NVEO
Natural Volatiles & Essential Oils

Productivity Of Chikpea Varieties And The Effect Of Different Planting Times And Depths On Grain Quality Indicators

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Abstract:
Our country population satisfaction with grain and protein-rich crops is an urgent problem facing the botany. Today one of the most important issues in our country is the legumes, cereals planting, expanding their area and increasing productivity. Large-scale legumes planting also leads to an increase in soil structure and fertility.
Chemical fertilizers are widely used in irrigated lands for high yields. Excessive use of fertilizers, which in turn leads to negative consequences such as soil ecology disturbance. This is because a certain chemical fertilizers proportion used are assimilated by the plants, the rest is absorbed into groundwater and another part glows in the air and a certain part damages the soil microflora, causes the beneficial insects (entomofauna) extinction that spread in this environment and leads to soils salinization.

Key words: Legumes, chickpeas, beans, grain, yield element, number of beans per plant, number of grains per bean, number of grains per plant, weight of 1000 grains, protein,depleted bacteria,soil fertility.

1. Introduction

Our country population satisfaction with grain and protein-rich crops is an urgent problem facing the botany. Today one of the most important issues in our country is the legumes, cereals planting, expanding their area and increasing productivity. Large-scale legumes planting also leads to an increase in soil structure and fertility.

Chemical fertilizers are widely used in irrigated lands for high yields. Excessive use of fertilizers, which in turn leads to negative consequences such as soil ecology disturbance. This is because a certain chemical fertilizers proportion used are assimilated by the plants, the rest is absorbed into groundwater and another part glows in the air and a certain part damages the soil microflora, causes the beneficial insects (entomofauna) extinction that spread in this environment and leads to soils salinization.

2. Materials and methods

In obtaining high agricultural crops yields, in improving the soil mechanical composition and the amount of mineral elements in it it would be advisable to make extensive use of local (livestock waste) fertilizers. However, it is not yet possible to provide all irrigated lands of the country with local fertilizers, because, firstly, the livestock hooves number has sharply decreased, second, transportation problems are also a major issue in the local fertilizers transportation to the field.

In carrying out measures to improve the agrochemical and agrophysical condition of irrigated soils, the legumes importance, which have nitrogen-fixing bacteria in their roots, is

immeasurable. In addition to the complete assimilation by nitrogen substances plants accumulated by the legumes roots, increases the soils structure, i.e. the granularity. In addition, many costs are reduced. One such legume is the Chikpea crop.

Among legumes, the Chikpea plant, which provides high protein amounts and quality oil, has a special feature. Today, in the world developed countries, Chikpeas from legumes play an important role in the livestock diet.

Peas are also superior to other legumes in nutritional value, such as Chikpeas, lentils, soybeans and the like.

Today, the area under peas is 14,573,000 hectares worldwide, compared to 2007, it has expanded by 3.3%[1]. The main pea-growing countries are India, Australia, Pakistan, Argentina, African countries and Mexico, India is the leader in pea production (10,984 thousand/t), accounting for 73 percent. The second place is taken by Australia (661 thousand/t) and the third by Pakistan (601 thousand/t). At present, the peas yield is 10 s/ha, which is 2.2% more than in 2007.

Today in various major research centers around the world much attention is paid to Chikpeas resistant varieties creation to extreme conditions, morphophysiological properties research of created varieties, increase their nutritional value, crop formation, improving the cultivation technology elements, to determine the crop qualities dependence on cultivation methods. In this regard, their soil with biological nitrogen enrichment can increase productivity, save organic and mineral fertilizers, in solving these problems, it is important to deepen research on the crop biological properties, the reaction varieties to the hydrothermal factors of the region and their photosynthetic activity.

Special attention is paid to agriculture development in our country, the widespread introduction of scientific approaches and advanced modern technologies in this area, ensuring food security, fruits and vegetables, melons, the grain and grain products increase, import and export issues. Inefficient cotton fields in this regard have been reduced, along with the expansion of vines and orchards the area under legumes is being expanded to produce high quality products. In the Action Strategy for the further development of the Republic of Uzbekistan for 2017-2021 «.... Consistent development of agricultural production, further strengthening the country's food security, introduction of intensive methods of agricultural production, first of all, modern agro-technologies that save water and other resources...» and other functions are defined [2]. Based on these tasks, in meeting the demand of the population for grain and grain products, it is important to select varieties of peas suitable for different environmental conditions, to coordinate the technology of their cultivation on the basis of varietal characteristics. Increasing the winter hardiness of the plant by choosing the right planting time and depth, especially in the fall, is one of the current challenges to achieve high and quality grain yields.

3. Research study degree

Scientific research work on cultivation of Chikpea in arable lands in the Republic conducted by P.Oleynik, P.Shukurullaev, K.Eshmirzaev, I.Irnazarov, A.Abdiev; Kh. Atabaeva, I. Khamdamov, L. Savkina, S.Mustanov, Z.Bobomurodov, Z.Yuldosheva, G.Mirsharipova, B.Mavlonov on cultivation on irrigated lands, and foreign scientists V.Balashov, G.Bodnar, G.Lavrinenko, N.Germantseva,

1http://www.fao.org.faostat;

2 Presidential decree of the Republic of Uzbekistan PD-4947 on February 7, 2017 "On the Actions Strategy for the further development of the Republic of Uzbekistan"

G.Lavronov, R.Malhotra, M. Saxena and relevant recommendations for its introduction into production.

4. Research methods

Field experiments were conducted in 2015-2017 in the conditions of ancient irrigated light gray soils of "Karim Bobo" farm of Pakhtachi district of Samarkand region. Soils analysis of field and production experiments was carried out in the central laboratory of the Samarkand veterinary medicine institute (former Samarkand agricultural institute).

According to the requirements of Grade, I seed standard for cultivated seeds, seeds with a moisture content of not less than 95%, with a variety purity of not higher than 14% were used.

In the experiment, the row spacing in the pea planting scheme was 60 cm and the row spacing was 6 cm. Pea seeds were sown in the soil in the fall on November 20, November 30 and December 10 at 3-5 cm, 6-9 cm and 10-12 cm depth. Before the experiment, the soil was plowed to 25–30 cm depth. Prior to the experiment, the plowed land was irrigated to maintain soil moisture with maturation and before planting, the ground was loosened and divided into plots.

In experiments, Chikpea cultivation was carried out on the basis of agrotechnologies adopted for the region.

Lazzat, Uzbekistanskiy-32, Yulduz varieties of peas were used in the experiment.

The agrochemical and agrophysical properties of experimental field soils were examined by the following methods:

- the humus amount in the soil was determined by I.V. Tyurin method; total NPK quantities were determined in the improved methods of I.M. Maltseva and L.P. Gritsenko; mobile forms of nutrients in the soil - nitrate-shaped nitrogen-Grandvald-Lyaju method was determined; mobile phosphorus was determined by the B.P.Machigin method; exchangeable potassium was detected in a flaming photocolorimeter by P.V. Protasov method; the experiment was determined using cylinders from a 0–30 cm layer of field soil; in N.A. Kachinsky method the mass volume and porosity of the soil were determined;

- in agrochemical and agrophysical analysis of soil samples "Methods of agrochemical analyzes of soils and plants in Central Asia" [4; 187-p.], "Methods of agrochemical, agrophysical, microbiological research in irrigated cotton areas" [3;440-p.], "Methods of conducting field experiments" [5; 146-p.] methodical manuals were used.

All observations in the field experiment were performed in odd returns. The following main developmental phases of the pea have been identified:

1. Sprouting;
2. Budding;
3. Flowering;
4. Legumes formation;
5. Cooking.

Each growth onset and development phase of the Chikpea was determined when 10% and the full period were observed in 70% plants. The bush thickness, germination, storage, and other parameters of the pea were determined in 1 m single odds.

For the analysis of the yield structure, 25 plants were obtained from each experimental variant. The protein content of the grain was determined in accordance with SS-13586-1-68, and the fat content was determined by the Soxhlet method.

Field experiments, research and other analyzes were carried out according to the generally accepted methods of UzCRI and UzSSRI, the State variety testing commission and B.A. Dospekhov [2; p. 351].

The obtained data on productivity were processed by B.A. Dospekhov's method of analysis of variance.

6. Research results

The pea crops yield depends on the biological characteristics of the variety, the climate in which it is grown, water, light, nutrient regime, predecessors, the agro-technological methods used[12;129-p].

Each external environmental factor or applied agrotechnological process has a significant impact on pea yield and grain quality. The highest and highest quality grain can be grown when the cultivation technology is adapted to the biological characteristics of Chikpea varieties [11;106-p.].

Yield is the sum of the plants yields in a given unit area. If the plants in the crop are sparse, the yield per hectare will be low due to the decrease in the number of bushes, although each individual plant productivity is high. As the bush thickness increases, the individual plant productivity decreases, but productivity increases to a certain extent. In this case, if the number of plants in a certain unit area is optimized, the yield will be the highest [10;109-p.].

During the experimentation years on sowing dates and planting depth options, the same agronomic techniques were used in the Chikpea varieties cultivation in all variants, and the data obtained to determine the yield (Table 1) were recorded.

From our research data, it was observed that the yield differs not only by varieties, but also by experimentation years. For example, in 2015, the Yulduz variety yielded 18.1-25.7 sentner per hectare in autumn sowing time and sowing depth, in 2016, this figure was 19.0-26.9 sentner, in 2017 - 19.3-28.2 sentner, and over the years the yield was 18.8-26.9 sentner.

When analyzing Uzbekistanskiy 32 varieties in the experiment productivity in the 2015 experiments on options was 16.2-24.6 s, in 2016 was 17.1-25.4 s, in 2017 was 18,1-26,2 s and over the years was 17,1-25,4.

When analyzing the yield indicators by flavor variety, the following results were obtained during the experiment years. In the 2015 experiments, the options average was 12.2-21.6 s, in 2016 was 13,0-21,6 s, in 2017 was 13,8-22,7 s. and average yields over the years was 13,0-22,0 s.

Table 1

The influence of different planting times and depths on the chikpea varieties yield, s/ha

Sowing dates	Planting depth	2015	2016	2017	On average years	Extra harvest	
						s/ha	%
Yulduz type							
November 20	3-5 (control)	21,9	22,3	22,9	22,4	-	-
	6-9	25,1	25,9	26,3	25,8	3,4	15,2
	10-12	21,0	21,6	22,1	21,6	-0,8	-3,6
November 30	3-5	21,9	22,7	23,8	22,8	0,4	1,8
	6-9	25,7	26,9	28,2	26,9	4,5	20,1
	10-12	21,2	22,0	23,1	22,1	0,3	1,3

December 10	3-5	18,9	19,6	19,9	19,5	-2,9	-12,9
	6-9	20,3	21,1	22,4	21,3	-1,1	-4,9
	10-12	18,1	19,0	19,3	18,8	-3,6	-16,1
For sowing period (A) Sd=		0,71	0,65	0,67			
$EKIF_{05}$=		1,51	1,37	1,43			
Planting depth (V) and Sd=		0,71	0,65	0,67			
for interaction $EKIF_{05}$=		1,51	1,37	1,43			
Sx%=		4,04	3,54	3,58			
Uzbekistanskiy-32 type							
November 20	3-5 (control)	19,0	19,9	19,6	19,5	-	-
	6-9	22,7	23,3	23,9	23,3	3,8	19,5
	10-12	18,4	19,0	18,9	18,8	-0,7	-3,6
November 30	3-5	21,0	21,7	22,7	21,8	2,3	11,8
	6-9	24,6	25,4	26,2	25,4	5,9	30,3
	10-12	20,3	20,8	21,9	21,0	1,5	7,7
December 10	3-5	17,0	17,7	18,9	17,9	-1,6	-8,2
	6-9	18,7	19,9	20,7	19,8	0,3	1,5
	10-12	16,2	17,1	18,1	17,1	-2,4	-12,3
For sowing period (A) Sd=		0,64	0,62	0,65			
$EKIF_{05}$=		1,35	1,30	1,37			
Planting depth (V) and Sd=		0,64	0,62	0,65			
for interaction $EKIF_{05}$=		1,35	1,30	1,37			
Sx%=		3,94	3,73	3,74			
Lazzat type							
November 20	3-5 (control)	16,0	16,3	16,8	16,4	-	-
	6-9	19,3	19,7	20,6	19,9	3,5	21,3
	10-12	15,1	15,5	16,0	15,5	-0,9	-5,5
November 30	3-5	17,8	17,9	18,8	18,2	1,8	11,0
	6-9	21,6	21,6	22,7	22,0	5,6	34,1
	10-12	17,0	17,3	18,1	17,5	1,1	6,7
December 10	3-5	13,0	13,5	14,6	13,7	-2,7	-16,5
	6-9	14,4	15,3	16,9	15,5	-0,9	-5,5
	10-12	12,2	13,0	13,8	13,0	-3,4	-20,7
For sowing period (A) Sd=		0,52	0,46	0,53			
$EKIF_{05}$=		1,10	0,98	1,13			
Planting depth (V) and Sd=		0,52	0,46	0,53			
for interaction $EKIF_{05}$=		1,10	0,98	1,13			
Sx%=		3,90	3,38	3,70			

When we analyzed the productivity indicators for the experiment years, it was found that the field experiments yield in 2017 was higher in all varieties than in the 2015 and 2016 experimental options, and this year the climate indicator can be related to temperature and humidity.

In the experiments conducted in 2015-2017, the Chikpea varieties yield sown in the fall was high in 2017 when analyzed by years and yield in all varieties in sowing variants of sowing time and sowing depth in comparison with 2015 is 0.5-2.5 ha/s, 0.3-1.6 ha/s higher than in 2016 climatic conditions in 2017, i.e. the amount of precipitation and temperature indicators, had a significant impact, that is, it can be explained by the fact that in February, March, Arpel, May, during the periods of yield elements and yield formation, the average air temperature was 18.3 0S and the amount of precipitation in these months was 204.2 mm.

The highest rate for the varieties studied in the experiment was observed in Yulduz variety in sowing times and planting depth options, 18.8-26.9 quintals per hectare, while the lowest rate was 13.0-22.0 quintals per hectare and the difference in yield between these two varieties of 5-6 quintals is related to the preservation of seedlings until the end of the growing season in all planting options, this indicator can be explained by the fact that Yulduz variety is 1-2% higher than the Uzbekisktanskiy-32 variety, and 2-3% higher than Lazzat variety.

7. Grain quality indicators

Chikpeas are a valuable food plant, the grain is rich in protein and fragrant, demanding to temperature. Currently, the cultivation technology on irrigated lands is also being introduced [7;132-133-p].

Among legumes, Chikpeas are the leading crop. It is widely used as food and fodder. Chikpea varieties contain 20-30% protein, 5-8% fat and up to 120 grams of digestible protein per 1 kg [8;192-p.].

Chikpea grain contains 25.8% protein, 8.19% fat, 60% starch and sugars, 3% cellulose and is widely used in the food industry[9;147-152-p.].

The legumes share in increasing food production and ensuring our table satiety is significant. This is explained by the fact that their grain contains up to 25-30% protein[6;13-14-p.]

A.A.Chernyaev [13; 143-b] noted that even in drought years there is high yields possibility of peas, and with the correct application of agronomic measures it is possible to get Chikpeas crop rich in protein more than 2 times.

The changes research in the indicators that determine the Chikpeas grain quality in accordance with the growing conditions by varieties in each soil and climatic conditions will help to improve the crop quality, along with its yield.

For this reason, during 2015-2017, Chikpea varieties were sown in autumn at different times and planting depths, and the amount of protein and fat in the grain, which determines the grain quality along with the yield, was studied (Table 2).

Experiments have shown that the amount of protein and fat in Chikpea grain varies more depending on the biological characteristics of the variety and weather conditions, and to some extent on the timing and depth of sowing the seeds.

The protein content of pea grains is high in Yulduz variety, averaging 23.1-23.8% in autumn sowing dates and sowing depth options, this figure was 21.6-22.4% in the Uzbekistanskiy-32 variety and 20.5-21.3% in Lazzat variety. The protein content of Yulduz variety was found to be 1.4-1.5% higher than the average Uzbekistanskiy-32 variety and 2.5-2.6% higher than the flavor variety.

When analyzing the grain composition of Chikpea varieties over the experiment years, the protein content of the grain in 2015 and 2016 formed a close indicator of the sowing time and sowing depth research options, the average Yulduz variety was 23.3-24.1%, while in field experiments in 2017, this figure decreased to 0.5-0.8% compared to previous years, these figures were observed in Uzbekistanskiy-32 and Lazzat, respectively.

Another indicator of the quality of Chikpea grain is the amount of fat it contains. Experiments have shown that the amount of oil in the Chikpeas seeds in the variant sown at 6–9 cm depth in the third decade of November (30.11). The highest 7.1% was observed in the flavor variety, the other option is the second decade of November (20.11) and in the first decade of December (10.12) 3-5 cm and 0.3–1.3% higher than those planted at 10–12 cm depth.

When comparing the fat varieties content = on experimental options Uzbekistanskiy-32 variety is close to Yulduz variety on average 5.9-6.6% on options, it was found to be 0.7-, 0.9% higher than the Yulduz variety. According to the varieties, the fat content in the Lazzat variety grain is slightly higher that 6.6 - 7.1% according to this indicator, it is 1.4-1.6% higher than Yulduz and 0.5-0.7% higher than Uzbekistanskiy-32.

Therefore, in order to have good Chikpea grain quality, it is necessary to correctly determine the optimal sowing time and sowing depth of the crop by varieties the protein amount in the grain per hectare is 274.3 - 621.4 kg and the fat amount is 88.4 - 167.6 kg.

8. **Conclusion**

In the experiment years, the autumn sowing periods and sowing depth affected the yield, the number of seedlings in the 6-9 cm variant is 3-4% higher than in the 3-5 cm and 9-12 cm depth options, which affects the yield, the highest rate was observed in the variant planted at 6-9 cm depth in the third decade of November (30.11), yield up to 1-3 quintals per variety compared to other experimental sowing dates and sowing depth options, it is optimal to plant peas in the fall at 6–9 cm depth in the third decade of November (30.11) and in this option planting is recommended for widespread use in agriculture.

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Table 2

Sowing periods and sowing depth influence on grain quality indicators of chickpea varieties (average perennial, 2015-2017)

Sowing dates	Planting depth, cm	Protein, %			Protein obtained from 1 hectare of land, kg			Fat, %			Fat from 1 hectare of land, kg		
		1*	2*	3*	1*	2*	3*	1*	2*	3*	1*	2*	3*
November 20	3-5	23,4	21,9	21,1	524,2	427,1	346,0	5,5	6,4	6,8	123,2	124,8	111,5
	6-9	23,1	21,8	20,6	596,0	507,9	409,9	5,7	6,5	7,1	147,1	151,5	141,3
	10-12	23,6	22,1	21,2	509,8	415,5	328,6	5,4	6,0	6,7	116,6	112,8	103,9
November 30	3-5	23,3	21,8	20,7	531,2	475,2	376,7	5,6	6,6	7,0	127,7	143,9	127,4
	6-9	23,1	21,6	20,5	621,4	548,6	451,0	5,7	6,6	7,1	153,3	167,6	156,2
	10-12	23,5	22,0	20,9	519,4	462,0	365,8	5,5	6,2	6,9	121,6	130,2	120,8
December 10	3-5	23,6	22,1	21,3	460,2	395,6	291,8	5,3	6,1	6,6	103,4	109,2	90,4
	6-9	23,4	21,8	20,9	498,4	431,6	324,0	5,5	6,5	6,9	117,2	128,7	107,0
	10-12	23,8	22,4	21,1	447,4	383,0	274,3	5,2	5,9	6,8	97,8	100,9	88,4

Note: 1*-"Yulduz" type, 2*-«Uzbekistanskiy-32» type, 3*-«Lazzat» type