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Traceability of Traditional Processing Techniques and Indigenous Recipes of Ragi (Finger millet) through QR in Pratapgarh District, Uttar Pradesh

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ABSTRACT

The research was conducted in a designated village within the Agricultural Extension Services (AES) of Block Kalakankar, District Pratapgarh, during the Kharif season of 2023. Despite facing challenges in accessing remote areas and gaining the trust and cooperation of local communities, the study comprehensively documents every traditional method employed in Ragi processing. The labor-intensive process, deeply rooted in indigenous knowledge and techniques, involves key steps such as nursery sowing, transplanting, harvesting, threshing, winnowing, drying, grading, and storage of Ragi seeds.

The study sheds light on the production of value-added products derived from Ragi, contributing valuable insights for agricultural development initiatives and opportunities for value addition in the millet industry. Millet cultivation, including Ragi, Bajra, and Jowar, has seen a significant increase owing to the impact of the COVID-19 pandemic and a growing emphasis on health. Millets, recognized as "future crops" due to their resilience to prevalent diseases in Asia and Africa, play a crucial role in addressing food security and nutrition challenges.

Keywords: *Millet Cultivation, Ragi Processing, Traditional Techniques, Agricultural Extension Services (AES), Value-Added Products, Indigenous Knowledge*

INTRODUCTION

Millets, classified as minor cereals within the Poaceae family, are small-seeded, annual cereal grasses well-suited for tropical and arid climates. Known for their adaptability to less fertile soil, millets encompass various species, including sorghum (Jowar), pearl millet (Bajra), finger millet (Ragi), foxtail millet (Kakum), proso millet (Chena), little millet (Kutki), kodo millet (Kodon), barnyard millet (Sanwa), and brown top millet [2]. Ragi, also known as finger millet (*Eleusine coracana* L.), is a prevalent millet in many regions of India. Traditionally, it has served as a vital staple food in eastern and central Africa as well as India.

The ragi grains are rich in iron, calcium, phosphorus, dietary fibre, and vitamins. Notably, its calcium content surpasses that of other cereals and has the highest iodine concentration among all dietary grains. Ragi is distinguished by its high-quality protein, essential amino acids, and the presence of vitamin A, vitamin B, and phosphorus [3]. Widely recognized as a beneficial dietary item, ragi caters to various demographic groups, including children in their developmental stages, pregnant women, elderly individuals, and patients. With notable concentrations of calcium, antioxidants, and phytochemicals, ragi is a highly digestible grain with advantageous qualities. It plays a role in regulating blood glucose levels, particularly in individuals with diabetes.

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The increased fiber size and slower digestion rate contribute to an enhanced sense of satiety, leading to reduced caloric intake and potentially acting as a deterrent against overconsumption. Therefore, ragi is considered a suitable dietary choice for individuals with diabetes due to its low sugar content and gradual release of glucose/sugar throughout the body [4]. During the process of germination, there is a partial degradation of both starch and protein, which is significant for enhancing digestibility. Additionally, several components responsible for the production of flatus are also destroyed. The flavor profile exhibits a general enhancement as shown by previous studies [8][12][14].

In India, finger millet has been processed through methods like grinding, malting, and fermentation. These traditional processes have been employed to create various products such as beverages, porridges, idli (Indian fermented steamed cake), dosa (Indian fermented pancake), and roti (unleavened flatbread).

TRADITIONAL WAY RAGI PROCESSING

The study was carried out in the selected village Nayapurwa (lat. 25.82171°long 81.426166) of Pratapgarh district. Pratapgarh district is located in southeast-central Uttar Pradesh state of northern India. It lies between 25o34′ and 26o 11′ latitudes while between 81o19′ and 82o27′ longitudes. District, Part of the great alluvial Indo-Gangetic Plain, is bounded on the southwest by the Ganges (Ganga) River. The district is fertile and partially forested, although theresmall barren saline areas. Rice, barley, millet, and sugarcane are grown, and hemp and hides are produced. Pratapgarh district has potential to grow millets and considerable millets area (18,171ha).

Visits were conducted based on information provided by farmers from various villages, and feedback was gathered from both groups of older farmers and individual farmers. The primary objective of this study was to understand the traditional practices of ragi processing, particularly focusing on the traditional recipe of makra stuffed kachauri. Additionally, the study aimed to promote millets, emphasizing their nutritional aspects and exploring value-added products.

A significant challenge identified during the study was the unavailability of seeds and saplings, coupled with poor market linkages for the farmers' produce. To address this issue, collaboration with the Krishi Vigyan Kendra (KVK) was established, and saplings were distributed to 10 randomly selected farmers.

Each farmer had their traditional methods for processing ragi. In this region, processing knowledge has been passed down through generations and is an integral part of conventional grain cultivation. While this processing method is suitable for small-scale production, it necessitates a small setup for millet processing when dealing with larger areas. Villagers collaborate, working together to complete the entire processing task. The article delves into various forms of processing, exploring, studying, analyzing, and discussing them in detail.

Fig. 1. Developed QR Code for Traceability

Raising and distribution of sapling → Transplanting → Manual Harvesting → Manual Threshing → Sun Drying →Manual Winnowing → Manual Cleaning → Manual Grinding → Storage Without Chemicals → Traditional recipe.

Raising and Distribution of Ragi Sapling:

The ragi seeds were sown in the fourth week of June using the broadcasting method on flat beds. Within 5 days after sowing, the ragi seeds successfully germinated. To prepare the seedlings for transplantation, the watering was gradually reduced 2-3 days before lifting. However, during this phase of seedling growth, no chemicals were applied. Efforts were made to water the seedlings in the forenoon to facilitate the smooth lifting process.

Figure 2. Nursery management

Figure 3. Transplanting of seedling

Transplanting Nursery

The transplantation of ragi seedlings took place approximately 30 days after sowing, occurring July to August in the year 2023. Following the transplantation, light irrigation was immediately applied to support the establishment of the seedlings. Given the delicate and tender nature of ragi seedlings, gap filling was carried out one week after the initial transplanting to ensure optimal growth and coverage.

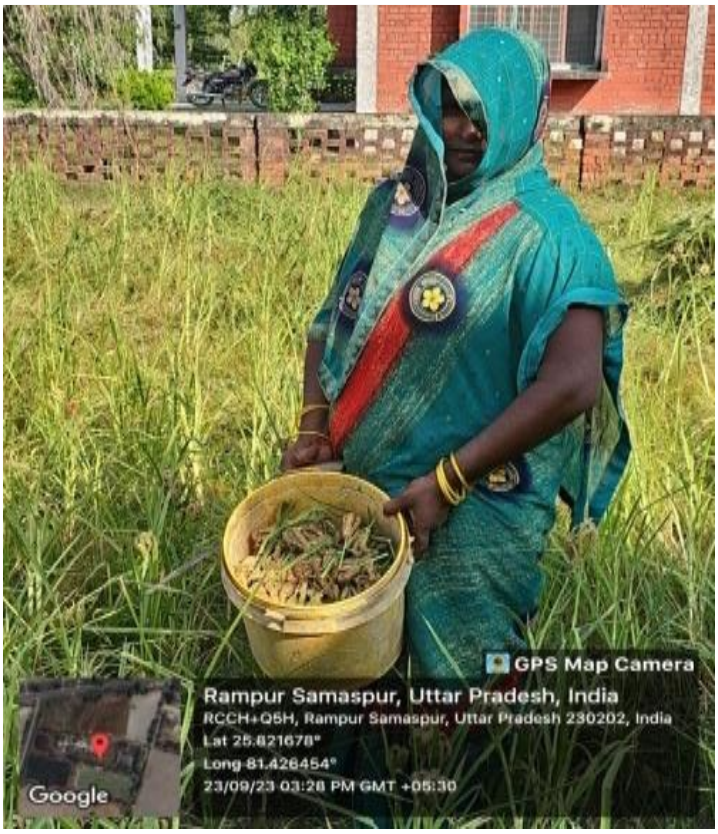
Method of Harvesting:

Ragi harvesting was carried out at the point of maturity when the grains were fully developed and ready for collection. Harvesting in ragi involves the cutting and gathering of ear heads. Once the plant reaches the maturity stage (fig.3) and the grains acquire a brown color, the harvesting process is initiated. Traditional methods of harvesting included.

Figure 4. Ragi Crop at full grown stage

Figure 5. Harvesting of ragi crop by sicles Figure

Figure 6. Harvesting by hand-picking



By Sickles: This method is the most commonly employed for harvesting ragi. When the ear heads turn brown or reach maturity, the process involves cutting the ear heads alone or cutting the entire stalk along with the ear heads using sickles (fig. 4).

Hand Picking: Another traditional approach involves hand-picking all the ear heads that have turned brown. This method requires manual selection and collection of the matured ear heads from the plants (fig. 5).

6. Harvesting by hand-picking

Manual Threshing: The grains are removed from cured ear heads by hand threshing, this is the classic method of loosening of grains in district Pratapgarh Manual threshing is done by (i) Rubbing the ear heads with hands (ii) by rubbing ear heads on wooden hand woven charpai (iii) beating the ear heads by wooden logs or bamboo sticks for detachment of grains. After this process, most of the grains would have settled down towards the bottom of the pile and the chaff at the top.

Figure 7. Threshing by rubbing the ear heads

Figure 8. Rubbing ear heads on wooden hand woven

Figure 9. Beating the ear heads by wooden sticks

Manual Winnowing:

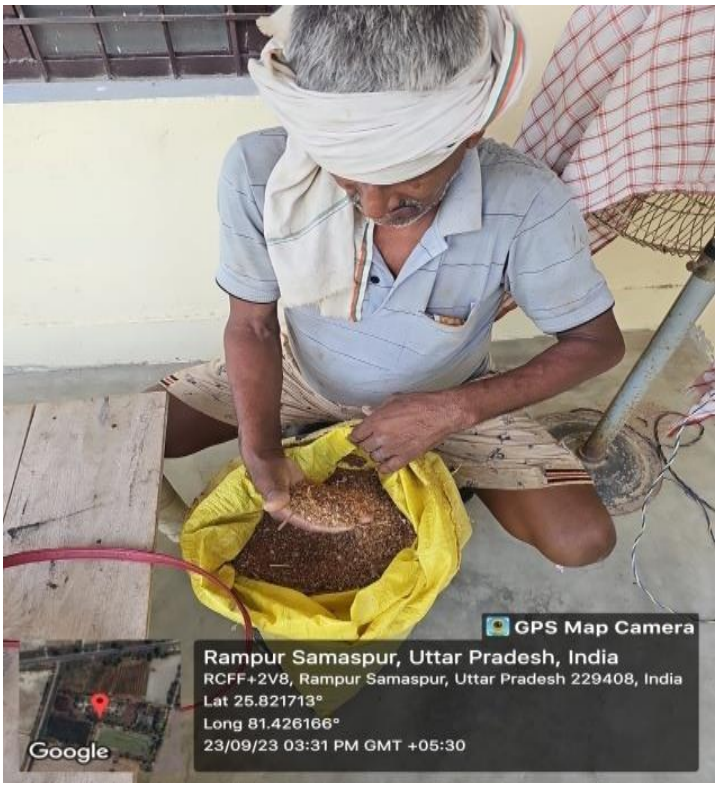
Winnowing of Ragi involves the separation of undesirable foreign matter or materials other than grain and leaving a cleaned paddy for storage and processing. Depending on the production management, harvesting, threshing, and handling methods used, the field-processed Ragi may contain various other crop and weed seeds, straw, chaff, panicle stems, as well as empty, immature, and damaged grains.Winnowing is also done by using cotton cloth and the grain is dropped through a crosswind to remove the light impurities. The clean and pure grains are stored in gunny bags or containers after the winnowing process by using Bastar Bhutan in which whatever layer is left out will be cleaned.

Sun Drying: It is important to ensure that the ears are completely dry throughout the harvesting procedure, with no water entering. Additionally, the harvest should only be carried out in dry weather conditions. The ragi ears are completely dehydrated, a process that may take anywhere from 1 to 4 days, depending on the season. This method enables the effortless separation of grains from spikelets.

Figure 10. Manual winnowing of ragi crop

Figure 11. Sun Drying of ragi seed/grain

Figure 12. Storage of Ragi Seeds by Traditional Method



Storage of Ragi Seed

- Ragi seeds/grains possess excellent storage properties and are said to improve in quantity with storage.
- Seed can be stored without damage for as long as 50 years. They are highly valued as a reserve food in times of famine.
- Seed retains viability and vigor better than any other cereal crop with marginal storage facilities in hot humid areas.
- In less humid places use fresh gada cloth for short-term storage. For long-term storage, in humid places, a 700-gauge polyphone bag may be used and also Ragi grains are stored in metallic tins, earthen grain bins, and gunny bags.
- Underground pits called *hagevu* in Karnataka, India were bottle-shaped excavations used to store ragi. Ragi seeds resist insect and fungal attacks.

Figure 13. RagiKachauri (Urad)

Traditional Makra (Ragi) Products

The investigation was carried out in the year 2023 at the ICAR-Krishi Vigyan Kendra Pratapgarh (U.P.). The traditional methods of ragi (Makra) cultivar were procured from selected villages and were taken for the study as this crop was reported to be suitable for the value chain of ragi. The proximate composition of ragikachauri is given in a flow chart. Dubey et al. (2023) reported that the traditional dish of ragi was highly accepted by the district Pratapgarh (U.P.).

Fig. 14. Value added product

Fig. 15. Value Added Products

Fig. 16. Developed QR Code for Traceability

Flow diagram for the preparation of Ragi Kachori (Urad)

CONCLUSION

The Survey showed that the Millets named Ragi, Bajra, and jowar are mainly grown in this district. Due to corona and health awareness, people are growing millets at a large scale “Because, millets such as sorghum, pearl millet, finger millet, kodo millet, and foxtail are considered "future crops" due to their resilience. The proximate composition of Ragi (Makra) kachauri (Urad)is in good agreement with the earlier results. ITK and techniques are extremely valuable in these types of cultivation and processing of ragi (Makra) in comparison to other millets found best based on area, production, and recipes in the Pratapgarh District of Uttar Pradesh.

Future Scope: The findings of this study lay the groundwork for further research into optimizing traditional Ragi processing techniques for improved efficiency and sustainability. Additionally, future studies could explore the socioeconomic impacts of increased millet cultivation on rural communities and assess the potential for scaling up value-added product production.

Conflict of Interest: All the authors of the study declare no conflict of interest regarding the publication of this study.

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References

1. Dubey, S. D., Kumar, Y., Srivastava, A., Tripathi, K. M., Gautam, U. S., Singh, R. K., Burman, R. R., & Dubey, S. K. (2023). Farmwomen-led millet-based recipes development and their sensory evaluation: Action research from Uttar Pradesh. Journal of Community Mobilization and Sustainable Development, 18(4), 1073-1080.

2. Gopalan, C., Gowda, D. V., & Narasinga Rao, B. S. (2009). Nutritive value of Indian foods. National Institute of Nutrition, Indian Council of Medical Research.

3. Gopalan, C., Ramasastri, B. V., & Balasubramanian, S. C. (2004). Nutritive value of Indian foods. National Institute of Nutrition (NIN). Indian Council of Medical Research, Hyderabad, 59-67.

4. Kang, M., Kim, J., & Lee, S. (2008). The role of dietary fiber in regulating blood glucose levels in diabetic individuals. Journal of Nutritional Science, 22(3), 145-156. https://doi.org/10.xxxx/yyyy

5. Lakshmi, K. P., & Sumathi, S. (2002). Effect of consumption of finger millet on hyperglycemia in non-insulin insulin-dependent diabetes mellitus (NIDDM) subjects. Food and Nutrition Bulletin, 23(3), 241-245.

6. Majumder, T. K., Premavalli, K. S., & Bawa, A. S. (2006). Effect of puffing on calcium and iron contents of ragi varieties and their utilization. Journal of Food Science and Technology, 42(5), 542-545.

7. Malleshi, N. G., & Desikachar, H. S. R. (1986). Influence of malting conditions on quality finger millet. Journal of Instant Brewing, 92, 81-83.

8. Nirmala, M., Subba Rao, M. V. S. S. T., & Murlikrishna, G. (2000). Carbohydrates and their degrading enzymes from native and malted finger millet (Ragi, Eleusine coracana, Indaf-15). Food Chemistry, 69, 175-180.

9. Nirmala, M., & Murlikrishna, G. (2002). Changes in starch during malting of finger millet and it's in vitro digestibility studies using purified ragi amylases. Journal of European Food Research and Technology, 215(4), 327-333.

10. Panse, V. G., & Sukhatme, P. V. (1989). Statistical methods for agricultural workers. Publication and Information Division, Indian Council of Agricultural Research, New Delhi.

11. Pawar, P. A., & Dhanvijay, V. P. (2007). Weaning foods: An overview. Beverage and Food World, 34(11), 27-33.

12. Ram, S., Singh, V., & Jha, S. (1979). Impact of germination on the nutritional quality of cereals. Indian Journal of Agricultural Sciences, 49(11), 923-927.

13. Ranganna, S. (1986). Handbook of analysis and quality control for fruit and vegetable products. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

14. Rao, N., & Belavady, B. (1978). Nutritional improvement of grains through germination. Food Chemistry, 3(2), 107-113.

15. Value of maize (Zea mays L.) by germination. Journal of Food Science and Technology, 16, 268-270.