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MILLETS: A PATH TO SUSTAINABLE NUTRITION THROUGH PROCESSING AND VALUE-ADDING STRATEGIES

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INTRODUCTION

Small-seeded grains called millet have been grown and eaten all across the world for generations. It is well-known for its toughness, versatility in growing environments, and high nutritional value. Millets are a good source of dietary fibre, protein, and minerals like calcium, iron, and zinc. Unfortunately, despite their nutritional advantages, millets are frequently disregarded and underutilised because of a lack of awareness, poor processing methods, and few value addition. In this article, we'll look at processing and value-adding techniques that can increase millets' nutritive content and commercial viability.

AIM AND OBJECTIVE

The aim of this article is to explore processing and value addition techniques that can enhance the nutritional content and commercial viability of millets. The objective is to raise awareness about the importance of millets as a nutritious food source and to highlight the various processing and value addition methods that can be employed to improve their quality and appeal. By understanding these techniques, individuals involved in millet production, processing, and marketing can make informed decisions to increase the acceptance and utilization of millets globally.

Processing Techniques: Cleaning, grading, dehulling, milling, and polishing are all phases in the processing of millets. Each of these procedures is critical in boosting the ultimate product's quality and nutritional value. These are some millet processing processes to consider.

1. **Cleaning:** The first and most important stage in millet processing is cleaning. The raw millet is cleaned to eliminate any foreign particles that might be hazardous to human health, such asstones, dirt, and other plants parts.
2. **Dehulling:** Dehulling is the removal of the grain's outer coat. The grain's outer layer carries antinutrients including such phytic acid, which decreases micronutrient bioavailability. Dehulling improves millet digestibility and nutritional value.
3. **Milling:** Milling entails turning millet into flour. This procedure can be carried out in a variety of methods, including stone grinding, roller milling, and hammer milling. Depending on the intended end result, a milling technique is selected.
4. **Polishing:** The last step in millet processing is polishing. The polished grains look better and last longer. Polishing eliminates any leftover contaminants and boosts the product's flavor and texture.

Value Addition Techniques: To transform raw millet into value-added goods such as ready-to- eat snacks, cereals, and beverages, value addition methods are used. These methods can improve millets' nutritional value, palatability, and shelf life, making them more appealing to customers.

Here are some value addition techniques that can be used for millets

1. **Fermentation:** Fermentation is the process of microbes turning carbohydrates into organic acids, alcohols, and gases. Millets' nutritional value is improved by fermentation by increasing their bioavailability and digestibility.
2. **Extrusion**: Extrusion is a high-temperature, high-pressure method that may be used to make ready-to-eat snacks, morning cereals, and other items. Extrusion improves the nutritional value of millets by lowering antinutrient levels and boosting protein content.
3. **Germination:** Germination is the process by which grains sprout. Germination improves the nutritional value of millets by boosting protein content, digestibility, and micronutrient bioavailability.
4. **Roasting:** Roasting is a dry-heat procedure used to make roasted millet snacks, morning cereals, and other items. Roasting millets improves their taste, texture, and storage life.
5. **Milling:** The grains are processed to get rid of the husk and bran, which decreases the fiber content but improve digestibility and shelf life. The resultant flour may be used to make bread, pancakes, risotto, soup and other baked products.
6. **Popping:** Popping is one of the oldest technique of millet processing that involves

heating the millet in a dry pan until they popped like popcorn. This enhances nutritional bioavailability and makes grains digestible. Popped cereal grains can be consumed as a snack or combined with cereal for breakfast.

Here are some easy traditional recipes from millets

1. Cooked Food Zan Zan: The Monpa people of Arunachal Pradesh are known for their delicious porridge dish called Zan Zan. It is made with millet flour and eaten for breakfast. They typically season it with salt, pepper and eat it with meat, vegetables, dairy cheese, and soy beans.

2. Panchkuti Khichdi: This dish is in the manner of Himachal Pradesh. for Panchkuti Khichdi combines pearl millet with 5 different dals and is boiled in a single pot. Ghee is used to temper the entire spices before being poured over the khichdi, which gives the food a unique scent and enhances the flavor and aroma.

3. Koda/Mandua ki roti/ Finger millet: People in Uttarakhand used to eat Koda's Roti, Puri since long time. Kodra was regarded as an energising food since it contained iron. koda ki roti (finger millet bread) was prepared and eaten with fresh homemade butter. It is Gluten-free, incredibly easy-to-digest. Mandua Ki Roti (Chapatis) is also high in calcium and protein. In Sikkim and Manipur, it is also known as Kodo ko roti and Temae Tan, respectively. Kodo ko Roti is often cooked from finger millet and eaten with tomato Chatney.

4. Baadi Baadi: A cuisine from Uttarakhand called Baadi Baadi is made using finger millet flour. Baadi pairs well with Gahat (Horse gram) ki dal or Phaanu (made from Horse gram) and have a good nutritional value. Boiling water must first be added before mandua can be cooked. Add ghee for a richer flavour.

5. Jhangore ki Kheer: *Jhangore ki Kheer*, a tasty Pahari dish, is prepared with jhangora (barnyard millet), milk, and sugar and is topped with kewra fragrance, nuts, and raisins.

6. Palau: Boiling Jhangora (Barnyard Millet) and Mattha together creates a dish in Uttarakhand known as Palau (buttermilk). Jhangora and mattha, the two main constituents, are beneficial to our bodies in a variety of ways. Takra, also known as butter milk or *mattha*, is said to be laghu, or light and simple to digest, and it balances the two doshas, vata and kapha. Digestive problems might benefit from it as well.

7. Juma: One of Lahaul Spiti's favourite wintertime dishes is juma. In sheep intestines, a paste made of spiced wheat/millet flour is placed. After being cooked by steam, this is served hot with Sauce or tchati (mutton soup).

8. Sura: The majority of places in Himachal Pradesh where sura is made include Mandi,

Chhota Bhangal, and the Lug valley of the Kullu district. Sura is a fermented beverage made from finger millet. The flour from finger millet is naturally fermented to make it. During ten days, flour is stored in a container after being made into dough and kneaded. After ten days, water is added, followed by partially baked rotis that are prepared and placed in the container. Traditional herbs are added after two days, and fermentation is allowed to continue for a further 8 to 10 days. In Kullu's rural districts, particularly in the lug valley, sura is drank during regional celebrations like shoeri saja and nuptials.

9. Madua Apong: Pong and Madua Apong are two popular drinks made in Arunachal Pradesh using rice and millet, respectively, and uncontrolled fermentation. Among the tribes, Temm [Millet] is used to make Madua Apong, an organic wine with a deep crimson coloration.

10. Raksi: In Nepal's mountainous areas, raksi is a traditional distilled alcoholic beverage that is well-liked, particularly by the Gurung and Magar ethnic groups. It is produced by distilling fermented grains like millet, rice, or barley, and is frequently sipped at celebrations and social events. Raksi is made by boiling fermented grains in a big pot, collecting the rising steam, and condensing it via a pipe into a liquid. The liquid is then stored in a jar and allowed to mature fora number of months before being consumed.

11. Chhang: In the Himalayan areas of India, Nepal, and Bhutan, chhang is a traditional fermented drink prepared from barley, millet, or rice. It is typically drunk during social events, holidays, and religious rituals. Grains are boiled in water, cooled, then mixed with yeast and starting culture to make chhang. The combination is then allowed to ferment for a few days before being eaten. Chhang is sometimes served in a wooden cup called a tongba and has a little sour flavour. It is typically drunk via a bamboo straw.

12. Bai: Bai is a traditional fermented food from the state of Manipur, made from millets, soybeans and rice. It is often consumed as a side dish or a snack and is considered to be a healthy food option due to its high protein and fiber content. The process of making Bai involves soaking and boiling soybeans, millets and rice, then mixing them together and allowing the mixture to ferment for several days. The fermented mixture is then shaped into small balls and dried in the sun before consumption.

CONCLUSION

Millets have a long history of consumption and hold immense untapped potential for increased nutritional value, improved flavor, and enhanced commercial viability through processing and value addition. Various techniques such as dehulling, milling, polishing,

fermentation, extrusion, germination, and roasting can be employed to transform millets, leading to higher consumption rates and the exploration of new markets. Millet-based products can cater to the needs of health- conscious consumers who seek gluten-free alternatives. Additionally, incorporating millets as functional ingredients in processed foods can significantly boost their nutritional content and fibre intake. The Himalayan region stands out for its rich cultural heritage of fermented foods and beverages, offering unique flavors, textures, and notable health benefits. Preserving the traditional methods of preparing and consuming these dishes, passed down through generations, plays a crucial role in enriching regional culinary traditions.

REFERENCES

1. Gupta RK, Gangoliya SS, Singh NK. Reduction of phytic acid and enhancement of bioavailable micronutrients in food grains. J Food Sci Technol, 2015; 52(2): 676-684.
2. Krishnan S, Srivastava S. Effect of processing on nutritional composition and functionalproperties of millets: A review. Front Nutr, 2019; 6: 100.
3. Kumar B, Gupta R, Kumar M. Potential of millets: Nutritious grains. Int J Food Sci Nutr, 2016; 1(1): 1-9.
4. https://apeda.gov.in/milletportal/files/Uttrakhand_Millet_Value_Added_Products_Catalogue.p df
5. https://www.millets.res.in/pub/2019/Millets_Indian_Himalaya.pdf.