IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

PREPARATION OF APPLE BUTTER AND IT'S STORAGE STABILITY

[1]Tambe S.C., [1]Potphode P.D., [1]Raut S.P., [2]Gaikwad A.A.*

[1]Student, Saikrupa College of Food Technology, Ghargaon,
[2]Principal, Saikrupa College of Food Technology, Ghargaon,
Food Process Technology, SCFT, Ghargaon,
Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (MS), India

Abstract: In the present study entitled preparation and formulation of apple butter where carried out in Department of Food Process Technology, SCFT, Ghargaon. The principle ingredients were used apple, sugar, spices (cinnamon and nutmeg powder). The study was under taken to produce stable and organoleptically preferred apple butter with four different concentration of Total Soluble Solid (TSS) i.e. S1 (TSS=50ºBrix), S2 (TSS=55ºBrix), S3 (TSS=60ºBrix), S4 (TSS=65ºBrix). Sodium benzoate is used as preservative. The organoleptic properties were judged on basis of colour texture, consistency, taste and over all acceptability by using 9 points hedonic scale. The result shown that sample no 3 containing 60 ºBrix got high score in all parameter and selected as final product. The selected product S3 (60ºBrix) have good nutritional values i.e. carbohydrate (95.44), protein (1.80), ash (<0.1) and energy (388.96). The storage potential of butters was observed up to 12 weeks. All samples showed slight change in TSS, colour and acidity. The minimum physiochemical quality attributes were deteriorated due to addition of preservative. The samples were completely free from spoilage due to higher total soluble solid and antimicrobial properties present in apple.

Key words – **Organoleptically, Butter, TSS, Physiochemical.**

I. INTRODUCTION

The present study was undertaken to assess the suitability of edible waste of watermelon fruit in the preparation of Fruit Butter. Fruits and vegetables being perishable in nature undergo spoilage at various stages of their harvesting, handling, transport, storage, marketing, processing. The spoilt produce is not fit for marketing and is a virtual loss. Some fruits do not find much suitability for processing and are mostly used for direct consumption (Table purpose), one such fruit is apple (Bhatnagar D K ., 1991).

Fruit butter is prepared from unpeeled or sometimes unpitted fruits until tender and then forcing it through a sieve or food mill. Sugar, and sometimes spices and lemon juice, are added and the pulp is reduced by cooking until thick. No gelling agent, such as pectin, is used. There is no butter used in the product unlike fruit curds (Gross D R 1974).The term fruit "butter" derives from its spreadability. Preparation of fruit butter is similar to that of jam except that fine pulp is used and small quantities of spices are added (Srivastava and Sanjeev Kumar., 2001).

Apples (*Malus domestica Borkh*.) which belong to the *Rosaceae* family are amongst the most diverse and ubiquitously cultivated fruit species (Park *et al*., 2006). This fruit is a significant part of the human diet due to its large production scale, with 84.6 million tons produced in 2014 (FAO, 2015). In addition, frequent consumption of apples has been associated with beneficial

effects against risks, markers and a etiologies of cancer, cardiovascular diseases, asthma, and Alzheimer's disease (Hyson, 2011). Many phytochemicals, such as phenolic compounds, possess medicinal properties and antimicrobial activities against fungi, bacteria and yeasts (Alberto *et al.,* 2006). In the last few decades, the attention of markets towards new products that possess nutraceutical properties (i.e., capable of decreasing the risk of diseases) has boosted scientific research focused on characterizing molecules in food products and their derivatives, including fruits. The development of functional foods with health-beneficial properties and the extension of food shelf life are the main goals of food science research (Francini and Sebastiani, 2013). The antimicrobial activity of extracts containing concentrated polyphenols may be an interesting subject of study (Albayrak *et al*., 2010). Antimicrobial agents, including food preservatives, have been used to inhibit the growth of food-borne bacteria and extend the shelf life of processed foods. Many extracts from plants, herbs, and spices possess antimicrobial functions, and could be used as a source for antimicrobial agents that prevent food spoilage and inhibit the growth of pathogens (Bagamboula *et al*., 2003; Albayrak *et al*., 2010). Many plant polyphenols are known to possess antimicrobial properties (Puupponen-Pimiä *et al*.,2001)

In this context, phenolic fractions from apple extracts have been tested against Gram-positive and Gram-negative bacterial strains. However, the effect of concentrated phenolic extracts (unfractionated or fractionated through solid phase extraction) from apples on pathogens is still poorly known. In the present work, the antioxidant activities and phenolic contents of apple extracts obtained by solid phase extraction were evaluated and their antibacterial activities against Escherichia coli, Listeria monocytogenes, Salmonella Typhimurium, and Staphylococcus aureus were investigated.

Apple is highly nutritive food. It contains minerals and vitamins in abundance. The food value of the apple is chiefly constituted by its contents of sugar which ranges from 9 to 11% of this, fruit sugar constitutes 60% and glucose 25% and cane sugar only 15% per 100gm of apple contains moisture 84%, protein 0.2%, Fat 0.5%, Minerals 0.3%, Fiber 1.0%, carbohydrates 13.4%, among mineral and vitamins it contains 10 mg of Calsium, 14mg of phosphorus and 1 mg, iron per 100gm of fruit 100 gm of apple gives calorific values of 59 Calories. Thus fruits are an important supplement of the human diet as they possess almost all the nutritive components required for the growth and development of the human body leading to a healthy physique and mind. Also these are a ready source of energy with a unique capacity sto guard against many deficiency diseases. Fruits and vegetables are highly perishable commodities- "as they are living tissues that are subject to continuous changes after harvest at this scale the postharvest losses (NHB 2001- 2002).

II. MATERIALS AND METHODS

The raw material for preparation of apple butter i.e. apple were collected from the local market of Shrigonda. preservatives were purchased from local market of Shrigonda.

Table No. 1. Formulation of apple butter

Sr.No.	Ingredients	TSS(°Brix)
Sample No. 1	Pulp + Sugar +Preservative	50
Sample No. 2	Pulp + Sugar +Preservative	55
Sample No. 3	Pulp + Sugar +Preservative	60
Sample No.4	Pulp + Sugar +Preservative	65

Preparation of apple butter

Fresh apple fruit was used for extraction of pulp. The apple was weighed and pulp was extracted. Then pulp was filtered by muslin cloth and apple butter was prepared by following the recipe recommended by Awan and Rehman (2004), During preparation of butter the standard preservative sodium benzoate was used. Apple butter was prepared with pulp and four different concentrations of TSS as shown in table 1.

Sensory Evaluation

Quality of apple butter was evaluated for sensory characteristics (color, taste, flavour, mouthfeel and overall acceptability) during storage on hedonic rating scale by a semi trained panelists members.

Physico-Chemical analysis

The physio-chemical attributes like pH, acidity and total soluble solids were analysed to assess the quality of butter. The total soluble solid (TSS), titratable acidity and pH was determined by the standard method of AOAC (2000).

Microbiological Evaluation

Microbiological analysis of butter was performed by following the method of Harrigan (1998). The samples were prepared by 10 fold serial dilution and the total standard plate count was estimated by using nutrient agar as medium. The colonies were counted by colony counter.

III. RESULTS

The research was concluded to study quality parameter of apple butter by physiochemical and sensory parameters during storage period. The four different types of butter were prepared with different concentration of Total Soluble Solid (TSS).

Sensory analysis

Table no 2 Sensory analysis of apple butter

	Sensory Attributes					
	Color	**Flavour**	**Consistency**	**Taste**	**Mouth Feel**	**Overall Acceptability**
S_1	7.2	7.7	7.7	7.2	7.3	7.3
S_2	7.2	7.6	7.4	7.6	8.0	7.5
S_3	8.1	8.3	8.2	8.4	8.3	8.2
S_4	7.7	7.9	7.6	7.8	8.2	7.8

The four samples were judged by a semi trained panel of 10 judges. The mean score for colour, flavour, consistency, mouthfeel, taste, overall acceptability of the samples were evaluated and the mean score of the responses were presented in the table.

Samples S_3 shown the better colour and acceptability than other squashes. The flavour of sample S_3 was most preferred than other squashes. In comparison of flavour, butter S_3 and S_4 were better than butter S_1 and S_2. Among all sample, flavour of S_2 sample was less acceptable. Consistency of butter S_3 was most preferred and significantly different than other samples. The mouth feel of sample S_3 and S_4 were significantly better than other samples. The S_1 has shown less mouth feel and acceptability among sample. Among all sample of taste of S_3 and S_4 were most preferred than other sample.

Overall acceptability of sample S_3 was most preferred and significantly different than other samples S_1, S_2, and S_4. The sample S_1 and S_2 had shown least satiety when compared with other samples.

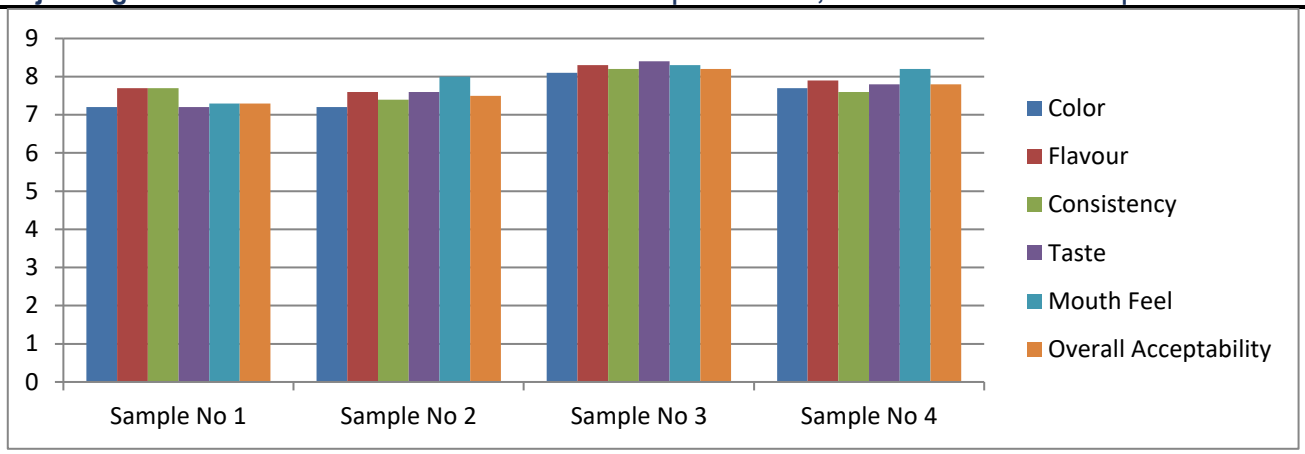

Fig No 1. Sensory Evaluation of apple butter

Nutritional Analysis

Sample 3 (60ºBrix) has got high ratings during sensory evaluations, so only sample no 3 was taken for a nutritional analysis. The result of nutritional analysis is as shown in table given below.

Table no 3 Nutrient content of apple butter

Sr.No	Test Parameters	Result	Units
1	Moisture	2.70	g/100 gm
2	Total Fat	<0.1	g/100 gm
3	Ash	<0.1	g/100 gm
4	Protein	1.80	g/100 gm
5	Carbohydrate	95.44	g/100 gm
6	Energy Value	388.96	Kcal/100 gm
7	Vitamin C	6.9	mg/100 gm

Storage study:

Table no 4 The storage study on the chemical analysis of apple butter

			Storage Period (Days)					
Parameters	**Samples**	**0**	**15**	**30**	**45**	**60**	**90**	**Mean**
TSS	S_1	50.10	50.25	50.45	50.65	50.80	51.08	**50.55**
	S_2	55.06	55.34	55.44	55.67	55.98	56.13	**55.44**
	S_3	60.11	60.39	60.61	60.78	60.94	61.09	**60.65**
	S_4	65.01	65.29	65.51	65.76	65.91	66.15	**65.60**
	Mean	**57.57**	**57.81**	**58.00**	**56.96**	**58.40**	**58.61**	
%Acidity (as Citric Acid)	S_1	1.22	1.23	1.26	1.28	1.31	1.34	**1.27**
	S_2	1.24	1.24	1.26	1.29	1.33	1.36	**1.28**
	S_3	1.32	1.33	1.36	1.38	1.40	1.43	**1.37**
	S_4	1.34	1.35	1.36	1.39	1.42	1.45	**1.35**
	Mean	**1.28**	**1.28**	**1.31**	**1.33**	**1.36**	**1.39**	
pH	S_1	3.42	3.39	3.36	3.32	3.28	3.30	**3.38**
	S_2	3.49	3.45	3.42	3.39	3.36	3.32	**3.40**
	S_3	3.46	3.43	3.40	3.37	3.33	3.25	**3.33**
	S_4	3.48	3.45	3.41	3.39	3.36	3.32	**3.40**
	Mean	**3.46**	**3.45**	**3.39**	**3.36**	**3.33**	**3.29**	

TSS

The result revealed that the effect of treatment and storage period was found to be highly significant on Brix of apple butter. Total soluble solid (TSS) initially adjusted in formulation S1,S2 ,S3 and S4 showed a negligible change throughout the 90 days storage period at room temperature. It was observed that the range of TSS increased this range was similar to range as repeated by Rangana (1979). The percentage change of TSS is greater in last two weeks (11th and 12th week) than other weeks and it is due to conservation of carbohydrate and acid into sugar.

Titratable acidity

The result revealed that the effect of treatments and storage period was found to be highly significant on the acidity of apple butter acidity was calculated on the basis of titratable acidity of all formulation varied directly with storage period and it was gradually increased. The acidity of various fruit butter was within the range of 1.22 to 1.45 %. This implies that the amount of apple pulp affected the acidity of the butter. The acidity of sample S3 and S4 were more acidic than S1 and S2 (Table No 4).

pH

The result revealed that the effect of treatment and storage period was found to be highly significant on the pH of apple butter. The variations in pH were observed throughout 90 days storage period in all formulation. The relationship between pH and acidity is interrelated. The higher the acidity. The lower the pH occurred during the storage period at room temperature S1 and S2 has lower pH than butter S3 and S4 (Table No 4). The change in pH is associated with number of reason. It might be due to effect of heat treatment on the biochemical condition of fruit and vegetable and slower rate of respiration and metabolic acidity (Jitareerat *et al*., 2007).

Microbiological analysis

Table no 5 Microbial Analysis of Apple Butter

	Storage period (Week)	SPC (log cfu/g)	Coliform (log cfu/g)	Yeast and Mold (log cfu/g)	TPC (log cfu/g)
S_1	0	3.42	Absent	Absent	Absent
	2	3.43	Absent	Absent	Absent
	4	3.50	Absent	Absent	Absent
	8	3.53	Absent	Absent	Absent
	12	3.56	Absent	Absent	Absent
S_2	0	3.41	Absent	Absent	Absent
	2	3.44	Absent	Absent	Absent
	4	3.48	Absent	Absent	Absent
	8	3.57	Absent	Absent	Absent
	12	3.59	Absent	Absent	Absent
S_3	0	2.75	Absent	Absent	Absent
	2	2.78	Absent	Absent	Absent
	4	2.79	Absent	Absent	Absent
	8	2.82	Absent	Absent	Absent
	12	2.85	Absent	Absent	Absent
S_4	0	2.19	Absent	Absent	Absent
	2	2.22	Absent	Absent	Absent
	4	2.23	Absent	Absent	Absent
	8	2.25	Absent	Absent	Absent
	12	2.28	Absent	Absent	Absent

The result shown that the storage period was highly significant on the microbial count of apple butter. The microbial status of the apple butter showed value of viable count of S_1 (3.56 log CFU/g), S_2 (3.59 log CFU/g), S_3 (2.85 log CFU/g) and S_4 (2.33 log CFU/g) respectively. The storage period on the microbial count of the apple butter revealed that the microbial count gradually increased with increment in storage period. However, lower microbial load was observed in S_4 (50gm of pulp, 65°Brix, 1.34% acidity) i.e. 2.19 to 2.28 CFU/gm . There is no growth in coliform, yeast, mold and TPC. The result clearly indicated the presence of antimicrobial potential due to addition of preservatives.

IV. Discussion

Acidity is an important attribute because tartness was a major factor in the acceptability of apple butter. Acid gives the characteristic sourness to the product. Citric acid was the major acid in apple that enhances the characteristic flavor of apple butter ready. Highest acidity (1.45) was record in S_4 while lowest (1.22) was observed in S_1 The data is found to reveal at 0, 30, 60 and 90 days of storage The data regarding acidity in different treatments of This was gradual increase in acidity in all treatments during storage up to 90 days. Increase in percent acidity might be due to the slight growth of micro-organism in the butter Rangana (1991). Similar finding have been reported by (Sogi and Singh, 2001) in Kinnow Jam and Candy, The increase in acidity during the storage may be due to formation of organic acid by ascorbic acid degradation or the increase in acidity could have also occurred due to the hydrolysis of pectin are reported by (Aggarwal *et al*., 2014) in kinnow butter. The data on Total Soluble Solids (TSS) for all formulations has been presented in (Table 4) TSS of apple butter was found to increase with increase in storage duration. After 90 days of storage, the initial stage. The effect of samples on TSS changes was observed significantly. The lowest mean TSS (51.08°Brix) is recorded in S_1. while the highest TSS (66.01°Brix) is observed in S_4 to inferior in improving the TSS level of the apple butter in all the samples TSS was found gradually increased with increase in storage period. This might be

due to the conversion of polysaccharides into sugars during hydrolysis process. Increase in TSS might also be attributed to the reduction in moisture content of the product with storage. Increase in TSS with storage was also by (Iftikhar *et al*.,2007) in Apple and Pear Mixed Fruit Jam and (Yawin and Marsh 1999) in apple butter. The pH has great importance to maintain shelf stability; pH can also influence the flavor and processing requirements of the apple Butter The data about pH (Table no 4) indicated that there was a variation in TSS samples The highest mean pH 3.40 observed in S_2 and S_4. While the lowest mean pH (3.33) was observed in S_3 Increase might be due to the slight growth of micro-organism in the butter. The data about pH was clear in (Table. 4) (Rangana 1991). Similar results were reported by (Ehsan *et al*., 2003) in case of grapefruit apple marmalade and (Ali Muhammad. *et al.*, 2008) in apple jam.

V. Conclusion

It was found that apple contains a limited amount of protein, although rich in dietary fiber content and carbohydrate, so a successful combination with cinnamon, nutmeg powder for butter production would be nutritionally advantageous. Apple with spices had significant effect on the functional properties of the butter. Cooked apple produced samples which can be used for production of butter goods with improved functional properties. The results obtained could be very valuable in decision making for industries that want to take nutritional advantage of apple butter.

VI. References

1) (A.O.A.C. 2000) Ofiicial Method of Analysis Association of Afficial Analytical Chemist Washington DC.
2) A. Bhatnagar D K (1991), Utilization of Watermelon rind for jam making, Indian Food Packer, Volume 45(1), Pg.no:46-48.
3) A. Gross D R (1974), Fruit Preserves, Jams and Jellies, *Encyclopedia of Food Engineering*, AVI Publication Co, Connecticut, Volume 2, Pg.no: 469.
4) A. Srivastava R P and Kumar S (2009), Fruits and Vegetable Preservation, Principles and Practices, *International Book Distributing Co.* limited, Lucknow, Third Edition, Pg.no: 309-310.
5) Alberto, M.R.; Farías, M.E. and Manca De Nadra, M.C. Effect of gallic acid and catechin on Lactobacillus hilgardii 5w growth and metabolism of organic compounds. *Journal Agriculture and Food Chemistry*, 2001, vol. 49, no. 9, p. 4359-4363.
6) Dianne A. Hyson Advances in Nutrition ,A Comprehensive Review of Apples and Apple Components and Their Relationship to Human Health , Volume 2, Issue 5, Pages 408–420, 2011.
7) Ehsan Farzana Naz ,Origin, Ideas And Practice of new Public Management Lessons For Developing Countries mohammad Asian Affairs, Vol. 25, No. 3 :30-48, July-September, 2003.
8) Hafeez Ur Rehman, Imtiaz Ahmed And Masood Sarwar Awan Testing Wagner's Law For Pakistan: 1972-2004 Pakistan Economic and Social Review Vol. 45, No. 2 (Winter 2007), pp. 155-166 (12 pages)
9) Harrigan, 1998 labrotary methods in food microbiology .
10) Iftikhar, T., M. Niaz, M.A. Zia, M.A. Qadeer, S.Q. Abbas, M.I.Rajoka and I.U. Haq. 2007. Screening of media and Kinetic studies for the production of lipase from a mutant strain of Rhizopus oligosporus", Biotechnologies International Symposium "Which biotechnologies for south countries"Proceedings of Biotech World 2007. Oran Algerie, 24-25 November 2007
11) Ji-Sook Park, Jae-WonHa Ultrasound treatment combined with fumaric acid for inactivating food-borne pathogens in apple juice and its mechanisms *Food Microbiology* Volume 84, 2019, 10327
12) Phenolic Compounds in Apple (Malus x domestica Borkh.) Compounds Characterization and Stability during Postharvest and after Processing Alessandra Francini andLuca Sebastian Antioxidants 2013, 2(3), 181-193
13) Pongphen Jitareerat,Sudkanueng Paumchai,Sirichai Kanlayanarat &Somsiri Sangchote Effect of chitosan on ripening, enzymatic activity, and disease development in mango (*mangifera indica*) fruit Pages 211-218 2010
14) Ranganna, S. (2001) Hand Book of *Analysis and Quality Control for Fruits and Vegetable Products*. 7th Edition, Tata Mc Graw Hill Book Co., New Delhi, 594-625.

15) Sevil Albayrak, Ahmet Aksoy, Osman Sagdic, Songul Albayrak, Antioxidant and antimicrobial activities of different extracts of some medicinal herbs consumed as tea and spices in turkey, *Journal of food biochemistry* Volume 36, Issue5 2012 Pages 547-554

16) Sogi, D.S., Kaur, I. and Batra, A. 2004. Utilization of non conventional tomato (Lycopersicon esculentum L) seed oil in mayonnaise. *Journal of Food Science and Technology*, 41(1): 47–49.