

## Original Research Article

# Studies on the Sensory and Microbiological Parameters of the Pork Sandwich Spread in View with its Stability at Frozen Storage

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## ABSTRACT

### Keywords

Spread, shelf life, TPC, Psychrophilic, log cfu/ g

Pork sandwich spread incorporated with different ingredients like honey, vitamin –C and nisin was stored and studied for the attainment of its maximum shelf life at the frozen storage. A highly significant ( $P \leq 0.01$ ) difference for the appearance, flavor, juiciness, texture, spread ability, adhesion ability and overall acceptability. Although, the score was in decreasing trend on 45<sup>th</sup> day, even though the scale of score was rated between ‘good’ to ‘very good’ by the panelists. The remarkable acceptability for the pork sandwich spread was given by the panelists even on 45<sup>th</sup> day of storage. Total Plate Count (TPC) and Psychrophilic count on 45<sup>th</sup> day of storage were found to be 2.85 log cfu/g and 2.13 log cfu/g respectively. The Coliform, Yeast and Mould were not detected throughout the experimental period in the treated sample and it was found safe for consumption.

## Introduction

Meat as a food item is well accepted globally and do vary in its form for consumption. Meat has been identified, often wrongly, as a food having a high fat content and an undesirable balance of fatty acids. Meat consumption in India particularly varies according to its state, religion, consumption pattern and above all the taste. In fact lean meat is very low in fat (20-50 g/kg), pork and poultry have a favorable balance between polyunsaturated and saturated fatty acids (P:S) and grazing ruminants produce muscle with a desirable n-6:n-3 polyunsaturated fatty acid ratio. Storage of meat often leads to the development of abnormal odors and tastes and loss of colour. Chemical composition

and biological characteristics make meat an excellent environment for microbial growth. Many factors influence the growth rate and activity of the microorganisms, including temperature, atmosphere, pH, salt concentration and product composition. The spoilage rate was related to initial pH, fat content etc. regardless of the origin of the meat (Blixit and Borch, 2002). Meat spread is a convenience product and constitutes meat, fat and other ingredients. Many such parallel products are available in the market but are not the meat based. Hence in the present study the product was incorporated with certain ingredients (honey, vitamin-C and nisin) having functional properties to improve the product quality and storage

stability. Honey treatment appeared to reduce bacterial growth in the product (Anon, 1998). Nisin is a bacteriocin with the advantages of degradation by proteolytic enzymes in the gastrointestinal enzymes and also non-toxic (Guerrero *et al.*, 1995). Citric acid is also known to confer protection against product deterioration, the pH of a product is shifted to being more acidic, where very few moulds, yeast and bacteria are able to grow and multiply.

### **Materials and Methods**

Meat samples were obtained from pigs (live weight between 60-70 kg) slaughtered in the experimental abattoir of Livestock Products Technology Division (IVRI, Izatnagar). After removal of all separable connective tissue and fat, meat was trimmed off and stored in colourless polythene bags for overnight at  $4\pm 1^{\circ}\text{C}$  for conditioning and then frozen at  $-18\pm 1^{\circ}\text{C}$  for further use. Lean meat in the form of small cubes was minced in the meat mincer. weighed refined oil, spices (Pati, 1990), condiments i.e. onion, garlic and ginger (3:2:1), common salt (0.5%) and black salt (1%) were browned in a pan, then minced meat was added to it and braised for 30 minutes at  $84\pm 2^{\circ}\text{C}$ . The pressure cooking method was opted for the preparation of the product and after cooling, the antioxidants (0.02%) and carrageenan (0.20%), skimmed milk powder (2.5%), rusk (2%) along with molten butter (15%) was added to the product. A pre weighed mixture of sugar (0.25%) sodium nitrate and nitrite (0.02%) citric acid (0.20%) sodium tripolyphosphate (0.40%) sodium ascorbate (0.10%) and glycerol (2%) and ice (1.81%) was added to it. Thorough mixing of the ingredients with the minced meat was done to obtain the homogeneity. The product was grinded in the mixer grinder at 500-1200 rpm for 1-2 minutes to get the paste of desired consistency, meanwhile the

colouring agent was also added (at the rate of 0.20gm /15ml/1kg batch). The product was transferred in a glass tray and stored for further experiments. Honey (6%) level, Vitamin-C at the rate of 500 ppm and nisin at the rate of 12 mg/kg level was added and carried for the sensory and microbiological parameters on frozen storage. Plastic pet jars with lid of 200 g capacity were used for storage studies. Experienced taste panel members consisting of scientist and post-graduate students of the Division and the Institute evaluated the sensory attributes viz. appearance and colour, flavour, juiciness, texture, adhesion ability, spreadability and overall acceptability of treatments and control using 7 point descriptive hedonic scale (Baker and Scott- Kline, 1988; Keeton, 1983).

Total plate count, psychrotrophic count, coliform count, and yeast and mold counts in the samples were determined following the methods as described by APHA (1984). Data were analyzed statistically on a Window XP computer in the Computer Centre of the Institute using Statistical Software Packages developed by following the procedure of Snedecor and Cochran (1989).

### **Results and Discussion**

A highly significant ( $P \leq 0.01$ ) difference for the appearance, texture, spread ability and adhesion ability, juiciness and overall acceptability scores were recorded. The flavour scores declined from 7.0 at 0 day to 6.3 at 45days of storage and was rated as 'very good' and no off flavour was perceived by the panelist (Table 1). This highly significant decrease ( $P < 0.01$ ) in appearance and colour scores might be due to lipid and muscle pigment oxidation leading to non-enzymatic browning of the product (Pandey, 2006).

**Effect of Storage on Sensory Parameters of Pork Sandwich Spread at Frozen Storage (-18 ± 1°C)**

Parameters	0 Day	15 <sup>th</sup> Day	30 <sup>th</sup> Day	45 <sup>th</sup> Day
Appearance/Colour	6.92 ± 0.07	6.79±0.10	6.78±0.08	6.08±0.08**
Flavour	7.00±0.00	5.75±0.17	6.92±0.04	6.33±0.01**
Juiciness	6.92±0.07	6.66±0.16	6.85±0.09	5.75±0.17**
Texture	7.00±0.00	6.92±0.07	6.54±0.13	5.91±0.20**
Spreadability	6.92±0.07	6.78±0.17	6.75±0.08	5.75±0.17**
Adhesionability	6.92±0.01	6.90±0.05	6.86±0.03	6.45±0.07**
<b>Overall Acceptability</b>	6.86±0.07	6.79±0.10	6.64±0.17	5.58±0.20**

\*\*Highly significant (P<0.01)

**Effect of storage on Microbiological Parameters of Pork Sandwich Spread at Frozen Storage (-18 ± 1°C)**

Microbiological parameters	Days of storage			
	0 Day	15 <sup>th</sup> Day	30 <sup>th</sup> Day	45 <sup>th</sup> Day
Total plate count (log log cfu/g)	2.30±0.006	2.38±0.008	2.53±0.007	2.85±0.02**
Psychrophilic count (log log cfu/g)	Not detected	Not detected	1.81±0.005	2.13±0.003**
Coliform count	Not detected	Not detected	Not detected	Not detected
Yeast and Mould count	Not detected	Not detected	Not detected	Not detected

\*\*Highly significant (P<0.01)

This overall decrease in flavour is in agreement with that of Cheney *et al.*, (1984), Foegeding and Ramsey, (1987), Bater *et al.*, (1992) and Cunningham, (1977). The findings of juiciness is in agreement with that of Pandey (2006) stating that decrease in juiciness was due to loss of moisture. The texture scores decreased from 7.0 on 0 day to 6.5 on 30 days and thereafter it decreased to 5.9. This loss of texture might be due to loss of moisture at low temperature storage. This finding is in agreement with that of Pandey (2006) for pork sandwich spread. The spread ability scores of the product stored for various periods at frozen temperature. The scores decreased from 6.9 at 0 day to 5.7 at 45day of storage at frozen temperature. This finding is in agreement

with that of Pandey (2006) observing decrease in the spread ability scores that might be due to the loss of moisture during frozen storage of pork sandwich spread. The significant (P<0.01) decrease in the overall acceptability score might be due to decrease in other sensory attributes like colour, flavour, juiciness and spread ability. Although, the score was in decreasing trend on 45th day even though the scale of score was rated between ‘good’ to ‘very good’ by the panelists. Results of ANOVA revealed a highly significant effect (P<0.01) on total plate count of pork sandwich spread stored at frozen temperature. There was an increasing trend in the TPC but spoilage was not detected even at the 45th day. On 30th day of storage, the count was 2.53 log cfu/g

and increased to 2.85 log cfu/g at the end of 45th day of storage. With the progress in storage period, the TPC increased linearly. In spite of progressive increase in the TPC, the count was, nevertheless, within the limit of 5.33 log cfu/g laid by Cremer and Chipley (1977). Results of ANOVA revealed a highly significant effect ( $P < 0.01$ ) on psychrotrophs of pork sandwich spread stored at frozen temperature. On the 30th day, the count was 1.81 log cfu/g which increased to 2.13 log cfu/g at 45 days of frozen storage. These were not detected in the treated sample throughout the storage period. It might be due to the sufficient heat treatment (Pressure cooking, 122° C) and/or due to hygienic measures followed during product preparation. No yeast and mould were detected in the product throughout the storage period at frozen temperature.

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