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THE INFLUENCE OF SOWING DATES, SEEDING RATES AND PLANTING METHODS ON THE ACCUMULATION OF DRY MASS IN BUCKWHEAT CULTIVATED AS A SECOND CROP

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Abstract
This article presents data on the effect of sowing dates, seeding rates, and planting methods on the accumulation of dry mass in buckwheat cultivated as a second crop. It was observed that the dry mass per plant was higher in variants with single-row sowing across different sowing dates, ranging from 25.0 to 30.2 g/plant. Conversely, the dry mass yield per hectare was determined in variants with three-row sowing across all sowing dates, ranging from 42.6 to 50.8 q/ha. The highest accumulation of dry mass was observed in the variant sown on June 20 with a single-row method at a rate of 1 million seeds/ha. The accumulation of dry mass across development phases was as follows: 3.6 g/plant in the tillering phase, 8.9 g/plant in the panicle emergence phase, 13.2 g/plant in the flowering phase, and 30.2 g/plant in the fruit formation phase.

Keywords: Buckwheat, as a second crop, sowing date, seeding rate, planting method, dry mass, developmental phase.

INTRODUCTION

Buckwheat is one of the most important grain crops, cultivated primarily for groats used in preparing dietary foods. According to the scientific works of Professor Kh.N. Atabayeva, in addition to easily digestible proteins, fats, and

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carbohydrates, buckwheat grain contains a significant amount of mineral salts, organic acids, vitamins, and microelements. In terms of protein quality, buckwheat is not inferior to the protein of leguminous grain crops. Its protein is rich in essential amino acids such as lysine and arginine [1; 2; 4].

The composition of buckwheat groats includes approximately 9% protein, as well as citric and malic acids. Furthermore, it contains considerable amounts of vitamins B1 (thiamine), B2 (riboflavin), and P (rutin). Vitamin E, present in the seeds, contributes to the long-term preservation of the groats. Buckwheat flour is used in the production of confectionery and bakery products. Buckwheat straw, in turn, is utilized as feed for agricultural animals. According to data from Kh. Atabayeva and J. Khudaykulov, 100 kg of buckwheat straw contains 30 feed units [1; 2].

S. Urokov and other scientists [9] noted in their scientific works that in the conditions of the Zarafshan Valley, high and quality grain yields of buckwheat cultivated as a second crop were obtained on areas freed after grain crops.

According to data provided by Professor Kh.N. Atabayeva [1], buckwheat is one of the relatively early-maturing crops among grain crops, with its vegetation period lasting 80–90 days.

In research conducted by Wang Ying [11], A. Baumgertel, A. Loeber, and W. Kreis [10], the level of buckwheat product production was studied. The authors emphasized that buckwheat is a crop with not only nutritional but also medicinal significance. The study revealed that buckwheat contains a large amount of biologically active substances, such as rutin, which play an important role in strengthening blood vessels, reducing inflammation, and improving overall human health. The importance of expanding the range of buckwheat products and their use in healthy nutrition was also noted.

According to data from V.M. Vazhov [6], buckwheat grain contains valuable amino acids: lysine content is 7.9%, arginine 12.7%. Furthermore, the groat composition includes significant amounts of valuable ash elements such as potassium, calcium, iodine, and boron.

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The influence of environmental conditions on the morphological structure of buckwheat and the formation of yield and vegetative organs in the conditions of Tatarstan (Russia) was studied in the scientific works of L.R. Kadyrova. According to the researcher's data, when grown under favorable climatic conditions, the buckwheat plant develops vigorously, tillers well, and can form up to 500-00 yield elements per plant [7].

In his research, N.V. Parakhin confirms that the balance between vegetative and generative organs in buckwheat is the main biological mechanism determining productivity and emphasizes that this balance can be regulated through agrotechnical measures [8].

MATERALS AND METHODS

The experiment was conducted in 2015-2017 in the the field of experimental plot of the Tashkent State Agrarian University. The soil of the experimental field is a typical sierozem, which has been irrigated for a long time, the mechanical composition is sandy, the groundwater is located at a depth of 15-18 meters.

The experiment studied the influence of different sowing dates, seeding rates, and planting methods on the growth, development, and yield of the buckwheat variety "Илишевская" cultivated as a second crop. Buckwheat seeds were sown at three dates (early -June 20, medium- July 1, late - July 10), using three seeding rates (1 million seeds/ha, 2 million seeds/ha, and 3 million seeds/ha), and three planting methods (single-row, double-row, and triple-row).

Phenological observations and biometric measurements were conducted according to the methodological guidelines: "Методика Государственного сортоиспитания сельскохозяйственных культур", "Methods of Conducting Field Experiments", "Scientific Research Work in Plant Growing" [3], and "Методика полевого опыта" [13]. The mathematical-statistical analysis of the research results was performed using Microsoft Excel software based on the analysis of variance (ANOVA) method by B.A.Dospekhov [12, 13].

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RSEULTS AND DISCUSSION

Dry mass is the weight of biomass remaining after a plant sample has been completely dried, with no water content present. It indicates the degree of accumulation of organic substances produced during photosynthesis within the plant body. Dry mass is considered an important indicator for assessing plant growth intensity, biomass production, photosynthetic efficiency, and yield formation, and it is studied in numerous scientific research works.

Dry mass accumulation is regarded as a crucial physiological indicator that comprehensively reflects the photosynthetic activity of plants, their nutritional conditions, and the influence of agrotechnical factors. The intensity of biomass production plays a decisive role in the formation of final yield.

It is known that plant yield is directly dependent primarily on the amount of organic substances synthesized during the process of photosynthesis. These organic substances accumulate in plant tissues, forming the basis of dry matter production. Dry mass accumulation is considered one of the key physiological indicators expressing the degree of plant growth and development. With an increase in the rate of the photosynthesis process, the production of assimilates and their accumulation in vegetative and generative organs intensifies, resulting in a subsequent increase in dry mass quantity. This, in turn, positively impacts the plant's biomass production and the formation of final yield.

It has been established that under different sowing dates, seeding rates, and planting methods for cultivating buckwheat, the degree of dry mass accumulation and yield formation in plants varies from one another.

According to the results of the conducted experiments, the three-year average experimental data showed that when buckwheat seeds were sown as a second crop on June 20 at a rate of 1 million seeds/ha in single rows, a longer vegetation period led to greater accumulation of dry mass in the buckwheat crop. However, as the seeding rate increased, the amount of dry mass per plant decreased: in the variant sown with a single-row method at 1 million seeds/ha, the dry mass was 3.6 g/plant in the tillering phase, 8.9 g/plant in the panicle emergence phase, 13.2 g/plant in the flowering phase, and 30.2 g/plant in the fruit formation phase. In

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contrast, in the variants sown with double-row and triple-row methods, the dry mass decreased by 0.6-1.1 g/plant in the tillering phase, 1.4-2.6 g/plant in the panicle emergence phase, 2.1-4.0 g/plant in the flowering phase, and 4.8-9.1 g/plant in the fruit formation phase (Table 1).

For the sowing date at the medium term (July 1), it was observed that when buckwheat seeds were sown as a second crop using the single-row method at a rate of 1 million seeds/ha, a longer vegetation period resulted in greater dry mass accumulation in the buckwheat crop. However, it was found that as the seeding rate increased, the amount of dry mass per plant decreased. In the variant with single-row sowing at 1 million seeds/ha, the dry mass was 3.4 g/plant in the tillering phase, 8.3 g/plant in the panicle emergence phase, 12.5 g/plant in the flowering phase, and 28.6 g/plant in the fruit formation phase. In the variants with double-row and triple-row sowing methods, a reduction in dry mass was observed by 0.5-1.0 g/plant in the tillering phase, 1.3-2.5 g/plant in the panicle emergence phase, 2.1-3.9 g/plant in the flowering phase, and 4.8-8.9 g/plant in the fruit formation phase.

Table 1. Influence of Sowing Date, Seeding Rate, and Planting Method on Dry Mass Accumulation in Buckwheat Across Developmental Phases, g/plant. (Average 2015-2017)

№	Variants			Developmental Phases				q/ha
	Sowing date	Seeding Rate, million pieces/ha	Planting Method	the tillering	the panicle emergence	the flowering	the fruit formation	
1	June 20	1	the single-row	3,6	8,9	13,2	30,2	24,1
2		2	the double-row	3,0	7,5	11,1	25,4	40,3
3		3	the triple-row	2,5	6,3	9,2	21,1	50,8
4	July 1	1	the single-row	3,4	8,3	12,5	28,6	22,6
5		2	the double-row	2,9	7,0	10,4	23,8	37,6
6		3	the triple-row	2,4	5,8	8,6	19,7	47,2
7	July 10	1	the single-row	3,0	7,4	10,9	25,0	19,5
8		2	the double-row	2,6	6,5	9,5	21,8	33,9
9		3	the triple-row	2,2	5,3	7,8	17,9	42,6

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During the late sowing date of the experiment (July 10), it was determined that when buckwheat seeds were sown as a second crop using the single-row method at a rate of 1 million seeds/ha, the relatively longer plant development period resulted in greater accumulation of dry mass in the buckwheat crop. As observed in the earlier sowing dates, the same pattern was maintained during this period: as the seeding rate increased, the amount of dry mass per plant decreased. In the variant sown with the single-row method at 1 million seeds/ha, the dry mass was 3.0 g/plant in the tillering phase, 7.4 g/plant in the panicle emergence phase, 10.9 g/plant in the flowering phase, and 25.0 g/plant in the fruit formation phase. In contrast, in the variants sown with double-row and triple-row methods, the dry mass decreased by 0.4-0.8 g/plant in the tillering phase, 0.9-2.1 g/plant in the panicle emergence phase, 1.4-3.1 g/plant in the flowering phase, and 3.2-7.1 g/plant in the fruit formation phase.

The experimental data revealed that when accumulated dry mass was calculated per hectare, a change in patterns was observed. In the conducted experiment, when sown on June 20, the accumulated dry mass quantity was the highest: in the variant sown with the single-row method at 1 million seeds/ha, it was 24.1 q/ha; in the variant sown with the double-row method at 2 million seeds/ha, it was 40.3 q/ha; and in the variant sown with the triple-row method at 3 million seeds/ha, it was 50.8 q/ha. In the variants sown on July 1 and July 10, these dry mass indicators decreased, but an increase in dry mass quantity was observed with higher seeding rates, i.e., due to an increase in the number of plants per unit area.

CONCLUSION

Based on the results of the conducted experiments, it was observed that the dry mass per plant was higher in treatments sown with the single-row method at a rate of 1 million seeds/ha across different sowing dates, ranging from 25.0 to 30.2 g/plant. In contrast, the dry mass per hectare was determined to be highest in treatments sown with the triple-row method at a rate of 3 million seeds/ha across all sowing dates, ranging from 42.6 to 50.8 q/ha.

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