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FEATURES AND IMPORTANCE OF PROCESSING SECONDARY AGRICULTURAL RESOURCES

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ABSTRACT:

The agricultural sector, while crucial for global food security, generates a significant volume of by-products and residues. These secondary agricultural resources (SARs), often dismissed as waste, represent a vast untapped potential for economic growth, environmental sustainability, and resource efficiency. Processing these SARs transforms them into valuable products, mitigating environmental challenges and creating new economic opportunities. This article delves into the features of SAR processing and its profound importance across multiple sectors.

INTRODUCTION. Wine production in modern Uzbekistan began in ancient times. Grapes in Central Asia were introduced about 6,000 years ago, and at that time there was a very high technology of winemaking and grape growing. The development of local winemaking is confirmed by archeological findings, as well as ancient works on wine.

In 2021, the 2021-2024 viticulture development program was adopted, according to which 48 districts of the republic specialize in grape growing based on natural and climatic conditions and agricultural culture. It is planned to increase the area of technical grape plantations by 40 thousand hectares.

Last year, 90,000 tons of grapes were processed, which is an annual increase of 8.7%. 161 types of grape wine are produced in Uzbekistan.

Enterprises that have received many awards at international exhibitions, such as Khovrenko Samarkand Winery, Tashkentvino Combine, Bagizagan, Sultan Sharbati, Château Hamkor, are engaged in wine production in Uzbekistan.

Secondary resources in the production of the above products are grape seeds. Grape seeds are used to produce the most valuable vegetable oil, as well as flour or grape powder, which is actively used in confectionery, medicine and pharmacology. When using secondary

resources, the main factor is, on the one hand, mitigating the impact on the environment, and on the other hand, obtaining additional new types of products. SARs encompass a wide range of materials derived from agricultural activities, excluding the primary products intended for direct consumption. These resources are categorized based on their origin:

- Crop residues: These include stalks, leaves, husks, straws, cobs, and other plant parts remaining after harvesting the main crop. Examples are rice straw, wheat straw, corn stover, sugarcane bagasse, and coconut shells.
- Animal by-products: This category includes manure, feathers, blood, bones, hides, and other materials derived from livestock.
- Processing by-products: These are residues generated during the processing of agricultural products, such as fruit peels, seed cakes, spent grains, and whey.
- Food waste: This includes food rejected during harvesting, processing, transportation, or consumption.

The composition of SARs varies greatly depending on the source material, geographical location, and agricultural practices. This heterogeneity necessitates tailored processing techniques to optimize the extraction of valuable components.

Features of SAR Processing: Technological Advancements and Challenges

SAR processing involves a series of steps aimed at transforming these resources into useful products. These steps may include:

- Collection and transportation: Efficient and cost-effective methods for collecting and transporting SARs are crucial, particularly in areas with dispersed agricultural activities. This often presents a logistical challenge, especially for bulky and perishable materials.
- Pre-treatment: This stage prepares the SARs for further processing. Pre-treatment methods include cleaning, size reduction (e.g., milling, chopping), drying, and sorting. The choice of pre-treatment methods depends on the target product and the nature of the SAR.
- Processing: This is the core stage where SARs are transformed into valuable products. Processing methods are highly diverse, ranging from simple mechanical separation to complex biochemical and thermochemical conversions. Examples include:
- Product refinement and packaging: This stage involves further processing to meet quality standards and packaging for distribution.

Challenges in SAR Processing:

Importance of SAR Processing: A Multifaceted Impact

The importance of SAR processing extends across several key areas:

a) Environmental Sustainability:

- Waste reduction: Processing SARs reduces the volume of agricultural waste disposed of in landfills, mitigating environmental pollution and greenhouse gas emissions.
- Resource conservation: SAR processing conserves valuable resources like water and energy, reducing the environmental footprint of agricultural activities.
- Soil improvement: Compost and other organic amendments derived from SARs improve soil fertility, reducing the need for synthetic fertilizers.
- Carbon sequestration: Biochar, a charcoal-like material produced from pyrolysis of biomass, can sequester carbon in the soil, mitigating climate change.

b) Economic Benefits:

- Creation of new industries: SAR processing creates new economic opportunities in rural areas, generating employment and income.
- Value addition: Transforming low-value SARs into high-value products increases profitability for farmers and processors.
- Reduced disposal costs: Processing SARs reduces the costs associated with waste disposal and management.
- Enhanced competitiveness: Utilizing SARs can enhance the competitiveness of agricultural products by reducing reliance on external inputs.

Grape seeds are distinguished by the fact that they are used for the production of dietary oil, which is very valuable in fatty acid content. The modern technology of vegetable oil production includes preparatory operations related to the preparation of seeds for oil extraction; pressing, primary and complex oil purification and extraction operations.

The technology of grape oil extraction has its own characteristics and, first of all, they are related to the fact that grape seeds are the secondary raw material remaining after extracting juices and other products from grape fruits.

Grape seeds have a high moisture content (43-50%), after drying them to 8-9% moisture, they are cleaned of unnecessary impurities. Cleaning of grape seeds from mineral and organic waste is carried out in separators with sieves (diameter of holes, mm):

- upper sieve 12-14
- medium sieve 8-10
- lower sieve 4-5

Large waste comes out of the upper and middle sieves. The main part of the grape seed falls from the lower sieve. When the initial contamination of grape seeds is 4%, the contamination level should not exceed 1%.

After cleaning in separators, the grapes are cleaned of metal impurities in magnetic separators before sending the grains to crushing. Due to the high oil content of the skin of grape seeds and the high mechanical strength of the seeds themselves, they are processed in an unrefined form**.**

To extract oil from grape seeds, it is necessary to destroy the cellular structure of their tissues. The required level of grinding is achieved by applying mechanical forces to the processed product. These forces cause crushing, splitting, friction, or impact movements.

Shaft grinders are used for this. It is recommended to crush the grape seeds twice. The resulting flour is ground again in two passes in smooth shaft grinders. The ground product should be at least 70% of the fraction passing through a 1-millimeter sieve.

Moisture-heat treatment of crushed grape seeds is characterized by some features. The presence of a husk that requires a large amount of moisture in the pulp obtained from unthreshed grains requires it to be moistened at 12-13%. Since grape skins contain 8 to 9% starch, the viscosity of the material can be increased with high moisture levels and subsequent heating. During heat treatment, moisture from such material is almost not lost, which does not allow to obtain the necessary moisture and texture for pressing, and pressing becomes ineffective. In order to evenly distribute the moisture when moistening the liquid, condensate and saturated water vapor are introduced into it at the same time, and the temperature of the moistened liquid is brought to 70-800C. Parameters of preparation of mezha: humidity of the mixture - 12-13%; the wetting temperature of the solution is 70-800C; moisture content of the pulp entering the press is 6-7%; the temperature of the table entering the press is 100-1050C.

Taking into account the high viscosity of the pulp (51-53%) and the solid structure of the pulp, it is necessary to control the moisture content of the finished pulp entering the press to prevent possible pressing.

Pressing is carried out in screw presses in two stages. After pressing, the resulting oil is cooled and then filtered.

Physico-chemical parameters of grape oil obtained by cold pressing and moisture-heat treatment are shown in Table 1.

The oil obtained by pressing the grape seed is pale yellow, almost odorless. The oil pressed from grape juice has a dark-green color and needs to be cleaned.

Table 1. Physico-chemical indicators of grape oil

Naming of indicators	Grape oil	
	Moisture-heat treatment	Cold pressing
rest by mass, %	10,0	0,2
acid number, per gram/mg	1,05	1,35
perikis number, % 12 (1/20 mol per 1 kg)	0,13 (10,0)	0,2 (15,0)
absorption coefficient at 232 nm at 270 nm	 0,43 0,16	 0,60 0,10
amount of unsaponifiable matter	1,19	1,02

During the production of agricultural products, a large amount of by-products, residues and waste are generated. Effective processing of these resources (processing of secondary agricultural resources) allows to increase the economic efficiency of agricultural enterprises, protect the environment and create new jobs.

Conclusion. Processing secondary agricultural resources presents a significant opportunity to enhance the sustainability and economic viability of the agricultural sector. By transforming waste into valuable products, SAR processing addresses environmental concerns, creates new economic opportunities, and contributes to food security and rural development. While challenges remain, ongoing research and technological advancements are paving the way for a more efficient and sustainable utilization of these resources. Continued investment in research, infrastructure development, and market promotion will be crucial to fully realize the potential of SAR processing.

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