The effect of sowing dates and seed rates on field germination of new varieties of wheat

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Abstract. The article presents the effect of sowing dates and seed rates on the field gemination of seeds of new varieties of durum wheat Javahir, Mingchinor, Langar, Yoqut-2014 in drought conditions. The complete harvest of winter durum wheat and its wintering, storage until harvest, and ultimately, obtaining an abundant and high-quality grain harvest from the crop directly depend on the correct determination of the optimal sowing period and norms. The purpose of the study was to determine the effect of sowing dates and seed rates on the field germination of new durum wheat in the conditions of typical gray soils of the drought conditions of Kashkadarya region. In research, the highest germination of durum wheat seeds was observed when planted on October 21, that is, the fertility of seeds compared to when planted on October 1 (control) was 2.9 in accordance with Javokhir, Mingchinor, Langar, Yoqut-2014 varieties; 2.7; 3.2; increased by 3.3%. A decrease in field fertility of all durum wheat cultivars was observed with late sowing. This indicator is 5.8 in the Jawakhir variety compared to the one planted on October 21 in the first ten days of December; 6.1 in Mingchinor; 6.3 at anchor; Ruby decreased by 6.4% in 2014. In the Mingchinor variety, 2.1% delay in planting dates from October 21 and 6.6% decrease in seed germination in field conditions were found. In the article, the impact of planting dates and standards of durum wheat varieties Javahir, Mingchinor, Langar, Yoqut-2014 included in the State Register of Agricultural Crops on field germination was studied and recommendations were given based on the experimental results.

1 Introduction

Today, the world's dryland farming areas are 1.4 billion hectares or 85-87% of the total agricultural land (http://www.fao.org 2020.). At present, dry land is widely spread in Afghanistan, Iran, China, India, Pakistan, Sudan, Turkey, and Central Asian countries [1-12].

Durum wheat is a hot and dry climate crop. Durum wheat is one of the most important cereal crops, and about 17 million are grown in the world. 38.1 million in an area of more than one hectare. tons of durum wheat grain is grown.

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Canada (5.2 million/t), Italy (4.3 million/t), Turkey (3.7 million/t), USA (2.3 million/t), Kazakhstan (2.2 million/t), Syria (2.2 million/t), Algeria (2.2 million/t), France (1.9 million/t), Morocco (1.8 million/t), Greece (1.1 million/t), Spain (1.0 mln/t), Tunisia (1.0 mln/t) are the leading countries in the world in durum wheat cultivation [12].

In our country, durum wheat is planted on an area of 4,000 ha, mainly in Kashkadarya, Jizzakh and Samarkand regions. Determining the suitable planting period and norms of durum wheat and improving the important agrotechnological elements of its cultivation are urgent issues.

Today, the analysis of new literature shows that in the production of abundant and high-quality crops from new varieties of durum wheat in dry lands, it is highly effective to bring out the maximum productivity of varieties and introduce the obtained results into production when using scientifically based cultivation technology, taking into account the biological characteristics of the variety, the soil and climate conditions of the region. gives

The growth and development of plants is the most important process that indicates the level of activity of their life and depends on the type of plant, growing conditions and agrotechnics.

Therefore, the growth and development of durum wheat is inextricably linked to the soil and climate conditions of the area where it is grown, as well as the applied agrotechnological measures.

The field productivity of durum wheat varieties registered in the state register for planting in dry lands of Uzbekistan has been little studied. In particular, the influence of planting dates and standards on the development of field fertility of durum wheat cultivars is not sufficiently covered in the literature.

2 Materials and methods

The soils of Yashin-Yamin farm, Yakkabog district, arid hilly region, where the experiments were conducted, consist of typical gray soils with average humus.

In our experimental fields, the limited field moisture capacity (LFMC) of typical gray soils was 19.3%.

The wilting moisture content of the plant varied from 4.3% to 5.6% in different layers of the soil section. This indicator was significantly higher only in the 0-40 cm layers of the soil, 4.7-5.7%.

The soil of the experimental field is a typical gray soil, the mechanical composition is medium sand, the bulk density of the soil is 1.26 g/cm^3, the specific gravity is 2.7 g/cm^3. The agrochemical description of the soil is as follows: the appropriate amount of humus in the plowed (0-30 cm) and under-ploughed (30-60 cm) layers of the soil is 0.82; 0.91%, total nitrogen 0.059; 0.070 phosphorus 0.085; 0.142 and potassium 1.7; 2.1%, the reaction of the soil environment (pH) was determined to be 7.2.

In general, typical gray soils are suitable for agriculture and tend to improve their agrochemical and agrophysical properties if used correctly and appropriately. Therefore, in order to achieve abundant and high-quality harvest of winter wheat and other crops in these lands, it is necessary to carry out agrotechnical activities in a timely and high-quality manner.

"Yashin-Yamin" farm, Lalmikor kyr-adir region of Yakkabog district, surrounded by Hisar mountain ranges on the east and west sides, the west and north sides are open, the terrain consists of kyr-adirs.

Average perennial air temperature in dry regions is 10-16 ºC. The amount of annual precipitation increases from the lower regions to the mountainous areas. As the place rises above the sea level, its temperature decreases and the amount of precipitation increases.

According to the Chimkurgan agrometeorological station, the weather conditions in 2017-2020, when the experiment was conducted, were as follows. In 2018, when the

experiment was conducted, the amount of precipitation during the wheat vegetation period (February-June) was 109.8 mm. This indicator means 120.4 mm less compared to the perennial (230.2 mm) of this period.

Long-term studies show that the distribution of rainfall in dry areas during the vegetation period of autumn grain crops, the amount of moisture in the soil is important for the formation of grain yield. In this regard, in 2019, the amount of precipitation in the early stages of vegetation of durum wheat varieties (budding-shooting) was 311.2 mm. However, in 2018, weather conditions were unfavorable for autumn grain crops in dry areas. In this year, rainfall in May-June (earing-ripening) was much less (22.6 mm) compared to the long-term average (49.2 mm), which led to a sharp decrease in soil moisture. It was observed that precipitation is extremely low, especially during the stages of flowering, milk-wax ripening, which is the most responsible period for the plant's harvest.

It is known that the growth, development and productivity of grain crops in dry farming often depend on the amount of atmospheric precipitation. According to the Chimkurgan weather station, the amount of annual precipitation is 14.6 mm in October, 42.5 mm in November, and 25.4 mm in December. In the 2017-2018 harvest year, when we conducted the experiment, the yield was relatively low due to the fact that the atmospheric precipitation was 124.7 mm less than in many years. In the 2018-2019 and 2019-2020 harvest years, the amount of annual precipitation is 44.8, in accordance with the years compared to the perennial; 33.3 mm was high and this had a positive effect on wheat yield.

We conducted the field experiments in the typical gray soils of Yashin-Yamin farm, Yakkabog district, Kashkadarya region during the years 2017-2020. As the object of the study, the new varieties of durum wheat included in the State Register for planting in dry lands were studied: Javokhir , Mingchinor, Langar and Yoqut-2014. In the experiment, these varieties are 1.10 (control); 21.10; 11.11 and 1.12 planting periods: 2.0 per hectare (control); 2.5; 3.0 and 3.5 million pieces of fertile seeds were planted.

The analysis of soil and plant samples, the quality, biochemical composition and technological characteristics of durum wheat grain were studied in the laboratory of the Southern Agricultural Research Institute (formerly the Kashkadarya Branch of the Research Institute of Grain and Legume Crops).

Field experiments were arranged with 4 returns, the size of the plots was 50 m^2, and they were arranged in a row, two, and tiered. The predecessor is a clean plow. Except for the methods studied in the experiments, all the technological methods of wheat cultivation were performed on the basis of agrotechnics adopted for this region.

Laboratory, field and production experiments, biometric measurements, phenological observations were carried out on model plants in scientific research works, physiological analyzes were carried out using the methodological manuals of "Methods of Conducting Field Experiments" [4].

The following studies were conducted to study plant growth, development and productivity of durum wheat:

- field germination of seeds and plant stem thickness were calculated in 10 locations diagonally across the plot in 0.5 m^2 areas where constant observation was carried out before going to the village, after the winter and before harvesting;
- durum wheat biometric indicators were conducted every 8-10 days on 20 plants selected from 0.5 m^2 plots in 4 replicates;
- characteristics of durum wheat, winter resistance and winter resistance of branches of different ages depending on agrotechnical methods, viability and productivity during the growing season, taking 20 plants from each pad after full germination of grass, and the order of formation of head and side stems were determined. A productive cluster was found in the phase of wax ripening;

- resistance to dormancy was determined in the earing and wax ripening phases of the grain on a 5-point scale by the method of scalding.

In the experiment, the yield of durum wheat was determined in all variants directly by harvesting with combine harvesters. The obtained yield was calculated based on standard humidity and 100% purity [5].

- by multiplying the nitrogen content of crude protein in grain by 5.7, determined by the Keldal method, the protein is determined by the Bertrand method.

- ammophos (N-11%, P_2O_5-46%), potassium chloride (60%), ammonium nitrate (34%) were used in the experiment;

The agrochemical properties of the soils of the experimental field were investigated in the following ways:

The content of humus in the soil was determined by the method of I.V. Tyurin, by the method of N-NO_3-Granwald-Lyaju, by the method of P_2O_5-Machigin, and by the method of V.P. Protasov in an alternating potassium flame photocolorimeter. Total nitrogen and phosphorus in the soil were determined by K.E. Ginzburg, E.M. Sheglova and V.V. Wilfius, and total potassium by Smith methods.

To determine the yield structure of durum wheat in the experiment, 100 plants were sampled from designated plots (0.5 m^2) in each variant and replication before harvest. In laboratory conditions, they include: plant height, total and productive stalks and the number of stalks with spikes per 1 m^2, spike length, number of grains in spikes and spikes, mass of one spike and 1000 grains, yield of grain and grain from 1 m^2 of stalk, grain moisture and contamination level GOST according to, grain vitreousness was determined using Diafanoskop DSZ-3 tool, grain nature was determined using PX-1 tool. The amount of gluten was determined by washing the dough made from the sample in accordance with GOST 13586-1-68 through a centrifuge, and its quality was determined using the IDK-3 device.

The economic efficiency of growing durum wheat was calculated according to the methodology of determining the economic efficiency of the results of scientific research in agriculture. The costs of growing one hectare of durum wheat were determined according to the regulatory documents adopted in the republic, prices, grain purchase prices.

3 The obtained results and their analysis

Despite the fact that natural conditions are important for the growth and development of durum wheat, agrotechnological methods (planting period, rate) have a great impact on plant development.

We can observe this effect from the germination of durum wheat to the end of the plant's growth period.

Therefore, due to the fact that durum wheat varieties created in recent years, in the conditions of the typical gray soil of the semi-arid Kashkadarya region, are sensitive to winter, drought, dormancy, growth period, planting period and standards, through the development of their variety agrotechnics increasing productivity and grain quality is one of the important theoretical and practical tasks.

In the cultivation of a high yield of durum wheat, it is a very important measure to grow lawns of an acceptable thickness [9].

According to L.N. Khalilova [11], the field fertility of seeds is in most cases less than the laboratory fertility. The field fertility of seeds depends on the quality of seeds, agrotechnics, soil and climate conditions, damage of seeds, lawns by diseases and pests, and other factors.

According to A. Ilashev, T. Orinboev, R. Siddikov [6], the seeds of durum wheat, like the seeds of soft wheat, start to turn green at a temperature of +1+2 ºC. However, biochemical and physiological processes are slow in durum wheat growing at this temperature. As the temperature rises, these processes intensify and the supply of nutrients to the sprouting fruit

accelerates. A favorable temperature for seed germination is +12+20 ºC, and the increase of temperature to +30 ºC reduces the germination of seeds in field conditions and the formation of lawns. When there is enough moisture in the surface layer of the soil, at +14+16 ºC, grass will be formed in 7-9 days. When the daily temperature is +10 ºC, the grass germinates in 12 days, at +20 ºC it takes 5-7 days after sowing. The optimum temperature for seed germination is +25 ºC. The planting-to-germination period can vary from 7 to 50 days, depending on temperature, seeding depth, soil moisture, and other factors, and in some years even longer in dryland farming.

Durum winter wheat's water demand increases during the growing season. In order for the seeds to germinate evenly, it is necessary to have more than 10 mm of moisture in a thickness of 10 cm of the soil [6].

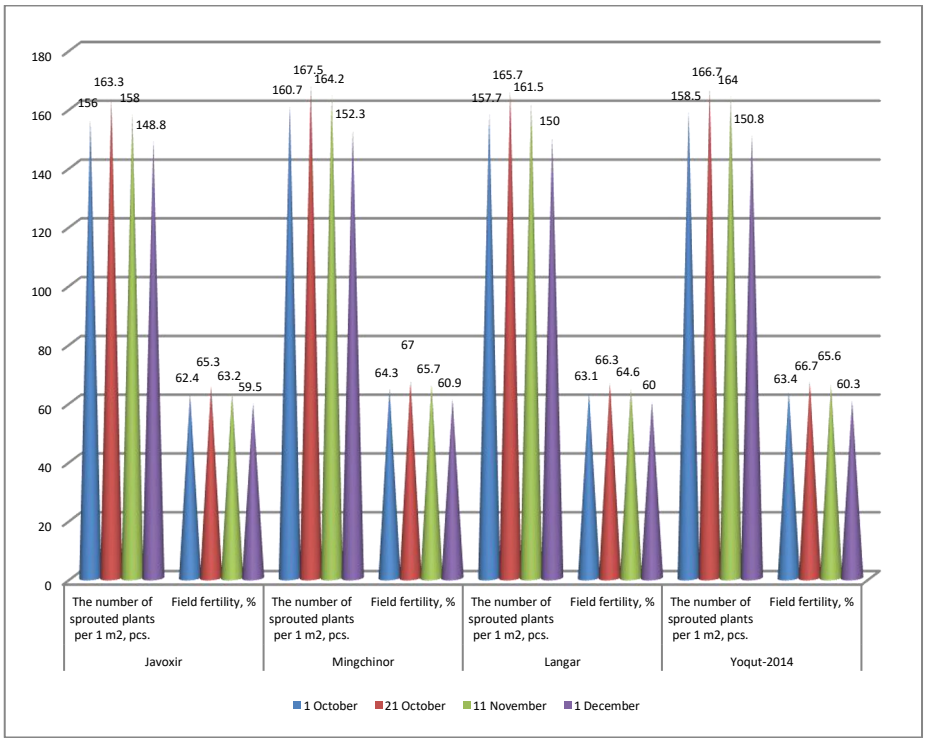

Fig. 1. Dependence of field fertility of durum wheat seeds on planting dates (2017-2020 years).

In our experiments, it was observed that the field fertility of the seeds was reduced when it was carried out earlier and later than the optimal sowing period. Depending on the planting period, the field fertility of seeds ranges from 59.5 to 65.3% in Javokhir variety, from 60.9 to 67.0% in Mingchinor, from 60.0 to 66.3% in Langar, and from 60.3 to 66% in Yoqut-2014 variety. changed to .7% (Fig. 1). In the years of research, the lowest indicators of field fertility of durum wheat varieties were observed in the plots planted for the 2017-2018 crop year. That is, atmospheric precipitation falling on the soil until the end of October in the fall of 2017 was less (5.3 mm) compared to the long-term average (14.6 mm). As a result, compared to the years 2019 and 2020, the field fertility of Javokhir , Mingchinor, Langar and Yoqut-2014 varieties of durum wheat is 3.0-4.3; 2.4-5.1; 2.5-4.9; It was observed to be less than 2.5-5.0%.

In our experiments, when planted on October 1 (control), the field germination of seeds in Javokhir , Mingchinor, Langar, Yoqut-2014 varieties of durum wheat was 62.4; 64.3; 63.1;

It was 63.4%. Higher field fertility of seeds was observed in the third ten days of October (21.10), i.e., the fertility of seeds was 2.9 in accordance with Javokhir , Mingchinor, Langar, Yoqut-2014 varieties compared to when they were planted on October 1 (control); 2.7; 3.2; increased by 3.3%. A decrease in field germination in seeds of all durum wheat cultivars was observed with late sowing. This indicator is 5.8 in the Jawakhir variety compared to planting on October 21 in the first ten days of December; 6.1 in Mingchinor; 6.3 at anchor; It decreased by 6.4% in Yakut-2014 (Fig. 1).

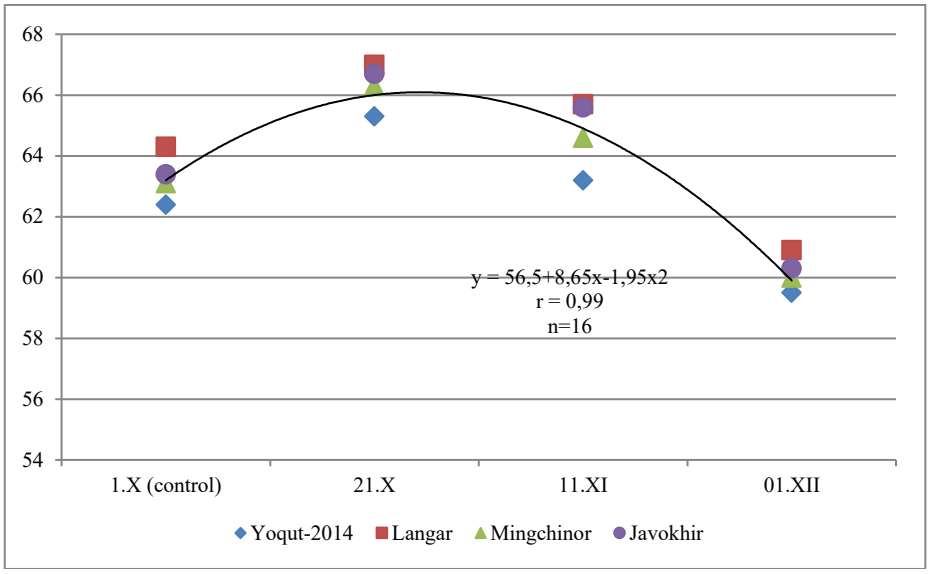

Fig. 2. Correlative dependence of seed germination of durum wheat cultivars on planting dates.

The reason for the low seed germination when planted on October 1 (control) is the relatively high temperature of the air during this period and the absence or lack of moisture in the soil, in most cases the top layer of the soil has dried up. On the contrary, when it is planted late, the germination period is extended due to the decrease in temperature. The seeds remain in the soil for a long time and are damaged by fungi and diseases. Also, the seeds from the seedlings planted in the first December period germinated in the spring.

V.G. Melkumyan [7], A. Shoimurodov [9], P. X. Bobomirzaev[1;3], P. Kh., Bobomirzaev, A. R. Rakhimov[2] researchers stated that the sowing rate affects the field fertility of seeds. For example, some authors show that the field fertility of seeds decreases with the increase of the sowing rate, while other researchers have shown that the field fertility of seeds increases with the increase of the sowing rate.

The statistical analysis of the dependence of durum wheat seed germination on sowing dates revealed that there is a relationship between the indicators with a curvilinear description, the regression equation is y = 56.5+8.65x-1.95x2 and the correlation coefficient is equal to r = 0.99 was determined (see Figure 2). It was concluded from this that regardless of durum wheat varieties, if the planting date is postponed after October 21, the field fertility of seeds decreases (Fig. 2).

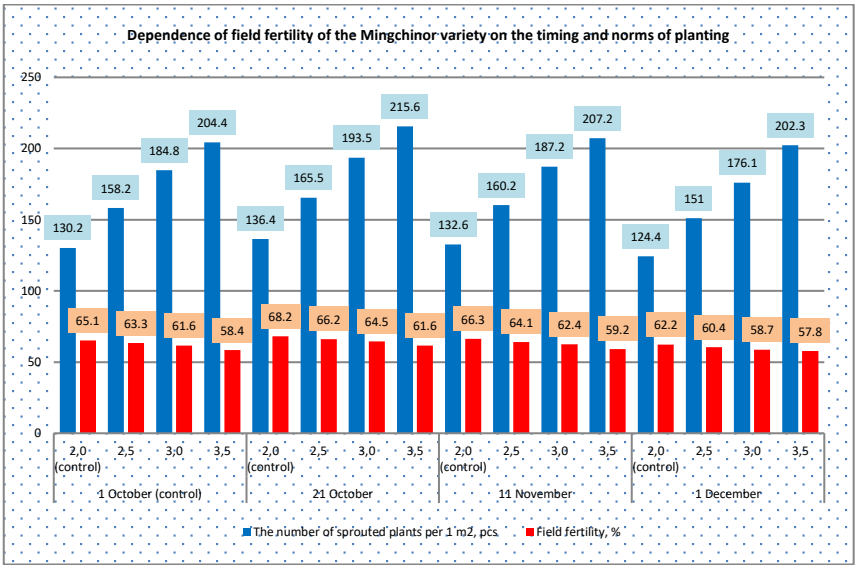

Fig. 3. Dependence of field fertility of seeds of durum wheat variety Mingchinor on sowing period and standards.

Our research shows that planting dates and rates affect grass emergence and wheat bush thickness.

When the Mingchinor variety of durum wheat was sown on October 1 (control), the seed germination in field conditions was the highest 65.1% when the sowing rate was 2.0 million fertile seeds per hectare.

Such regularity was also observed when planting on October 21, November 11 and December 1. When sowing was carried out later than the optimal dates, field germination of seeds decreased in all sowing rates. However, in the late period (December 1), when the sowing rate was increased from 2.0 million viable seeds to 3.5 million viable seeds per hectare, the difference in the Mingchinor variety was 4.4% (Fig. 3).

4 Conclusions

According to the results of the research, it can be concluded that the field fertility of durum wheat varieties depends on the time of grass formation, sowing time and norms. With the delay of the planting dates and the increase in the standards, the germination of the seeds in the field conditions decreased.

Therefore, in all cases, the formation of grasses in a short period after planting indicates increased fertility in field conditions, on the contrary, the formation of grasses late indicates a decrease in field fertility.

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