The influence of planting times on the formation of the root system of wheat varieties in the conditions of the Zarafshan valley

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Abstract. In the article, the study of the underground organs of plants is of particular importance for solving important issues related to plant biology, ensuring the proper development of crops in agriculture, the interaction of plants with the habitat in the process of growth and development, and therefore the morphological structure (shape, formation) of the root plants in different soil conditions, etc.) are characterized by extreme diversity. The formation of the above-ground mass of plants depends on the growth of the root. Therefore, in our experiment, in addition to studying the development of the wheat root system, it is aimed at studying the patterns of its growth and development, its relationship with the aboveground parts of the earth, and, finally, the influence of planting dates. on the root system of various ecological conditions of the area. In our studies, the level of development of the root system of wheat varieties depends on its penetration into the soil, the root mass, the type of soil and its mechanical composition, the topography of the sowing field, the degree of erosion, and the depth of the soil. groundwater, plant species, variety, planting dates, norms, watering, diets. It has been established that the development and activity of the root system has a significant impact on the formation of wheat varieties. The article considers the influence of sowing time on the formation of the root system of durum wheat Krupinka and soft wheat variety Krasnodarskaya 99, included in the State Register of Agricultural Crops, and recommendations are given based on the results of the experiment.

1 Introduction

Today, 235.8 million people live in more than 132 countries around the world. wheat was sown on an area of more than one hectare, and in 2020 - 754.8 million square meters. tons of grain grown, of which soft wheat accounts for 95% of the total amount of planted wheat. In a number of large countries of the world that grow soft winter wheat, through the use of resource-saving technologies, increasing soil productivity, preventing the salinization

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process, as well as saving irrigation water and mineral fertilizers, grain yield and quality are increased, as well as high economic efficiency [1-13].

When growing wheat on irrigated lands, the root system develops differently depending on the moisture content of the soil. It is located mainly in the arable layer of soil of a small radius, which, in turn, is directly dependent on soil moisture.

From seedlings to the cob, 90-95% of the root of a wheat plant is formed, and the main part of the root (70-80%) is located in the arable layer, the mass of the root decreases as the root penetrates deep into the soil.

In studies, the weight of durum wheat variety "Istiklal" when planted in October and November was 36.7 and 14.5 g at the end of the growing season in autumn. Plant root coverage was 50.4% when planted on October 1, 37.5% when planted on November 1, the active root surface changed from 25.6 to 12.6% [9; p. 33].

When studying the development of the root system of winter wheat, the root system averaged 35-40 cm during the period of tuberization. During the period of the spikelet, the roots are the longest, penetrate into the lower soil layer and penetrate to a depth of up to 65-67 cm at a soil moisture content of 60-70-60% and up to 58-64 cm at 65-75-60%. irrigation regime, the formation of adventitious roots from the joint is determined [2; S. 57-63].

According to K.M. Sytnik and others, the function and importance of the root system in providing it with moisture and nutrients in the process of growth and development of wheat plants are great. Since the development and activity of the root system significantly affect the formation of the wheat crop [8; p. 363]. According to Shevelukha, the level of development of the root system of wheat planted in autumn, namely, its penetration into the soil, the root mass, depends on the type of plant, variety, planting time, norms, irrigation regime, nutrition [11; p. 432].

B. Kholikov., Kh. According to the results of market experiments, the earing period of wheat in autumn is physiologically very intense, the appearance of adventitious roots means that its need for nutrition and moisture has reached its maximum point at that time, and the further development of adventitious roots means that wheat needs a certain amount of nutrition and moisture even during the period of milky-wax maturation, which indicates the need [10; p. 25].

One of the common features of grain crops is the umbilical form of their root system, located on the side with a width of 80-150 cm and a depth of 120-200 cm [6; S. 52-60]. G.A. Lavronov [5; p.352] it is indicated that the secondary roots of wheat can penetrate the soil by 60-80 cm, and the primary roots - to a depth of 200-220 cm.

Features of the formation of the root system of varieties of durum and soft wheat, registered in the state register of plantings on irrigated lands of Uzbekistan, have been little studied. In particular, the influence of sowing time on the development of the root system of durum wheat varieties is not sufficiently covered in the literature.

2 Materials and methods

The Samarkand region, where the research was conducted, differs from other regions in that it has the main characteristics of the climate: the plain is below sea level, it is far from the ocean, and it has a complex orography. 63% of the main agricultural crops grown in the region are grown at an altitude of 100-500 m above sea level, and 37% are grown at an altitude of 500-700 m.

The Zarafshan Valley is located in the central part of Central Asia and has a continental climate. Due to the fact that the valley is long from west to east and the relief is getting higher, the temperature regime and the amount of natural precipitation are different everywhere. Sometimes the temperature rises to +44 °C in the plains and +33 °C in the mountains. Winter

is quite warm in the plain part of the valley, the average January temperature is from 0 °C to -1.3 °C, and in the mountainous part from -3 °C to -10 °C. The lowest temperature is -35 °C. Annual natural precipitation is 114-400 mm (increasing from west to east), only in the western part of the Zarafshan ridge - 881 mm in Amonkoton. Most of the natural precipitation falls in the cold season in the flat part, and in the hot season in the mountainous part [1; p. 4-43].

The irrigated areas are diverse depending on the geomorphological soil layer, topography and depth of groundwater location. In the terrace of 3 basins of the Zarafshon river, underground water is deep and does not affect the structure of the land, light gray soil has developed in these areas. Their main area is old-new (more than 20 years) irrigated fields. Protected lands are rare and isolated. According to the mechanical composition, it goes from light sandy soil to heavy sandy soil. Mountain rocks also belong to sandy soil and have a layered structure. Therefore, light gray soils have great drainage here. Rapid mineralization of plant residues leads to rapid leaching of nutrients from the soil by precipitation. For example, it is 1.3-1.7% in the arable layer of old irrigated gray soils, 1% in newly irrigated lands, and 5-7% in steep hills. These soils are eroded in the form of flat erosion. The leaching is weak and moderately saline with sulfate salts. These salts will be washed away by irrigation in the coming years. Light gray soils are highly carbonated with 7-8% CO_2.

The main part of irrigated arable land of Samarkand region has a mechanized composition of medium kumoq (169.9 thousand hectares), which is suitable for farming. The area of sandy, loamy and light sandy soils with mechanical composition is 43.2 thousand hectares, and the area of heavy sandy and clayey soils is 43.2 thousand hectares. 48.6% of the irrigated areas of the region consist of typical gray soils, 40.4% - meadow gray soils, 8.6% - light gray soils, and 2.4% - meadow-swamp soils.

The soil of the Samarkand scientific-experimental station, which is located in the village of Oktepa, Boylata MFY, Ishtikhon district, consists of meadow gray soil.

The district is located at an altitude of 415.9 m above sea level, and a significant part of the development of the national economy consists of cotton growing, grain growing, horticulture, and specialized agriculture, in addition, there are livestock and cocoon breeding industries.

The soil of the area where we conducted the experiment is old irrigated grassy gray soil, the mechanical composition is medium sand, and the depth level of seepage water is 2-3 meters. The volume mass of the driving layer is 1.31-1.34 g-cm^3, the degree of porosity is 30-35%.

The amount of humus in the soil is 1.3%.

The soil of the experimental area is composed of loess and alluvial deposits, the parent rock of which is a meadow-gray soil, and high carbonation occurs, therefore, the soil water absorption environment is neutral and weakly alkaline.

Beneath these deposits lie layers of gravel, sand and silt. The water level of Sizot on the surface (2.0 - 3.05 m), fresh. Hydromorphic soils are common in this area; meadow-gray soils with frequent agro-irrigation are common in irrigated and old-irrigated soil layers.

We conducted field experiments in 2020-2022 at the Samarkand scientific and experimental station, located in the Ishtikhon district of the Samarkand region. Krupinka durum wheat and Krasnodarskaya 99 soft wheat were taken as experimental objects.

By experience, these varieties are 1.10; 11.10; 21.10; Sowing at planting dates 1.11 and 11.11. The size of the 4-reversible considered sites of field experiments is 50 m2, 2 tiers. Previous harvest of corn for grain. In the experiment, plant care was carried out on the basis of agricultural technology adopted for this region.

All phenological observations and biometric measurements carried out in the field experiment were carried out using the methodological manuals of UzCRI “Methodology for

conducting field experiments" [3]. The analysis of variance of the obtained data on productivity was determined according to B. A. Dospekhov [4].

The content of humus in the soil was determined by the method of I.V. Tyurin, by the N-NO3-Granwald-Lyu method, by the R2O5-Machigin method, and by the method of V.P. Protasov in an alternating potassium solution. flame photocolorimeter. Total nitrogen and phosphorus in the soil K.E. Ginzburg, E.M. Shcheglova and V. V. Wilfius, the total potassium is determined by the Smith method.

To determine the structure of durum wheat yield in the experiment before harvesting, 100 plant samples were taken from the designated plots (0.5 m2) in each variant and repetition. Under laboratory conditions, these include: plant height, total number and productive stems and the number of stems with ears per 1 m2, ear length, number of grains in ears and ears, weight of one ear and 1000 grains, grain and grain yield per 1 m2 of stem, humidity and contamination of grain according to GOST, grain transparency (glassiness) in 100 grains randomly obtained on the device Diaphanoscope DSZ-3, the nature of the grain was determined on the device PH-1 by multiplying the content of crude protein by grains, the nitrogen in which was determined by the method of Keldal 5 ,7, the protein was determined by the Barnstein method. The amount of gluten was determined by washing the dough prepared from the sample according to GOST 13586-1-68 through a centrifuge, and its quality was determined on an IDK-3 device.

Harvesting and accounting were determined on the harvested experimental field for each return before harvesting. Productivity was calculated with an accuracy of 0.1 kg. Samples were taken from the experimental fields to determine the moisture content of the grain, and the yield was determined by the standard (14%) moisture content in the grain.

The mass of roots was determined in monoliths with a soil shear surface of 50x15 cm. The physiological assessment of the root system of durum wheat planted in autumn was assessed by the adsorption of methylzinc from the absorbing total and active root surface, depending on the irrigation method and the planting time as an absorbing organ [7; p. 311]

3 The results and discussion

Our research shows that planting dates have a significant effect on the above-ground mass and root system of fall-planted durum and soft wheat. The development of the root system and aboveground mass was the highest in durum and soft wheat varieties planted in the early period (1.10). It was found that the root mass of 100 plants before wintering in the Krupinka variety of durum wheat planted in the first ten days of October was 13.4 g, and the surface mass was 29.0 g. The level of rooting of the plant was 46.2%. In the Krasnodarskaya 99 variety of soft wheat, this indicator corresponds to 15.0, 30.4 g; and the level of root provision was 49.3%. With the delay of planting dates, the indicators of root, surface mass, and level of root supply decreased (Fig. 1).

In general, in all planting periods, the above indicators were higher compared to the soft wheat variety.

Compared to early (1.10) planting of durum wheat (biological autumn) in the Krupinka period, the root mass of 100 grains of the plants planted in the late (11.11) period was 15.2 g, the surface mass was 43.9 g, and the level of root provision was 6.8% less. . Similar patterns were observed in the Krasnodarskaya 99 variety of soft wheat (biological autumn).

During the tuber phase of development of durum and soft wheat cultivars, the level of root supply of the plant decreased, but this indicator remained high in the early planted plants (Fig. 1).

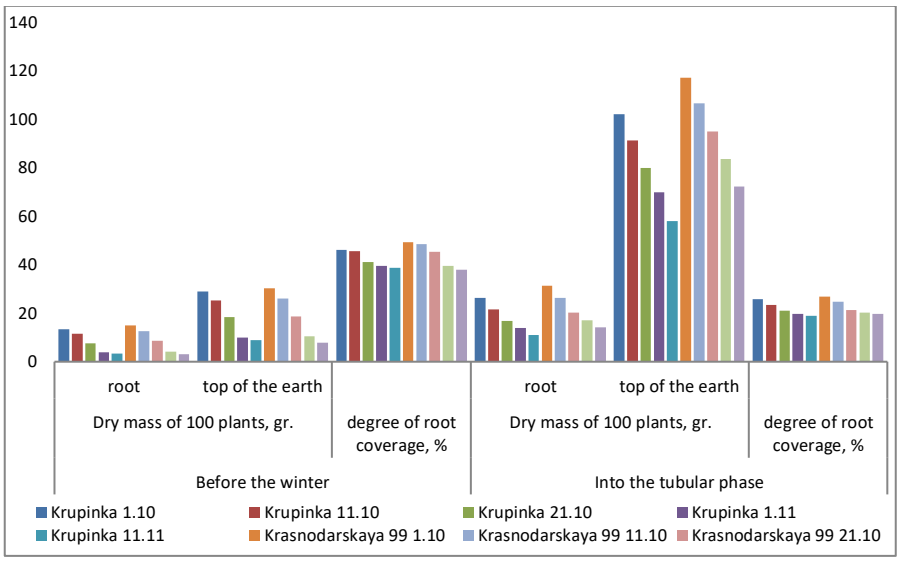

Fig. 1. Development of wheat above-ground mass and root system during the pre-wintering and tuber phase of planting periods

During the earing phase of wheat planted in autumn, it was observed that the root and above-ground mass of the plant increased and the level of root supply decreased, and it was found that the root and above-ground mass of the plant was the highest when planted in the period (11.10).

It was noted that the root mass of the Krupinka variety planted in this period was 21.3 g, the above-ground mass was 72.0 g, and the level of root supply was 1.7% higher than when it was planted in the early (1.10) period. Similar data were obtained in the Krasnodarskaya 99 variety. By the heading phase, durum wheat root mass was 13-23% lower than that of soft wheat in all planting periods.

By the wax ripening phase of wheat, the root mass of 100 plants of the Krupinka variety is 74.5 during the optimal planting period; 558 g, the level of root coverage was 13.3%. Planting in the early or late periods led to a decrease in these indicators. The same pattern was observed in the Krasnodarskaya 99 variety.

In our experiments, it was shown that planting dates affect the mass of the wheat root system, the level of development, penetration into the pit, distribution in the soil layer (Table 2). As determined in the experiments, the root system in irrigated lands mainly spreads in the surface plowed layer of the soil, for example; 57.2% of the root mass of the Krupinka variety and 72.3% of the Krasnodarskaya 99 variety were located in the 0-40 cm layer when planted in the period (11.10).

Table 2. Distribution of roots in soil layers depending on the period of planting (2020-2022)

Planting dates	Root dry mass per layer in 1 m^2 monolith							
	0–40 cm		40–120 cm		120–240 cm		0–240 cm	
	gr	%	gr	%	gr	%	gr	%
Krupinka								
1.10	118,6	60,3	67,9	34,6	10,1	5,1	196,6	100
11.10	122,0	57,2	76,3	35,6	15,1	7,1	213,4	100
21.10	111,7	61,9	60,1	33,3	8,7	4,8	180,5	100
1.11	102,4	63,5	52,2	32,3	6,6	4,2	161,2	100
11.11	90,2	67,9	38, 3	28,8	4,3	3,3	132,8	100

Krasnodarskaya 99								
1.10	185,5	75,2	52,2	21,2	9,0	3,6	246,7	100
11.10	195,1	72,3	59,3	22,0	11,4	4,2	269,8	100
21.10	177,5	75,7	49,4	21,1	7,5	3,2	234,4	100
1.11	161,6	78,2	38,5	18,6	6,4	3,2	206,6	100
11.11	137,9	82,1	26,2	15,6	3,8	2,3	167,9	100

A decrease in the root mass of the Krupinka variety is observed even when it is planted earlier or later than the optimal period, but even if it is planted late, 67.9% of it is located in the 0-40 cm layer of the soil. This indicator is equal to 82.1% in the Krasnodarskaya 99 variety. Analysis shows that durum wheat has less root mass than soft wheat, but its many roots penetrate the soil more than soft wheat. For example, in the layer of 120-240 cm of soil, in 1 m2, the Krupinka variety of hard wheat accumulated 15.1 g or 7.1% root mass, while in the soft Krasnodarskaya 99 variety, this indicator was equal to 11.4 g or 4.2%.

4 Conclusions

Conclusions. According to the results of the research, it can be concluded that in autumn, until the rest period of wheat growth, a well-developed root system, above-ground mass, and plant rooting were observed in the plants planted in the early (1.10) period. With the delay of planting dates, the level of plant root, aboveground mass, and root supply also decreased. It was found that the Krasnodarskaya 99 variety of soft wheat compared to the Krupinka variety of hard wheat had a higher root, above-ground mass, and the level of root supply to the plant. It was observed that hard wheat roots penetrated deeper into the soil and accumulated more mass and penetrated the lower layers more than soft wheat roots. In the Krupinka variety, the main mass of the root in the upper 0-40 cm layer of the soil is 57.2% in the period of planting (11.10), 67.9% in the period of (11.11), 72.3 in accordance with the period of planting in the Krasnodarskaya 99 variety of soft wheat; 82.1%, and 7.1 in the 120-240 cm layer of the soil according to varieties; 4.2% was determined.

Therefore, the biological autumn Krupinka variety of durum wheat and the Krasnodarskaya 99 variety of soft wheat accumulate more mass in the deep layer of the soil and settled more in the lower layers.

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