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NUTRITIONAL AND MEDICINAL VALUE OF CHICKPEA GRAIN

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ABSTRACT

This study investigates the effect of sowing dates on the protein, oil, non-nitrogenous extractive substances, and maturation levels in chickpea grains grown under slightly saline soil conditions. The findings indicate the impact of sowing time on the chemical composition of chickpea, including its nutritional and medicinal properties.

KEYWORDS

Chickpea, sowing date, varieties, grain, protein, oil, maturation level, "FLIP98-140c-(GulDU-ToshDAU)," "FLIP98-183c-(Halima)," "FLIP98-152c," "FLIP98-116c-(MirOz)," "Uzbekistan-32.".

INTRODUCTION

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In the context of ensuring sufficient agricultural production to meet the needs of the population, it is necessary to further deepen agricultural reforms and create an effective system of measures aimed at ensuring food security. One of the key tasks is the increase in leguminous grain crops, particularly those rich in proteins.

Chickpea, as one of the most valuable crops, contributes not only to solving protein issues but also to increasing grain production, maintaining and improving soil fertility, and ensuring the production of environmentally friendly products. It accumulates significant amounts of organic matter in the soil, improves nitrogen balance, converts difficultly soluble phosphates into plant-available forms, and enhances the soil's water-physical properties. Chickpea residues decompose more quickly compared to cereal residues, effectively protecting the soil from wind and water erosion and ensuring additional protein production [3; 11; 12; 17].

The human daily intake of protein should average 90-100 grams, which constitutes approximately 12% of the total caloric intake [6]. Chickpeas are among the most valuable legumes in terms of their nutritional content, containing over 80 elements beneficial for the human body, including proteins, fats, and vitamins.

Chickpeas stand out among all legumes due to their high nutritional value and richness in vitamins and other biologically valuable substances. The grains contain more than 80 elements beneficial to the human body.

Due to their high nutritional content, chickpeas are in high demand for food and feed purposes. Chickpea grains contain 25-30% protein, 4-7% oil, 47-60% non-nitrogenous extractive substances, 2.4-12.8% cellulose, 4.0% ash, phosphorus, potassium, and various vitamins: A (carotene), E, C, PP, and B vitamins (B1 thiamine, B2 riboflavin, B4 choline, B6 pyridoxine), as well as more than 10 beneficial microelements (iron - 2.6 mg, zinc - 2.9 mg, iodine - 3.4 mg, copper - 0.7 mg, manganese - 2.1 mg, selenium - 28.5 mg, molybdenum - 60.2 mg, boron - 0.5 mg, silicon - 92 mg, cobalt - 95 mg). This composition helps prevent anemia and, in terms of energy and satiety, makes chickpeas comparable to livestock meat [3; 7].

M.I. Smirnova-Ikonnikova points out that chickpea grains contain essential amino acids such as arginine (9.5–12.5%), histidine (1.6–3.1%), lysine (2.2–6.1%), methionine (1.6–2.2%), tyrosine (1.5–2.9%), tryptophan (0.8–1.1%), cysteine (0.7–0.8%), with the main part of the protein being in the form of globulin. The fats in chickpea grains are mainly semi-drying, and they contain up to 2% phosphatides (lecithin), which enhance food properties.

When chickpea grains are added to mixed feed, their digestibility improves. The stems and leaves are rich in oxalic and malic acids. The straw is unsuitable for cattle but serves as a good feed for sheep. In sheep farming, young lambs up to six months old are supplemented

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with milk made from chickpea grain, promoting faster and stronger growth.

Chickpeas are rich in essential amino acids such as lysine, arginine, histidine, tyrosine, cysteine, and others, which are crucial for both human and livestock health. These amino acids cannot be synthesized by the body and must be obtained through food. Chickpeas do not have specific medicinal properties but are beneficial to human health due to their chemical composition. Omega-3 and omega-6 fatty acids, iron, and folic acid help restore the body, strengthen the immune system, and enhance the nervous system. Due to the presence of folic acid, chickpeas are also recommended for use by pregnant women and those planning to conceive.

Chickpeas help detoxify the body, relieve bronchitis, and chickpea decoction aids in preventing poisoning. Young chickpea shoots are considered effective for managing diabetes. However, it is not recommended for breastfeeding mothers and children under six years old [5].

Abu Ali Ibn Sina, in his work "The Canon of Medicine," describes the medicinal properties of chickpeas, noting their unique benefits in lung nutrition, the use of chickpea oil for treating burns, ulcers, and itching, and its boiled water for alleviating toothache and milk swelling. Additionally, chickpeas are known for their ability to dissolve kidney stones and their positive effects on intestinal diseases, diarrhea, and urinary organ treatment in France and the United Kingdom. Extracts from the stems and leaves, as well as apple, lemon, and oxalic acids, are widely used in South-East Asian countries such as India, China, and Burma for medicinal purposes [18].

D.A. Bender and A.E. Bender emphasize that chickpeas are an excellent source of copper, folic acid, and zinc, as well as protein, vitamin A, and iron. They are highly nutritious and serve as a healthy carbohydrate source for individuals with insulin resistance or diabetes.

As noted by E. Stepanova, consuming 100 grams of boiled chickpeas per day is sufficient to provide the body with essential nutrients. For individuals with a weak stomach, it is recommended to limit intake to 30 grams per day. Chickpeas are superior to other legumes in terms of their nutritional value (329 kcal/100 g mass) [16].

Chickpea milk, obtained from chickpea grains, has the same nutritional and medicinal properties as cow and soybean milk. Additionally, due to the composition of semi-drying fatty acids in chickpea, lipid formation is reduced [2].

Chickpea grains are used to prepare chickpea flour, various side dishes, soups, omelets, pastries, bread, jelly, and other dishes. When mixed with wheat flour (10-20%), it enhances the quality and nutritional value of bread, confectionery, and pasta products. Chickpea flour is also used in children's food. Chickpea bran, roasted and mixed with tomato paste, raisins, sesame, or walnut kernels, is used to make sweet bars. In some countries, including India and Azerbaijan, chickpea acid

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is used as a substitute for vinegar and in the preparation of cold beverages.

V.G. Klimenko's research shows that the protein content in all chickpea varieties ranges from 12.6% to 31.0%, with this variation dependent on soil-climatic conditions and protein biosynthesis [9].

The data in the literature suggests that the protein content in chickpea grains changes depending on cultivation techniques [13; 14]. This underlines the necessity of developing scientific guidelines for selecting and cultivating varieties suited to the soil-climatic conditions of each region [1; 11].

METHODS

Our research was conducted at the experimental production base of the Institute of Grain Legume Research in Sirdarya, under irrigation conditions with slightly saline soils. The soil had less than 1% residual dry matter, with an overall salinity of 0.030-0.033%, chloride levels often exceeding the toxicity threshold, reaching up to 0.036%, sodium content of 0.047%, and sulfate content of 0.130-0.134%.

The experimental field is located in the southeastern part of the Mirzachul region, characterized by a sharply continental climate with hot, dry summers and moderate winters. The region experiences significant temperature variations between day and night and between summer and winter.

The experiment utilized chickpea varieties from the global collection, including "FLIP98-140c-(GulDU-ToshDAU)", "FLIP98-116c-(MirOz)", "FLIP98-152c", "Halima" and "Uzbekistan-32."

The sowing of chickpea seeds occurred in the second half of October (autumn) and the first ten days of March (spring), with seeds germinated under the natural moisture conditions of the soil. General agronomic practices were followed, and the preceding crop was autumn wheat. The variants were arranged in 4 replications, with each plot covering 48 m^2.

Data collection and analysis were performed following the "Methodology for State Variety Testing of Agricultural Crops" (1985, 1989) [10], and statistical analysis was carried out using B.A. Dospekhov's (1985) guide to variance analysis and the SPSS-17 program [7].

The technological quality indicators of the grain, including:

-Protein content (Kjeldahl method)

- Oil content (Soxhlet apparatus using a solvent extraction method)

- Cellulose content (Henneberg and Stohmann method)

- Ash content (Mendel method)

- Maturity level of the seeds

RESULTS AND DISCUSSION

The results from the experiment showed that sowing dates had a significant impact on the chemical composition of chickpea grains:

Water content: Chickpea grains sown in spring had water content up to 8.5-9.6%, while autumn sowing

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showed a slight decrease, with the range from 8.0-9.4%.

Oil, non-nitrogenous extractive substances, and total energy showed significant differences across varieties.

Fiber content: Chickpeas sown in spring had higher fiber content compared to autumn sowing, except for the "FLIP98-140c-(GulDU-ToshDAU)" variety, which showed the opposite trend. "FLIP98-140c-(GulDU-ToshDAU)" and "FLIP98-183c-(Halima)" varieties had lower fiber content (4.9-4.98%), while the control variety "Uzbekistan-32" had the highest fiber content (9.45-9.65%) in both sowing dates.

Oil content: The oil content in chickpea grains from autumn sowing was 0.06-1.96% higher than in spring sowing. "FLIP98-152c" had the highest oil content of 6.47% when sown in autumn.

Ash content: Sowing date had little effect on the ash content of chickpea grains.

Non-nitrogenous extractive substances: These were higher in autumn-sown chickpeas. The highest non-nitrogenous extractive substances were found in "FLIP98-116c-(MirOz)" (66.83%) in autumn sowing, and the lowest in "Uzbekistan-32" (60.14%) in spring sowing.

Regarding oil content, chickpea seeds sown in the spring had 0.06-1.96% lower oil content compared to those sown in the autumn. Among the varieties studied, the "FLIP98-152c" variety had the highest oil content (6.47%) when sown in autumn.

The data analysis indicated that planting time had little impact on the ash content of chickpea seeds. The lowest ash content was observed in the "FLIP98-183c-(Halima)" variety when sown in autumn (3.49%). The amount of nitrogen-free extractive substances was higher in all varieties when sown in autumn. The highest level of nitrogen-free extractive substances was found in the "FLIP98-116c-(MirOz)" variety (66.83%) when planted in autumn, while the lowest was in the

"Uzbekistan-32" variety (60.14%) when planted in spring.

According to the experimental results (Table 3.18), chickpea varieties sown in autumn had higher total energy value. The highest energy value was recorded for the "FLIP98-183c-(Halima)" variety (361.67%), while the lowest was in the "Uzbekistan-32" variety (306.12-309.5%).

The protein content in the seeds was affected not only by the planting time but also by the biological characteristics of the varieties. When the "Uzbekistan-32" variety was sown in the spring, it had a protein content of 20.28%. The "FLIP98-152c" variety had the highest protein content at 24.28%, while the "FLIP98-140c-(GulDU-ToshDAU)" variety had the lowest protein content at 18.8%. The variability in protein content between the varieties suggests that the biological characteristics of the varieties influence this trait. Specifically, the "FLIP98-152c" variety had 4.0% more protein than the control variety, indicating a

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good match between genotype and environment. When chickpeas were sown in the spring, the protein content in the seeds ranged from 18.8% to 24.28%, while in the autumn sowing, the protein content decreased by 1.25-2.59%. These data confirm that spring sowing results in a higher protein content in the seeds. Conversely, when planted in the autumn, the oil content in the seeds was higher. Chickpeas, widely consumed in our diet, are appreciated for their quick and easy cooking characteristics, making them of practical significance.

The cooking time of chickpea varieties was studied, and it was found that the cooking time for the varieties "FLIP98-140c-(GulDU-ToshDAU)", "FLIP98-183c-(Halima)" and "FLIP98-152c" was 30 minutes, while for the "Uzbekistan-32" variety it was 40 minutes, and for "FLIP98-116c-(MirOz)" it was 50 minutes. Therefore, the varieties "FLIP98-140c-(GulDU-ToshDAU)", "FLIP98-183c-(Halima)" and "FLIP98-152c" are not only suitable for food and energy sources but also can be considered among resource-efficient varieties.

Table

Effect of Planting Time on Seed Quality Indicators (Average of 3 Years of Data)

(*Data from "Grain products research institute"*)

№	Indicator	Varieties									
		Uzbekistan-32		FLIP 98-140c-(GulDU-ToshDAU)		FLIP 98-116c -(MirOz)		FLIP 98-152c		FLIP 98-183c-(Halima)	
		planting time									
		spring	autumn	spring	autumn	spring	autumn	spring	autumn	spring	autumn
1.	Moisture content, %	8,5	8,0	9,4	9,2	9,2	9,2	8,8	8,0	9,6	9,4
2.	Protein, %	20,28	17,66	18,8	17,55	19,55	18,93	24,28	21,69	19,90	19,43
3.	Crude fiber, %	9,65	9,45	4,9	7,5	5,72	5,24	6,49	5,43	4,98	4,69
4.	Oil, %	4,99	6,06	4,79	5,0	5,18	5,24	4,51	6,47	5,11	5,18
5.	Ash content, %	3,86	4,10	3,60	3,67	3,67	3,76	4,00	4,04	3,76	3,49
6.	Nitrogen-free extracts, %	60,14	63,77	64,91	65,77	65,89	66,83	60,72	62,37	66,66	66,81
7.	Total energy value, kcal	306,12	309,5	310,75	314,27	314,37	315,45	313,5	319,9	314,54	361,67

CONCLUSIONS

Sowing date significantly influenced the chemical composition of chickpea grains. Autumn sowing led to

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lower protein content and higher oil content, compared to spring sowing. These results confirm that spring sowing leads to higher protein content, while autumn sowing enhances oil content. Introducing chickpea varieties such as "FLIP98-152c" and "Halima" in Sirdarya could provide new opportunities for protein-rich crops and increased yields.

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