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Paper Authors

Aripova Shakhnoza Rakhmanovna, Dusmuratova Saodat Ismailovna



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ESTABLISHMENT OF OPTIMAL TERMS AND METHODS FOR GROWING SEED FRUITS OF THE NEW LINE LH-1916 SQUASH IN THE TASHKENT REGION, UZBEKISTAN

¹Aripova Shakhnoza Rakhmanovna, ²Dusmuratova Saodat Ismailovna

¹Junior researcher at the Laboratory of Vegetable-melon crops breeding of the Research Institute of Vegetable, melon crops and potato. The Republic of Uzbekistan, aripovashakhnoza@gmail.com

²Doctor of Agricultural Sciences, Professor of the Department of Vegetable growing, melon growing and potato growing of Tashkent State Agrarian University. The Republic of Uzbekistan, saodatis@mail.ru

ABSTRACT

The article presents the results of studies of a comparative assessment of the cultivation of seed fruits of marrow by seedling and direct sowing methods at various dates of planting and planting in the conditions of the Tashkent region. Researchers size-mass characteristics of fruits of the new line LH-1916 squash to determine the timing and methods of growing at the output and quality indicators of seeds of fruits and seeds.

The aim was to establish the optimal time for sowing and planting seedlings of the promising line of short-leafed shape LH-1916 during the spring period of growing for seed purposes.

Studies to identify ways and optimal timing of growing a new line of squash LH-1916 for seed purposes were carried out in 2016 and 2019 at the experimental site of the Scientific Research Institute of Vegetable, melon crops and potato. Four spring terms of sowing and planting seedlings were tested: April 1-3, April 10-12, April 20-21 and April 30 – 1 May.

The conducted counts to determine the average weight of seed fruits in the lines of squash LH-1916 showed that with the postponement of the planting time when growing by seedlings, the weight of the seed increased, and when grown in a direct sowing way, the largest seed fruits were formed at dates in the first ten days of April (10-12.04).

The measurements of the length, width, thickness of the pulp of the seed fruits were carried out and the fruit index was determined. The tested squash line LH-1916 has elongated fruits. According to the results of measurements of the fruit in longitudinal and cross-sections, it was found that the length and width of seed fruits with seedling and direct sowing cultivation methods differed insignificantly, but the thickness of the flesh with direct sowing methods was greater in seed fruits compared to seedling cultivation methods.

The seed yield from one fruit in grams and percentage did not depend on the average weight of the seed fruit. Apparently, these indicators were influenced by an increase in daily temperatures and a decrease in the relative humidity of the air with a postponement of the sowing and planting dates, at which the intensity of pollination and fertilization of the squash decreased. It can also be assumed that this is a varietal trait of the studied line.

Under the conditions of the Tashkent region of Uzbekistan, the highest yield of seeds

from fruits in the LH-1916 line was established when growing marrow by the seedling method in the first decade of April (April 1-3 and 10-12), and with a direct sowing culture - when sowing seeds on April 1, which is associated with the most favorable temperature conditions for the culture of squash.

Key words: squash, line LH-1916, growing method, sowing time, planting time, seedlings, seeds, fruit weight, size-mass characteristics, seed fruit.

INTRODUCTION

Squash (*Cucurbita pepo subsp. pepo*) comes from the northern Mexico (Oaxaca Valley), where originally only its seeds were eaten. After its discovery by Columbus, the marrow was introduced to Europe in the 16th century, along with other "curiosities" from the New World. They looked closely at the outlandish plant for a long time, growing it in botanical gardens, then tasted it and began to cultivate it as a vegetable plant, eating unripe fruits. In the 18th century, Italians were the first to use unripe squash for food (www.ovoshevodstvo.ru).

Currently, it is distributed from the subtropics to the northern borders of agriculture. In the CIS, it is grown everywhere, but in small areas, mainly in the southern regions. In the north, this crop is cultivated in suburban vegetable zones and on individual plots. Squash is widespread in Bulgaria, Greece, Canada, France, and the USA. In the countries of Western Europe and the United States, the zucchini variety is widespread, with a more compact bush and high yields. In recent years, zucchini has become one of the favorite dietary foods of the population of Uzbekistan. Therefore, the study of this culture in the natural and climatic conditions of our country is relevant.

Squash refers to the early maturing form of a hard-barked pumpkin. The advantage of zucchini over other pumpkin

crops is their high yield and nutritional value. There are climbing and bush forms (Pavlov LV, Paraskova OT, Kondratieva I.Yu., et al., 2010).

In the CIS, two types of squash are ubiquitous: short-growing and climbing. The first forms a bush with short branches, the second has no branches (side shoots). Plants of this type are more productive, keep a compact bush until the end of the growing season, which facilitates the processing of the field (Pivovarov V.F., Dobrutskaya E.G., 2001).

Squash and zucchini varieties are early ripening vegetables with an attractive appearance. Due to its short growing time, this crop can be grown in Uzbekistan in spring and re-culture in a seedling and direct sowing way.

For squash, frosts are destructive, but it can withstand a short cold snap to 6- 10°C. Seeds begin to germinate at a temperature of 8-10°C, which is 4-5°C higher than the minimum germination temperature for cucumbers. Unlike cucumber, squash is rather drought-resistant, but high yields are obtained when provided with moisture (Prokhorov I.A., 1997).

Squash can be grown in a wide variety of soil types but is best grown on soils with a medium texture. Good yields can be obtained on lighter and heavier soils if properly managed. The soil must be well-drained and supplied with organic matter. Squash grows best in soil pH 6.0–7.0.

Squash is a monoecious plant. Flowers are dioecious, solitary, rarely in small inflorescences. Male flowers are often open and fall off after pollination. The female flowers remain on the plant until the ovary begins to grow, and this can only happen when pollination is successful. Without pollination, female flowers fall off and plants will not form fruit. The female flower is connected to the fruit, while the male flower has a long, slender stem. Male flowers bloom earlier than female flowers (Kirillova O.A., Bukharov A.F., Ivanova M.I., 2015).

Squash usually bears fruit, ready to harvest 40-50 days after sowing. The fruit should be harvested in an immature stage when the flesh and skin are soft and juicy. Squash fruits grow quickly, so you need to harvest every day or every other day.

The use of seeds with high physiological, physical, sanitary and genetic quality is a priority factor for achieving profitable vegetable production. The widespread use of hybrid seeds has led growers to demand high quality seeds as these seeds are more expensive than open-pollinated seeds. On the other hand, it is necessary to take into account some factors that would improve the yield and quality of seeds grown under the conditions of the republic, and it became possible to sell domestic seeds on the market at affordable prices.

MATERIALS AND METHODS

Studies to identify the methods and the optimal time for growing a new line of squash LH-1916 for seed purposes were carried out in 2016 and 2019 at the experimental site of the Research Institute of Vegetable, melon crops and potato. The institute is located in the Tashkent district of

the Tashkent region. The climate of the region is similar to that of most vegetable farms located in the flat central part of Uzbekistan.

The soils of the experimental site are typical loams, cultivated, moisture-consuming, the depth of groundwater is more than 6-7 meters, the amount of total humus in the soil is 0,641-0,943%, nitrogen 0,072-0,121%, phosphorus 0,130-0,171% and potassium 1,627-2,206%.

The air temperature in 2016 during the growing season of the squash in March was 12,9⁰C higher than the average long-term value (10,8⁰C), and in April, 15,8⁰C, the average temperature did not exceed the long-term average (15,9⁰C). During this period, 39,2 mm of precipitation fell, which is 13,3 mm lower than the norm. The relative air humidity was 3,8% higher than the long-term average. Precipitation in May was 33,8 mm more than the average annual value. The average daily temperature in June is 27,4⁰C, which is 0,4⁰C higher than the average annual temperature. The precipitation in June was 2,3 mm more than the average annual precipitation – 8,3 mm. These conditions were favorable for the development of squash plants. In July, the average daily air temperature was 28,6⁰C, the amount of precipitation was 0 mm. August was warm (average daily temperature 27,1⁰C) and no precipitation. In September, the temperature dropped to 23,3⁰C.

The weather conditions of the growing season in 2019 were also favorable for the development of the squash. The amount of precipitation fell at the level of 169.2 mm, which was 25.1% more than the average annual value. April was characterized by very heavy rainfall, but all the following months were dry.

In general, the weather conditions in 2016 and 2019. were favorable for the growth and development of squash, with the exception of dry July and August, during which the lack of moisture was compensated by irrigation.

The aim of the research was to establish the optimal time for sowing and planting seedlings of a promising line of short-leafed squash LH-1916 in the spring period of growing for seed purposes.

Research methodology. The experiment was carried out with a promising squash line LH -1916. 4 spring terms of sowing and planting seedlings were tested: April 1-3, April 10-12, April 20-21 and April 30 – 1 May. Sowing seeds in greenhouses was carried out in the third decade of February, I-II - ten days of March, and I - ten days of April, according to the test dates for planting seedlings in open ground. Two-row plots, 10 m long, layout $(140+70)/2 \times 50$ cm. The area of the accounting plot is $21,0 \text{ m}^2$. On each plot, 40 plants were placed, the experiment was repeated 4 times.

Seed fruits of squash lines LH-1916 (seed age - 40 days) from the seedling method of cultivation were collected from the first term - in the first decade of June; from the II date - in the II decade of June, from the III date of planting - in the III decade of June. In the I-decade of July, seed fruits were collected from the IV-planting date and from the I-sowing date at the squash line. From the II and III-term of cultivation, when sowing with seeds, the seed fruits were collected in the II decade of July, from the IV-term of sowing - on the III-decade of July. After harvesting the fruits, the testes were ripened for 10-12 days. The size and mass characteristics of seed fruits are taken into account: average

weight, length, width, thickness. We also measured the weight of 1000 seeds. Statistical processing of the research results was carried out according to B.A. Dospikhov (Dospikhov B.A, 1985) on an IBM PC / AT, MICROSOFT EXCEL 7.0.

RESULTS AND DISCUSSION

After harvesting, the seeds were placed in boxes for indoor ripening. After ripening, measurements of the size and mass characteristics of the fruits were carried out (table 1). when studying the characteristics, the length of the fruit, the width (diameter), the thickness of the pulp and the weight of the fruit were determined. Fruits were measured with a ruler and caliper with an accuracy of 1 mm, then weighed on a balance with an accuracy of 10 g.

The calendar dates for collecting seed fruits of the last dates of planting seedlings coincided with the dates for harvesting seed fruits of the 1st and 2nd seed sowing dates. Therefore, the average weight of the seed fruit in the plants of the squash line at the first and second seeding terms was the highest. After harvesting the fruits, the testes were ripened for 10-12 days. Then the seeds were extracted from the fruits and dried in the open air.

The carried out counts to determine the mass of seed fruits in the lines of squash LH-1916 showed that with the postponement of the planting date when growing by seedlings, the mass of the seed fruit increased. The average fruit weight varied from 1352 to 1410 g. The calendar dates for harvesting seed fruits of the last dates of planting seedlings coincided with the dates for harvesting seed fruits of the 1st and 2nd seed sowing dates.

Therefore, the average weight of the seed fruit in plants of the line at the first and second seeding terms were the largest.

When grown in a direct sowing way, at 10-12.04, the largest weight was 1406,7 g, the smallest - at a sowing date of 20- 21.04 – 1355,0 g. When sowing with seeds, the growing season lengthens, and at the last dates of sowing during the period of pollination and fertilization, the temperature rises, in this regard, the fruits are formed with a lower weight (fig.1).



Fig. 1. Seed fruits of the LH-1916 squash line.

The tested line was measured (length, width, pulp thickness) of the seed fruits and the fruit index was determined. When measuring (in longitudinal and cross-section) the seed fruits of the LH-1916 line, it was found that with the seedling method, the lines along the length of seed fruits within the growing period had a slight difference, i.e. the difference between them was 1,0-1,9 cm.

In terms of the diameter of the seed fruits in the cross section, the widest were the fruits grown at the time of 30.04-1.05 by seedlings (9,7 cm), and the narrowest at the time of 1-3.04 (8,5 cm). With the planting dates of 10-12.04 and 20-21.04, the width of

the seed fruits was from 8,5 to 8,9 cm. In the thickness of the pulp, the seed fruits from all growing periods had a slight difference, i.e. this difference ranged from 2,2 to 2,4 cm.

With the direct sowing cultivation method, the measurements of the parameters of the seed fruits of the squash line LH-1916 showed that the fruits obtained from the sowing date 1-3.04 (35,2 cm) were longer, and with the postponement of the sowing dates, the fruits were formed shorter compared to the previous sowing dates (32,2-33,2 cm).

In terms of the diameter of seed fruits, the widest were the fruits grown at a period of 1-3.04 by a direct sowing method (9,8 cm) and the narrowest at a period of 10-12.04 (9,0 cm). With the planting dates of 20-21.04 and 30.04-1.05., the width of the seed fruits was 9,7 cm. The thickness of the fruit pulp ranged from 2,3 to 2,4 cm.

According to the results of measurements of the fruit in longitudinal and cross-sections, it was found that the length and width of seed fruits with seedling and direct sowing methods did not differ significantly from each other, but the thickness of the flesh when the seedling method was greater in seed fruits compared to direct sowing methods.

In the studied squash line, the seed yield from one fruit in grams and percentage did not depend on the average weight of the seed fruit. Apparently, these indicators were influenced by an increase in daily temperatures and a decrease in the relative humidity of the air with a postponement of the sowing and planting dates, at which the intensity of pollination and fertilization of the squash decreased. It can also be assumed that this is a varietal trait of the studied line (Table 1).

With the seedless cultivation method

in the squash line LH-1916, when determining the mass of seed fruits, it was found that the planting time influenced this indicator. The weight of the seed fruit at the sowing dates of 10-12.04 and 20- 21.04 had the highest value in 1419,5 – 1428,0 g, then the sowing date was 30.04 -1.05 (1378,8 g), and the smallest indicator was when growing seed fruits 1-3.04 (1358,9 g).

According to the seed yield from one fruit (in grams), the sowing time of 1- 3.04 was the best (22,0 g), the sowing time of 10-12.04 – 20,4 g, when sowing seeds on 20-21.04 and 30.04-1.05., the mass of seeds from 1 fruit was almost the same (21,0-21,5 g).

In terms of the number of seeds isolated from 1 fruit, the sowing time of 1- 3.04 was the leader in the LH-1916 line (205 pieces); with a sowing date of 30.04-1.05. the number of seeds from 1 fruit was the smallest: 197 pieces. Sowing dates of marrow seeds 10-12.04 and 20-21.04 had an intermediate position between the first and last dates, which amounted to 198-201 pcs.

In line LH-1916, the seed yield from the fruit did not depend on the average weight of the fruit. The seed yield in grams varied for the best options from 22,4- 23,8 g. With the direct sowing cultivation method, this line, when sowing with seeds on April 1-3, the seed yield in grams was 22,0 g, the number of seeds in the fruit was 204,0 pieces, while at the rest of the seed sowing times, the fluctuations of these indicators between the experimental variants were insignificant (table 1)

Table 1.

Seed fruit weight, size and mass characteristics of seed fruit and seed yield of the squash line LH-1916 at different periods and methods of growing (average over 2 years)

Sowing and planting time	Seed fruit weight, g	Fruit length, cm				Fruit width, cm				Pulp thickness				Seed yield from one fruit		
		X _{max}	X _{min}	X̄	V%	X _{max}	X _{min}	X̄	V%	X _{max}	X _{min}	X̄	V%	quantity, pieces	gram	%
1-3.04	1352,2	32,1	33,3	33,38±1,46	4,37	8,1	8,9	8,48±0,33	3,9	2,0	2,1	2,08±0,05	2,41	213,0	23,8	1,76
10-12.04	1370,6	30,7	34,0	32,48±1,67	5,15	7,8	8,8	8,48±0,46	5,4	2,0	2,2	2,10±0,12	5,5	204,0	22,4	1,64
20-21.04	1410,1	32,0	34,0	32,85±0,87	2,65	8,4	9,5	8,93±0,48	5,36	2,0	2,1	2,05±0,06	2,82	206,0	21,8	1,54
30.04-1.05	1368,3	32,6	36,1	34,38±1,47	4,46	8,9	10,7	9,73±0,74	7,62	2,3	2,5	2,38±0,10	4,03	203,0	21,3	1,55
1-3.04	1358,9	33,0	38,5	35,18±2,38	6,76	9,2	10,5	9,80±0,57	5,83	2,3	2,4	2,35±0,06	2,46	204,0	22,0	1,62
10-12.04	1419,5	36,5	35,7	32,22±4,08	12,67	7,5	9,5	8,95±0,97	10,85	2,2	2,5	2,40±0,14	5,85	202,0	21,5	1,51
20-21.04	1428,0	29,5	36,5	32,98±2,88	8,74	9,2	10,3	9,70±0,54	5,52	2,2	2,5	2,30±0,14	6,15	198,0	21,0	1,47
30.04-1.05	1378,8	29,5	36,0	33,18±2,80	8,43	8,9	10,5	9,73±0,79	8,16	2,1	2,4	2,25±0,13	5,74	194,0	20,4	1,50

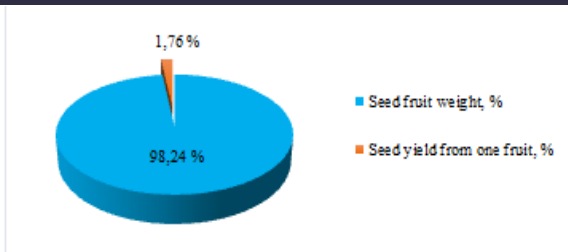


Figure. 2. The seed yield of the squash line LH-1916 with the seedling method of cultivation on April 1-3.]

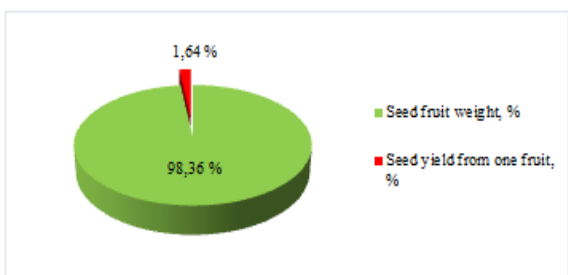


Figure. 3. The seed yield of the squash line LH-1916 with the seedling method of cultivation on April 10-12.

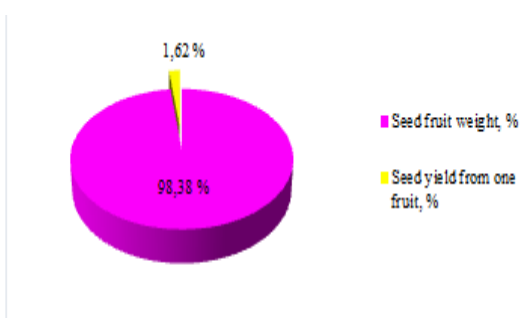


Figure.4. The seed yield of the squash line LH-1916 with the direct sowing method of cultivation on April 1-3.

In the studies carried out, it was found that when growing seed fruits of squash, the timing of cultivation had a certain effect on the seed yield in percent. The LH-1916 line had the best percentages of seed yield when grown by seedlings on April 1-3 and 10-12. With direct sowing of seeds, the best sowing time was April 1-3 (see fig. 2, 3, 4).

In the first decade of April, the most favorable conditions of temperature and relative humidity are established in the Tashkent region, under which pollination and fertilization are the best.

CONCLUSIONS

With the postponement of the planting date when growing by seedlings, the mass of the seed fruit increased. The average fruit weight varied from 1352 to 1410 g. The calendar dates for harvesting seed fruits of the last dates of planting seedlings coincided with the dates for harvesting seed fruits of the 1st and 2nd seed sowing dates. When grown in a direct sowing way, at 10-12.04, the largest weight was 1406,7 g, the smallest - at a sowing date of 20-21.04 – 1355,0 g.

In terms of the diameter of the seed fruits in the cross-section, the largest were the fruits grown at a period of 1-3.04 by a direct sowing method (35,18 cm), and the most compact at a period of 10-12.04 (32,23 cm). At the sowing dates of April 1-3, April 20-21 and April 30 – 1 May, the width of the seed fruits was from 9,7 to 9,8 cm.

The length and width of seed fruits with seedling and direct sowing methods did not differ significantly between themselves, but the thickness of the pulp when growing without direct sowing was greater in seed fruits compared to seedling growing methods. When comparing the correlation coefficient of the thickness of the fruit pulp with the yield of seeds from the fruit in grams and percent, it was found that in the squash line LH-1916, the thicker the fruit pulp, the lower the seed yield.

According to the definition of the fruit index, it was found that at all planting dates the fruit index was in the range of 3,4-3,9 since squash line LH-1916 has an elongated fruit shape. In the studied squash line, the seed yield from one fruit in grams and percentage did not depend on the average weight of the seed fruit. It can be assumed that this is a varietal trait of the studied line.

Under the conditions of the Tashkent region of Uzbekistan, the highest yield of seeds from fruits in the LH-1916 line was established when growing marrow by the seedling method in the first decade of April (April 1-3 and 10-12), and with a direct sowing culture - when sowing seeds on April 1-3, which is associated with the most favorable temperature conditions for the culture of squash.

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