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Biometric Indicators of Chickpea Varieties

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Abstract. The article analyzes the dependence of the biometric indicators of chickpea plants on sowing dates. Naturally, the timing of sowing significantly affects the duration of the vegetation period, the accumulation of heat during this period, light regime, soil moisture availability, and the formation of generative organs. Therefore, the sowing date is highly correlated with all biometric indicators, including plant height, number of pods, number of seeds per pod, and overall yield.

Keywords: Chickpea, sowing date, plant height, number of pods, number of seeds, yield.

Introduction. In global agriculture, the cultivated area of chickpea is steadily increasing. Currently, it is grown on approximately 13–14 million hectares and ranks third among leguminous crops. A number of researchers emphasize the sensitivity of chickpea to various agronomic practices, such as sowing dates, seeding rates, doses of mineral fertilizers, application of microfertilizers, as well as the use of biopreparations for seeds and during the plant growing season [1, pp. 14–15; 2, pp. 59–63; 3, p. 52].

The correct selection of sowing dates directly affects the vegetative and generative development of plants. Determining the relationship between the climatic conditions of each region and sowing dates is considered one of the effective ways to increase yield.

Studying the influence of sowing dates on the development and yield indicators of varieties is one of the актуal topics in agriculture. Identifying the effects of different sowing periods on plant vegetation and yield characteristics contributes to increasing productivity under existing climatic conditions.

Investigating the expression of economically valuable traits and the relationships between them is of great importance for introducing a variety into production. In particular, such important

characteristics as plant height and the height of the lowest pods determine the suitability of a variety for mechanized harvesting.

Varieties of Lugansk selection with medium-sized grains are distinguished by their plant height. The height of plants in the varieties Smachny, Ornament, and Dobrobut ranges from 61 to 65 cm, while red-seeded varieties have a height of 58–59 cm. The shortest plants were observed in the Iordan variety (44 cm) and Budjak variety (48 cm) [5, pp. 27–30; 6, pp. 10–13].

Changes in plant height depending on sowing dates have been noted in a number of studies. According to the research of A. Ali et al. [7, pp. 35–42], under early sowing conditions, the plant's growth period is extended, allowing greater biomass accumulation under optimal conditions. In this process, the interaction of temperature, light, and moisture plays a decisive role.

The height of the lowest pods above ground (HLPG) mainly depends on the formation and growth process of pods, and several studies have examined its relationship with sowing dates. M. Sharif and M. Ahmad [10, pp. 178–186] determined that sowing time directly affects biometric indicators, including HLPG. As they noted, optimal sowing time and air temperature are essential for the proper formation of the height of the lowest pods above ground.

The number of pods and seeds formed per plant are highly sensitive indicators to sowing dates. In a study conducted by R. Lal and B. Kang [8, pp. 120–136], it was noted that by adjusting sowing dates, it is possible to ensure full seed formation and increase yield. They also observed that under delayed sowing conditions, the number of pods and seeds decreases.

N. Rajput and K. Singh [9, pp. 89–98] studied the impact of climate change on the effectiveness of sowing dates. They showed that rising temperatures negatively affect the developmental phases of leguminous crops depending on sowing time. In particular, late sowing leads to a shortened development period, resulting in reduced pod formation and lower grain yield.

Materials and Methods. Field experiments were carried out during 2022–2024 on irrigated typical gray soils of the "Elita Seed Production Farm" located in the Payariq district of Samarkand region. In the field trials, chickpea varieties Yulduz, Uzbekistanskiy-32, Milyutinskiy-6, and Umid were used as the main crops. Sowing was performed manually using a template, with 70 cm row spacing and 5 cm spacing between seeds.

In the research work, the establishment of experiments, biometric measurements, phenological observations, and physiological analyses were conducted based on the guidelines of "Methodology of State Variety Testing of Agricultural Crops", "Methods of Conducting Field Experiments", and "Scientific Research Methods in Crop Science." The average number of nodules per plant (pcs) and their mass (g) were determined at the end of the growing season using the method of G. S. Posipanov [4, p. 300]. Yield structure was analyzed according to the method of A. N. Maysuryan, and statistical analysis of the data was performed using Microsoft Excel based on B. A. Dospekhov's methodology "Methodology of Field Experiment."

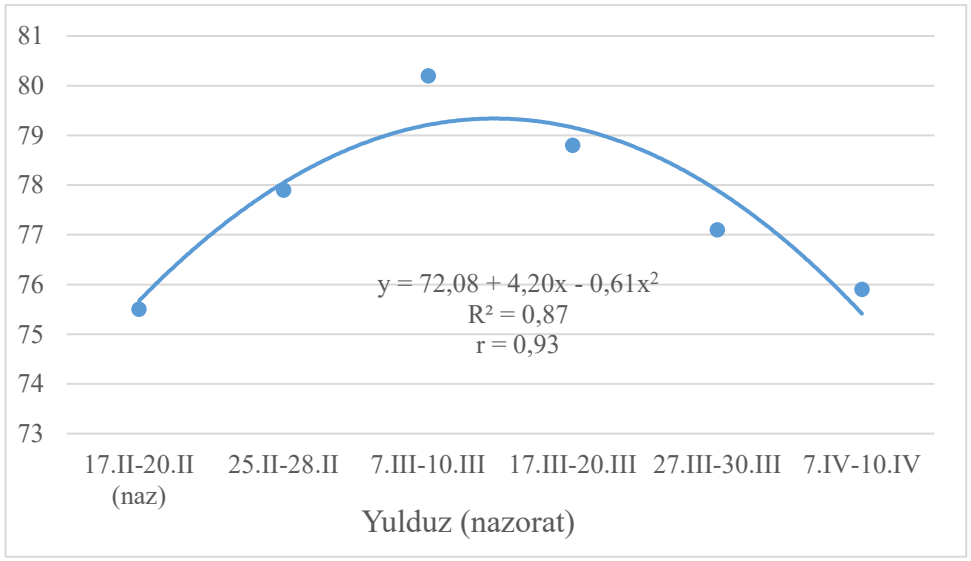
Results and Discussion. The results obtained from experiments conducted on irrigated typical gray soils of the Samarkand region showed that the biometric indicators of chickpea varieties significantly vary depending on sowing dates. It was observed that with delayed sowing, the plant height decreased. In early sowing periods, particularly in the variants sown on February 17 and 20, higher plant height was recorded. For example, the Milyutinskiy-6 variety reached 70.5 cm under early sowing conditions (17–20 Feb), while under late sowing (7–10 Apr) it was 64.0 cm. Similarly, in the Umid variety, plant height was 73.9 cm (17–20 Feb) and 73.2 cm (7–10 Apr). This can be explained by the influence of climatic factors, especially temperature and light during the growing period. In Yulduz (control) and Uzbekistanskiy-32 varieties, although plant height under delayed sowing was higher than in early sowing, it was still lower than under optimal sowing periods.

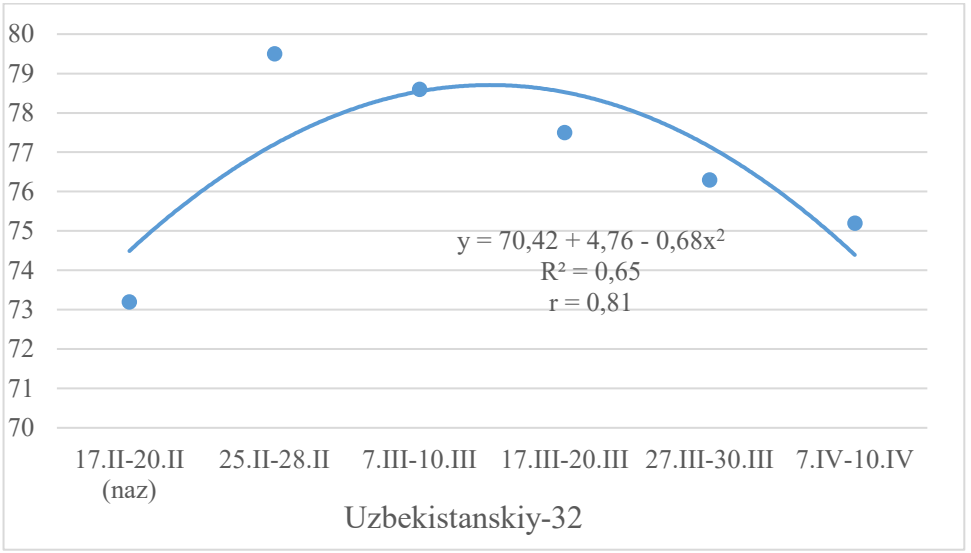
Correlation-regression analysis of the dependence of plant biometric indicators on sowing dates revealed significant results. Naturally, sowing time sharply affects the duration of the vegetation period, heat accumulation, light regime, soil moisture availability, and the formation of generative organs. Therefore, it is expected that sowing time has a strong correlation with all biometric indicators.

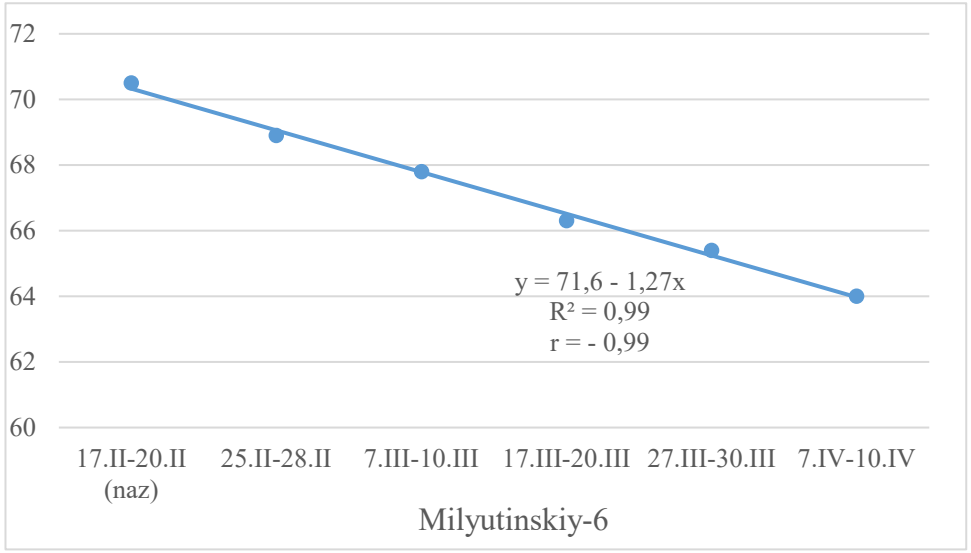
The relationship between plant height at maturity and sowing time was found to be inversely linear in the Milyutinskiy-6 variety ($r = –0.99$), while in other varieties it followed a parabolic pattern: Yulduz (control) ($r = 0.93$), Uzbekistanskiy-32 ($r = 0.87$), and Umid ($r = 0.82$). This indicates that in Milyutinskiy-6, plant height decreases as sowing is delayed, whereas in other varieties, both early and late sowing result in lower plant height (Picture. 1).

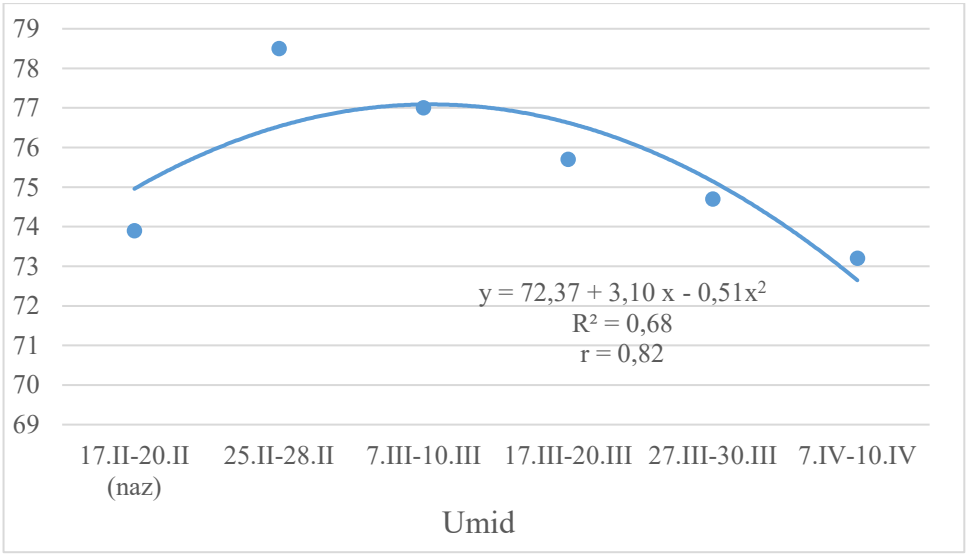
Statistical analysis of the dependence of the height of the lowest pods above ground (HLPG) on sowing dates showed that in all varieties, delayed sowing leads to a decrease in HLPG. The relationship was inverse and linear, with negative correlation coefficients ($r = –0.93$ to $–0.97$) (Picture. 2).

The dependence of the number of pods and seeds per plant on sowing dates followed a parabolic trend. It was statistically confirmed that both early and especially late sowing resulted in lower values. In all varieties, the correlation coefficient was found to be significant ($r > 0.7$) (Pictures. 3 and 4).

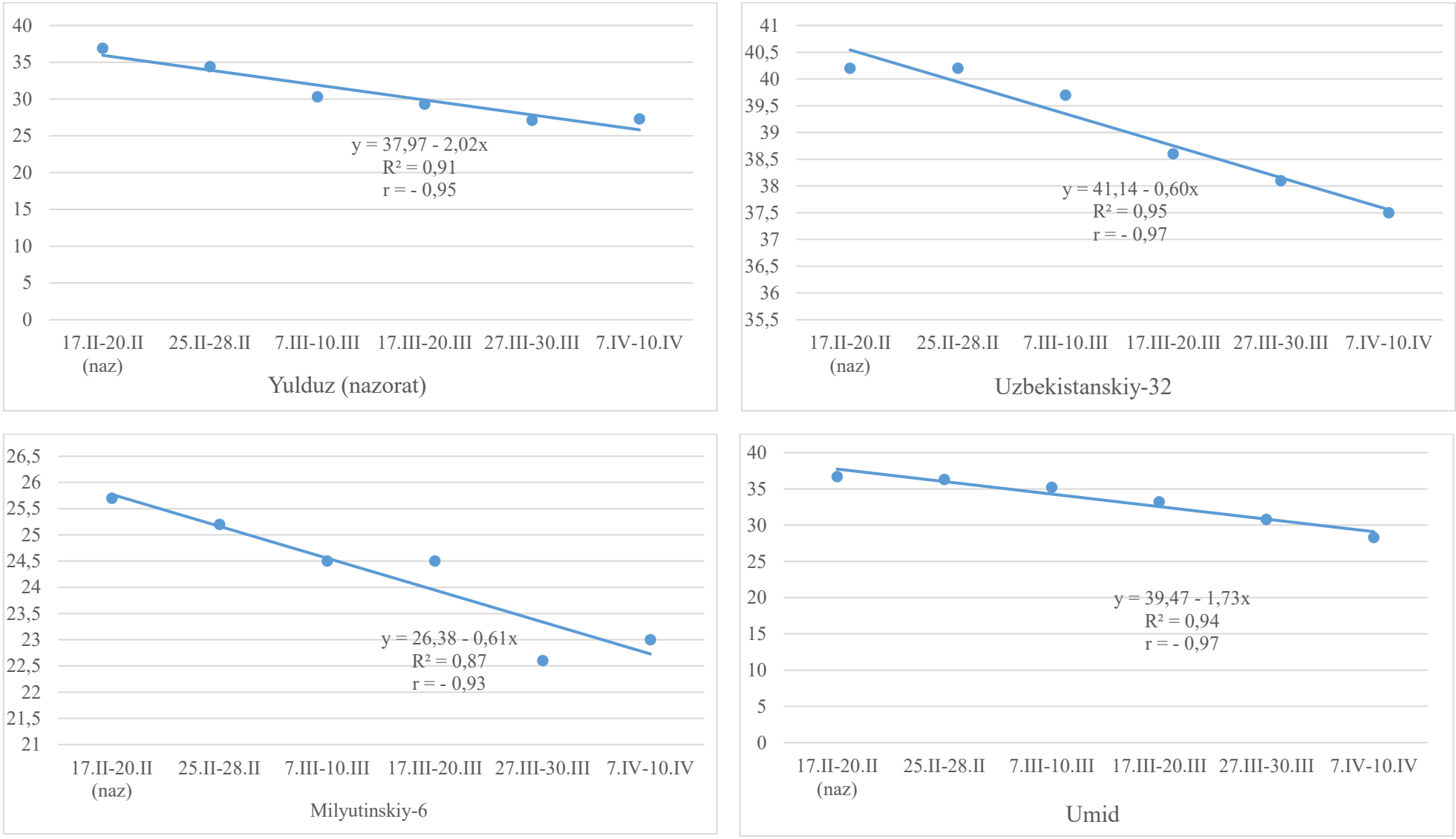




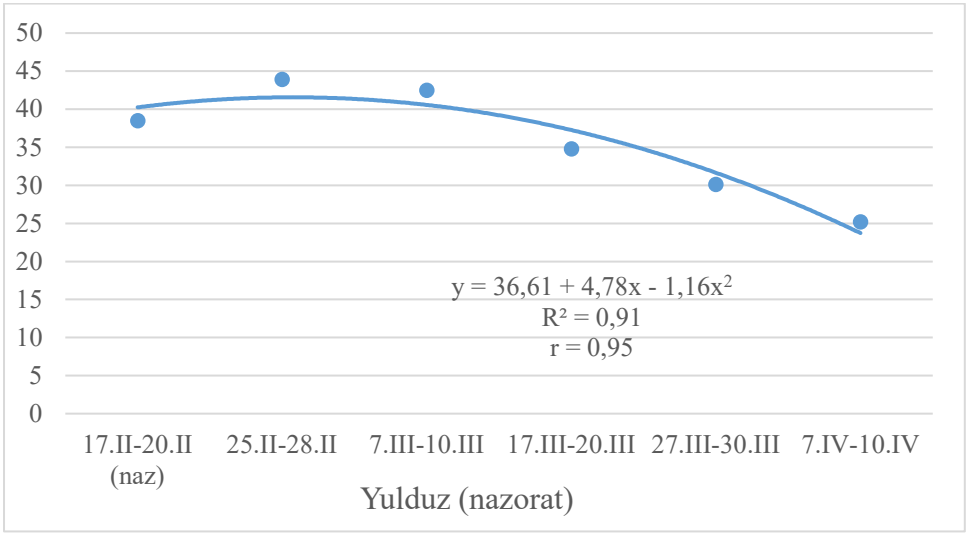


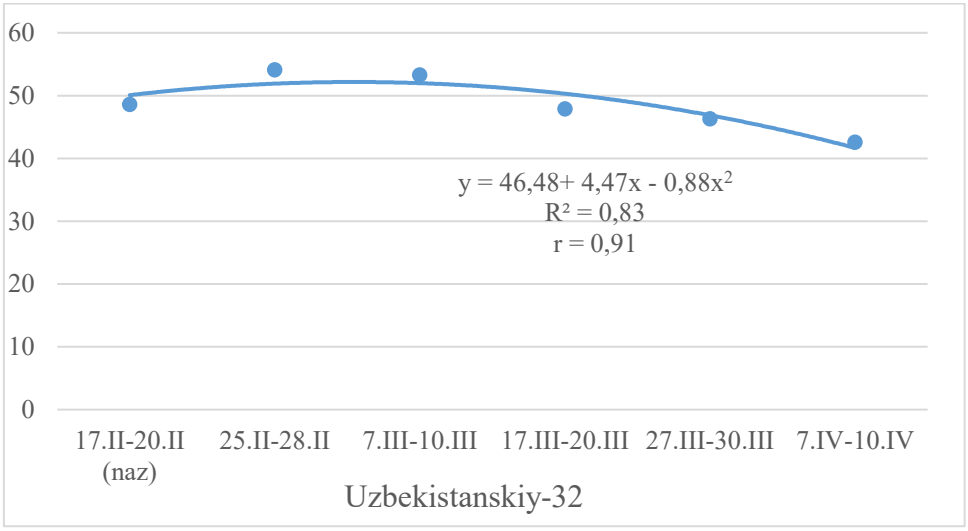


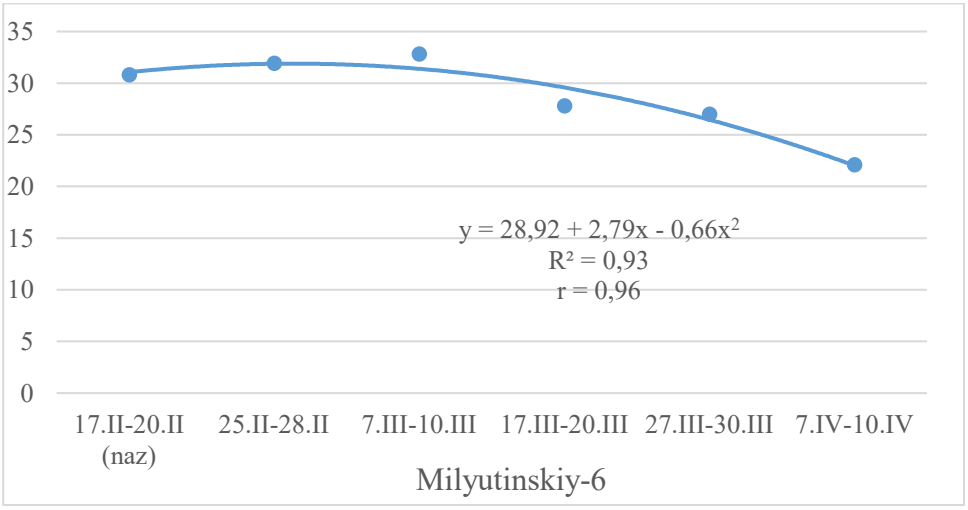
Picture 1. Dependence of the height of pea varieties on planting dates (2022-2024)

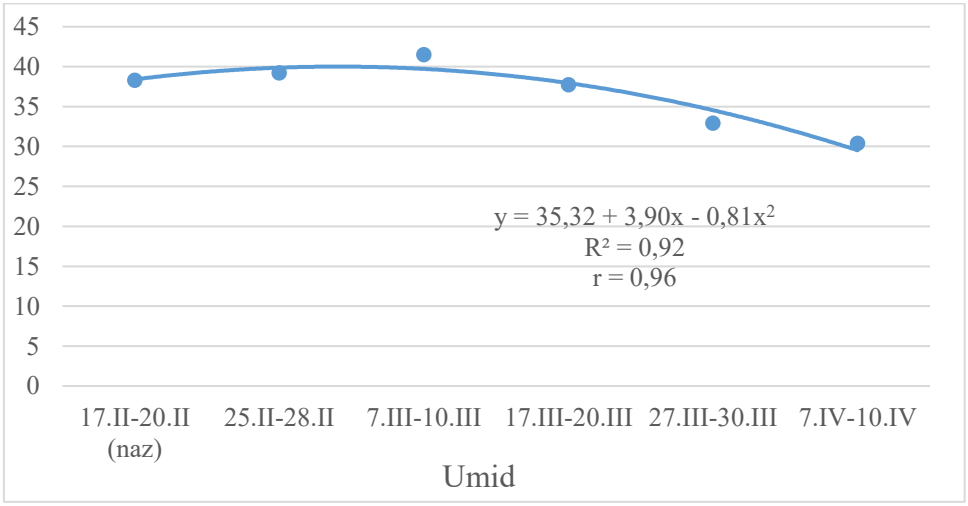


Picture 2. Dependence of ODEB of pea varieties on planting dates (2022-2024)

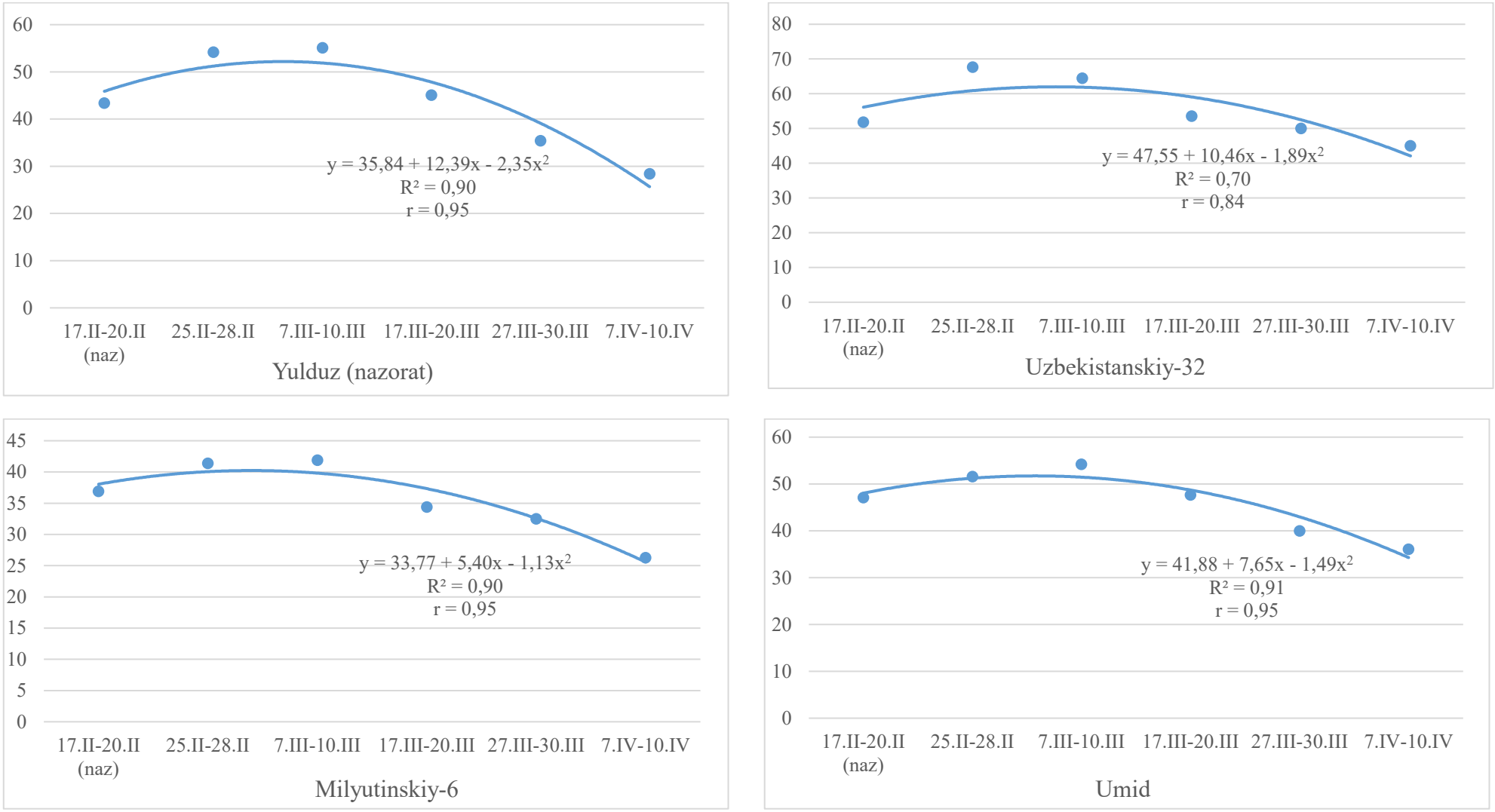








Picture 3. Dependence of the number of pods per plant on planting dates (2022-2024)



Picture 4. Dependence of the number of grains per plant on sowing dates (2022-2024)

It was determined that the height of the lowest pods above ground (HLPG) was significantly higher when the seeds of the studied varieties were sown early. For example, in the Yulduz (control) variety, HLPG was 36.9 cm under early sowing (17–20 Feb), whereas under late sowing (7–10 Apr) it decreased to 27.3 cm. In the Uzbekistanskiy-32 variety, the corresponding values were 40.2 cm (17–20 Feb) and 37.5 cm (7–10 Apr).

Sowing dates had a significant effect on the number of pods formed per plant. It was observed that delayed sowing led to a decrease in pod number. For instance, in the Yulduz (control) variety, the number of pods was 38.5 under early sowing (17–20 Feb) and decreased to 25.2 under late sowing (7–10 Apr). In the Uzbekistanskiy-32 variety, the values were 48.6 and 42.6, respectively.

The number of seeds per plant also varied depending on sowing dates. In the Yulduz (control) variety, it was 43.4 seeds under early sowing (17–20 Feb) and decreased to 28.4 seeds under late sowing (7–10 Apr). In the Uzbekistanskiy-32 variety, the corresponding values were 51.8 and 45.0 seeds.

Conclusion. In conclusion, early sowing dates—particularly when seeds are sown between February 17 and 20—ensure higher results across all biometric indicators of the varieties. Delayed sowing (late March and April) leads to reduced vegetative development and a significant decrease in the number of pods and seeds.

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