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## Feasibility study for small scale commercialization of preserved foods

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### Abstract

The present study was undertaken with the objective to evaluate the shelf life and sensory qualities of different preserved products for checking their feasibility for small scale industries. Preserved products viz., Fruit jam, jelly, Fruit cheese, marmalade, Fruit preserve, sauces, pickles, candy, squash, Fruit nectar, Lime cordial, Fruit RTS, Meat pickle and Mushroom soup powder were prepared. The products were further analyzed for their sensory and storage qualities. The preserved products like papaya tutti-fruity, meat pickle and red chilli pickle showed highest overall acceptability on organoleptic evaluation. These three most acceptable preserved products scored 5 out of 5 organoleptic evaluation followed by papaya RTS (4.94) and papaya pine apple RTS (4.94). Jackfruit jelly and mushroom soup powder had the lowest sensory scores of (2.4) and (2.85) respectively. The Shelf life evaluation showed that there was no spoilage in steeped vegetables, papaya preserve, amla preserve, papaya RTS, orange squash, Papaya squash, Papaya pickle, Papaya tutti fruity and Canned pineapple on the 30th day of storage. Papaya is one produce that has emerged as the most suitable for post-harvest preservation

**Keywords:** Shelf life evaluation, sensory quality, spoilage and preserved products

### 1. Introduction

Food preservation industry has been a potential source for income generation from ancient times. Losses of fresh agricultural produce cause wastage of the total agricultural output. In rural areas farmers produce numerous crops, fruits and vegetables but are unaware of adding value to their produce that may add to their daily income. In India, fruits and vegetables are wasted to the tune of 30,000 million tones due to poor post-harvest management. The perishable fruits and vegetables are available as seasonal surpluses during certain parts of the year in different regions and are wasted in large quantities due to the absence of facilities and know-how for proper handling, distribution, marketing and storage. Furthermore massive amounts of the perishable fruits and vegetables produced during a particular season results in a glut in the market and become scarce during other seasons (Pritchard, 1991) <sup>[1]</sup>. Fruits and vegetables need simple technologies of processing, preservation and transport. They suffer nearly 35% post-harvest losses. Only 1% of the total fruits and vegetables produced are processed in the 3000 food industries in the country (Das, A.K. 1991) <sup>[2]</sup>.

Fruit processing is necessary where it ensures fair returns to the growers to improve their economic condition. It also helps to mitigate the problem of under-employment during off-seasons in the agricultural sectors. According to the estimates, nearly 30% of the fruits are lost due to spoilage, handling, transportation and lack of cold storage and processing techniques (Singh, 1994) <sup>[3]</sup>.

Food sectors have been rapidly growing as the market demand is no longer confined to local or regional area of supply. Retailers and food industries now source their products from all over the world, transforming the food industry towards an interconnected system with a large variety of complex relationships.

A Study on the Nigerian Food Industry showed that the number of food manufacturing companies (FMCs) increased over the years with the largest number of FMCs established in the 1980s. The range of products produced is still small, with several FMCs producing similar products. Indigenous entrepreneurs wholly own 56.9% of the FMCs. (Kehinde, 2007) <sup>[4]</sup>.

Food preservation refers to any one of a number of techniques used to prevent food from spoiling. Food preservation prevents the food from being spoiled by the action of enzymes and microorganisms. Food preservation helps to increase the safe storage period of foodstuffs, and the availability of out of season fruits and vegetables. A study was therefore undertaken to prepare a wide variety of preserved products and their shelf life and sensory qualities were evaluated. On the basis of these estimations a number of products have emerged as suitable items that can be commercialized and contribute to the livelihood security of the marginal farming community. The commercialization of preserved foods are also necessary because of the Millennium Development Goals (MDGs), of which the eradication of extreme poverty and hunger presents a great and present challenge. The World Bank (2000) emphasizes the importance of promoting opportunity,

facilitating empowerment and enhancing security in order to achieve poverty reduction. Poverty is recognized as a multifaceted phenomenon, encompassing issue of security, self-esteem, power and control, as well as income and wealth considerations. (Poulton and Poole, 2001) [7].

The product commercialization includes trial production and market test of the products. The further production depends on the consumer acceptability and outcomes of the release. (Siriwongwilaichat, 2001) [8].

**2. Materials and methods**

**2.1 Product selection:** The common produce of the farmers of Uttarakhand were selected for the study. The study was carried out between the months of December 2015 to May 2016.

Categories of the raw materials were as follows:

**Table 1**

Fruits	Vegetables	Others
Apple, papaya, guava, amla, orange, pineapple	Jackfruit, tomato, carrot, ginger, chilli, lime, cucumber	Meat, Mushroom

**2.2 Product formulation:** Standard procedures were used in the preparation of the given items. A total of 33 different preserved products were prepared from the above mentioned raw materials. The details are mentioned below.

Fruit jam: Apple

Fruit jelly: Papaya, guava, jackfruit,

Fruit Chesse: Papaya cheese, guava cheese, jackfruit cheese

Fruit preserve: Amla preserve, Carrot preserve, Papaya preserve,

Sauce: Apple sauce, Tomato sauce, Plain chilli sauce, Spiced chilli sauce, Tomato chilli sauce

Fruit RTS: Papaya RTS, Papaya pine apple RTS, Papaya squash

Pickle: Papaya pickle, Meat pickle, Cucumber pickle, Red chilly pickle, Tomato pickle

Other: Papaya tutti fruity, canned pineapple, Mushroom soup powder, Fruit nectar, Lime cordial, Ginger candy, Tomato puree, Orange squash, Fruit marmalade.

**2.3 Organoleptic Evaluation of products**

Sensory evaluation offers the opportunity to obtain a complete analysis of the various properties of food as perceived by human sense. Sensory evaluation is an important method for evaluating new products and provides quality measure for production control. (Singham, 2015) [10].

Sensory evaluation of the products was done by semi trained panellists using 5 point Hedonic scale and score card method. The products were evaluated for colour, appearance, texture, flavour, after taste and overall acceptability (Amerine, 1965) [6].

**2.4 Study of storage life of the preserved products:** In today's era the storage time of a product is determined by the type of packaging applied to the product. Good packaging plays two important roles, which are technical and presentational. Technical aspects of packaging aim to extend the shelf life of the food by better protection from all the hazards during storage. Presentational aspects are not concerned with shelf life but such packaging increases sales by creating a brand image that the buyer instantly recognizes. (Peter, 1993) [9].

The present study was designed to analyse the shelf life of preserved products by determining the spoilage. The products were analysed on 1<sup>st</sup> day, 15<sup>th</sup> day and 30<sup>th</sup> day of their storage and the shelf life was determined by the presence of visible decay such as fungal growth, gas production and off flavour. Sensory evaluation too was carried out in the three time intervals to determine change in quality with storage time.

**3. Results and Discussions**

**3.1 Periodical organoleptic evaluation of the prepared products:** The products were prepared and bottled by standard techniques. The samples were evaluated organoleptically thrice in a period of 30 days. The samples were graded by numerical scoring on a five point hedonic scale. The results of organoleptic evaluation are given in Table 1 and fig 1. Out of the products prepared only 6.0% preserved products were unacceptable by consumers on the other hand 30.0% preserved products were moderately acceptable and rest 64% preserved products were highly acceptable.

**Table 2:** Categorization of the preserved products on the basis of sensory qualities

Highly acceptable (64%)	Moderately acceptable (30%)	Unacceptable (6%)
Apple jam	Jackfruit cheese	Jackfruit jelly
Papaya jelly	Amla preserve	mushroom soup powder
Guava jelly	Carrot preserve	
Papaya cheese	Papaya preserve	
Guava cheese	Apple sauce	
Fruit marmalade	Plain chilly sauce	
Tomato sauce	Tomato chilly sauce	
Tomato puree	Tomato pickle	
Spiced chilly sauce	Lime cordial	
Red chilly pickle		
Ginger candy		
Orange squash		
Fruit nectar		

Papaya RTS		
Papaya pineapple		
Papaya squash		
Papaya pickle		
Papaya tutty fruity		
Canned pineapple		
Meat pickle		
Cucumber pickle		

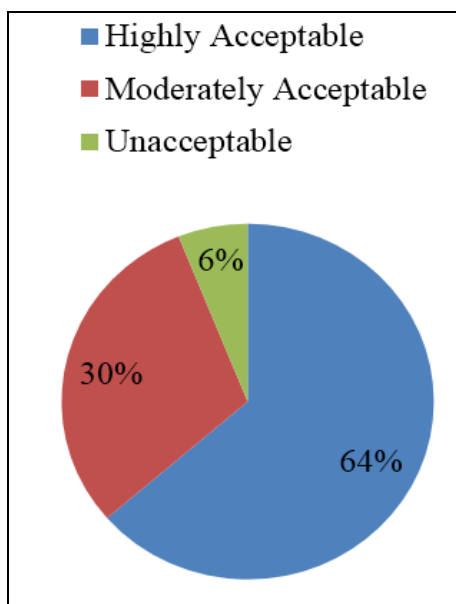


Fig 1: Acceptability % of preserved products

### 3.2 Sensory evaluation of preserved products

Details of individual sensory characters of the preserved products is given in table 3, On the basis of colour we find that

papaya tutty fruity, meat pickle and red chilli pickle are the most acceptable, these have scored 5 out of 5, followed by Orange squash (4.92) and spiced chilli sauce (4.9). On the other hand the jack fruit jelly scored the lowest. Out of 5 jackfruit jelly scored (2.5) for colour. Evaluation of the scores given for texture showed that the papaya tutty fruity, meat pickle and red chilli pickle again scored 5 and are most acceptable. However the jackfruit jelly scored lowest (2.4) and is least acceptable. Flavour of papaya tutty fruity, meat pickle and red chilli pickle was most appreciated and acceptable with 5 out of 5 score, followed by papaya jelly (4.9), Orange squash (4.84), papaya RTS (4.84), papaya pine apple RTS (4.84), papaya squash (4.84) and the jackfruit jelly recorded the lowest score (2.3). Thus overall organoleptic acceptability of papaya tutty fruity, meat pickle and red chilli pickle emerged to be the highest followed by papaya RTS (4.94) and papaya pine apple RTS (4.94). The jackfruit jelly and mushroom soup powder had the lowest sensory scores of (2.4) and (2.85) respectively indicating that these products are not suitable for commercialization. However papaya tutty fruity, meat pickle and red chilli pickle have potential for being taken up for commercialization as they obtained scores of 5 out of 5 on the basis of sensory evaluation though shelf life of these products is low.

Table 3: Sensory quality of preserved products

S. No.	Products	Colour	Texture	Flavour	Over All Acceptability
1	Apple jam	4.76	4.53	4.30	4.53
2	Fruit jelly				
	(a) papaya jelly	4.5	4.6	4.9	4.6
	(b) guava jelly	4.7	4.8	4.6	4.7
	(c) jackfruit jelly	2.5	2.4	2.3	2.4
3	Fruit cheese				
	(a) papaya cheese	4.76	3.92	4.00	4.2
	(b) guava cheese	4.5	3.8	3.9	4.06
	(c) jackfruit cheese	3.15	3.3	2.8	3.08
4	Fruit marmalade	4.84	4.84	4.69	4.79
5	Fruit preserve				
	(a) amla preserve	4.15	3.9	3.3	3.78
	(b) carrot preserve	3.8	3.6	3.8	3.73
	(c) papaya preserve	3.7	3.56	3.6	3.62
6	Sauces				
	(a) apple sauce	4.15	3.9	3.3	3.78
	(b) tomato sauce	3.8	3.6	3.8	3.73
	(c) tomato puree	3.7	3.56	3.6	3.62
7	Plain chilly sauce	4.15	3.8	3.9	3.95
8	Spiced chilly sauce	4.9	5	4.8	4.9
9	Tomato chilly sauce	4.3	3.5	3.7	3.83
10	Red chilly pickle	5	5	5	5
11	Tomato pickle	4.46	3.30	3.46	3.74
12	Ginger candy	4.61	3.46	4.72	4.26
13	Orange squash	4.92	4.84	4.84	4.86
14	Fruit nectar	4.5	4.6	4.15	4.41
15	Lime cordial	3.8	4.5	3.2	3.83
16	Fruit RTS				
	(a) papaya RTS	5	5	4.84	4.94

	b) papaya pine apple RTS	4.7	4.6	4.84	4.94
	(c) papaya squash	4.7	4.6	4.84	4.71
	(d) papaya pickle	4.2			
	(e) Papaya tutti fruity	5	5	5	5
	(f) Canned pineapple	4.3	4.3	4.5	4.4
17	Meat pickle	5	5	5	5
18	Mushroom soup powder	2.8	2.7	3	2.85
19	Cucumber pickle	4.7	4.6	4.8	4.7

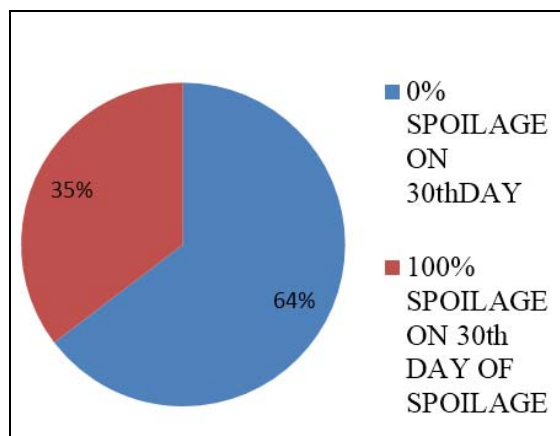
### 3.3 Shelf life evaluation of preserved products

The Shelf life evaluation of food products given in Table 4 and fig 2, it shows that there was no spoilage in Steeped vegetables, papaya preserve, amla preserve, papaya RTS, orange squash, Papaya squash, Papaya pickle, Papaya tutti fruity, canned pine apple on the 30<sup>th</sup> day of storage. These

products have potential for being adopted for commercial production on the basis of their storage stability. On the other hand guavas jelly, papaya jelly, papaya pineapple RTS, lime cordial, Tomato pickle and Orange marmalade showed 100% spoilage on the 30<sup>th</sup> day. Therefore these products cannot be recommended for commercialization.

**Table 4:** Shelf life evaluation of preserved products

S. No.	Product	1 <sup>st</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day
1	Apple jam	No spoilage	20% spoiled	30% spoiled
2	Guava jelly	No spoilage	20% spoiled	100%spoiled
3	Guava cheese	10% spoiled	100% spoiled	-
4	Jack fruit jelly	80% spoiled	100% spoiled	-
5	Papaya jelly	10% spoiled	30% spoiled	100% spoiled
6	Papaya cheese	100% spoiled	-	-
7	Orange marmalade	No spoilage	30% spoiled	100% spoiled
9	Steeped vegetables	No spoilage	No spoilage	No spoilage
10	Papaya preserve	No spoilage	No spoilage	No spoilage
11	Amla preserve	No spoilage	No spoilage	No spoilage
12	Tomato puree	10% spoiled	20% spoiled	30% spoiled
13	Chilly tomato sauce	100% spoiled	-	-
14	Spiced chilly sauce	100% spoiled	-	-
15	Chilly pickle	70% spoiled	100% spoiled	-
16	Egg pickle	30% spoiled	100% spoiled	-
17	Ginger candy	100% spoiled	-	-
18	Tomato pickle	No spoilage	30% spoiled	100% spoiled
19	Cucumber pickle	No spoilage	20% spoiled	30% spoiled
20	Orange squash	No spoilage	No spoilage	No spoilage
21	Guava nectar	No spoilage	100% spoiled	-
22	Lime cordial	No spoilage	No spoilage	100 % spoiled
23	Papaya RTS	No spoilage	No spoilage	No spoilage
24	Papaya pineapple RTS	No spoilage	No spoilage	100% spoiled
25	Papaya squash	No spoilage	No spoilage	No spoilage
26	Papaya pickle	No spoilage	No spoilage	No spoilage
27	Papaya tutti fruity	No spoilage	No spoilage	No spoilage
28	Canned pineapple	No spoilage	No spoilage	No spoilage



**Fig 2:** % spoilage of preserved products

### 4. Conclusion

There is great opportunity to enhance the market of preserved products in the country, which needs concerted efforts in the

coming years to reduce our dependence on huge imports of food products. The above research revealed that papaya is one produce that has emerged as the most suitable for post-harvest preservation on the basis of sensory scores as well as storage stability. A total of 4 items were prepared using papaya (Papaya RTS, Papaya squash, Papaya pickle, Papaya tutti fruity). Among these Tutti Fruti was found to be on the top based on the two evaluation procedures. Thus value addition of papaya can become an additional source of income generation in areas where papaya is cultivated by the farming community.

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