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**RESULTS OF SELECTIONS CONDUCTED IN SEEDLING NURSERIES FOR INITIAL
PROGENY TESTING IN PRIMARY CHICKPEA SEED PRODUCTION**

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Annotation: The article presents information on the creation and practical implementation of the cultivation of high-yielding chickpea varieties in irrigated soil and climatic conditions by organizing a system of primary seed production of local chickpea varieties Zumrad, Palvon and newly created varieties Marzhon, Ak-don, included in the State Register.

Key words: Plant, stem, height, pea, variety, seed, pod, flower, pod, grain, 1000 grain weight, yield, variety, selections.

Introduction

Chickpea is considered one of the important crops under the conditions of Uzbekistan and plays a significant role as a source of food security and plant-based protein. Primary seed production is a crucial stage in the development of high-yielding, disease-resistant, and drought-tolerant varieties. Seedling nurseries for first-year progeny testing represent the initial phase of the selection process, where individual selection, evaluation of morphological traits, and identification of superior lines are carried out.

Chickpea seeds are a valuable source of energy and plant-based protein, containing beneficial vitamins, proteins, minerals, and dietary fiber. Chickpea protein has one of the most balanced amino acid compositions, and its carbohydrate content is several times higher than that of soybean flour, making it a more affordable alternative to animal protein [5]. Unlike many other legumes, chickpea seeds contain almost no anti-nutritional components, and in terms of essential amino acids—methionine and tryptophan—they surpass all other leguminous crops [6, p. 20].

The ability of chickpea plants to form a symbiotic relationship with nodule-forming bacteria is of great importance for adaptive farming systems that increasingly emphasize the use of natural, biological, and environmentally friendly processes in agriculture. Expanding the cultivation of grain legumes contributes to improving soil fertility and supporting balanced production of green fodder [7]. It has been noted that incorporating green biomass and chickpea seeds into the diet of livestock improves feed quality and reduces the likelihood of animals becoming ill and speeds up their recovery.

Chickpea seeds are incorporated into feed either as flour, crushed, or in an unprocessed form. One hundred kilograms of chickpea grain provide 122 feed units and 19 kg of digestible protein [8, p. 125]. A comparative nutritional assessment of pea and chickpea forage varieties showed that chickpea contains a higher amount of protein, whereas peas contain more fat. In addition, the concentrations of calcium and phosphorus in chickpea were 0.1% higher, while fiber and sugar contents were 1.4% and 0.8% higher, respectively. The amount of starchy substances in chickpea exceeded that of peas by 3.8% [9]. When chickpea green biomass is used as feed during the grain formation and filling stages, animals gain 130–200 g of weight per day, as this feed is nutritionally comparable to concentrated feed [10].

In studies of the physiological indicators of drought tolerance in chickpea, it was determined that the levels of water, ascorbic acid, and proline—both before and after flowering—were significantly higher in drought-tolerant samples. These parameters, along with relatively low



water loss and better membrane permeability, were found to be inherited traits in drought-tolerant chickpea genotypes [13]. An important factor is the ability of chickpea to halt its development during severe drought and then resume growth and produce a good yield once favorable conditions return [11].

N.I. Vavilov [12] noted in his works that chickpea appears to have been deliberately developed for semi-arid conditions. However, in the mid and late seasons, high-yielding chickpea varieties do not fully realize their potential, which leads to a significant decrease in both productivity and seed quality [14]. Early-maturing chickpea plants can escape severe drought and heat stress, making early-maturing genetic material particularly important for chickpea improvement.

Materials and Methods

In 2025, at the Grain and Legume Crops Research Institute, first-year progeny testing nurseries were established to scientifically organize the primary seed production system for chickpea varieties included in the State Register for cultivation in our country, including local varieties Zumrad and Polvon, as well as institute-developed varieties Marjon and Oq-don. Scientific experiments were conducted to multiply chickpea seeds within this framework.

For this purpose, during the summer of 2024, 250 elite plants were carefully selected from the chickpea varieties Zumrad, Polvon, Marjon, and Oq-don, grown at the Institute's Central Experimental Farm in the ecological variety testing demonstration nursery. These plants fully expressed the varietal characteristics. Seeds from each selected plant were then individually placed into separate small bags for further study and multiplication.

On February 17–18, 2025, at the Central Experimental Farm of the Grain and Legume Crops Research Institute, pre-prepared seeds of the chickpea varieties were sown manually using hand-held dibblers. Each progeny's seeds were planted in a 2.4 m² area according to a 60 cm × 5 cm × 1-row spacing scheme at a depth of 4–5 cm. This established the first-year progeny testing nurseries, which represent the initial stage of the primary seed production system for chickpea.

During the growing season of chickpea plants, phenological observations were conducted on designated plants of each variety to fully monitor and record the stages of growth and development, including full emergence, full flowering, full podding, and full maturation. All agronomic practices in the progeny testing nurseries intended for seed production were carefully implemented, with particular attention paid to protection from weeds and especially from insect pests.

Results

In seed production, the main requirement for obtaining varietal seeds is to ensure the varietal identity and purity of new varieties, starting from the study of their progeny. To achieve this, selections were carried out several times for each variety at different stages of growth, based on morphological traits characteristic of each variety.

In our experiments, to maintain the varietal purity of the chickpea varieties under cultivation, selections to ensure varietal identity and purity were performed three times during the growing season for all chickpea varieties.

To ensure varietal purity, the first selection in chickpea varieties was carried out during the tillering–stem elongation stage. At this stage, selections were based on the growth and development of the tillers in each variety.

The second selection in the seedling nurseries was conducted during the flowering–podding stage, where plants were evaluated based on traits such as flower color and pod shape. Plants that were heavily damaged by pests or lagging in development were removed, and selection continued to maintain varietal purity.



The third selection was conducted as the chickpea plants entered the maturation stage. At this stage, selections were based on indicators such as the natural yellowing and shedding of leaves, the varietal coloration of hairs on stems and pods, and the full varietal expression of seeds in the pods (including shape, seed coat color, size, etc.). These traits allowed for the clear identification and removal of off-type plants in the seedling nurseries, ensuring the maintenance of varietal purity.

As a result of the first selection for varietal purity, 15 progenies from the “Zumrad” variety, 19 progenies each from the “Polvon” and “Oq-don” varieties, and 21 progenies from the “Marjon” variety exhibiting off-type traits, disease symptoms, insect damage, or stunted growth were discarded. The remaining progenies were retained for further cultivation: 235 from “Zumrad,” 231 from “Polvon” and “Oq-don,” and 229 from “Marjon.” It was also noted that the lowest number of discarded progenies during the first selection was observed in the “Zumrad” variety, where 15 progenies were removed. Consequently, the number of pure progenies that passed the first selection for this variety amounted to 235.

Table 1.

Results of selections conducted in first-year progeny testing nurseries for primary chickpea seed production. 2025

№	Variety Name	Total Number of Progenies	Number of Progenies Discarded During Selection			Total	Families Passing Selection	
			I	II	III		number	%
First-Year Progeny Testing Nursery, 2023								
1	Zumrad	250	15	18	19	52	198	79,2
2	Polvon	250	19	21	23	63	187	74,8
3	Oq-don	250	19	17	18	54	196	78,4
4	Marjon	250	21	19	25	65	185	74,0

The second selection for varietal purity in chickpea progenies was carried out during the flowering–podding stage. As shown in Table 1, 21 progenies from the “Polvon” variety, 19 from “Marjon,” 18 from “Zumrad,” and 17 from “Oq-don” were discarded. The number of progenies that passed the selection and continued to be cultivated amounted to 214 for “Oq-don,” 217 for “Zumrad,” and 210 each for “Marjon” and “Polvon.”

The third selection for varietal purity in chickpea varieties was conducted during the maturation stage. At this stage, selections were based on indicators such as natural yellowing and shedding of leaves, varietal coloration of hairs on stems and pods, and full varietal expression of seeds in the pods (including shape, seed coat color, size, etc.). These traits allowed for clear identification and removal of off-type plants in the seedling nurseries, ensuring the maintenance of varietal purity.

As a result of the third selection, 18 progenies from the “Oq-don” variety and 19 from “Zumrad” were discarded, leaving 196 and 198 pure progenies, respectively. From the “Polvon” and “Marjon” varieties, 23 and 25 progenies were discarded, resulting in 187 and 185 progenies passing the selection, respectively.

Based on the final results of selections conducted in the first-year progeny testing nurseries, 52 progenies from the “Zumrad” variety, 54 from “Oq-don,” 63 from “Polvon,” and 65 from “Marjon” were discarded.

The number of pure progenies that passed the final selections in the first-year progeny testing nurseries was as follows: 198 (79.2%) for the early-maturing “Zumrad” variety, 196 (78.4%) for “Oq-don,” 187 (74.8%) for “Polvon,” and 185 (74.0%) for “Marjon.”



Progenies selected from the first-year progeny testing nurseries were superior in terms of varietal yield performance. Consequently, in the same year, the progeny seeds of the “Zumrad,” “Oq-don,” “Polvon,” and “Marjon” varieties were prepared for the second-year family testing nurseries for the following year’s planting.

To gradually expand chickpea cultivation areas in our country and increase the volume of chickpea seed production, it is essential to select varieties that are well-adapted to the soil and climatic conditions of each region and to pay attention to the biological characteristics of the varieties. Specifically, it is important to correctly allocate early-, mid-, and late-maturing varieties, and to strictly adhere to the appropriate sowing dates and seeding rates.

At the same time, strict adherence to the prescribed cultivation agrotechnology in the fields sown for seed production is required. This includes removing off-type varieties and other species to ensure pure varietal seeds, properly fertilizing the chickpea plants with mineral nutrients, and correctly organizing the irrigation process to achieve high-quality seed production.

In organizing chickpea seed production, it is first and foremost important to use high-yielding varieties, study their biological characteristics, and manage them appropriately to achieve positive results.

Any good variety will retain its hereditary traits only if it is sown from high-quality, pure seeds and if all agronomic practices are correctly followed during the seed multiplication process, ensuring that the plants remain free from diseases and pests.

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