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From skills to sustainability: Capacity building of rural women in quality-preserves and super grain products

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Abstract

Nutripreneurship refers to the establishment, management, and expansion of enterprises that generate profit while simultaneously enhancing food and nutrition security. It serves as a significant catalyst for economic development, offering a viable alternative to traditional employment by promoting self-employment, income generation, and poverty alleviation. Additionally, nutripreneurship contributes to improved nutritional status, better health outcomes, and strengthened overall food and nutrition security. This study was conducted among 120 rural women to improve their skills in developing quality preserved foods and supergrain products. A five-day training in batches was organised to train the women on fruits and vegetables preserved products such as jam, candy, pickles, ketchup, chutneys, squashes, and bottling of products. Similarly, a separate five-day training in batches was organised to train the women on supergrain bakery products such as muffins, cakes, biscuits, cookies, pizza, pav, buns, icing of cake, and packaging. These trainings were consisted of demonstrations, lectures, hands on practices sessions, and an exposure visit to a small-scale unit. Results indicated that post knowledge score of women on various preserved and baked products at baseline ranged from 0.32 ± 0.18 to 0.49 ± 0.27 , which increased significantly ($p \leq 0.05$) after exposure of training programme and ranged from 1.42 ± 0.33 to 1.91 ± 0.45 . Consequently, the five-day training program led to a substantial improvement in trainees' awareness and knowledge of food processing, preservation, baking techniques, cost estimation, packaging, and marketing of the developed products. It also enhanced their understanding of the nutritional and health benefits, as well as the entrepreneurial potential, of these products.

Keywords: Bakery, entrepreneur, preservation, quality, sustainable, supergrain, training

Introduction

Rural women play a pivotal role in sustaining agricultural economies, yet their contributions often remain undervalued and underutilized. In many regions, women are the custodians of traditional food practices, preservation techniques, and grain cultivation, but limited access to training, technology, and markets constrains their potential (Singh *et al.*, 2022) [13]. The intersection of capacity building, sustainable livelihoods, and value-added food products such as quality-preserves and super grains offers a transformative pathway to empower rural women while strengthening community resilience.

The concept of quality-preserves that are nutrient-rich, hygienically processed fruit and vegetable products and super grain products that are high-value grains like pearl millet, quinoa, millets, and amaranth represents both economic opportunity and nutritional advancement (Sah *et al.*, 2021) [10]. Quality preserved fruit and vegetable products are vital for rural Indian entrepreneurs by reducing huge post-harvest losses, creating year-round income, providing stable jobs (self/wage), adding significant value to seasonal

gluts, ensuring year-round nutrition, and tapping into growing domestic as well as export markets. Vocational training is important to ensure the availability of a skilled workforce, enhancing ability potential of entrepreneurs, increasing efficiency, maintaining and enhancing product quality, minimizing wastages in the production process, reducing fatigue, and increasing the speed of work (Bora and Deca, 2021) [1].

By equipping rural women with skills in modern preservation methods, packaging, branding, and sustainable grain processing, communities can unlock new income streams, reduce post-harvest losses, and promote healthier diets. This approach not only enhances food security but also aligns with global sustainability goals, particularly those related to gender equality, poverty reduction, and responsible consumption. Capacity building in this context extends beyond technical training. It encompasses entrepreneurship development, collective organization, and market integration, enabling women to transition from subsistence producers to active participants in local and global value chains. Such empowerment fosters self-

reliance, strengthens rural economies, and contributes to the preservation of cultural heritage through traditional food practices (Singh *et al.*, 2020) ^[12]. Moreover, the integration of sustainability principles ensures that these initiatives are environmentally conscious, socially inclusive, and economically viable. Provision of incentives as a component of the training toolkit serves as a motivational strategy that encourages women to adopt the acquired skills and establish small-scale entrepreneurial ventures independently. Such support mechanisms contribute significantly to enhancing their self-confidence, entrepreneurial motivation, and capacity for self-employment (Spandana *et al.*, 2023) ^[14].

The literature shows that rural women's empowerment through food processing and super grain initiatives is promising but under-researched, with gaps in sustainability integration, entrepreneurship training, and market linkages. There is a lack of evidence on how entrepreneurial training can transform rural women from producers into business leaders (Singh *et al.*, 2022) ^[13].

This research paper explores the impact of vocational training on knowledge scores and skill acquisition in the production of quality-preserved foods and supergrain products among farm women. By focusing on quality-preserved and supergrain products, the study highlights a model where tradition meets innovation, creating pathways for rural women to achieve economic independence while contributing to broader goals of food security and sustainable development.

Materials and Methods

The study was carried out among 120 rural scheduled caste women from Garhkhera, Gothara Mohabtabad, Bhatola, Chandpur, Atali, Mandhawali, Bahadurpur, Maujpur, Fatehpur Biloch, Piala, Machhgar, Samaipur, Shahpur Kalan, Rajpur Kalan, Chhainsa, Chirsi, Kabulpur, Sehwak, Dayalpur, Malerna, Sidola, Deeg, Mirzapur, and Bhopani villages of Faridabad district to enhance their competencies in the preparation of quality preserved foods and supergrain-based products. A series of five-day training programmes, conducted in batches, focused on the preparation of preserved fruit and vegetable products, including jams, candies, pickles, ketchup, chutneys, squashes, and bottled products. In addition, another five-day batch-wise training programme was organised on the development of supergrain bakery products such as muffins, cakes, biscuits, cookies, pizza, pav, buns, cake icing, and

product packaging. The training programmes incorporated lectures, practical demonstrations, hands-on practice sessions, and exposure visits to small-scale processing units. The pre- and post-knowledge scores regarding preparation of preserved fruit and vegetable and supergrain bakery products were collected; 1 score was assigned to each correct response, and 0 score to each wrong response. Training utility was measured by getting the response of trainees for 21 items related to training on a four-point continuum i.e., very useful, useful, undecided, and not useful with scores assigned 4, 3, 2, and 1 respectively. Adoption of technology has been indicated in percentage. Data was statistically analyzed using SPSS software to draw some meaningful interpretations.

To address the financial constraints faced by women while establishing entrepreneurial ventures, trainees successfully completed the five-day training programme on quality fruit and vegetable preserves were provided with a processing kit. The kit included a food processor with accessories, kadai, pressure cooker, strainer, and other essential utensils. Likewise, participants who completed the bakery training programme received a bakery kit comprising an oven, beaters, gloves, sieve, baking tray, muffin tray, measuring cups, measuring spoons, silicon brush, silicon ladle, cooker, pan, and related equipment. These support kits were distributed to facilitate the practical application of acquired skills and encourage the establishment of small-scale enterprises.

Results and Discussion

Results presented in Table 1 indicated that pre and post-training knowledge scores and gain in knowledge by the trainees under various heads. The results of the first head i.e. millets products (biscuits, cakes and muffins) indicated that the pre-training score of grain processing was found to be 2.28 and that was increased to 6.15 after imparting live demonstrations and lectures on various technologies such as processing of raw materials, preparation of biscuits, cakes and muffins with and without egg, faults and remedies of cake, biscuits and muffins. Similarly, trainees' knowledge score increased from 1.10 to 3.18 regarding the value addition of baked and preserved products. The average percent gain in knowledge after having exposure of trainings indicated that it increased tremendously, almost by 60 percent.

Table 1: Impact of vocational training on pre and post-knowledge scores of women regarding development of quality preserves and super bakery products

	Pre-knowledge score	Post knowledge score	Gain in knowledge	t-value
Millets products i.e., biscuits, cakes and muffins (10)	2.28 ± 0.10	6.15 ± 0.36	3.87 (63)	13.5*
Value addition of products (5)	1.10 ± 0.16	3.18 ± 0.31	2.08 (65)	12.1*
Preparation of bread, buns and pizza (5)	0.90 ± 0.12	2.75 ± 0.28	1.85 (67)	11.6*
Milk and dark chocolates making (5)	1.50 ± 0.12	3.70 ± 0.56	2.20 (59)	7.5*
Icing of cakes with different motifs (2)	0.75 ± 0.19	1.80 ± 0.49	1.05 (58)	6.1*
Preserved fruits products (8)	3.86 ± 0.27	6.50 ± 0.38	2.64 (41)	6.2*
Preserved vegetable products (5)	2.35 ± 0.11	4.62 ± 0.48	2.27 (49)	5.2*
Juices and squashes (5)	2.10 ± 0.25	4.50 ± 0.38	2.40 (53)	7.9*
Faults and remedies in preserved products (5)	1.28 ± 0.12	4.45 ± 0.36	3.17 (71)	6.8*
Setting up a value chain (5)	1.40 ± 0.23	4.65 ± 0.56	3.25 (70)	6.9*
Microfinancing (2)	0.56 ± 0.15	1.58 ± 0.38	1.02 (64)	5.4*
Packaging of products (3)	1.10 ± 0.17	2.58 ± 0.38	1.48 (57)	7.5*
Cost calculation of developed products (5)	1.55 ± 0.21	4.25 ± 0.47	2.70 (63)	6.8*
Total maximum scores (65)	20.73	50.73	30 (59)	6.4*

Values are mean ± SD; * Significant at 5% level

The maximum gain in knowledge *i.e.*, 71 and 70 per cent, was observed for faults and remedies in preserved products (pickles and chutneys) and setting up a value chain, respectively, whereas the minimum gain in knowledge *i.e.*, 41 per cent, was observed for the preserved fruit products (pineapple squash, mixed fruit jam, apple jam, and guava jelly). The possible explanation behind their particular pattern of gain in knowledge may be that pickling is always at the core of women's hearts, and due to silly mistakes, their product gets spoiled easily, so their curiosity to cure these faults led them to learn more about pickling. Secondly, after making the product ready, the main challenge faced by them is generally where to sell the finished product, that make them learn more about it. The reason behind they gain minimum knowledge regarding preserved fruit products maybe these products are less familiar and consumed by

them, and therefore are not in much demand in rural settings. Similar results of training exposure on gain in knowledge and skill development of trainees were observed by Kobba *et al.*, 2020^[4]; Elakkiya and Asokhan 2023^[2]; Raja *et al.*, 2023^[5]; Kumar *et al.*, 2024^[8]

The results given in Table 2 represented the effectiveness of the training program conducted by KVK Faridabad in terms of the usefulness of the delivered contents within different heads and sub-heads. However, all the delivered contents were found useful by the trainees, yet as per the weighted mean scores, preserved products of vegetables and faults and remedies in pickles, chutneys and sauces were found the most useful content with a weighted mean score of 3.73-3.76, followed by preparation of biscuits and cookies, and setting up a value chain with a weighted mean score of 3.60-3.73.

Table 2: Utility of contents delivered on scientific components in different training programs

Knowledge contents	V. Useful	Useful	Don't know	Not Useful	Overall utility (W.M.S.)	Rank
Cereals, pulses & oil seeds processing	180	80	20	20	3.50	V
Value addition of bakery products	130	150	10	10	3.36	VII
Understanding of raw ingredients used in bakery	100	170	10	20	3.12	XIII
Preparation of bread, buns and pizza	140	130	20	10	3.33	IX
Preparation of cakes and muffins	120	170	5	5	3.35	VIII
Icing of cakes with different motifs	120	140	20	20	3.20	XI
Faults and remedies in cake and muffins	100	190	-	10	3.27	X
Preparation of biscuits and cookies	120	150	10	20	3.73	II
Faults and remedies in biscuits and wafers	90	160	20	30	3.03	XIV
Preparation and packing of chocolates	110	160	10	20	3.20	XI
Functions of various ingredients in bakery	80	200	10	10	3.17	XII
Principles of fruit and vegetable preservation	150	120	10	20	3.33	IX
Fruit and vegetable processing	150	110	40	-	3.36	VII
Preserved products of fruits	80	140	40	40	2.86	XV
Preserved products of vegetables	220	80	-	-	3.73	II
Faults and remedies in pickles, chutneys and sauces	240	50	10	-	3.76	I
Faults and remedies in jam, jellies and squashes	70	220	10	-	3.20	XI
Preservation by drying and dehydration	210	70	10	10	3.60	III
Storage of ingredients & developed products	200	80	10	10	3.56	IV
Smart packaging of developed products	150	80	50	20	2.86	XV
Cost calculation of developed products	160	110	20	10	3.40	VI
Setting up a value chain	190	100	10	-	3.60	III

Further, the storage of ingredients and developed products secured IV rank in terms of the usefulness of contents, whereas cereals-millets, pulses, and oil seeds processing secured V rank, and the cost calculation of developed products obtained VI rank by securing a weighted mean score of 3.40. Fruits and vegetables processing and fruit and value addition of bakery products were liked next by the trainees by having a weighted mean score of 3.36. Our findings are in close agreement with the earlier observations revealed by Poshia and Pandya, 2019^[7]; Sah *et al.*, 2021^[10]; Jumi *et al.*, 2023^[3]; Rani *et al.*, 2024^[9]; Yadav *et al.*, 2024^[15]; Manikandan and Devi 2025^[6]).

Conclusion

Five-day vocational training programs resulted in a significant enhancement in participants' knowledge and awareness regarding food processing, preservation techniques, bakery product preparation, cost calculation, packaging, and marketing strategies for value-added products. The trainings also improved trainees' understanding of the nutritional and health benefits

associated with these products, along with their potential for entrepreneurship development. The present study evaluated the impact of ten vocational training programs focused on quality fruit and vegetable preserves and super grain bakery products in strengthening the livelihood security of unemployed youth and rural women. Participants reported that both the training content and the tool kits provided under each domain were highly beneficial. The combination of theoretical lectures, practical demonstrations, and distribution of essential equipment and starter kits proved to be an effective approach for promoting small-scale entrepreneurial activities and income generation. Furthermore, adoption of these technologies was found to be more sustainable and economically viable when implemented through self-help groups, thereby contributing to improved livelihood opportunities and community empowerment.

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