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SUMMER SQUASH YIELD CAPACITY FORMATION DEPENDING ON THE SOWING TERMS IN CONDITIONS OF THE RIGHTBANK FOREST-STEPPE ZONE OF UKRAINE

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The results of scientific research on sowing summer squash under different terms, their influence on the onset of phenological phases, the duration of interphase development periods, biometric parameters of summer squash plants and production as well as yield capacity are presented.

The term of sowing greatly influences the quality of germination, the growth, the development and the productivity of plants. The term of sowing is determined by the duration of vegetation period, climatic and soil conditions of growing zone. Early or late terms of sowing are not acceptable for summer squash growing. The appearance of seedlings may be delayed in case of early sowing into insufficiently heated soil, and if sown in conditions of long-term cold weather seeds may swell and not germinate, after that it may mould and die. In case of the late sowing, especially in dry years, the seeds can't manage to use winter and early spring moisture reserves, get into dry soil, don't geminate and don't give sprouts before falling out of late spring or summer precipitation, which leads to the delayed appearance of seedlings as well as to the low fruit yields [3].

Polishchuk S. F. mentions that the optimal term of summer squash sowing in the Forest-steppe zone is the 20^{th}-25^{th} of May, that is the period when the threat for May frosts is over and the soil is heating up to 10-14^{0}C [5].

Methods of scientific research. The research on studying the yield capacity and biometric parameters of summer squash fruit under different sowing terms was carried out in 2011-2012 in conditions of the Right bank Forest-steppe zone on the

experimental field of Vinnytsia national agrarian university. The soil of the experimental plot is forest grey, medium loamy, characterized by such indicators: content of humus – 2,4 %, reaction of soil solution (pH) – 5,8, soaked basis amount – 15,3 mg/100 g of soil, P_2O_5 – 21,2 mg/100 g of soil, K_2O – 9,2 mg/100 g of soil. The object of the investigation was summer squash varieties Zolotynka and Chaklun. The repetition of the experiment is four times, the area of the accounted plot is 40 m^2. During the experiment field, statistic, and laboratory investigation methods were used. In accordance with the methods, carrying out of phenological observations, biometric measurements and accounting was provided [4]. Morphological features like shape, colour of leaves and squash fruit were determined visually, the amount of leaves – with the help of counting. The area of the leaf blade was determined by the method of V. I. Kamchatny [2]. The yield was harvested as fruits were forming according to the requirements of current standard – "Fresh summer squash. Technical conditions – SSU 318 – 91" [1]. Technology of summer squash growing is generally accepted for the Right bank forest-steppe zone. For the planned density plants were thinned out in the phase of the third real leave by the scheme 120x70 cm, which is 11,9 thousands plants per ha. The sowing term 5.05 was chosen for control. The variants of the experiment were terms: 25.04; 5.05; 15.05 та 25.05.

The results of the scientific research. Phenological phases of the summer squash set in different terms, which depended on the sowing term, that is, the later seeds are sown, the later shoots appeared, grew and developed in future (table 1). Thus, on the plots of the first sowing term (25.04), separate shoots of the variety Zolotynka were fixed - 7.05, mass– 11.05, and on the plots of the last sowing term (25.05) – 30.05 і 1.06 accordingly. The same regularity as for the term of the shoots appearance was observed with the Chaklun variety.

Plants in variants with sowing terms 25.04 blossomed earlier: 14.06 – of Zolotynka variety and 13.06 – of Chaklun variety, in the control variant - by 5 and 6 days later. Fruits of summer squash plants with sowing terms 25.04 were set earlier; 18.06 of Zolotynka variety and 17.06 – of Chaklun variety, which is

accordingly by 5 and 6 days earlier in comparison with the plants in the control variant. Harvesting began before the sowing term 25.04: 22.06 of Zolotynka variety and 20.06 of Chaklun variety, in the control variant – 26.06, which is by 4 and 6 days later.

1. The date of the onset of phenological phases of summer squash growth and development depending on the sowing term (average for 2011-2012)

Variety	Sowing term	Appearance of seedlings		Mass flowering	Beginning of fruit setting	Beginning of harvesting	Completion of harvesting
		single	mass				
Zolotynka	25.04	7.05	11.05	14.06	18.06	22.06	22.09
	5.05 (K)*	15.05	17.05	19.06	23.06	26.06	25.09
	15.05	22.05	24.05	24.06	27.06	30.06	23.09
	25.05	30.05	1.06	29.06	2.07	3.07	15.09
Chaklun	25.04	11.05	10.05	13.06	17.06	20.06	25.09
	5.05	14.05	16.05	16.06	20.06	23.06	25.09
	15.05	22.05	25.05	23.06	26.06	29.06	22.09
	25.05	30.05	1.06	29.06	2.07	5.07	17.09

Note: C* – control

The research showed that the sowing term influenced the duration of interphase periods of summer squash plants (table 2). Thus, interphase development periods of plants with later sowing terms were faster. For example, the period from the sowing to the appearance of mass seedlings with the sowing term 25.04 was 16 days of Zolotynka variety, with the sowing term 25.05 – 7 days, of Chaklun variety – 15 and 7 days accordingly. The shortest period from the mass appearance of seedlings to the mass flowering had both investigated varieties of plants with the latest sowing term (25.05) and amounted 28 days, whereas plants with the first sowing term (25.04) – 34 days.

The term of sowing influenced the duration of period from the mass appearance of seedlings to the beginning of harvesting. This period amounted 32

and 34 days with the sowing term 25.05 of Zolotynka and Chaklun varieties, with the sowing term 5.05 (control) – 40 and 38 days accordingly.

One of the indicators influencing the amount of yield is the duration period of yield coming. This period was the longest one in the variant with the sowing term 25.04 and amounted 92 days of Zolotynka variety, and 97 days of Chaklun variety, whereas in the variant with the sowing term 25.05 – 75 and 74, which is less by 17 and 23 days accordingly.

2. Duration of interphase periods of summer squash development depending on the sowing term, days (average for 2011-2012)

Variety	Sowing term	Appearance of seedlings		From mass seedlings to			Duration of yield coming, days
		single	mass	Mass flowering	beginning of fruit setting	beginning of harvesting	
Zolotynka	25.04	12	16	34	38	42	92
	5.05 (C)*	10	12	33	37	40	91
	15.05	7	9	31	34	37	87
	25.05	5	7	28	31	32	75
Chaklun	25.04	11	15	34	37	40	97
	5.05	9	11	31	35	38	94
	15.05	7	10	29	32	35	85
	25.05	5	7	28	31	34	74

Note: C* – control

Strong direct connection between the duration of yield coming and the yield capacity of summer squash is determined by analysis (r=0,86).

Sowing terms influenced the growth and development of summer squash plants (table 3). During the phase of technical ripeness among the investigated variants varieties Zolotynka and Chaklun had the highest plants with the sowing term 25.04 – 80.2 and 79.0 cm accordingly, while in the control variant – 77.0 and 74.7 cm accordingly, which is by 3.2 and 2.0 cm less. The variety Zolotynka had

thicker stem under the sowing term 25.04 and 5.05 (control) - 31,3 та 30,0 mm. The largest amount of leaves was noted in the variety of Zolotynka under the sowing term 25.04 – 25.5, in the variety of Chaklun under the sowing term 25.04 and 5.05 - 26,3 and 25,3 pieces/plant accordingly, while in the control – 23,8 pieces/plant, which is by 1,7, 2,5 and 1,5 pieces/plant less.

3. Biometric indicators of summer squash plants in the phase of technical ripeness depending on the sowing term (average for 2011-2012)

Variety	Sowing term	Height of plants, cm	Stem thickness, mm	Amount of leaves, pieces/plant	Area of leaves, thousand m^2/ha
Zolotynka	25.04	80,2	31,3	25,5	14,1
	5.05(C)*	77,0	30,0	23,8	12,7
	15.05	62,8	27,5	22,3	9,7
	25.05	57,3	26,6	21,4	7,4
Chaklun	25.04	79,0	29,1	26,3	13,5
	5.05	74,7	27,1	25,3	12,7
	15.05	62,5	24,6	23,5	7,5
	25.05	58,2	22,4	19,3	6,4

Note: C* – control

Strong direct dependence between the amount of leaves and the area of the assimilated surface is determined by analysis (r=0, 88). The varieties Zolotynka and Chaklun were forming the largest area of the assimilated surface under the sowing term 25.04 – 14,1 and 13,5 thousands m^2/ha, and in the control – 12,7 thousands m^2/ha, which is by 1,4 and 0,8 thousands m^2/ha less. It is proved that there is strong direct dependence between the thickness of stem and the area of the assimilated surface (r=0,88), strong direct connection between the amount of leaves and the yield capacity is also determined (r=0,88) as well as strong direct connection between the area of leaves and yield capacity (r=0,73).

The investigations showed that sowing terms influence the level of yields of summer squash fruits (table 4). The investigated varieties formed the largest yield capacity in the variant with the sowing term 25.04. In average for 2011-2012 this

indicator is 60.0t/ha in the variety of Zolotynka, and 89.7 t/ha – in the variety of Chaklun. When sowing on 5.05 (control), yield capacity was somewhat lower: 52.0 t/ha of Zolotynka variety, 81,7 t/ha of Chaklun variety, which is lower by 7,0 t/ha in comparison with the first sowing term (25.04). The regularity in the yield capacity reduction until the late terms of sowing is observed in all variants of both investigated varieties.

4. Yield capacity and qualitative indicators of summer squash depending on the variety and the sowing term (average for 2011–2012)

Variety	Sowing term	Yield capacity, t/ha			+,- before control	Qualitative indicators of summer squash production		
		2011	2012	average		amount of fruit, pieces/ plant	the weight of fruit, g	Fruit diameter, cm
Zolotynka	25.04	65,2	54,6	60,0	8,0	15,0	337,1	4,9
	5.05 (C)*	56,7	47,2	52,0	-	12,7	345,2	4,9
	15.05	45,7	38,6	42,2	- 9,8	10,4	342,5	5,0
	25.05	38,5	31,7	35,1	- 16,9	6,6	387,5	5,2
Chaklun	25.04	96,0	83,3	89,7	37,7	21,4	346,1	5,0
	5.05	85,6	77,8	81,7	29,7	20,1	353,2	5,0
	15.05	61,7	50,8	56,3	4,3	13,4	352,2	5,1
	25.05	40,4	31,2	35,8	- 16,2	6,9	438,1	5,2
$HIP_{0,5}$	A	0,3	0,3	-				
	B	0,4	0,4					
	AB	0,5	0,5					

Note: C* – control

It should be mentioned that both the amount of fruits per one plant and the fruit weight depend on the sowing term, which affected the level of yield capacity of the investigated summer squash varieties. The largest amount of fruits of plants was formed in variants of the sowing term 25.04: of Zolotynka variety – 15 pieces, of Chaklun variety – 21.4 pieces per one plant, whereas in the variant of the last

sowing term (25.05) – 6,6 and 6,9 pieces accordingly. Strong direct dependence between the yield capacity and the amount of fruit is determined by analysis (r=0,99), as well as between the duration of harvesting and the amount of fruit (r=0,91).

Larger weight of fruit was noted under the sowing term 25.05 in the variety of Zolotynka – 387,5 g, in the variety of Chaklun – 438,1 g, and in the control – 345,2 g, which is by 42.3 and 92.9 g less. The largest fruit diameter was noted in the variety of Zolotynka and Chaklun under sowing term 25.05 – 5.2 cm in both variants, in the control – 4.9 cm, which is by 0.3 cm less.

Thus, in the result of studying sowing terms of summer squash we may conclude that the largest yield capacity is formed under the sowing term 25.04: 60,0 t/ha of marketable fruits in the variety of Zolotynka, 89,7 t/ha – in the variety of Chaklun.

Literature

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Резюме

В условиях Правобережной Лесостепи Украины проведены исследования по изучению влияния срока посева на урожайность плодов кабачка. Установлено, что оптимальные условия для роста, развития,

формирования продуктивных органов складываются при посеве 25.04. На растениях этого срока формировалось наибольшее количество листьев, плодов, что способствовало формированию наибольшей урожайности товарных плодов: сорта Золотинка 60,0, сорта Чаклун 89,7 т/га. При более поздних сроках посева (5.05, 15.05, 25.05) урожайность плодов кабачка существенно снижается. Установлено, что наибольшую урожайность кабачка получено в вариантах с использованием строка посева 25.04 – 89,7, 5,05 – 81,7 т/га – сорт Чаклун, что больше от контрольного варианта на 29,7 т/га и 21,7 т/га соответственно.

Summary

In conditions of the Right bank forest-steppe zone of Ukraine the studies on the effect of sowing term on the yield capacity of summer squash fruit is carried out. It is determined that the optimal conditions for the growth, development, the formation of productive organs are formed under the sowing term 25.04. On the plants of this period the largest number of leaves, fruits was formed, fostering the highest yield capacity of marketable fruits: the variety of Zolotynka - 60.0, the variety Chaklun - 89,7 t / ha. In the later planting dates (5.05, 15.05, 25.05), fruit yield capacity of summer squash is significantly reduced. It is found that the highest yield capacity of summer squash is obtained in variants with the sowing term 25.04 - 89.7 5.05 - 81.7 t / ha of Chaklun variety which is more in comparison with the control variant by 29.7 t / ha and 21.7 t / ha accordingly.