

The reliance of the yield of soybeans on sowing methods and seeding norms

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Abstract— The article is devoted to study the influence of sowing methods and plant density at sowing varieties “Nafis” in stubble crops of winter wheat. The article discusses the results of studies conducted in a three-year field experiment, and provides economically justified acceptance of the application of methods of sowing and plant density of soybean in the Tashkent Province.

Index Terms— method of sowing, plant density, root weight, number of nodules, weight of nodules, the chemical composition of the grain and soybean yields.

I. INTRODUCTION

Optimum density of standing of plants of a soya on irrigated lands in the South of Moldova in accordance with the norms of irrigation and fertilizer application ranges from 500 to 600 thousand plants per hectare [1]. In the experiments of Semilyakova, it is found that thickness of the crops affect the completeness of germination and survival of plants to harvest: the higher the seeding norms, the lower the germination of plants. By increasing the seeding norms from 500 to 800 thousand viable seeds, germination decreased from 79.9 to 77.4% respectively, while the survival rate from 58.6% to 45%.

Thickened crops led to increase in plant height from 68.2 to 73.6 cm height lower attachment beans. Therefore, changing the seeding rate can be adjusted adaptability of soybean to mechanized harvesting. With the increase in seeding rate, the number of lateral branches per plant decreased from 2.48 to 1.90 units. Also, analysis of the main elements of the yield structure showed that while there was an increase in seeding rates (norms) the number of beans per plant reduced, and weight of 1000 seeds and weight of seeds per plant as well. For the formation of high productivity of soybean is important to maintain optimal water-air regime in the root layer of the soil and the purity of the seeding during the vegetation period [2].

"Bright" depending on the weather conditions provides a seed yield of 1.3-2.3 tons per ha (on heavy black soils of forest-steppe zone of the Chechen Republic) where grows under rain fed conditions of ultra-early-maturing cultivar of soya of Northern ecotype, and medium early maturing variety of the southern ecotype "Vilana" – 1.6-2.7 tons respectively. At high moisture, soybeans are the advantage of ordinary method of sowing with spacing of 20 cm between rows. With this method of sowing, the seed yield of both varieties

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increased by 12-15% compared to in wide rows method. When growing soybeans under conditions of moisture deficit is more reliable - in wide method of sowing with row-spacing width of 45 cm [3]. With fewer plants, the yield drops sharply. It is found that the more plants remain to harvest, the higher harvest sorts of early ripening varieties exist. [4].

In terms of findings of other scientists, the study which was conducted in 2002 in the County of wood (Ohio) introduced to use of fertilizers in P50 K100. Inter-row spacing with 19 cm of soybean variety “Pioneer- 93 B01”. When seeding 740, 618, 494 and 370 thousand seeds /ha at the time of harvesting it was maintained 672 306, 569 640, 419 323 and 308 554 plants/ha, grain yield was 31.7; 30.8; and 25.5 to 29.4 cwt¹/ha. It is concluded that in case of late sowing (for example mid-June) it is advisable to use higher seeding rates as providing the formation of a higher yield. Seeding rate should not be below 500 thousand seeds per ha [5].

Our studies were conducted at the experimental station of Tashkent State Agrarian University in the period of 2013 – 2015. Experimental station is located near Tashkent in the upper reaches of the river Chirchik, Kibray district of Tashkent Province, at a height of 481 meters above sea level. The soil of experimental plot is a typical gray soils of ancient irrigation, non-saline with low content (in soil horizons 0-30 and 30-50 cm) of humus 0,925 – 0,715%, nitrogen 0,082-0,066%, phosphorus 0,153 - 0,139%, potassium 2,30-of 1.80 %. i.e. the security of soil nutrients is low. The soil has poor structure, good water permeability and high capillarity. The reaction of the soil solution is slightly alkaline.

Objects of research

The research focuses on soybean variety "Nafis", and the influence of sowing methods and density to the yield of the soybean.

II. METHODS

As methods, field and laboratory testing methods which were developed by the Uzbek research Institute of cotton growing have been employed. Also, phonological observations were carried out based on "the Methodology of State variety testing of crops"(by M. Kolos,1985) and statistical data processing was done according to B. A. Dosphehov "Methods of field experience".

The technology of soybean cultivation at the experiment

The soybean was sown in the second half of July after the harvest of winter wheat. Sowing was carried out in ordinary

¹ cwt- hundredweight (a unit of weight equal to 100 kilograms)

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and wide (70x3-1cm) methods, seeding depth with 5 cm, seeding rate was 550 - 750 thousand pieces per/ha. In furrow irrigation, the spacing between the furrows was 70 cm, for irrigation 800 m³/ ha was used for once irrigation. Before sowing, it is introduced that nitrogen 100 kg/ ha, phosphorus, 100 kg/ ha, and potassium 150kg/ ha.

III. RESULTS

On average for 3 years, at a plant density, average planting was 550 thousand/ ha. The weight of roots was amounted to 26.7 cwt/ha. The sowing density was on average planting to 650 thousand/ ha which led to an increase in the mass of roots up to 11.5 t /ha. Further increase in plant density in an ordinary sowing was 750 thousand/ ha, with a decrease in the mass of roots up to 1.3 cwt /ha. In our research, in wide crops at plant density was 350 thousand/ ha, the root weight was 21.6 kg /ha. At a density of 450 per hectare in wide planting, the root weight increased by 8.6 kg /ha.

Table 1- The root mass of the soybean varieties "Nafis" depending on the rules of sowing and norms and ways. (cwt / ha)

No	Options	Years			Average	
		2013	2014	2015		
Drill seeding method						
1	550 thousand/ha	24,0	33,0	23,2	26,7	
2	650 thousand/ha	33,6	43,3	37,8	38,2	
3	750 thousand/ha	32,0	42,1	36,6	36,9	
Wide-row planting method						
4	350 thousand/ha	17,1	30,9	16,9	21,6	
5	450 thousand/ha	23,7	38,6	27,9	30,2	
6	550 thousand/ha	22,4	36,8	27,3	28,8	
	HCP ₀₅	Piece	1,14	1,49	0,80	1,14
		%	4,53	4,07	2,87	3,82

For the development of nodules, certain conditions are required. Thus, the number of nodules on average for 3 years at a density of 550 per hectare, average 109 pieces of crop were sowed. In wide-row planting with plant density of 350 thousand/ ha, the number of nodules was 119.7 pieces. When stand density of 550 per hectare at sowing in wide, number of nodules decreased by 7 pieces. Weight of nodules ranged from 1.52 to 1.99 grams. The highest figure was at the plant density of 350 thousand/ ha. The number of beans in an ordinary sowing with the density of 550 per hectare was 39.2 pieces. When the density 650 -750 thousand/ ha, the average sowing number of beans decreased by 16.8 - 24.0% . When the density was 450 - 550 thousand/ ha at sowing in wide, the number of beans dropped by 14.2 19.6 per cent. Weight of bean ranged from 29.5 to 39.3 grams. Weight of bean ranged from to 23.7 to 39.3 grams. In our studies in wide-row planting, a number of beans with the plant density of 350 thousand/ ha was 39.3 pieces. The number of grains per plant when plant density was 550 thousand/ ha, an average sowing was 114.9. With a density of 650 - 750 per hectare, it decreased by 7.9% to 17.5% of the grains in comparison with the density of 550 thousand/ ha. In wide-row planting a number of grains with the density of 350 thousand/ ha was 123,8 pieces, with the density 450 - 550 per hectare

decreased by 12.1 and 20.4 % of the grain in comparison with plant density of 350 thousand/ ha.

Table 2- Biometrics findings of crop soybean variety "Nafis", depending on the rules and norms of sowing methods. (Average over 2013-2015.)

No	Options	Branch	Beans		Grain		Weight 1000 grain gram
			piece	gram	piece	gram	
Drill seeding method							
1	550 thousand/ha	1,1	39,2	35,5	114,9	23,4	151,0
2	650 thousand/ha	0,9	32,6	31,3	105,8	21,3	145,7
3	750 thousand/ha	0,7	29,8	23,7	94,8	18,7	141,4
Wide row planting method							
4	350 thousand/ha		50,0	39,3	123,8	27,4	155,1
5	450 thousand/ha		43,1	32,2	108,8	21,8	153,0
6	550 thousand/ha		38,0	29,5	98,5	19,2	145,8
	HCP ₀₅	gram	0,98	0,94	2,57	0,75	3,80
		%	2,70	3,53	2,75	4,16	2,54

The highest weight of grains per plant was observed in the 1st version, where the stand density in an ordinary sowing amounted to 550 thousand/ ha, and in wide planting 350 thousand/ ha. The mass of grain in an ordinary sowing ranged from 18.7 to 23.4 grams, wide-row planting – from 19.2 to 27.4 grams. The mass of 1000 grains in the plant density of 550 per hectare in the member planting 151.0 grams, if the density 650 - 750 per hectare decreased from 5.3 to 9.6 grams of grain, compared with the density of 550 thousand/ ha. The mass of 1000 grains in the plant density at sowing in wide 350 per hectare amounted to 155.1 grams, if the density 450 – 550 per hectare decreased from 2.1 to 9.3 grams of grain, compared with a plant density of 350 thousand/ ha.

The chemical composition of the grains generally inherent in biology class. But farming practices, growing conditions, plants affect the quality of the beans. When the density is 650 per hectare in the grain of soybean was 37.5% of the protein and 24.1 % body fat. And when you stand in an ordinary planting 750 thousand/ ha protein has increased to 39.6% and fat to 25.4%. When plant density 350 thousand/ ha in wide sown in grain of soybean was 37.5% of the protein and 23.7 % fat, while plant density of 450 per hectare in wide-row planting a protein increased to 38.9 % and the fat was 24.4 %.

Table 3- The influence of the sowing norms and standards, and methods on the yield of soybean variety

No	Options	Years			Average	
		2013	2014	2015		
Drill seeding method						
1	550 thousand/ha	25,4	24,4	26,4	25,4	
2	650 thousand/ha	23,8	22,4	24,1	23,4	
3	750 thousand/ha	20,9	21,5	23,2	21,9	
Wide-row planting method						
4	350 thousand/ha	22,6	21,5	20,8	21,6	
5	450 thousand/ha	20,9	19,3	18,2	19,5	
6	550 thousand/ha	18,9	18,2	16,6	17,9	
	HCP ₀₅	cwt/ha	0,52	0,80	0,80	0,71
		%	2,57	3,89	3,80	3,42

The sowing methods and stand density influenced yield. In an average 3-year grain yield at plant density of 550 per hectare amounted to 25.4 kg/ha, while plant density in the planting member from 650 - 750 per hectare was observed the reduction of the yield from 1.9 to 3.5 t/ ha When plant density 350 thousand/ ha in wide sowing soybean yield was 21.6 t/ ha when plant density 450 - 550 thousand/ ha in wide planting crops decreased from 2.1 to 3.7 t/ ha.

IV. CONCLUSIONS

1. Methods of sowing influenced the development of the root mass. The greatest mass of roots at 38.2 cwt/ ha obtained in ordinary crops with a density of 650 thousand/ ha.
2. The greatest development of nodules was observed at the density of 350 thousand/ ha at sowing in wide-row method.
3. The highest content of protein and fat in grains of soybean was observed at a density of 750 per hectare in the member and sowing density of 450 thousand hectares in wide-row planting.
4. The highest yield of 25.4 cwt/ ha of grain was received at the plant density of 550 thousand/ ha.

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