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Winter Wheat Varieties – Planting Dates And Photosynthetic Activity

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Summary: The article examines the growth and development of winter wheat varieties on typical irrigated gray soils of the Zarafshan Valley, photosynthetic activity of plants, physiological and biochemical properties in winter, winter hardiness and yield, as well as grain quality depending on the timing of planting. In the course of the study, the task was to study the possibilities of photosynthesis and the efficiency of photosynthesis in zoned varieties at different seeding rates and levels of intensification of production to increase the yield of winter wheat as the main food crop.

Photosynthesis is one of the most important processes in plants, and data on metabolism make it possible to determine the effectiveness of agricultural techniques used in the formation of crop yields. Rational use of climate, soil resources, as well as methods of agrotechnical influence ensures optimal leaf surface area. The experiments were carried out on Intensive, Unumli-bugdoy, Sanzar 8, Skifianka varieties.

When the level of photosynthetic potential in the earliest planting options (September 15) was set equal to 100%, the differences between planting periods were even more noticeable. It is noticed that the photosynthetic potential of plants planted on September 30 and October 15 is significantly higher than that of plants planted in the early period.

The cultivars differ slightly from each other in terms of photosynthetic potential based on their biological properties. The average photosynthetic potential of Sanzar-8 wheat sowing in the temperate period (October 15) is 812,6 thousand m^2/ha, the photosynthetic potential of Intensive wheat sowing is 809,0 thousand m^2/ha. The photosynthetic potential of the Skifyanka was 787,6 thousand m^2/ha, and the average photosynthetic potential of the Skifyanka was 696,3 thousand m^2/ha.

An analysis of observations showed that wheat varieties studied at different planting times had different effects on leaf index and photosynthetic potential. During temperate climates, 30 September and especially 15 October, the leaf index of the planted plants and therefore the photosynthetic potential will be high. It is noticed that in plants of early planting (September 15), these indicators are somewhat lower. In late planted plants, the number of leaves and photosynthetic potential are sharply reduced.

Key words: winter wheat, winter hardiness, sowing time, unfavorable factors, soil and climatic conditions, photosynthesis, photosynthetic potential, productivity, grain quality.

Introduction

Meeting the needs of the population in food, including bread and bakery products, will always remain a topical problem. In this connection, scientists of our republic and abroad carry out scientific research in priority directions, such as breeding for resistance to various extreme conditions, irrigation, foliar feeding, justification of sowing terms to increase grain yield in irrigated and arid conditions, and certain results have been achieved.

It is known that the life of green plants is constantly dependent on photosynthetic activity, which is characterized by the accumulation of organic matter and the release of oxygen into nature. After all, this process not only ensures the growth and development of plants, but also coordinates all the physiological processes occurring in the plant and determines the productivity. Therefore, it is advisable that all technological measures used in crop production and farming should be aimed at optimizing the photosynthetic activity of the crop field.

Literature analysis on the topic

The most urgent, important and extremely responsible measure in the agronomy of winter wheat is to sow at the optimal time. The biological nature of winter wheat does not allow planting it either too early or too late. Finally, winter wheat planted early (with the exception of Krasnodar varieties) experiences a lack of light and temperature, resulting in severely reduced growth, development and grain yield. Winter wheat planted very late germinates slowly, not even fully, does not have time to germinate. The number of productive stems decreases. As a result, grain yields are low [11].

Growth, development and maturation of winter wheat in autumn depend on planting time, method, variety characteristics, weather conditions of the year, fertilization, irrigation and predecessors. When winter wheat is planted too early, the temperature is too high and the plants grow vigorously until winter, resulting in a variety of fungal diseases and pests. If planted late, they do not have time to mature before harvesting, do not accumulate enough plastic, and in most cases the seedlings die at harvesting. Resistance of such plants to adverse environmental factors decreases, and yields decrease [8, 10, 14, 16, 17, 18].

In each irrigated area, district, farm of Uzbekistan, the optimal planting dates are determined depending on the variety, soil, its moisture and fertility, in particular, whether it is provided with microelements and organic fertilizers, weather conditions [6, 21].

According to the results of experiments carried out in Uzbekistan, the sowing period of winter wheat in irrigated lands depends on soil and climatic conditions and biological characteristics of the variety. In experiments conducted by N. Khalilov and M. Atamurodova [15] on irrigated lands of Samarkand province, the optimum period for sowing of biological winter wheat Bezostaya-1 is the first ten-day period of October, and for biological spring and dhuwarak varieties, such as Intensive, Unumly-wheat, the second ten-day period of October.

On irrigated lands of Samarkand region to obtain high yield and quality seeds from intensive type of winter wheat variety "Jasmine" it is recommended to apply mineral fertilizers at the rate of N180P135K90 kg/ha [20].

In experiments A. Roziboev, N. Mansurova [7] it was found that the field fertility of seeds decreased when sowing earlier or later than optimal time. The field fertility of seeds in the variety Zamin-1 depending on the sowing date ranged from 75.0 to 88%, and in the variety Niconia - from 70.3 to 84.0%. At late planting the germination period increases due to the decrease in soil and air temperature. Seeds remain in the soil for a long time and are damaged by fungus and other diseases.

In experiments, winter wheat seeds sown on September 15 and October 1 germinated in an average of 6-7 days. At later sowing dates (October 16, November 1), the sowing-germination period was 8-14 days [4].

If the planting date is delayed, seed germination can extend for 8-14 days. In addition, the plant turns out to be short, stunted, and the root system develops weakly [9].

If planted at a convenient, optimal time, the seeds will fully germinate, be sufficiently covered before frost and overwinter well. If planted late, seeds germinate rarely, the plant does not have time to take root before winter, lawns become wet, and winter hardiness decreases [13].

A decrease in plant height was observed when sowing was delayed. When sowing winter wheat on November 1, the period of seed germination was extended, the grasses entered the winter before they had time to take root, and some of them were damaged by winter frosts. When analyzing the crop structure, it was found that the yield in plots with seeding rate of 6.0 m/ha was formed due to the thickness of the plant stem, but not due to spike-like stems, which appeared due to clumping of plants [4].

It should be noted that since Bukhara province belongs to the southern regions, it is advisable to sow winter wheat at the rate of 200 to 250 kg per hectare, depending on the mechanical composition and fertility of soil and salinity level, rather than 150 kg/ha. Due to the full germination of seeds in plots sown in the early period, sprouts thicken and the stems become stunted. At late dates, wheat varieties sown after October 25 and in November do not fully reach the tillering phase and sprouts do not fully germinate, and depending on how they emerge from the shell, this affects the yield to a greater or lesser extent [6].

When determining the appropriate timing of sowing, it should be based on the fact that the winter wheat plant should enter the phase of budding and give 2-3 stems before the onset of permanent frost in the region. This requires 40-45 days after planting. Then wheat will be resistant to winter [11].

When sowing cereal seeds in the optimal period, the sprouts fully recover, the root of the plant develops well, settles into the soil and

is sufficiently compacted. To grow a rich harvest of winter wheat, first of all, it is necessary to achieve such a density of sprouts, which will provide a high yield in the field. In order to achieve sufficient sprouting density, high-quality planting must be done in time. One of the main factors influencing the good growth and development of winter wheat, resistance to cold and increased yield is the time of sowing seeds [12, 22].

Winter wheat planted at the right time adapts to cold evenly. In the latter stages, the process of photosynthesis is accelerated, a lot of sugar is accumulated, as a result of respiration and other physiological processes, wheat resistance to cold increases. Most importantly, the sowing of wheat is completed in the fall. Winter wheat should be sown at such a time that the period from sowing to the beginning of severe cold days should be at least 40-50 days [19].

Thus, analysis of literature data shows that the optimal sowing date of winter wheat should be determined depending on soil and climatic conditions of the region, in particular, soil fertility - its provision with organic matter and micronutrients, biological characteristics of the variety.

Research methodology

In the experiments seeds of biological autumn wheat varieties "Sanzar-8", "Skifianka", "Intensive", "Unumli wheat" were sown in 6 dates: September 15, September 30, October 15, October 30, October 30, November 15 and November 30. Sowing was carried out in November.

Variants of the experiment were placed in two layers with 4 replications. The area of each plot was 50 m2. During cultivation of wheat varieties, soil moisture was maintained at 70% relative to PDNS. Mineral fertilizer N200P140K100 kg/ha was used in the experiment. Phosphorus and potassium fertilizers were applied before plowing in full, nitrogen fertilizers were applied in two terms: early spring - at the beginning of the phase of budding and at the beginning of the phase of tuber formation.

Phenological observations and biometric measurements were carried out according to the "Methodology of State Variety Testing of Agricultural Crops" [4].

Based on the leaf surface formula S=a*b*0.67 we determined net photosynthetic productivity and photosynthetic potential according to the method of A.A. Nichyparovich [6].

Analysis of variance of the obtained data was carried out according to B.A. Dospekhov [1].

Analysis and results

It was shown that photosynthetic potential of wheat varieties varies depending on the timing of planting, stages of development and biological characteristics of the variety. Photosynthetic potential is high at relatively active stages of growth and development of wheat varieties (tuber, earing and flowering) and decreases in the phase of wax maturity. The decrease in photosynthetic potential in the phase of wax maturity of grain is associated with the yellowing, drying and falling of the lower leaves. The greatest photosynthetic potential was observed in the phases of earing and flowering varieties. The maximum and optimum photosynthetic potential for all phases of varieties was on October 15. Photosynthetic potential of plants planted earlier than this date, especially in late terms, is low. The lowest photosynthetic potential is observed in varieties planted on November 30. Photosynthetic potential of variety "Sanzar-8", planted late November 30, decreased from 3.7 to 5.3 times by phase and averaged 187.5 thousand m2/ha per day, while on October 15 this figure averaged 812, This equals 6 thousand m2/ha per day. Similar differences are observed in other varieties, i.e. photosynthetic potential of the variety Intensive by phase is 4.3 - 6.3 times, photosynthetic potential of the variety Unumli wheat - 3.5 - 4.8 times, and photosynthetic potential of the variety Skifianka was less than 4.0 - 5.9 times.

If we consider the photosynthetic potential of the earliest planting variants (15 September) as 100%, the differences between the planting dates become even more noticeable. The above data show that the photosynthetic potential of plants planted on September 30 and October 15 is significantly higher than that of plants planted early.

This increase was 43.9-88.1% in the "Intensive" wheat variety, 45.6-83.2% in the "Unumley wheat" variety, 37.5-79.2% in the "Sanzar-8" variety, and 31.2-72.8% in the "Skifianka" variety. Photosynthetic potential was very low in variants with late planting, especially in variants planted on November 15 and 30 (compared with September 15). As a result, the average photosynthetic potential was 25.2-58.6% in the variety "Sanzar-8", 24.1-59.6% in the variety "Intensive", 32.7-55.0% in the variety

"Unumli-bugdoy", and in the variety "Skifianka" it was lower by 30.1-63.1%.

Varieties slightly differ in the value of photosynthetic potential depending on their biological characteristics. Photosynthetic potential of wheat variety "Sanzar-8" planted at the appropriate time (October 15) averaged 812.6 thousand m2/ha*day, photosynthetic potential of the variety "Intensive" - 809.0 thousand m2/ha*day, "Unumly- Photosynthetic potential of the variety "Wheat" was 787.6 thousand m2/ha*day, and photosynthetic potential of the variety "Skifianka" averaged 696.3 thousand m2/ha*day.

Analysis of the above data shows that different planting dates have different effects on the leaf index and photosynthetic potential of the wheat varieties studied. Leaf index (leaf level) and, consequently, photosynthetic potential of plants planted at the appropriate dates, September 30 and especially October 15, were high. It was noted that these indices were slightly lower in plants sown early (September 15). Leaf area and photosynthetic potential of plants planted late were sharply reduced. In our opinion, such a decrease in photosynthetic potential depends on the conditions of plant maintenance during the winter period.

It was shown that the level of dry matter accumulation in the studied wheat varieties depends on the sowing period. The data collected for three years of experiments show that the amount of dry matter in the body of plants is highest at sowing on September 30 and especially on October 15.

The average dry weight of plants planted during these periods was 32.7-37.5 g/bush for the variety "Sanzar-8", 34.7-39.3 g/bush for the variety "Intensive", 30 for the variety "Fertile wheat", it was 3-35.8 g/bush and 27.9-30.0 g/bush for the variety "Skifianka". The variety "Sanzar-8" had 18.0-35.4%, the variety "Intensive" had 14.5-29.7%, and the variety "Skifianka" had 13.9-34.6% and 12.0-20.5% more.

Plants sown late (especially November 15 and 30) are characterized by the fact that the dry weight of plants is very low. It was taken into account that the average mass of plants with the sowing date of November 30 was 17.5-21.1 g/plant for all varieties. These figures were 29.7-31.8% less compared with plants planted early and 50.2-67.2% less compared with the mass of plants planted in the optimal period (October 15). Variants with the planting date of October 30 and November 15 occupied an intermediate position.

In general, for the studied wheat varieties, different planting dates have a strong influence on the accumulation of dry mass of plants. For all varieties, the highest dry mass was in plants sown on October 15 and the lowest in plants sown very late, on November 30.

The net photosynthetic productivity of plants varied in wheat varieties during the growing season. This index is somewhat higher at the tuberous and spikelet stages of plant development, and it was observed that the net photosynthetic productivity is the highest in the flowering phase. Later, until the phase of wax maturity of grains, the net photosynthetic productivity decreased significantly.

Compared with the varieties planted in the early phase (September 15), the varieties planted on September 30 and October 15 had the highest net photosynthesis productivity. The net photosynthetic productivity of Sanzar-8 plants planted September 30 and October 15 was 17.1-31.1% in the tuber phase, 18.4-34.7% in the ear phase and 15.1 in the flowering phase compared to plants planted September 15. -18.9%, 41.9-50.9% at the wax maturity phase of grain, and 19.8-30.3% on average for the growing season. Similar differences are observed in other varieties. The plants of the variety "Intensive" are similar, the net photosynthetic efficiency is 17.8-33.3% in the tuber phase, 21.9-30.9% in the ear phase, 191.1-15.6% in the flowering phase and 22% in the wax maturity phase. The yield was 19.1-35.3%, and it was higher by an average of 19.7-26.7 during the growing season. Also, the net photosynthetic productivity of the plants of the variety "Unumli wheat" in the tuber phase is 22.0-36.3%, in the ear phase - 22.1-36.9%, in the flowering phase - 14.4-18.2%, in the phase of wax maturity - 29%, 2-43,3% and on average during the growing season - 20,1-30,8%, while the net photosynthesis productivity of the "Skifianka" variety plants in the tuber phase was 2,9-36,2%, in the earing phase - 7,5-10,2%. It was higher by 19.8-26.9% in the flowering phase, by 27.7-50.8% in the wax maturity phase, and by an average of 13.1-27.8% during the growing season.

Planting was carried out on November 15 and 30. Net photosynthetic productivity of varieties was very low during the growing season. This decrease was observed in all varieties studied. The decrease in net photosynthetic productivity during the growing season averaged 5.1-9.0% in the variety "Sanzar-8", 4.4-15.9% in the variety "Intensive", 7.4-16.7% in the variety

"Unumli-bugdoy" and was equal to 6.1-15.5% in the variety "Skifianka".

Thus, it was found that wheat varieties planted on October 15 had the highest net photosynthetic productivity, while wheat varieties planted in November, especially those planted on November 30, had sharply lower net photosynthetic productivity. The differences between these planting dates are 39.3% for the variety "Sanzar-8", 42.6% for the variety "Intensive", 47.5% for the variety "Unumli-bugdoy" and 43.3% for the variety "Skifianka".

Average differences in the net photosynthetic productivity of plants are small between varieties "Sanzar-8", "Intensive" and "Unumli wheat", and compared with these varieties, it was observed that the net photosynthetic productivity of plants of variety "Skifianka" is significantly lower. In plants of the variety "Skifianka" planted at the proper time (October 15), this decrease was 17.5% compared to the variety "Sanzar-8", 15.8% compared to the variety "Intensive" and 17.3% compared to the variety "Unumli-bugdoi, for late planting date seeds (November 30), these differences were even greater, 24.2% less compared to the Sanzar-8 variety, 16.3% compared to the Intense variety, and 13.0% compared to the Unumley-bugdoy variety.

In general, based on the average data obtained for all planting dates and phases studied, the varieties can be placed in the following order: "Sanzar-8", "Intense", "Unumley wheat" and "Skifianka". Plants planted on September 30 and especially on October 15 had the highest net photosynthetic productivity, while plants planted on November 30 had the lowest net photosynthetic productivity. Plants planted in other periods occupied an intermediate position in net photosynthetic productivity.

Conclusions and suggestions

The winter hardiness of wheat varieties occurs on the basis of physiological and biochemical characteristics of grasses. In our experiments, it was found that the total amount of amino acids was relatively high in wheat varieties sown at optimal times and lower in early and especially late varieties. The total amount of amino acids increased significantly during haying due to the amino acids alanine, valine, aspartic, glutamic acids and especially proline. It was found that the amount of proline, the most important amino acid determining the level of winter hardiness of varieties, increased in mid-winter compared with autumn by 610% in variety "Sanzar-8", 594% in variety "Intensive", 550% in variety "Unumli-bugdoy" and 400% in variety "Skifianka" . As a result, a favorable environment was created for plants to emerge from the village, there were positive changes in the further growth and development of plants. Photosynthetic potential of the field was optimized, and the net photosynthetic productivity of plants increased. As a result, productivity and yield increased and grain quality improved.

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