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TECHNOLOGY FOR STORAGE AND PROCESSING BEAN GROWING IN THE CONDITIONS OF KARAKALPAKSTAN

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Abstract:
The article covers the scientific and practical aspects of storage and processing technologies for bean seeds grown in the conditions of the Republic of Karakalpakstan. The biological and nutritional properties of beans, changes in product quality during storage, and processing stages were analyzed. Based on the research, the optimal temperature and relative humidity parameters for storing beans were determined. The effectiveness of technologies for sorting, drying, packaging, and canning products was also evaluated.

Keywords: beans, legumes, storage technology, processing, humidity, temperature, preservation

Today, providing the population with protein-rich food products is considered one of the critical tasks facing agriculture. Among leguminous crops, beans are of particular importance, as they contain high amounts of protein, carbohydrates, vitamins, and minerals.

In the conditions of water scarcity and soil salinity characteristic of the Aral Sea region, the agrobiological characteristics of the bean rank it among the optimal crops for cultivation in the region's agriculture. However, during the storage and processing processes after harvesting, losses are observed due to a decrease in product quality, the influence of pests, and increased humidity.

Therefore, the development and implementation of modern technologies for the storage and processing of beans is an urgent task.

GOALS AND TASKS OF THE RESEARCH

The aim of the study is to evaluate the effectiveness of technologies for storing and processing bean seeds grown in the conditions of Karakalpakstan.

Research objectives:

- studying the biological and technological properties of beans;
- determination of changes in quality indicators during the storage process;
- establishing optimal temperature and humidity regimes for storage;
- evaluating the effectiveness of processing technologies;
- development of proposals to reduce product losses.

OBJECT AND METHODS OF RESEARCH

The object of the study was local bean varieties grown in the Republic of Karakalpakstan.

The following methods were used in the research:

- laboratory tests;
- organoleptic assessment;
- moisture determination method;
- statistical analysis;
- technological observations.

Bean samples are analyzed monthly during storage,

Nutritional value of beans

Beans are rich in proteins and microelements essential for the human body.

Chemical composition of 100 g of dried beans

Indicator Quantity
Chemical composition of 100 g of dried beans
Indicator Quantity
Protein 20–25 g
1-2 g of oil
Carbohydrates 50-60 g
Fiber 4–6 g
Potassium 1100–1400 mg
Calcium 100–150 mg

Iron 5–8 mg
The protein in beans is well absorbed by the human body and can serve as an important substitute for animal protein.
After the beans are harvested, the preparation of the product for storage is carried out.
Stages of preparation for storage:
1. Cleaning.
2. Sorting.
3. Drying.
4. Packaging.
5. Warehousing.
The main factors affecting product quality during storage are:
• temperature;
• relative humidity;
• air exchange;
• pests and diseases.
Optimal storage regimes for beans
Indicator Recommended norm
Temperature 5-10°C
Relative humidity 60–70%
Grain moisture 12–14%
Shelf life 10–12 months
Research has shown that in cases where product moisture exceeds 15%, the activity of microorganisms increases and product quality deteriorates.
BEAN PROCESSING TECHNOLOGY
Processing beans allows for the supply of finished and semi-finished food products to the population.
The processing flow diagram is as follows:
Acceptance of raw materials → Sorting → Cleaning → Washing → Soaking → Heat treatment → Preservation or drying → Packaging → Finished product
Soaking process
Soaking beans in water for 8-12 hours:
• reduces the ripening time;
• improves digestion;
• reduces the amount of antinutrients.
Heat treatment
Beans are cooked at a temperature of 90–100°C. This process ensures product safety and improves flavor.
During canning, the product is placed in airtight containers and sterilized.
This method ensures the preservation of the product for 1-2 years.

RESEARCH RESULTS

During the storage process, the main quality indicators of the product are analyzed.
Changes in the quality indicators of beans during storage

Shelf life	Moisture (%)	Protein (%)	Shelf life	Moisture (%)	Protein (%)	Shelf life	Moisture (%)	Protein (%)
0 months	13.5	24.6	0 months	13.5	24.6	0 months	13.5	24.6
3 months	13.2	24.4	3 months	13.2	24.4	3 months	13.2	24.4
6 months	12.9	24.2	6 months	12.9	24.2	6 months	12.9	24.2
9 months	12.7	24.1	9 months	12.7	24.1	9 months	12.7	24.1
12 months	12.5	23.9	12 months	12.5	23.9	12 months	12.5	23.9

CONCLUSION

When storing beans grown in the conditions of the Republic of Karakalpakstan, maintaining product moisture at 12–14% and storing them at a temperature of 5–10°C is highly effective. The use of modern processing technologies ensures the quality and safety of products and expands the possibilities of providing the population with protein-rich food products.

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