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RESEARCH PAPER

Processing for Value Addition of Seasonal Fruit and Vegetables

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ABSTRACT

This research analyzes the customary techniques for preserving seasonal fruits and vegetables, emphasizing the following five recipes from the Himalayan region: Tomato Ketchup, Mixed Pickle, Apple Jam, Turmeric Halwa and Bottle Gourd Ladoo. These products are made in rural Jammu and Kashmir and provide a means for the region's households to economically sustain themselves by savoring and nutritionally enriching surplus produce. Incorporating traditional wisdom and using local ingredients like jaggery, turmeric, and bottle gourd, these recipes not only promote health-conscious consumption but also offer additional nutritional value. The study captures the processing steps of the products to prepare alongside their detailed nutritional profile per 100g. Their calorie content, macronutrients, fiber and more are compared and visually represented through a heatmap and comparative table to streamline selection for various dietary preferences. The research highlighted the importance of these value-added products with regard to food security, stimulating entrepreneurship and improving rural livelihoods.

HIGHLIGHTS

- Documented five traditional value-added products using seasonal fruits and vegetables from Jammu & Kashmir.
- Emphasizes traditional processing methods to enhance shelf life and reduce post-harvest losses.
- Provides nutritional analysis highlighting health benefits of each recipe.
- Promotes sustainable rural livelihoods through value addition of local produce.

Keywords: Value addition, seasonal fruits, seasonal vegetables, food preservation, nutritional value, rural livelihood, recipes

India is one of the foremost producers of fruits and vegetables. The Shivalik and Pir Panjal areas of Jammu and Kashmir are important for growing diverse seasonal horticultural crops, including apples, apricots, cherries, pears, and plums, along with many vegetables. Ahmad, R. *et al.* 2021. These areas with differing climate conditions have good soil, so they support rich plant and animal life in agriculture (Bundela, A. & Singh, A.

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2021) which is highly useful for domestic use as well as trade.

Even with this surplus, the reasons for post-harvest loss and waste of fruits and vegetables in India is due to missing coordination of Production and Processing fresh markets, poor knowledge exchange, insufficient transportation infrastructure, frozen supply chain radius gaps, absent timing windows for planting and sowing, and absence of specialized transport (Anand, S., & Barua, M. 2022). This creates not only an economic burden for farmers and traders, but nutritionally these losses are an important contributor to food insecurity. Traditionally, food processing techniques such as drying, fermentation, pickling, candying, jam-making, squash halwa and toffee production do add some value and respond to this issue (Sharangi, A. 2021). These methods are also instrumental in maintaining the nutritional value as well as the increased shelf-life of food and making off season availability of seasonal fruits and vegetables (Fathi, F. *et al.* 2022).

Ethnic fermented foods and beverages from Jammu and Kashmir include; fermented vegetables akin to sauerkraut, fruit pickles and vegetable preserves. These foods are a hallmark of Himalayan culture (Raja, J. *et al.* 2020). Also, SKUAST-Jammu has held workshops training rural women on processing vegetables and fruits to enable them to start their own businesses. Some emphasized products include bottle gourd, turmeric, apple jam, astringent candy, pickles and juices. The purpose of the study is to document five traditional value-added recipes from the Pir Panjal and Shivalik regions of J and K and analyze them.

PROCESSING OF THE FRUITS AND VEGETABLES

Processing minimizes post-harvest losses while extending the shelf life of fruits and vegetables. It also adds value to the products, making them nutritionally and economically advantageous (Liu, X. *et al.* 2022). In Shivalik and Pir Panjal areas of Jammu & Kashmir, the traditional processing methods are based on local knowledge systems that have been preserved over generations (Mahmood, T., & Farooq, A. 2021). Drying, boiling, fermenting, pickling, candying and jam-making not only aid in the preservation of excess harvest but also manufacture ethnically important foods which are delicious and nutritious (Kumar, A. 2019).

In addition, they are useful in the countryside where advanced cold storage and packaging facilities are unavailable. In addition, jaggery, mustard oil and vinegar as preservatives maintain the health and authenticity of the preparation (Kumar & Rajput, 2023). This next part explains how to make different traditional dishes using seasonal fruits and vegetables emphasizing their gastronomic and nutritional value.

RECIPE DESCRIPTIONS AND PREPARATION METHODS

The recipes above have all been made with traditional techniques. The mixed vegetable pickle recipe includes the sun-dried vegetables along with- spices and mustard oil. For the tomato ketchup, tomatoes were cooked with jaggery, spices, and vinegar. For the apple jam, boiled apples were blended with jaggery to create a smooth sweet spread. Fresh turmeric was roasted in ghee and

Table 1: Nutritional Value Table of Traditional Value-Added Products (Per 100g Serving)

Sl. No.	Recipe Name	Main Ingredient(s)	Calories (kcal)	Carbs (g)	Fat (g)	Protein (g)	Fiber (g)
1	Tomato Ketchup	Ripe tomatoes, onion	109	27	.32	1.1	.3
2	Mixed Pickle	Carrots, Cauliflower, green chilies and lemon	183	10	13	3	0
3	Apple Jam	Apples, jaggery	120	30	0	0	2
4	Turmeric Halwa	Turmeric, jaggery, ghee	320	45	12	2	1
5	Bottle Gourd Ladoo	Bottle gourd, coconut	260	36	12	3	2

sweetened with jaggery for the *halwa* thus termed as "*Haldi ka halwa*". Gourd ladoos were prepared from grated bottle gourd cooked with jaggery and ghee then formed into balls.

Tomato Ketchup

Main Ingredients: Ripe tomatoes, onions

Preparation

Wash and boil ripe tomatoes until the skin starts peeling. Remove the skin and blend into a puree. In a separate pan, saute finely chopped onions until translucent. Add the tomato puree, salt, jaggery, black pepper and a dash of vinegar. Simmer the mixture until thick and glossy. Strain for smooth texture and store in sterilized glass bottles.

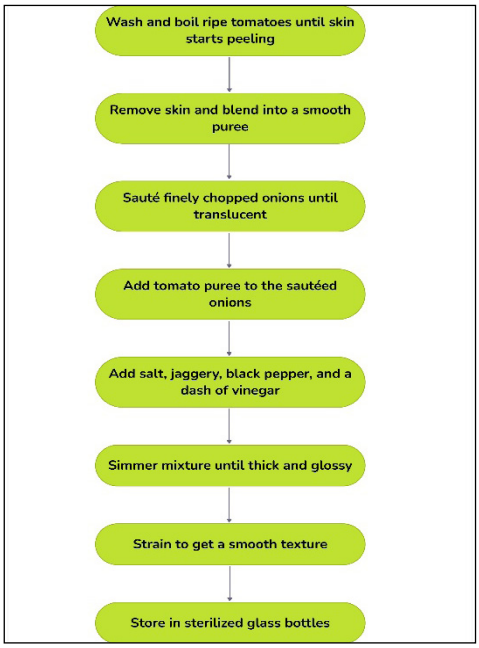

Fig. 1: Flow chart for the preparation of tomato ketchup

Mixed Pickle

Main Ingredients: Carrots, cauliflower, green chilies, lemon

Preparation

Wash and chop vegetables uniformly. Dry in the sun for a few hours. Prepare a spice mix using mustard seeds, fenugreek, turmeric and salt. Mix with jaggery and mustard oil. Combine the vegetables and spice mix in a large jar, ensuring they're completely submerged in oil. Leave the mixture in sunlight for a few days for natural fermentation.

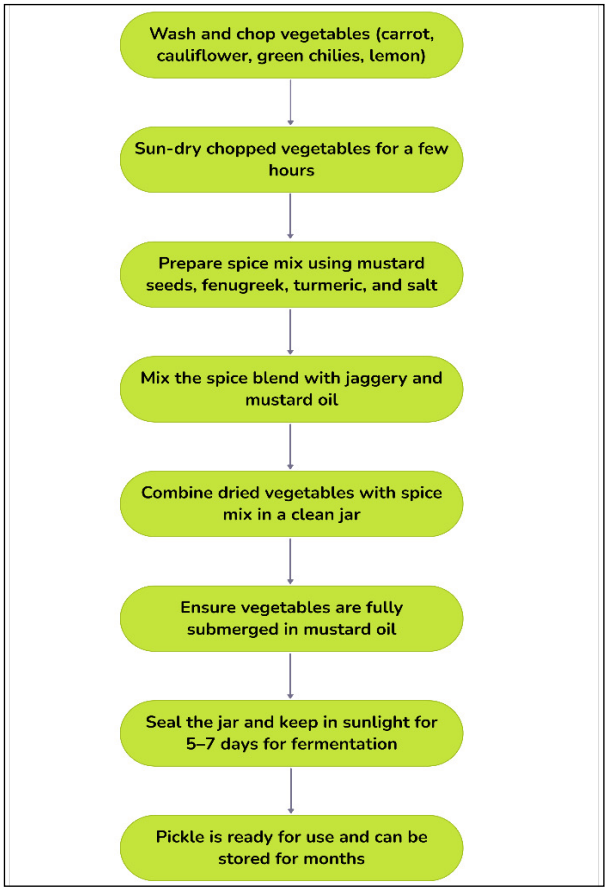

Fig. 2: Flow chart for the preparation of mixed pickle

Apple Jam

Main Ingredients: Apples, jaggery

Preparation

Peel, core, and finely chop apples. Cook with a small amount of water until soft. Mash or blend for a smooth consistency. Add jaggery and lemon juice, then cook slowly while stirring to avoid burning. Cook until the mixture thickens and passes the cold plate test. Optionally, flavor with cinnamon. Store in sterilized jars and refrigerate.

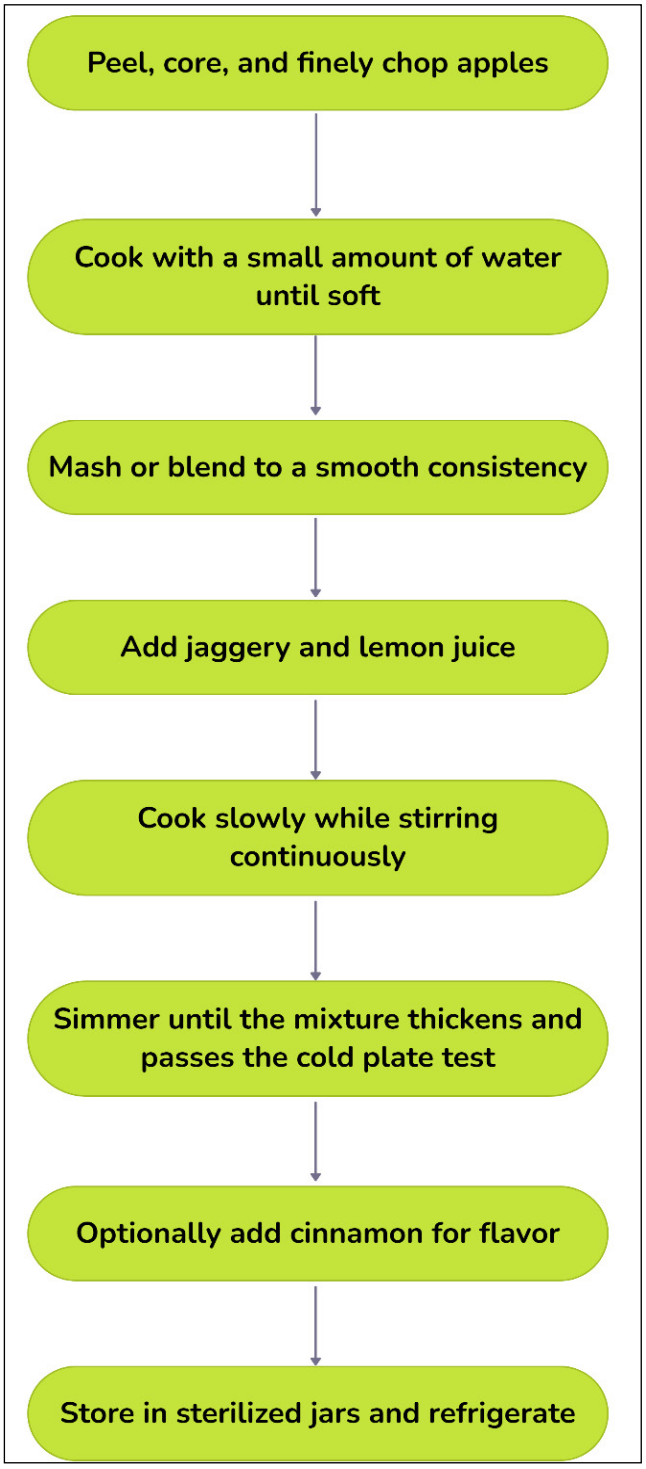

Fig. 3: Flow chart for the preparation of apple jam

Turmeric Halwa

Main Ingredients: Fresh turmeric, jaggery, ghee

Preparation

Grate fresh turmeric and saute in ghee until golden brown and aromatic. Add jaggery and mix thoroughly. Add crushed dry fruits and cook the mixture until it reaches a halwa-like texture. Serve warm or cool and store in airtight containers.

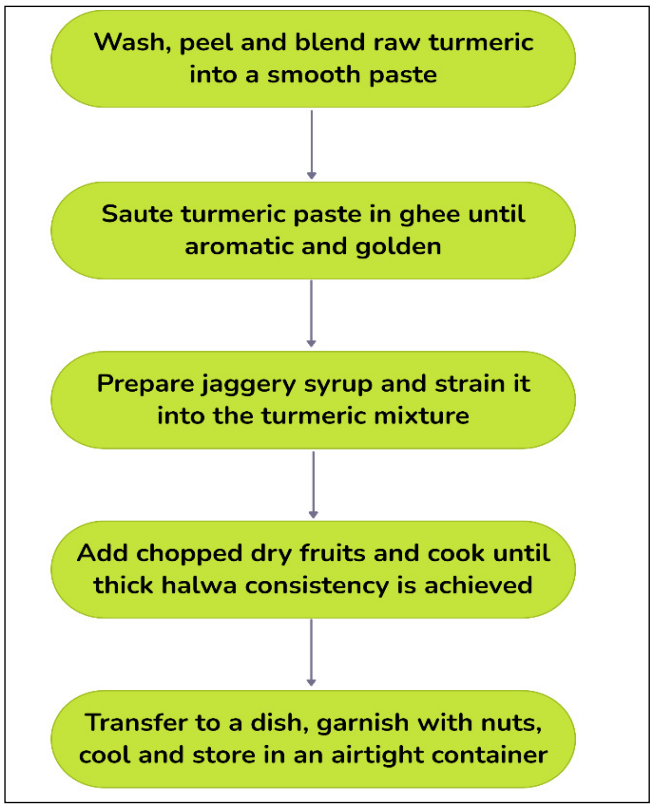

Fig. 4: Flow chart for the preparation of turmeric *halwa*

Bottle Gourd Ladoo

Main Ingredients: Bottle gourd, coconut

Preparation

Grate fresh bottle gourd and cook in a pan with ghee. Add milk and let it reduce while stirring. Mix in jaggery and desiccated coconut. Cook until the mixture thickens enough to roll into ladoos. Shape into small balls and roll them in dry coconut before storing.

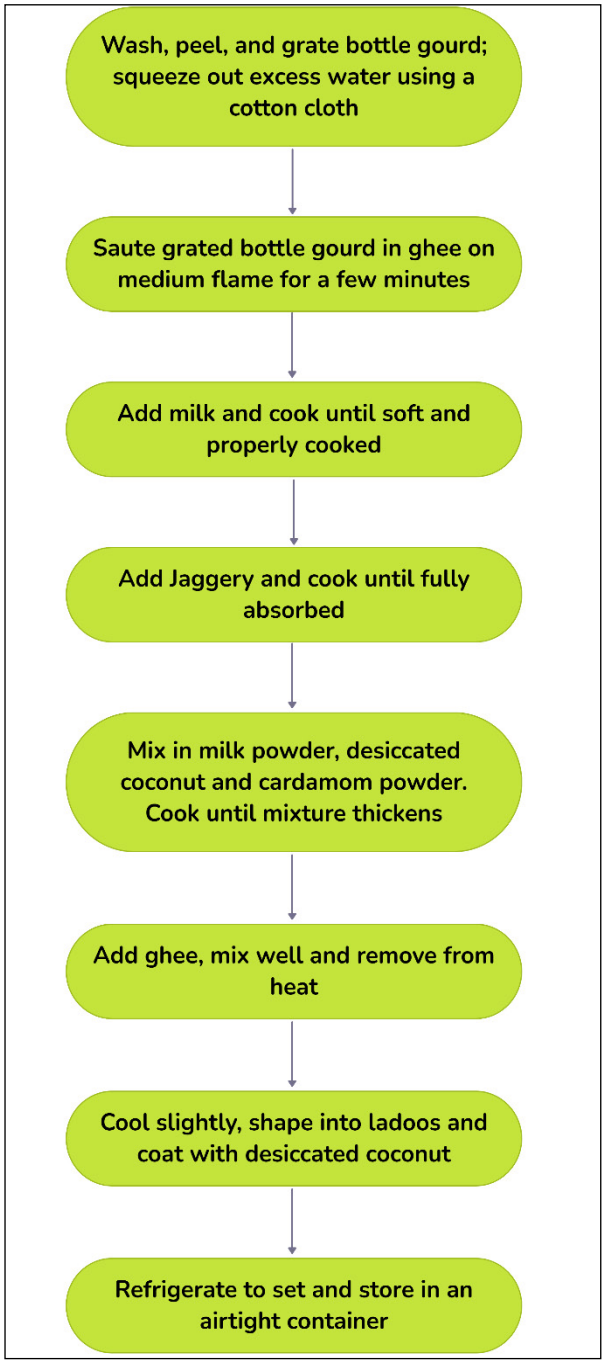

Fig. 5: Flow chart for the preparation of Bottle Gourd Ladoo

NUTRITIONAL CONTENT HEATMAP

A heatmap was prepared to visually represent the variation in nutritional content across these recipes. Products like Turmeric Halwa and Bottle Gourd Ladoo are energy-dense and rich in fats, while Tomato Ketchup and Apple Jam offer moderate calories with minimal fat. Mixed Pickle is rich in fats and protein, making it suitable as a probiotic side dish. Apple Jam and Bottle Gourd Ladoo provide higher fiber content, beneficial for digestion.

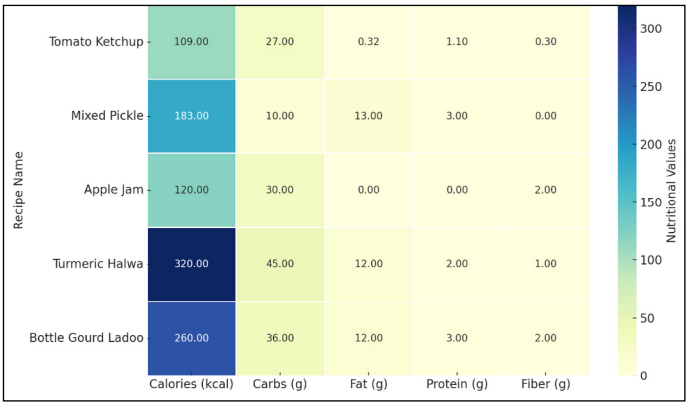

Fig. 6: Nutritional value heatmap of traditional value-added products (per 100g serving)

CONCLUSION

The traditional preservation techniques of seasonal fruits and vegetables can greatly aid in both extending the longevity of perishables and improving nutrition, food security and economic opportunities in rural areas. This report documents and evaluates five value–added traditional recipes which are Tomato Ketchup, Mixed Pickle, Apple Jam, Turmeric Halwa and Bottle Gourd Ladoo, showcasing a unique combination of local cooking skills, nutritional value and adaptability.

Analysis of the nutritional products indicates these receives multiple advantages. For example, turmeric halwa offers individuals 320 kcal and 12 grams of fat per 100 grams serving. It not only provides calories but also contains fat and anti-inflammatory benefits owing to turmeric. Portion ladoos of bottle gourd provide 36 grams of carbohydrates and 3 grams of protein, thus serving as good energy sources ideal for health supplement. Seasoned tomato ketchup has the lowest fat content of 0.32 grams and provides energy of 109 kcal alongside fiber marking its shelf life as a condiment. Apple jam

is known to have high sugar content along with the advantages of apples and jaggery aiding in cravings towards preservatives. In contrast, mixed pickle which combines carrots, cauliflower, chilies along with lemon serves as a fermented product containing high amounts of fat 13 grams and protein three grams serving to be quite useful in diet if consumed in limited quantities. Instead of refined sugar, jaggery was added in all recipes showcasing a shift towards traditional healthy options which reflects today's nutritional guidelines. Along with improving taste, jaggery fortifies the products with crucial minerals such as iron and magnesium making them more useful and optional.

This study reconfirms that the scientific validation and economic support of traditional food knowledge can enhance sustainable rural development. It calls for integrating traditional value-added products into the mainstream food systems thus merging tradition with innovation for a healthier and economically empowered future.

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