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THE INFLUENCE OF FEEDING AREA ON THE GROWTH, DEVELOPMENT, AND YIELD OF COWPEA (VIGNA CATJANG) UNDER THE CONDITIONS OF THE TASHKENT REGION

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Relevance of the Research

Under the modern conditions of agricultural development in the Republic of Uzbekistan, particular importance is attached to expanding the production of high-protein crops capable of ensuring national food security while simultaneously preserving soil fertility. Among such crops, a significant place is occupied by cowpea (*Vigna catjang*), which is distinguished by its high nutritional value, drought tolerance, capacity for biological fixation of atmospheric nitrogen, and adaptability to adverse soil and climatic conditions. In the context of an increasing scarcity of irrigation water and the necessity for the rational utilization of land resources, cowpea cultivation is emerging as one of the promising directions for the diversification of crop production.

Despite the significant potential of this crop, the yield of cowpea under commercial production conditions in Uzbekistan remains insufficiently high due to the imperfection of certain elements of cultivation technology. One of the most critical factors in yield formation is the plant feeding area, which determines the degree of availability of moisture, mineral nutrients, and solar radiation. Optimizing plant density allows for the creation of the most favorable conditions for the growth and development of the crop, enhances the efficiency of natural resource utilization, and ensures stable, high-quality yields.

Although scientific literature contains data regarding the influence of feeding area on the productivity of various species within the *Vigna* genus, research on *Vigna catjang* under the conditions of typical serozems (gray soils) in the Tashkent region is practically non-existent. This underscores the scientific and practical significance of the conducted work.

Purpose of the Research

The purpose of the research was a comprehensive evaluation of the influence of various feeding areas on the growth, development, formation of yield structure elements, and productivity of *Vigna catjang* in order to improve its cultivation technology under the irrigated conditions of the Tashkent region.

To achieve this goal, the following objectives were addressed:

- To study field germination and plant survival rates under various sowing patterns;
- To investigate the characteristics of the progression of cowpea phenological development phases;
- To determine the dynamics of leaf surface area formation and the photosynthetic activity of the crops;
- To study the influence of the feeding area on the elements of the yield structure;
- To evaluate the yield and economic efficiency of various plant placement options.

Methods of the Research

The research was conducted during the 2025–2026 period at the experimental plots of the Tashkent State Agrarian University, located on typical serozem soils. Field experiments were laid out using the randomized block method in a fourfold replication. Various sowing patterns, differing in plant feeding area and calculated plant density, were studied.

During the research process, phenological observations, biometric measurements, determination of leaf surface area, analysis of yield structure elements, and calculations of the economic efficiency of the studied agrotechnical practices were carried out. Assessments and observations were performed in accordance with generally accepted methodologies for field experimentation and crop production.

The soils of the experimental plot were characterized by low humus content and essential nutrients, which allowed for an objective evaluation of the influence of the feeding area on plant productivity under conditions close to commercial production. The research was conducted over years with differing weather conditions, ensuring high reliability of the obtained results.

Перевёл эту часть текста на академический английский язык (Academic English), строго соблюдая научную терминологию и структуру. Таблица оформлена в удобном и чистом виде.

Main Research Results

Conducted studies demonstrated that the feeding area exerts a significant influence on the growth and development of Catjang cowpea (*Vigna unguiculata* subsp. *cylindrica*) plants throughout the entire vegetative period.

It was established that an increase in the feeding area creates more favorable conditions for the development of the root system, as well as for the improvement of the water and nutrient regimes of the plants. This contributes to an increase in field germination and plant survival rate by the time of harvest. At the optimal plant density, a more intensive progression of phenological phases and better development of the aboveground plant biomass were observed.

An important indicator of productivity was the photosynthetic activity of the crops. Plants grown with an optimal feeding area formed a more robust leaf apparatus, which ensured the efficient utilization of solar energy and the accumulation of organic matter. The improvement in photosynthetic activity promoted enhanced plant growth and the formation of a high yield.

Studies on the yield structure showed that increasing the feeding area to an optimal level had a positive effect on the number of pods per plant, the number of seeds per pod, and the 1000-seed weight. Conversely, excessive overcrowding of crops intensified intraspecific competition among plants for moisture, light, and nutrients, which led to a decrease in the productivity of individual plants and a reduction in overall yield.

The influence of the feeding area on the symbiotic activity of nodule bacteria was of particular importance. In variants with optimal plant placement, a more intensive formation of nodules on the roots was noted, which contributed to an increase in the level of biological nitrogen fixation and improved nitrogen nutrition for the plants.

Yield analysis indicated that optimal sowing schemes ensured the fullest realization of the crop's biological potential. The yield increased significantly compared to the overcrowded variants due to the improvement of all yield structure components and an increase in the efficiency of the crops' photosynthetic activity.

The economic evaluation of the research results demonstrated that applying an optimal feeding area ensures not only an increase in yield but also a rise in production profitability. Additional profit is generated through yield growth, improvement of product quality, and a more rational utilization of production resources.

Influence of feeding area on the growth and development of Catjang cowpea plants

Sowing Scheme, cm	Feeding Area, cm²	Plant Height, cm	Leaf Area, thousand m²/ha	Number of Nodules, pcs./plant
60 × 5	300	62.4	24.1	47
60 × 10	600	69.8	28.6	61
60 × 15	900	74.3	31.2	78
60 × 20	1200	76.9	32.8	86
70 × 20	1400	75.5	31.9	82

Conclusions

1. The feeding area is one of the most critical agrotechnical factors determining the growth, development, and productivity of Catjang cowpea under the irrigated farming conditions of the Tashkent region.
2. Optimization of plant density promotes improved nutrient conditions, water availability, and illumination of crops, which positively affects the biometric indicators of the culture.
3. A rational feeding area ensures the formation of a more developed leaf surface, an increase in photosynthetic activity, and the enhancement of symbiotic atmospheric nitrogen fixation.
4. The improvement of growth conditions contributes to an increase in the number of pods per plant, the number of seeds per pod, and the 1000-seed weight, leading to a higher crop yield.
5. The use of optimal sowing schemes allows for an increase in the economic efficiency of Catjang cowpea cultivation and can be recommended for wide implementation in the farms of Uzbekistan.