

Effect of sowing period, planting scheme and fertilizers to the structure elements of the soybean in the condition of west region of Azerbaijan

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Abstract:

In the given article, in west region of the Azerbaijan Republic, effect of sowing period, planting scheme and norms of fertilizers to the structure elements of the soybean in irrigated grey-brown soil are demonstrated. It is defined that if the soybean sowing is carried out in the period of 10-15 April, in comparison of early and late sowings, for the each 3 investigated sowing scheme and in 10t/ha+N₆₀P₉₀K₆₀ manure norms, the quantity of beans and grains in a plant, mass of grains from a plant and the mass of 1000 grains are much more in comparison of variation without manure.

Key words: sowing period, planting scheme, soybean, grey-brown, fertilizers, bean, grain, mass

Soybean is a valuable plant for overall usage. For the more quantity of protein and oil in it, it is accordingly belonged to the legume and oleaginous plants groups. There is 33-45% of protein, 25-27% of oil, 25-27 % of aqueous carbon in grain. Soybean growing households produce 2 products: full valuable proteins and vegetable oil. The protein in the grain of soybean

is more in 3.6 times in comparison of barley, and 4 times in the comparison of corn.

Soybean can be grown for the food, forage and technical purposes. Oil, margarine, soybean cheese, milk, flour, confectionery, canning and other products are produced from soybean seed. The oil extracted from soybean is raw material for soap-boiling industry. At the same time, it is used in lacquer and dye industry. For the producing of the vegetable oil, soybean is the first in the world. 40% belongs to the share of soybean, but 18-20% is to the share of sunflower.

The country of the soybean is considered Southeast Asia. It was known to the Chinese 6 thousand years B.C, and later it was grown in India, Japan, Korea, Vietnam and Indonesia. It was relatively begun growing later, in the XVIII century, in Europe.

For the sowing field, the soybean is in the first place among the cereal-“fabaceae” plants in the world. Soybean is grown approximately in 50 countries. The sowing field of soybean is approximately 30,0mln hectare in USA, 15,0mln hectare in China, 3,0mln hectare in Brazil. It is planted in India, Japan, Vietnam, Indonesia, Northern Africa, Australia, Ukraine, Russia, Moldova, Northern Caucasus, Georgia and Azerbaijan. The average productivity over the world is 14-15 centners. Soybean is a valuable green fertilizer and excellent predecessor plant.

The growing field of soybean is over half a million in Russia. In the leading household, in the irrigation condition, the grain productivity is 25-30 centners; the green mass productivity reaches in 250-300 centners (1, 2).

Soybean is considered high protein oleaginous plant which has been growing from ancient times. It is widely used in medicine, as food, technical, forage plant. For being rich with useful components and the overall usage, there is no any other plant equal to it in the world. That is why this plant is grown in

the all continents of the world. Its producing is increased for each year. According to production, soybean is in the fourth place after grain, rice, corn. At the same time, for gathering atmosphere nitrogen, soybean increases the soil fertility by means of its roots. Soybean is an important profitable plant from the economic, ecological and agronomical sides (3).

In Zavolje region of Russia, in the optimization of the soybean sowing factors, the highest productivity index is 400-600 m³/ha in a hectare in the irrigation condition, the quantity of the grain in a plant is 47,2 pieces, the weight of grain in a plant is 7,44gr, the mass of 1000 grains is 150gr, grain product is 3,46t/ha(8).

During the investigation of the effect of the height regulatory to the soybean plant, it is defined that the height of the plant increases 4-9cm, the quantity of beans is 5-12pieces , the quantity of the grain is 12-26pieces (in a plant).The protein yield in a hectare increases 116-170kg, the oil yield is 58-102 kg/ha(5).

In the central black ground (chernozem) zone of Russia, during the investigation period of sowing method, sowing norms, the effect of the fertilizers and spraying seeds to the productivity and quality of the hasty ("Kuryanochka") soybean sorts, it is defined that a high quantity of the beans in a plant (26,1 pieces) is 15cm between rows and in a hectare, in the 900 thousand density of plant, from the effect of the fertilizers, the beans increases 3,2 pieces in a plant. The mass of 1000 grains is 30 cm in the P₉₀K₆₀ norm of the fertilizersbetween rows, and the sowing norm is higher from 800 thousand pieces/ha, it is 173,1gr.

In the central zones of Russia out of black ground (chernozem) zone, the effect of fertilizers to the structure elements of the soybean and the grain product is studied. It is determined that in the wide row sowings, if the 600 thousand germinating seeds are sown, in the condition without manure

the quantity of the beans in a plant is 12,8 pieces, the grains in a plant is 22,4 pieces, the grains in a bean is 1,75 pieces, the grains in a plant is 2,99 gram, the mass of 1000 grains is 133,5 gram, the highest indexes are 18,5; 35,8; 1,93; 4,45; 134,3 gram before the N₆₀K₆₀ and the sowing with 50 gram molybdenum, in the variation of using seed (7).

In the researches with soybean in Uzbekistan, when the fertilizers are given in the norm of N₅₀P₁₀₀K₇₅, 10 kg nitrogen is given in the shape of feeding out of the root in the flowering period, so that 26,2 c/ha product is taken in 2 years and the increment is 9,2 c/ha. The quantity of beans in a plant is 31,7-41,0 pieces, the weight of bean is 15,2-21,6 gram, the quantity of the grain in a bean is 71,3- 94,1 pieces, its weight is 11,7-15,9 gram, and the mass of 1000 grains is 154,5-159,2 gram, the height of body is 69,2-84,3 cm (8).

Taking into consideration of the importance of the soybean in our republic, the main purpose of the investigation work is the increasing fertility of the irritated grey-brown (having chestnut color) soil in the “Ganja-Gazakh” region, defining the optimal sowing period ensured the high and qualitative product gathering, planting scheme and fertilizer norms. The field experiments are led in the irrigated grey-brown (having chestnut color) soil in the central practice base of the former Azerbaijan Scientific-Research Cotton-Growing Institution in 2013-2015. The field experiments are carried out with “Umanskaya1” soybean sort in 3 repetitions; the sowing is arranged in 1-5 April, 10-15 April, and 20-25 April. The total field of each variation is 54,0m²(30x1,80 m), the sowing is arranged with a row method in 3 sowing schemes in 45x5cm, 45x10 cm, and 45x15 cm, according to the hectare, 70,35 and 25 gram germinating seeds is picked up. The 100 % of manure, 70% of phosphor and potassium is given under the plowing in autumn, the rest 30% of phosphor and potassium is given in the feeding, in the period of branching between the rows, but

nitrogen is given only once in the yield period. The phenological observations are arranged over 25 plants, the agro technical events are arranged according to the adopted rules for the region.

In the mixed soil samples taken for the studying of the agrochemical features of the practice field soil from the layers of 0-30; 30-60 and 60-100 cm, the nourishment elements and the quantity of the assumed forms are defined.

In the taken soil samples: in the pH potentiometer, the total humus is defined according to I.V.Tyurine, absorbed ammoniac to D.P Konev, nitrate nitrogen to Qrandval-Lyaju, total nitrogen, total phosphor to K.E.Ginzburg and Q.M.Sheglov, engine phosphor with B.P.Machig's method, total potassium to Smith, exchangeable potassium with P.B.Protasov's method in fiery photometre.

Analysis of the soil samples shows that the grey-brown (hazel) soil is not highly provided with the assumed norms of nitrogen, phosphor and potassium. The pH is 7,8 in the layer of 0-30cm in the water solution, towards the lower layers, it is 8,4 in the layer of the 60-100 cm. Total humus, nitrogen, phosphor, potassium in the layer of 0-30cm are accordingly 2,15; 0,15; 0,13; 2,39%. But towards the lower layers, it rather reduces, in the layer of 60-100 cm, it is accordingly 0,85; 0,06; 0,07; 1,51 %. Absorbed ammoniac nitrogen is hesitated between 18,0-6,5; nitrate nitrogen is 9,7-2,6,engine phosphor is 15,8-4,5; exchangeable potassium is 263,5- 105,3 mg/kg.

The analyses, arranged in the grey-brown (having chestnut color) soil of the west region of Azerbaijan show that, according to the adopted gradation, this soil is weakly provided with the food items. That is why, for the growing, development of the soybean, its high yield, and the protection of the fertility of the soil, usage of manure and fertilizers are rather important and necessary. Effect of sowing period, planting scheme and fertilizers to the structure elements of the soybean have been

studied in 2013-2014. The experiments show that sowing period, planting scheme and the fertilizer norms in the base of manure effect the quantity of the beans and grains in a plant, the weight of the grain in a plant, the weight of the 1000 grains. The results of the research are given in the table 1-2.

Table 1: Effect of sowing period, planting scheme and fertilizers to the structure elements of the soybean(2013)

The quantity of the grains in a plant, piece			The weight of grain in a plant, gr				The weight of 1000 grains, gr			
45x5	45x10	45x15	45x5	45x10	45x15	45x5	45x10	45x5	45x10	45x15
25,6	55,1	76,3	4,1	8,8	12,2	118,5	123,2	124,3		
28,8	60,5	80,2	4,6	9,7	12,8	120,8	125,2	128,6		
32,7	69,4	91,6	5,2	11,1	14,7	123,5	130,2	132,4		
39,4	84,4	109,8	6,3	13,5	17,6	126,5	135,6	140,5		
36,3	76,3	101,4	5,8	12,2	16,2	124,5	133,8	138,2		
28,4	60,0	79,0	4,5	9,6	12,6	123,2	128,6	132,1		
30,6	65,4	85,9	4,9	10,6	13,8	125,1	131,3	136,5		
35,5	77,6	97,0	5,7	12,2	15,5	128,6	136,2	140,3		
42,7	97,5	113,0	6,8	15,8	19,2	135,2	145,0	148,2		
38,6	86,3	99,4	6,1	13,8	17,0	133,2	142,5	145,2		
24,2	48,8	64,8	4,0	7,8	11,0	117,2	122,3	125,2		
26,6	54,8	71,5	4,3	8,8	12,2	120,5	126,6	130,3		
29,8	60,5	80,7	4,8	9,7	13,7	123,5	131,5	135,3		
35,1	75,8	99,4	5,6	12,2	17,0	126,2	141,2	140,1		
32,2	70,2	87,4	5,2	11,2	15,0	124,2	136,2	138,2		

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Sowing period	Fertilizer norms	The quantity of the beans from a plant, piece		
		45x5	45x10	45x15
1-5 April	Without fertilizer	12,2	25,2	34,5
	Manure 10t/ha	13,7	28,8	37,2
	Base+N ₆₀ P ₆₀ K ₃₀	15,0	33,1	43,6
	Base+ N ₆₀ P ₆₀ K ₆₀	18,2	40,2	50,0
	Base+ N ₆₀ P ₁₂₀ K ₆₀	16,5	36,3	46,1
10-15 April	Without fertilizer	13,5	27,3	36,0
	Manure 10t/ha	14,6	30,0	39,2
	Base+N ₆₀ P ₆₀ K ₃₀	17,0	35,5	44,0
	Base+ N ₆₀ P ₆₀ K ₆₀	20,3	44,7	51,3
	Base+ N ₆₀ P ₁₂₀ K ₆₀	18,5	39,4	45,2
20-25 April	Without fertilizer	11,5	22,2	29,5
	Manure 10t/ha	12,6	25,1	32,5
	Base+N ₆₀ P ₆₀ K ₃₀	14,2	27,5	36,7
	Base+ N ₆₀ P ₆₀ K ₆₀	16,8	34,5	45,2
	Base+ N ₆₀ P ₁₂₀ K ₆₀	15,4	32,0	39,8

Table 2 Effect of sowing period, planting scheme and fertilizers to the structure elements of the soybean (2014)

The weight of grain in a	The weight of 1000 grains, gr		
	45x5	45x10	45x15
12,7	120,1	125,5	128,2
13,8	122,5	128,2	131,2
15,6	125,3	132,5	136,2
18,7	128,8	138,2	143,7
17,2	126,2	135,2	141,2
13,1	125,5	130,6	135,2
14,4	128,6	134,2	138,6
16,2	132,5	139,5	142,7
20,3	140,8	148,2	150,3
18,5	138,2	145,2	148,2
11,7	120,3	126,2	130,3
13,0	122,2	130,5	133,5
14,2	125,6	135,2	138,2
17,1	128,3	145,2	148,1
15,5	127,2	140,3	143,5

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Sowing period	Fertilizer norms	The quantity of the beans from a plant, piece				The quantity of the grains in a plant, piece			
		45x5	45x10	45x15	45x5	45x10	45x15	45x5	45x10
1-5 April	Without fertilizer	13,7	27,5	36,0	28,8	57,1	79,0	4,6	9,0
		14,6	31,3	39,1	30,6	65,2	85,7	4,9	10,4
		16,7	34,2	44,2	35,1	71,5	97,2	5,6	11,5
		19,3	42,0	53,2	40,6	87,3	117,0	6,6	14,1
		18,2	37,8	48,8	38,1	78,6	106,7	6,1	12,5
		15,0	28,7	35,0	31,4	63,1	77,1	4,7	10,1
10-15 April	Without fertilizer	16,6	31,0	38,5	34,7	68,2	84,7	5,2	11,0
		18,3	37,5	43,4	38,4	82,4	95,4	5,9	13,2
		23,5	45,6	54,3	49,0	100,3	119,3	7,4	16,1
		21,3	42,2	49,3	44,7	93,0	108,5	6,7	14,8
		13,7	23,6	31,3	28,7	52,0	68,8	4,3	8,3
		14,2	26,2	35,0	29,4	57,7	76,7	4,5	9,3
20-25 April	Without fertilizer	16,1	29,0	38,0	33,8	63,8	83,5	5,1	10,2
		18,5	35,0	45,7	39,0	76,7	100,6	5,8	12,3
		17,0	32,7	41,6	35,3	72,0	91,4	5,3	11,5
		16,1	29,0	38,0	33,8	63,8	83,5	5,1	10,2
		18,5	35,0	45,7	39,0	76,7	100,6	5,8	12,3
		17,0	32,7	41,6	35,3	72,0	91,4	5,3	11,5

As it is seen in the tables, in the variation without fertilizer, when the sowing is arranged in the period of 1-5 April, the quantity of the beans in a plant is 12,2-13,7 pieces, the quantity of the grains in a plant is 25,6-28,8 pieces, the weight of grain in a plant is 4,1-4,6 gram, and the weight of 1000 grains is 118,5-120,1 gram in the planting scheme of 45x5 cm, in the 45x10 cm, the quantity of the beans in a plant is 25,2-27,5 pieces, the quantity of the grains in a plant is 55,1-57,1 pieces, the weight of grain in a plant is 8,8-9,0 gram and the weight of 1000 grains is 123,2-125,5 gram, in the 45x15 cm, the quantity of the beans in a plant is 34,5-36,0 pieces, the quantity of the grains in a plant is 76,3-79,0 pieces, the weight of grain in a plant is 12,2-12,7 gram and the weight of 1000 grains is 124,3-128,2 gram. But in the manure variation of 10t/ha(base), it significantly increases in comparison of the variation without fertilizer, in the planting scheme of 45x5 cm, the quantity of the beans in a plant is 13,7-14,6 pieces, the quantity of the grains in a plant is 28,8-30,6 pieces, the weight of grain in a plant is 4,6-4,9 gram and the weight of 1000 grains is 120,8-122,5 gram, in the 45x10 cm, the quantity of the beans in a plant is 28,8-31,3 pieces, the quantity of the grains in a plant is 60,5-65,2 pieces, the weight of grain in a plant is 9,7-10,4 gram and the weight of 1000 grains is 125,2-128,2 gram, in the 45x15 cm, the quantity of the beans in a plant is 37,2-39,1 pieces, the quantity of the grains in a plant is 80,2-85,7 pieces, the weight of grain in a plant is 12,8-13,8 gram and the weight of 1000 grains is 128,6-131,2 gram.

In the result of the application of the various norms of the fertilizers together with manure, the quantity of the beans in a plant, the quantity of the grains in a plant, the weight of grain in a plant and the weight of 1000 grains significantly increase in the variation without manure and 10t/ha manure variation. So, in the variation of base +N₃₀P₆₀K₃₀, in the 45x5 cm, the quantity of the beans in a plant is 15,0-16,7 pieces, the

quantity of the grains in a plant is 32,7-35,1 pieces, the weight of grain in a plant is 5,2-5,6 gram and the weight of 1000 grains is 123,5- 125,5 gram, in the 45x10 cm, the quantity of the beans in a plant is 33,1-34,2 pieces, the quantity of the grains in a plant is 69,4- 71,5 pieces, the weight of grain in a plant is 11,1-11,5 gram and the weight of 1000 grains is 130,2-132,5 gram, in the 45x15 cm, the quantity of the beans in a plant is 43,6-44,2 pieces, the quantity of the grains in a plant is 91,6-97,2 pieces, the weight of grain in a plant is 14,7- 15,6 gram and the weight of 1000 grains is 132,4-136,2 gram. The highest results in the base+ N₆₀P₉₀K₆₀ variation are as follows: in the 45x5 cm, the quantity of the beans from a plant is 18,2-19,3 pieces, the quantity of the grains in a plant is 39,4-40,6 pieces, the weight of grain in a plant is 6,3-6,6 gram and the weight of 1000 grains is 126,5-128,8 gram, in the 45x10 cm, the quantity of the beans from a plant is 40,2-42,0 pieces, the quantity of the grains in a plant is 84,4-87,3 pieces, the weight of grain in a plant is 13,5-14,1 gram and the weight of 1000 grains is 135,6-138,2 gram, in the 45x15 cm, the quantity of the beans in a plant is 50,0-53,2 pieces, the quantity of the grains in a plant is 109,8-117,0 pieces, the weight of grain in a plant is 17,6-18,7 gram and the weight of 1000 grains is 140,5-143,7 gram.

As it is seen in the tables, in the variation without fertilizer, when the sowing is arranged in the period of 10-15 April, the quantity of the beans in a plant is 13,5-15,0 pieces, the quantity of the grains in a plant is 28,4-31,4 pieces, the weight of grain in a plant is 4,5-4,7 gram, and the weight of 1000 grains is 123,2-125,5 gram in the planting scheme of 45x5 cm, in the 45x10 cm, the quantity of the beans in a plant is 27,3-28,7 pieces, the quantity of the grains in a plant is 60,0-63,1 pieces, the weight of grain in a plant is 9,6-10,1 gram and the weight of 1000 grains is 128,6-130,6 gram, in the 45x15 cm, the quantity of the beans in a plant is 35,60-36,0 pieces, the

quantity of the grains in a plant is 77,1-79,0 pieces, the weight of grain in a plant is 12,6-13,1 gram and the weight of 1000 grains is 132,1-135,2 gram. But in the manure 10t/ha (base) variation, the results are rather increased in comparison of the variation without the manure, in the planting scheme of 45x5 cm, the quantity of the beans in a plant is 14,6-16,6 pieces, the quantity of the grains in a plant is 30,6-34,7 pieces, the weight of grain in a plant is 5,2-5,7 gram, and the weight of 1000 grains is 125,1-128,6 gram, according to the 45x10 cm, it is 30,0-31,0; 65,4-68,2 pieces and 10,6-11,0 the weight of 1000 grains is 131,3-134,2 gram, in the 45x15 cm, it is accordingly 38,5-39,2; 84,7-85,9 pieces, 13,8-14,4 and 136,5-138,6 gram.

In the result of the application of the various norms of the fertilizers together with manure, the quantity of the beans in a plant, the quantity of the grains in a plant, the weight of grain in a plant and the weight of 1000 grains significantly increase in the variation of without manure and 10t/ha manure variation. So, in the variation of base +N₃₀P₆₀K₃₀, in the 45x5 cm, the quantity of the beans in a plant is 17,0-18,3 pieces, the quantity of the grains in a plant is 35,5-38,4 pieces, the weight of grain in a plant is 5,7-5,9 gram and the weight of 1000 grains is 128,6-132,5 gram, according to the 45x10 cm, it is 35,5-37,5; 77,6-82,4 pieces, 12,2-13,2 and 136,2-139,5 gram, in the 45x15 cm, it is accordingly 43,4-44,0; 95,4-97,0 pieces, 15,5-16,2 and 140,3-142,7 gram. The highest results in the base+ N₆₀P₉₀K₆₀ variation areas follows; in the 45x5 cm, the quantity of the beans in a plant is 20,3-23,5 pieces, the quantity of the grains in a plant is 42,7-49,0 pieces, the weight of grain in a plant is 6,8-7,4 gram and the weight of 1000 grains is 135,2-140,8 gram, according to the 45x10 cm, it is 44,7-45,6; 97,5-100,3 pieces, 15,8-16,1 and 145,0-148,2 gram. Together with base, when the norms of the fertilizers (N₉₀P₁₂₀K₉₀) increase, the results of the structure elements of the soybean reduce in the

base+ N₆₀P₉₀K₆₀ variation in each of the three schemes, as being in the first sowing period.

As it is seen from the table, if the soybean sowing is arranged in the 20-25 April period, the results of the structure elements reduce in comparison of the first and second sowings, and the highest result is observed in the sowing of 10-15 April.

Thus, when arranging the soybean sowing in the 10-15 April period, in the each of the three schemes, according to the early and late sowings (1-5 and 20-25 April), the quantity of the beans from a plant, the quantity of the grains in a plant, the weight of grain in a plant and the weight of 1000 grains are much more. In the manure 10t/ha + N₆₀P₉₀K₆₀ norms of the fertilizers, the results increase, the incrementis that, in the 45x5 cm, the quantity of the beans in a plant is 6,8-8,5 pieces, the quantity of the grains in a plant is 14,3-17,6 pieces, the weight of grain in a plant is 2,3-2,7 gram and the weight of 1000 grains is 12,0-15,3 gram, according to the 45x10 cm, it is 16,9-17,4; 14,3-17,6 and 2,3-2,7 ; 12,0-15,3 gram, in the 45x15, it is 15,3-19,3; 34,0-42,2 pieces and 6,6-7,2 ; 15,1-16,2 gram, at the result,it influences to the growth of the productivity.

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