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The Comparative Description of Economic and Biological Indices of the New Garlic Varieties

H.Z. Terteryan, A.Sh. Melikyan
Armenian National Agrarian University
hasmik_terteryan1959@mail.ru, a_melikyan@yahoo.com

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ABSTRACT

The garlic varieties "Javakhk" and "Parvana-3" have been bred through the method of clonal selection upon the development of variety populations imported from Javakhk. Their yield capacity has made 114.0 c/ha and 120.0 c/ha, exceeding the control variety "Dzyunik" by 23.9 % and 30.4 % respectively.

The produced varieties surpass the control variant also in the bulb preservability, biochemical indices and disease resistance rate, which serves as a background for submitting them to the state variety trial.

It is recommended to cultivate the new varieties in the Ararat valley and its submountain areas for getting marketable yield, while it is relevant to grow them in mountainous areas for getting seed grains.

Introduction

Garlic is an ancient and valuable vegetable crop. It is widely used both in the food industry and traditional medicine.

The garlic bulb contains 25.0 %-48.4 % dry matters, 4.5 %-8.3 % proteins, 20 %-27 % polysaccharides, vitamins C, B_1, B_2, PP, E, while the ash is composed of more than 17 chemical elements including phosphorus, calcium, copper, selenium, iodine and iron. Besides, garlic is rich in phytoncides, which are volatile matters with bactericidal properties. They protect human organism from a number of undesired bacteria (Grigorevich, 2013, Kazakova, 1970).

Due to its unique features garlic promotes human health care and is also used in different agricultural food processing organizations. Thus, the production of high yielding and high-quality garlic varieties, and their introduction in the agriculture are among the prior measures to be taken in order to meet the growing demand of population and processing organizations for garlic, as well as to prolong its shelf life.

Materials and methods

The activities, related to the production of garlic varieties with economically efficient properties, were implemented in 2010-2017, on the Voskehat experimental farm, at the

Figure 1. Garlic seed field.

Figure 2. The garlic varieties: *a.- Javakhk* and *b.-Parvana-3*.

Armavir region/marz in consistent with the methodology of State Variety Trial for farm crops (Methodology of State Variety Trials for Farm Crops, 1985).

The content of dry matters in the garlic bulblet has been determined with refractometer, that of vitamin C - according to the Moore's and the total sugars according to the Bertrand's methodologies (Peterburgskiy, 1987).

The yield estimation was conducted through weighing the yield of each variant, then the resulted data were subjected to mathematical processing using the method of dispersion analysis (Dospekhov, 1985).

The diseases (bacterial root rot-*Pectobacterium carotovorum*, false powdery mildew - *Peronospora Schlerden*) were recorded due to the accepted methodology on a 5 point rating scale (Orzhekhovskaya, 1981).

The new garlic varieties belong to the spathe forming, south coastal winter species.

The garlic variety "Dzyunik", produced as a result of the development of the local Armenian varity population, has served as a control variant.

The variety sample "Javakhk" has been bred through the method of clonal selection by the improvement of the local variety population spread in Javakhk. The leaves are greenish, with average waxy layers, 8 items per plant. Their length is 35 cm, width is 1.9 cm and the height of pseudostem makes 20 cm. The bulb is hard, round or round-flattish. The dry sheaths of garlic are white with about 4-6 items, the sheaths of the cloves are of light red-violet color, while the fruit pulp is light cream-colored. The number of cloves is 6; their average mass makes 9 g, while the average bulb mass makes 60 g. It has semihot taste.

The variety sample "Parvana-3" has been also produced through clonal selection upon the development of varity population imported from Javakhk. It is a spathe forming winter variety. The leaves are dark greenish covered with thick waxy layer, 9-10 items per plant. Their length is 35 cm, the width is 1.9 cm and the height of pseudostem makes 27 cm. The bulb is hard, round or roundly stretched up. Th dry sheaths are white with faint violet stripes with 6 items. The sheaths of cloves are white-violet, the septum is red-violet and the fruit pulp is lght cream-colored. The number of cloves is 8-12 items, while their avreage mass amounts to 7 g (the central cloves are small, the peripheral ones are large). The bulb weight is 55-60 g, and it has hot or semihot taste.

Results and discussions

The results of phenological observations (Table 1) have disclosed that though all experimented varieties were planted in the same period, the new sample varieties germinated 1-2 days later than those of the control variant. It is noteworthy that the "Dzyunik" variety doesn't form any spathe. The spathe formation period started earlier in the new variety sample "Javakhk". The same regularity has been recorded in the spathe bolting phase.

During the observations, it has been found out that the "Dzyunik" variety ripened first, Javakhk variety was the second, while the variety "Parvana-3" ripened much later.

So, the duration of germination-ripening phase in the control variant "Dzyunik" made 109 days, in the "Javakhk" variety it was 112, while in "Parvana-3" variety it made 121 days.

Table 1. The growth and development times of the garlic varieties (2016-2018)*

N/N	Varieties (samples)	Planting	Mass germination	Spathe formation	Spathe bolting/ breaking	Ripening	Vegetation duration, day
1	**Dzyunik (control)**	07/11	06/03	-	-	23/06	109
2	**Javakhk**	07/11	07/03	22/06	30/05	26/06	112
3	**Parvana-3**	07/11	08/03	28/06	07/06	07/07	121

Table 2. The efficiency indices of the new garlic varieties (2016-2018)*

N/N	Varieties (samples)	Total yield, c/ha	Dry matters, %	Vitamin C, mg%	Total sugars, %	Preservation ability, day	False powdery mildew, %	Bacterial root rot, %
1	Dzyunik (control)	92.0	42.0	5.6	21.5	220	6	3
2	Javakhk	114.0	43.5	7.9	23.4	233	1.4	0.7
3	Parvana-3	120.0	43.5	6.8	22.0	242	2.4	1.2

LSD - 9.39 c/ha, E_x % - 2.4

*Composed by the authors.

The main goal of establishing and introducing any new crop variety in the production is to get high yield (Yedoyan, 2006, Guzhov, et al., 2003). It is worth mentioning that the new varieties have exceeded the control variant both in the total and marketable yield amount (Table 2). If the total yield amount in the control variant made 92.0 c/ha, then in the "Javakhk" variety this indicator surpassed by 23.9 %. The variety "Parvana-3" with its total 120.0 c/ha yield amount exceeded the "Dzyunik" variety by 30.4 %.

The yield quality is also a significant indicator for the evaluation of any crop variety. Upon the studies of qualitative indices of the bulblets it has been disclosed that "Javakhk" and "Parvana-3" varieties have surpassed the control variant in the content of dry matters and vitamin C by 1.5 % and 1.2 %-2.3 % respectively. The variety "Javakhk" exceeds the control variant by 2.1 % regarding its sugar content (23.4 %).

One of the utmost important issues in the process of garlic selection is the breeding of new possibly preservable varieties. Thus, if the shelf life of the bulblets of "Dzyunik" variety is 220 days, then that of the varieties of "Javakhk" and "Parvana-3" makes 233 and 242 days respectively.

There are a number of garlic diseases spread in Armenia, which have an adverse effect on the plants productivity. The introduction of a sustainable variety in the production will ensure not only an economic efficiency, but also a considerable reduction in the application of pesticides and environmental pollution.

According to the data of table 2, the plants of new garlic varieties (per natural background) are more resistant towards the diseases (bacterial root rot - *Pectobacterium Carotovorum*, false powdery mildew - *Peronospora Schlerden*) than those of the control variant.

Conclusion

According to the vegetation duration the new garlic varieties "Javakhk" and "Parvana-3" are mid-season and mid and late-season ripening plants.

The yield surplus of the bulblets in the new varieties has made 22.0 c/ha and 28.0 c/ha against the control variant "Dzyunik" (23.9 % and 30.4 % yield surplus has been recorded respectively).

In the result of biochemical analyses, it has been found out that the new varieties exceed the "Dzyunik" variety in the content of dry matters, total sugars and vitamin C.

The shelf life (preservability) of "Parvana-3" variety surpasses the same indicator of the control variety by 22 days.

Comparing with the control variant, the new garlic varieties, the plants of "Javakhk" (investigated on the natural background), in particular, are more resistant to the diseases (bacterial root rot - *Pectobacterium Carotovorum*, false powdery mildew - *Peronospora Schlerden*).

Hence, according to the experimental results, the new garlic varieties bred by our research group, significantly exceed the control variety "Dzyunik" in the efficiency index, which serves as a sound background for submitting them to state variety testing.

It is recommended to cultivate new garlic varieties in the Aararat valley and in its submountain zones (Ararat, Armavir, Kotayk, Aragatsotn) for getting marketable yield, while for seed grain breeding it is relevant to cultivate the mentioned varieties in the mountainous zones (Gegharkunik, Shirak).

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