-and micronutrients.

To increase the efficiency of fertilizers, it is important to use these fertilizers of different composition in accordance with international practice (Tarariko, 2007; Bezvikonnyi et al., 2020).

Analysis of recent research and publications

The application of bio-fertilizers such as vermicomposts have been recognized as an effective means for improving soil aggregation, structure and fertility, increasing microbial diversity and populations, improving the moisture-holding capacity of soils, increasing soil Cation Exchange Capacity (CEC) and increasing crop yields (Hargreaves et al., 2008).

Application of biohumus at the rate of 2.5-5 t/ha locally in rows before planting garlic caused an increase in yield of 3-10% in the conditions of North-Western Ethiopia (Alemu-Degwale et al., 2016). According to other authors Fikru Tamiru Kenea, Fikreyohannes Gedamu (application of vermicompost at a rate of 2.5-7.5 t/ha in this region increased the area of the leaf blade of garlic by 17.6-35.4%, the weight of the bulb by 2.8-5.9%, yield by 15.9-38.7% (Fikru Tamiru Kenea etal., 2018).

According to Ulyanych O.I., Yatsenko V.V. the best application rates of biohumus for multi-cloved forms (variety Sofievsky) are 1-3 t/ha, which allows to increase the yield by 1.4-2.4 t/ha and get the best indicators of crop structure, but increase in total yield can be achieved only at the maximum rate of biohumus -5 t/ha, which allows to increase the yield of this variety of garlic by 3.6 t/ha. Small-cloved forms of garlic (Prometheus variety) increase the weight of the bulb, mainly by increasing the weight of the clove and some extent increase their number. The optimal norm for obtaining a high yield with an excellent structure is 3-5 t/ha of compost, where the yield increase is 4-5.1 t/ha (Ulyanych and Yatsenko, 2018).

Vermicompost increases the bulb dry weight by the accumulation of non structured carbohydrates whole distribution patterns change, thus favoring the metabolism of fructan precursors and accumulating as scorodose. Such reserve substance accumulation in the vermicompost treatment occurs for a longer period due to the earlier start of bulbing this response translate into a 2-fold increase of the bulb's dry weight, increased size, and therefore, higher quantity and quality and yield at harvest (Juan et al., 2006).

The maximum shoot wet weight and shoot dry weight recorded in chemical and vermicompost treatments, respectively. The maximum number of bulblets per plant and bulb dry weigh observed vermicompost treatment (20 t/ha). Among all treatments, vermicompost had the highest effect on essential oil compared to chemical fertilizer. In general, 15 t/ha of vermicompost treatment compared to other treatments was appropriate for yield and production of essential oil and reducing the cost of crop production (Golmohammadzadeh et al., 2015).

Thus, in the conditions of unsatisfactory resource provision of agriculture with traditional organic fertilizers and ecological crises, there is an urgent need to develop technological solutions that would mobilize the possibilities of natural processes affecting the development of winter garlic plants, ensure stability of agricultural systems and increase its productive potential.

The aim of the research was to study the impact of organic fertilizers (vermicompost) on varietal productivity and biochemical parameters of winter garlic in the Western Forest-Steppe.

Methodology

Research on the study of effective methods of mulching table beets was conducted during 2019-2021 in the research field of the Training and Production Center "Podillia" Podilsky State University.

The soil of the experimental field is leached chernozem, low-humus, medium loamy on forest-like loams. The content of humus (according to Turin) in the soil layer 0-30 cm is 3.6-4.2%. The content of easily hydrolyzable nitrogen compounds (according to Cornfield) is 90-127 mg/kg, mobile phosphorus (according to Chirikov) 138-174 mg/kg and exchangeable potassium (according to Chirikov) -145-185 mg/kg of soil.

Garlic cultivation techniques are generally accepted for this zone and complied with SSTU 5048: 2008 "Garlic. Growing technology ". The size of the sown area during cultivation for marketable products is 20 m^2, accounting -10 m^2, the repetition of the experiment - four times.

We studied the fertilization of winter garlic varieties Kharkiv Violet, Liubasha and Spas vermicompost with a rate of 3 t/ha, which was applied locally in rows before planting, the control was the variant without fertilizers.

Phenological observations and biometric studies were performed according to the methods of G.L. Bondarenko and K.I. Yakovenko (Bondarenko and Yakovenko, 2001). Biochemical composition was determined by conventional methods (Hrytsayenko Z. M. et al. 2003).

Results

Analyzing the data of the research, it should be noted (Table 1) that, depending on environmental conditions and the application of organic fertilizers in garlic plants, the phases of growth and development are different. Thus, the seedlings appeared 30-40 days after planting in the ground in the autumn period. Restoration of vegetation was observed in the spring after the snow melted. The beginning of full germination on average for three years was for the period February 23-25 and lasted until March 1-2, and after 56 days of full germination marked the beginning of flowering arrows in plants (18-23.05).

Table 1. Dates of the growth and development phases of garlic depending on the variety and application of organic fertilizers (average for 2019-2021).

Variety	Organic fertilizers	Phase of growth and development of plants, date					
		Emergence of seedlings		Eginning of flowering arrow	Beginning of ripening	Technical ripeness	Duration of the growing season, days
		Beginning	Mass				
Kharkiv violet	Without fertilizers	21.02	2.03	18.05	15.06	25.06	120
	Vermicompost	05.11	25.02	20.05	19.06	28.06	128
Liubasha	Without fertilizers	07.11	1.03	20.05	21.06	28.06	130
	Vermicompost	25.10	22.02	22.05	23.06	2.07	142
Spas	Without fertilizers	20.11	2.03	21.05	18.06	27.06	122
	Vermicompost	10.11	23.02	23.05	20.06	1.07	135

According to the results of the study, the first leaves are formed 35-40 days after emergence of seedlings, depending on the application of organic fertilizer-vermicompost.

The formation of cloves on the plant takes 12-25 days or more. Then a flowering arrow begins to develop in the upper part in the center of the bulb, and the formation of new leaves of the peduncle is suspended. Flowering arrow reaches a height of 60-180 cm and more. In many varieties at the beginning of growth it is bent in the form of a loop, then leveled and becomes vertical. Arrows with age wood and do not require the application of organic fertilizers, less demanding of soil moisture, especially during the period of intensive formation and growth of the root system, leaves and bulbs. From insufficient moisture, nutrients during this period, the leaves begin to turn yellow from the top and gradually die. This is due to the fact that the root system of garlic, although well developed, but weakly branched and with a small number of formed root hairs.

The growing season of winter garlic plants with the use of vermicompost fluctuated most significantly and depended on weather conditions. The growing season of winter garlic plants in the varieties was slightly extended by applying vermicompost for 3-5 days.

It should be noted that garlic is quite cold-resistant culture. Its roots begin to develop at a temperature of 2-3℃, and leaf formation -5-7℃. The optimum temperature for plant growth and development for harvest is 16-20℃, while at elevated temperatures plant growth slows down. Also, garlic is quite demanding on soil moisture, especially during the period of intensive formation and growth of the root system, leaves and bulbs. Thus, the plant developed an average of 44.8 to 51.3 pieces of root hairs. Their greatest length was observed in the Liubasha variety on the fertilized variant (vermicompost) -195.4 mm, which is 4.2 mm less than in the variant without fertilizer application. In the variety Kharkiv violet without fertilizers this Figure was 159.3 mm, with the introduction of vermicompost the length of root hairs increased to 176.8 mm, in the variety Spas 178.3 and 184.2 mm, which exceeded the control by 17.6 and 22.9 mm, respectively (Table 2). Depth of occurrence in rooted garlic bulbs, in the studied varieties, ranged from 88.7 to 92.8 mm.

Table 2. Influence of variety and organic fertilizer on the development of the root system in winter garlic before the onset of winter (average for 2019-2021).

Variety	Organic fertilizers	Number of root hairs, pcs.	Length, mm	Depth of occurrence, mm
Kharkiv violet	Without fertilizers	44.8	159.3	88.7
	Vermicompost	46.5	176.8	91.2
Liubasha	Without fertilizers	48.1	191.2	90.3
	Vermicompost	51.3	195.4	92.8
Spas	Without fertilizers	47.1	178.3	90.4
	Vermicompost	49.4	184.2	91.3

Thus, according to the length of root hairs and the depth of the bottom of the bulb in garlic plants, there are variants with the application of organic fertilizer vermicompost.

Among the factors influencing the activity of photosynthetic potential, a significant role is played by the leaf surface, which characterizes the structure, physiological state of the plant. The leaf surface area primarily depends on the number of leaves on the plant, which determines the productivity, and depends on the elements of cultivation technology.

Studies have shown that the reaction of winter garlic varieties and the application of vermicompost in the variety Kharkiv violet in the initial stages of intensive growth on the 30th day after the beginning of spring regrowth in the control variant (without fertilizers) was 4.3 pieces on the plant then, as with the application of 3 t/ha of vermicompost, the number of leaves increased by 0.4 pcs. (Table 3).

Table 3. Dynamics of leaves number on the plant depending on the variety and application of vermicompost fertilizer, pcs. (average for 2019-2021).

Variety	Organic fertilizers	After the restoration of vegetation in the early spring, days		
		30	60	90
Kharkiv violet	Without fertilizers	4.3	6.5	5.3
	Vermicompost	4.7	7.2	5.9
Liubasha	Without fertilizers	5.1	7.7	7.1
	Vermicompost	5.5	8.1	7.4
Spas	Without fertilizers	4.4	6.9	6.2
	Vermicompost	4.6	7.5	6.6

Indicators of the leaves number on the plant of the Liubasha and Kharkiv violet varieties (without fertilizers) and with the application of vermicompost by 0.8 and 1.2 pieces/plant exceeded the control variant. The indicators of the leaves number on the plant of the Spas variety also exceeded the control variant by 0.1 and 0.3 leaves. On the 60th day, the difference in the number of leaves on the variants changed. Thus, in the variant where vermicompost was applied, the Kharkiv violet variety had an advantage over the control variant of 0.7 pieces of leaves per plant, variety Liubasha 1.8 pcs. per plant, exceeding the control variant by 1.2 pcs./plant. On the 90th day after spring regrowth, the number of leaves on winter garlic plants decreased. Thus, in the control variant of the Kharkiv violet variety it was 5.3 pieces/plant, for the application of vermicompost by 0.6 pieces/plant more, in the Liubasha variety - 1.8 pieces/plant, for the application of vermicompost -2.1 pieces/plant. In the Spas variety indicators of the number of leaves on the plant no significant difference was found. This can be explained by the fact that organic fertilizers (vermicompost) prolong the growing season and technical ripeness of the bulbs.

According to the indicator of the leaf surface area on the 30th day after the beginning of spring regrowth in the variant with the introduction of vermicompost of the Kharkiv violet variety, the control prevailed by 10.2 cm^2 (Fig. 1). Similar indicators were in the Liubasha and Kharkiv violet varieties. Thus, without fertilizer application (vermicompost) in the Liubasha variety, the leaf surface area exceeded the control variant by 8.2 cm^2, from vermicompost application by 15.4 cm^2, in the Spas variety -7.1 and 13.9 cm^2, respectively.

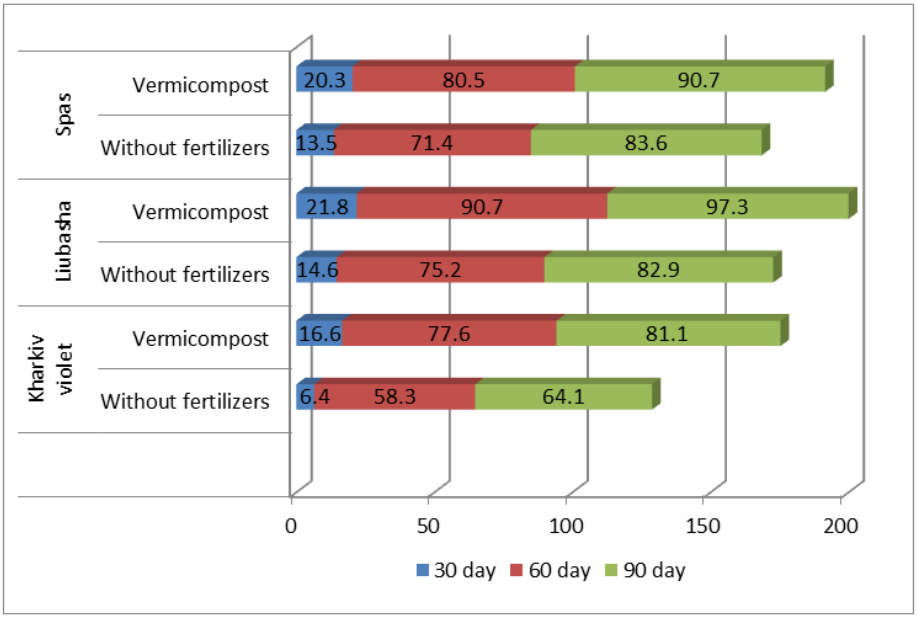

Fig. 1. Dynamics of leaf surface area after restoration of vegetation of plants in the early spring period, cm^2 (average for 2010-2021).

According to the indicator of the leaf surface area on the 60th day after the beginning of spring regrowth in the variant with the introduction of vermicompost variety Kharkiv violet was 77.6 cm^2. In the variant without fertilizer in Liubasha variety the leaf surface area was 75.2 cm^2, in the variant of vermicompost application - 90.7 cm^2, in the Spas variety -71.4 and 80.5 cm^2, respectively. On the 90th day after the beginning of spring regrowth, the difference between the variants on the area of the leaf surface decreased, due to the biological characteristics of plants and the period of technical features. In the control variant (without fertilizers) the leaf surface area of Kharkiv Violet was 64.1 cm^2, in the variant with vermicompost - 81.1 cm^2. A similar pattern is observed in the variety Liubasha and Spas. Thus, in the variety Liubasha in the variant with the application of vermicompost the leaf surface area was 97.3 cm^2, in the variety Spas -90.7 cm^2, respectively.

The results of the study showed that the maximum difference between the variants for plant height was at the beginning of the growing season (Table 4).

Table 4. Influence of variety and application of organic fertilizer vermicompost on the dynamics of plant height, cm (average for 2019-2021).

Variety	Organic fertilizers	After the restoration of vegetation, days in the early spring period		
		30	60	90
Kharkiv violet	Without fertilizers	22.8	48.6	60.5
	Vermicompost	24.3	54.5	64.8
Liubasha	Without fertilizers	28.6	58.2	67.3
	Vermicompost	31.2	63.4	73.9
Spas	Without fertilizers	25.1	51.1	62.7
	Vermicompost	27.6	53.7	66.2

Thus, on the 30th day after the beginning of spring regrowth of winter garlic in the area where vermicompost was applied, the increase in plant height in the variety Kharkiv violet was 1.5 cm higher, in the variety Liubasha in the variant without fertilizer - 5.8 cm higher than control, for vermicompost application - 8.3 cm, the Spas variety - 3.3 and 4.6 cm, respectively.

As a result of researches the difference on formation quantity of root hairs and their total length among garlic varieties at vermicompost application is established.

Thus, garlic varieties had similar dynamics of root system development, but the intensity of their development was not significantly affected by the application of organic fertilizers (Table 5).

Table 5. The impact of variety and organic fertilizer vermicompost on the development of the root system (average for 2019-2021).

Variety	Organic fertilizers	Number of root hairs, pcs.	Average length, cm	Total length of root hairs, cm
Kharkiv violet	Without fertilizers	71.4	18.7	1153.2
	Vermicompost	75.1	20.2	1274.3
Liubasha	Without fertilizers	55.8	20.3	894.5
	Vermicompost	63.2	22.1	1232.6
Spas	Without fertilizers	53.6	17.9	765.4
	Vermicompost	61.4	19.6	1137.4

According to the results of research on the application of vermicompost in the variety Kharkiv violet, the total number of root hairs increased by 3.7 pieces/plant, Liubasha and Kharkiv violet by 14.6 pieces/plant, the difference decreased by the introduction of vermicompost, and their number increased by 7, 2 pcs/plant, Spas -53.6 and 61.4 pcs/plant, respectively.

Thus, the average length of root hairs of winter garlic plants was 75.1 cm in the variant with the application of vermicompost in the variety Kharkiv violet, 63.2 cm in the variety Liubasha and Spas -61.4 cm, while in the variant (without fertilizers) the number of their formation in plants was: Kharkiv violet -19.4 cm, Liubasha -20.1 cm and Spas -18.0 cm, respectively. Thus, we can conclude that the application of organic fertilizer -vermicompost has a positive effect on the development of the root system and further on the growth and development of the plant and its productivity.

The results of research show that the structure of the crop and the yield of garlic are directly dependent on the total weight of the plant, the vegetative part and especially the weight of the bulb. Thus, the increase in the weight of garlic plants depends on the application of vermicompost (Table 6). Thus, in the control variant of winter garlic Kharkiv violet the average weight of the bulb was 35.2 g, and in the variant with the application of vermicompost -38.4 g, which is 3.2 g more. In the variety Liubasha this indicator was 47.3 and 52.7 g, and in the variety Spas -38.6 and 40.3 g, respectively.

Table 6. The structure of winter garlic yield depending on the variety and application of organic fertilizer vermicompost (average for 2019-2021).

Variety	Organic fertilizers	Weight, g			Yield, t/ha
		plants	leaves	bulbs	
Kharkiv violet	Without fertilizers	53.5	18.3	35.2	13.7
	Vermicompost	58.5	20.1	38.4	15.2
Liubasha	Without fertilizers	71.7	24.7	47.3	15.6
	Vermicompost	78.8	26.3	52.7	19.4
Spas	Without fertilizers	57.8	19.2	38.6	14.4
	Vermicompost	63.1	22.8	40.3	17.2

Thus, in the variety Kharkiv violet with the application of vermicompost yield was 15.2 t/ha, which is 10.9% higher than the control, the variety Liubasha -19.6 t/ha or 24.3%, respectively, the variety Spas -17.2 t/ha, which exceeded the variant without fertilizers by 2.8 t/ha or 19.4%, respectively.

Vermicompost affects the formation of garlic bulbs, and the yield of standard bulbs, in the variety Spas marketability is 79.6%, which is 2.1% higher than the control variant (variety Kharkiv violet), variety Liubasha - 80.3%, which is 2.8% higher (Table 7).

Table 7. The effect of vermicompost on the formation of garlic bulbs and dry matter content (average for 2019-2021).

Application of organic fertilizers	Bulbs			Output of standard bulbs, %	Dry matter %
	Length, cm	Width, cm	Form index		
Kharkiv violet					
Without fertilizers	5.1	4.6	1.1	75.9	37.4
Vermicompost	6.2	4.8	1.3	77.5	39.8
Liubasha					
Without fertilizers	5.6	4.7	1.2	79.2	40.3
Vermicompost	8.7	5.1	1.7	80.3	43.5
Spas					
Without fertilizers	5.6	4.7	1.2	77.3	38.6
Vermicompost	6.9	4.9	1.4	79.6	40.1

It has been found that the application of vermicompost fertilizer has a significant effect on the accumulation of dry matter and other quality indicators in garlic bulbs. As a result of research, it has been found that no significant difference between the varieties of garlic and the application of vermicompost fertilizer was observed. Thus, in the variety Kharkov violet with the application of vermicompost the dry matter content increased by 1.2% compared to the control variant (without fertilizer application). In the variety Liubasha without the application of fertilizer, the dry matter content exceeded the control variant by 5.5%, and when the vermicompost was applied, the dry matter content increased by 6.1%, respectively.

Thus, we can conclude that the quality of winter garlic cloves depends on environmental factors, growing season and elements of cultivation technology. The formation of quality indicators of garlic is also influenced by the length of the growing season, the intensity of solar insolation, and the temperature of air and soil. Under such conditions, the plant is well provided with light, forms

clove bulbs with the best quality. In addition, the quality of winter garlic bulbs depends on the application of organic fertilizers and elements of cultivation technology in conjunction with soil and climatic conditions.

Accumulation of quality indicators in garlic plants takes place as they develop, as well as meteorological conditions, soil conditions, application of fertilizers and agronomic measures. In our opinion, and some scientists between the meteorological conditions of the year in the development phase of the leaf surface on the content of quality indicators in the bulbs is a direct relationship. Also, the change in quality indicators depends on the length of the growing season, especially at the stage of technical ripeness of the bulbs, when the leaves turn yellow, lose elasticity, dry up and die.

The results of research showed that the quality of the bulbs (cloves) depended on weather and fertilizer conditions. The content of the main indicators of quality in products was determined in the phase of technical ripeness (Table 8).

Table 8. Influence of variety and application of organic fertilizer vermicompost on the chemical composition of winter garlic bulbs (average for 2019-2021).

Application of organic fertilizers	Dry matter, %	Sugars, %	Ascorbic acid, mg/100 g	$N\text{-}NO_3$, mg/kg
		Kharkiv violet		
Without fertilizers	36.3	2.2	9.6	53.3
Vermicompost	37.5	2.5	10.2	55.6
		Liubasha		
Without fertilizers	41.8	2.3	10.5	46.5
Vermicompost	43.2	2.4	11.4	49.8
		Spas		
Without fertilizers	38.6	2.1	10.1	48.4
Vermicompost	39.3	2.4	10.7	51.3

According to the results of research, the qualitative composition of winter garlic cloves for three years differed little. The dry matter content in the variant where organic fertilizer vermicompost was applied in the variety Kharkiv violet was 37.5%, Liubasha - 43.2%, Spas -39.3%, which is 1.2% compared to the control variant (without fertilizers) by 1.2%, 2.4% and 0.7% lower. The content of sugars in garlic bulbs (cloves) in the variant with the application of vermicompost fertilizer was in the variety Kharkiv violet - 2.5%, Liubasha -2.4%, Spas -2.4%, which exceeds the control variant. An important quality indicator in the production of garlic is ascorbic acid, which was slightly higher in the variant with the application of organic fertilizer - vermicompost.

Conclusion

Winter garlic plants develop more intensively from the application of organic fertilizer vermicompost and climatic conditions of cultivation. The phase of technical ripeness of winter garlic plants occurs in the third decade of June with a growing season of 128-142 days. The study of the dynamics of garlic root system throughout the growing season shows that the number of root hairs on the plant is from 44.8 pcs. up to 48.1 pcs. in the variant without fertilizer, then in the variant with vermicompost - 46.5 pcs. up to 51.3 pcs. The leaf surface area on the 60th day after the beginning of spring regrowth in the variant with the application of vermicompost variety Kharkiv violet was 77.6 cm^2. In the Liubasha variety, the leaf surface area was 90.7 cm^2 on the vermicompost application variant, and the Spas variety was 80.5 cm^2, respectively. On the 90th day after the beginning of spring regrowth, the difference between the variants on the area of the leaf surface decreased, due to the biological characteristics of plants and the period of technical features. Increasing the weight of garlic plants depends on the application of vermicompost fertilizer. Thus, in the control variant of winter garlic variety Kharkiv violet the average weight of the bulb was 35.2 g, and in the variant with vermicompost -38.4 g, which is 3.2 g more. In the variety Liubasha this indicator was 47.3 and 52.7 g, and in the variety Spas - 38.6 and 40.3 g, respectively. Yield of bulbs in the variety Kharkiv violet for the application of vermicompost was 15.2 t/ha, which is 10.9% higher than the control, the variety Liubasha -19.6 t/ha or 24.3%, respectively, the variety Spas -17, 2 t/ha, which exceeded the variant without fertilizers by 2.8 t/ha or 19.4%, respectively. Vermicompost affects the formation of garlic bulbs, and the yield of standard bulbs, in the variety Spas marketability is 79.6%, which is 2.1% higher than the control variant (variety Kharkiv violet), variety Liubasha -80.3%, which is 2.8% higher. The qualitative composition of winter garlic cloves depends on environmental factors, growing season and elements of cultivation technology. In the dynamics of changes in the chemical composition of garlic bulbs separately during the agrophytocenosis are changes in one or another indicator. Increased dry matter content in the products was observed in varieties with the variant of organic fertilizer vermicompost from 37.52 to 43.2%, sugar from 2.4% to 2.5%, ascorbic acid from 10.2 to 11.4 mg/100 g of crude substance.

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Citation:

Ovcharuk, V., Mialkovsky, R., Bezvikonny, P., Ovcharuk, O., Tulapina, D. (2022). Varietal productivity of winter garlic depending on the application of organic fertilizers. *Ukrainian Journal of Ecology.* 12:12-19.