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The Effect Of Soil-Climate On The Drain Productivity Of Peas Grown In Dryland

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ABSTRACT

Peas are superior to many legumes in their nutritional value and contain 20.1-32.4% protein. The amino acids in peas are unique in that they eliminate various harmful and pathological factors in the human body. Growth, development, yield, and yield quality of 75 pea cultivars were studied in dryland conditions. Based on field experiments, it was studied that the genetic characteristics of pea cultivars grown in light grey soils depend on local conditions. From the studied samples, 14 samples with high results compared to the control variant were selected. The yield of the selected samples was 4.4 centners higher than the control variant.

KEYWORDS

Pea, variety, dryland, natural selection, growing season, yield, quality.

INTRODUCTION

As a result of climate change, a significant increase in the process of desertification due to rising global temperatures, the decline year-by-year in irrigation water raises the issue of growing agricultural products in the conditions of drought (arable lands). Therefore, along with the introduction of an intensive system of intensive use of irrigated lands to meet the needs of the population for quality agricultural products, the issue of food security in the

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Republic will be fully addressed through the cultivation of drought-resistant vegetables, cucurbitaceous vegetables and legumes in arable lands (Robinson & Domoney, 2021).

According to the Annex 1 of the Resolution of the President of the Republic of Uzbekistan dated July 29, 2019 "On additional measures for deep processing of agricultural products and further development of the food industry" PR-4406, in 2018 in the country 6.2 thousand tons of peas grain is exported, by 2021 this number is planned to reach 19.2 thousand tons (President Resolution PQ-4406, 2019).

To fulfil the planned task, it is important to select pea varieties suitable for each arable land region and to develop most promising technologies, taking into account the characteristics of the region (Sun et al., 2016). It is certain problem that in the conditions of drylands, the yield largely depends to the use of precipitation moisture, sowing time, the right choice of planting depth to achieve high and quality grain yields.

To increase the efficiency of use in dryland conditions, it consists of planting cereals alternately with leguminous plants (Yadav et al., 2021). One such legume is the pea crop. Experiments have shown that when growing cereals after peas, the yield increases to 60%, accumulating on average about 50 ha/kg of pure biological nitrogen in the soil, which is equivalent to 6-8 ha/t of rotted manure (Aliqulov G, 2012; Mavlonov B. T., 2004).

The present study aims to investigate the effect of soil-climatic conditions of drylands on grain yield of peas.

To achieve this goal, sowing pea collections in arable land (i), determine their growth, development (ii) and productivity (iii), and determine the optimal variety sort from pea variety collections (iv).

MATERIALS AND METHODS

Field experiments were conducted in 2018-2020 in the pilot fields of the Kashkadarya branch of the Kamashi section of the Scientific Research Institute of Cereals and Legumes. The experimental site is located in the foothills and consists of light grey soils.

Field experiments were conducted in two tiers with two repetitions. During the experiment, phenological observation, calculation and analysis of pea variety samples were carried out according to the method of the Uzbek Cotton Research Institute and biometric indicators according to the methodology issued by the State Variety Testing Commission of Agricultural Crops (1991).

The disease resistance assessment of the cultivar samples studied in the experiment was evaluated as a percentage (%) on a scale developed at the International ICARDA Center (International Center for Agricultural Research in the Dry Areas, 1996).

The area selected for the field experiment was the area under cucurbitaceous vegetables grown on dryland as a past crop. In the care of crops, weed control was carried out by hand.

As the reason of that the experimental site is located in the central region of Kamashi district of Kashkadarya region, it was observed that the soil and climatic conditions of the region are close to average. It was determined that the amount of precipitation, air temperature, the effect of hot dry winds have a certain effect on the growth, development and yield of crops following the characteristics of the region. The observation of such results is a characteristic feature of dryland farming. Therefore, the analysis of the results of the experiment showed that the data obtained differ sharply from year to year. The area where the field experiments were conducted belongs to the pre-mountainous arable lands of the region and consists of light grey soils. The area of light grey soils in Kashkadarya region is 548.0 thousand hectares (Data from the Regional Department of Land Resources and State Cadastre). These soils are widespread around the Kashkadarya River, in the plains and foothills. Soil-forming rocks consist of loess, deluvial, and proluvial. The humus content in such soils is very low (0.8-1.4%), high carbonate, medium and light soils in terms of mechanical components. The amount of mobile phosphorus and exchangeable potassium is also insufficient. The area where the field experiments were conducted was an average of 650 meters above sea level, and from the plains, it is not saline due to its height of 200 m.

Since the field experiments were conducted on arable lands, no significant change in soil structure was observed during the field experiments. However, as a result of systematic farming on such lands, the biomass of the arable land increases and the efficiency of farming increases. Because with the increase of organic matter in the soil, its water-physical properties also will be improved. Light grey soils have been poorly studied, and most of the research has a geographical character. Some physical properties of soil were studied under the direction of Ryzhov S.N. and Sahakyants K.B. (1958).

RESULTS

The low content of humus in the soil was the reason for calling this region a characteristic feature of the southern region in terms of soil and climatic zones of the country. Therefore, when lands are developed for farming in the experimental area, organic and mineral fertilizers applied to the soil have a positive effect on crop growth, development and yield. The results of the experiment showed that the mobile phosphorus in the upper layer of pre-mountain light grey soils did not exceed 20-24 mg/kg. It is very difficult to increase the efficiency of arable lands with this amount of mobile phosphorus. The natural phosphorus content in the soil also does not exceed 0.08-0.17%. Therefore, it is necessary to increase the amount of phosphorus in the soil, along with improved agro-technological measures to increase the efficiency of foothill arable lands.

Under the conditions of the field experiments, the amount of exchangeable potassium in the soil averaged 150 mg/kg. From the analysis of the studies, it is clear that humus and other nutrients in the soil are not the same. Therefore, the agrochemical properties of the experimental soil were studied.

Table 1

Agrochemical description of the experimental field

Parameters	Soil layers, cm				
	0– 10	10 – 20	20 – 30	30 – 40	40 – 50
Humus content	0,810	0,905	0,901	0,805	0,510
Mobile nitrogen	0,050	0,055	0,053	0,048	0,030
Mobile phosphorus	0,105	0,110	0,105	0,102	0,101
Exchangeable potassium (mg/kg in the soil)	150	162	151	148	145

Table 1 shows that the nutrient elements in the soil of the field where the field experiments were conducted are very poor and there is almost no change in the soil layers. Because of the low content of humus, nitrogen, phosphorus and potassium in the soil layers, there are differences in the level of errors in chemical analysis. With this in mind, one of the main ways to dramatically increase the productivity of foothill lands in Kashkadarya region is to enrich the soil with organic and mineral elements.

No signs of soil salinity were observed in the experimental area under the conditions of the experimental zone.

The 2018-2020 season in which the experiments were conducted was the driest and the hottest season in 2018 compared to other years (Table 2).

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Table 2

The average daily air temperature for the 2018-2020 season, °C

Decade	October	November	December	January	February	March	April	May	June
2017-2018									
Decade 1	18,2	18,5	4,0	8,6	6,4	17,6	18,2	26,7	36,0
Decade 2	20,5	12,4	4,5	7,2	8,5	14,1	17,0	23,0	37,4
Decade 3	21,5	9,3	11,2	3,6	13,8	23,0	23,7	28,3	34,6
Average	20,1	13,4	6,6	6,5	9,6	18,2	19,6	26,0	36,0
2018-2019									
Decade 1	16,1	6,2	6,5	6,5	5,7	10,0	17,0	22,5	23,8
Decade 2	10,8	6,7	6,1	7,4	5,8	13,2	17,2	23,2	25,6
Decade 3	15,6	8,2	5,0	6,6	6,1	13,3	13,5	23,0	28,4
Average	14,2	7,0	5,9	6,8	5,9	12,2	15,9	22,9	25,9
2019-2020									
Decade 1	18,1	9,4	10,0	5,1	10,2	9,0	12,3	21,6	28,7
Decade 2	17,1	8,7	5,7	-0,2	4,8	15,3	15,7	20,4	28,1
Decade 3	16,1	2,5	8,5	3,8	10,1	12,9	21,6	27,7	28,8
Average	17,1	6,9	8,1	2,9	8,4	12,4	16,5	23,2	28,5

In the cultivation of agricultural crops on drylands, air temperature, precipitation and relative humidity affect the growth and development of the plant, the formation of the crop structure, productivity and quality (Zhang et al., 2016).

It was found that in 2019 and 2020 the temperature will be lower than in 2018 and will have a positive effect on the growth and development of cereals (Table 3).

Table 3

Precipitation in the 2018-2020 season, mm

Decades	October	November	December	January	February	March	April	May	June	**Total**
2017-2018										
Decade 1			5,2		6,4	4,3	11,5	1,8		**29,2**
Decade 2			6,7	5,2	15,3	9,7	20,4	3,7		**61,0**
Decade 3		1,8	3,8	8,4	8,8	6,2				**29,0**
Total	**0,0**	**1,8**	**15,7**	**13,6**	**30,5**	**20,2**	**31,9**	**5,5**	**0,0**	**119,2**
2018-2019										
Decade 1	5,3	9,9	10,0	26,5	18,2	0,8	13,1		18,5	**102,3**
Decade 2		4,2	4,1	7,2	58,4		22,4	34,0		**130,3**
Decade 3	33,8	24,6	2,3	12,2	1,0	31,5	51,5	4,2		**161,1**
Total	**39,1**	**38,7**	**16,4**	**45,9**	**77,6**	**32,3**	**87,0**	**38,2**	**18,5**	**393,7**
2018-2019										
Decade 1	1,0	13,8	4,3	24,2	17,1	8,4	45,1	29,1		**143,0**
Decade 2			6,3	26,6	35,5	0,7	36,0	19,8		**124,9**
Decade 3	1,8	20,0		22,7	12,9	23,5	3,1			**84,0**
Total	**2,8**	**33,8**	**10,6**	**73,5**	**65,5**	**32,6**	**84,2**	**48,9**	**0,0**	**351,9**

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DISCUSSIONS

Analyzing the data in table 3, the amount of precipitation in 2018 was 119.2 mm, while in 2019 it was 393.7 mm and in 2020 it was 351.9 mm.

In the spring season of 2018, the daily air temperature rose from the 3rd decade of April (23.70C), in the 3rd decade of May to 28.30C, and in the 1st decade of June to 36.00C, the growth and development of grain crops, the formation of yield elements had a serious negative effect.

In the 2019 season, in contrast to 2018, 94.2 mm in October-December 2018 and 299.5 mm in January-June 2019 had a positive effect on the growth and development of grain crops (Zhang et al., 2016).

In the CIFWN-20 hotbed planted for the 2020 harvest, 14 sorts were selected from 75 sorts that were higher than the control variety in all parameters (Figure 1).

In the CIFWN-20 nursery planted for the 2020 harvest, 14 sorts selected from 75 specimens that were higher than the control variety in all parameters.

When calculating the number of pods and grains in a single plant, it was returned that the number of grains per plant was 60 to 74, which is 14 grains more than the standard variety, which was 4.5 times higher than the number of grains per plant.

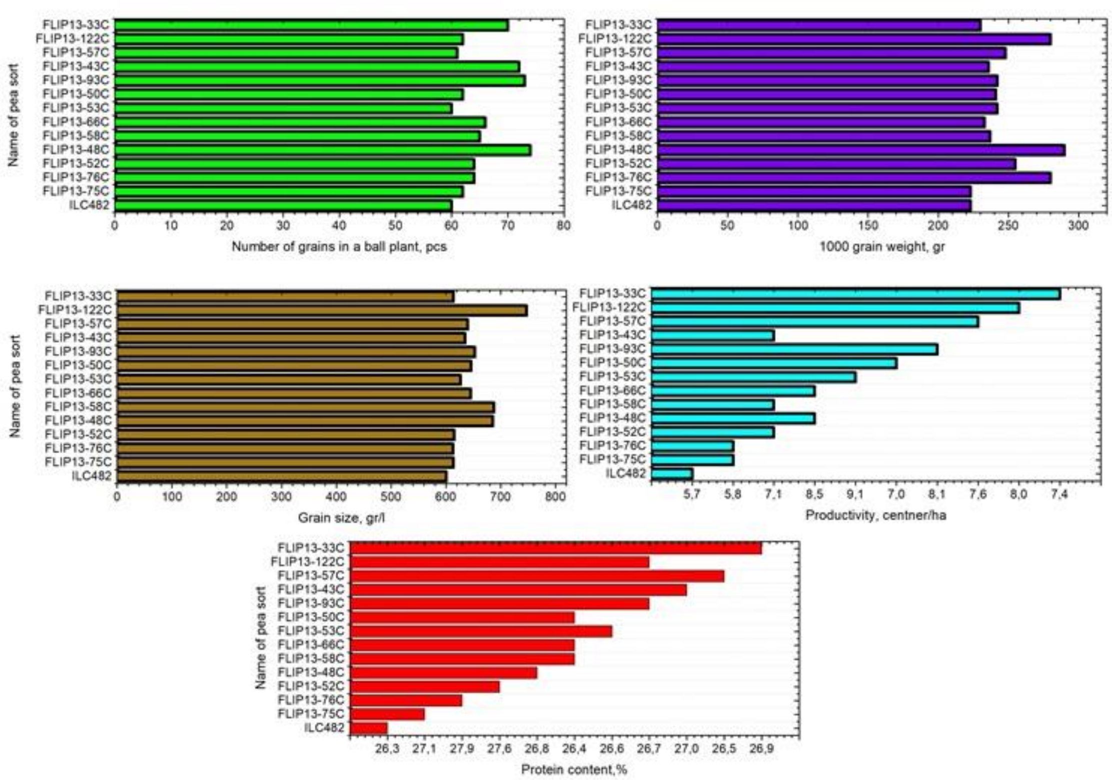

Figure 1. Productivity and quality of CIFWN-20 samples

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Besides, the grain weight of 1000 samples ranged from 223 g to 290 g, and the grain nature was 613-747 g/l. One of the most important quality indicators of pea grain is a technological quality indicator, which is to determine the amount of protein in the grain. It was found that the protein content of the above-selected samples was 26.4-27.9% (Robinson & Domoney, 2021; Wu et al., 2018).

One of the most important indicators is productivity, which is the expected result of any agricultural crops. Yield in this nursery was found to be 5.8 centner/ha to 9.1 centner/ha in 13 samples selected while the standard variety was 5.7 centner/ha, which is higher yields from 1-4 centner/ha.

The selected varieties and sorts were transferred to the next stages of selection work.

In the analysis of pea varieties and samples selected from CIEN-LS-20 seedlings, when calculating the number of pods in a single plant, 2-grain pods were 2-3, 3-grain pods were 1, and 1-grain pods were 22-25.

In the CIFWN-20 collection nursery, productivity and quality indicators in 10 samples were found to be higher than the standard (Obod) sort.

When calculating the number of grains in a single plant, it was noted that the number of grains in a single plant was from 67 to 73.

The grain weight per 1000 grains ranged from 243 g to 324 g, and the grain volume (nature) was 614-686 g/l. The protein content of pea grains was 23.4-26.4%.

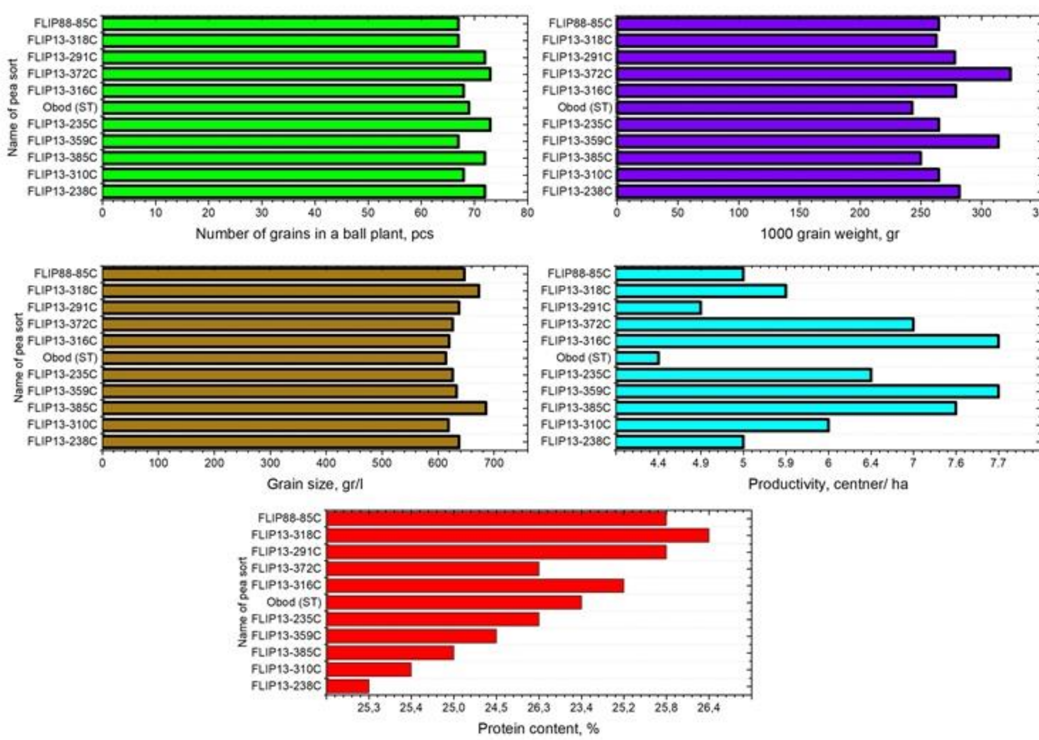

Figure 2. Productivity and quality of CIEN-LS-20 samples

The yield of samples selected from this nursery was 4.4 centner/ha in the standard variety, while in the 10 selected samples it was 4.9 centner/ha to 7.7 centner/ha, which is higher than 0.5-3.3 centner/ha found to be productive (Figure 2).

CONCLUSION

Fertility-oriented selection is the factors that ensure fertility and productivity, with the average crop yield per hectare, the average crop yield per hectare, and the weight of 1,000 seeds per hectare. The biological stability of the variety ensures a large number of plant cones at the appropriate planting rate under field conditions. The legumes in the plant depend on the racial characteristics of the coni variety and the conditions of cultivation.

Of the 36 varieties and specimens studied in the CIEN-E-20 seedling of the pea, 10 samples were selected because of their high performance in all respects relative to the standard (Obod) sorts.

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