



## Studies on the Effect of Natural Preservatives and Packing Materials on Physico-Chemical Quality of *Pinni*

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### Abstract

*Pinni*, a native heat dried sweet produce ready by roasting cereal flours mainly, with added khoa (desiccated milk) and sugar has a shelf-life of a few days under market place. In this study, result of preservers *viz. i.e.*, cardamom powder and rosemary on the storage-life of *pinni* stored at  $30\pm 1^\circ\text{C}$  was investigated. Two packaging techniques *viz.*, conventional cardboard boxes and polystyrene tray were compared for physico-chemical, quality of *pinni* during storage for 21 days and 28 days respectively at  $30\pm 1^\circ\text{C}$ . During storing, several variations took place in physico-chemical appearances, the changes being faster in control samples packed in both packaging materials as compared to cardamom and rosemary extract added *pinni* samples. The average tyrosine content for fresh *pinni* was  $9.75\ \mu\text{g}/5\text{ml}$  in control,  $9.35\ \mu\text{g}/5\text{ml}$  in cardamom and  $9.45\ \mu\text{g}/5\text{ml}$  in rosemary extracted added sample which increased significantly ( $p<0.05$ ) to  $13.87\ \mu\text{g}/5\text{ml}$ ,  $13.59\ \mu\text{g}/5\text{ml}$  and  $13.23\ \mu\text{g}/5\text{ml}$  respectively when packed in cardboard boxes similar results were found when *pinni* packed in polystyrene tray. There was slight effect of preservers on the excellence of *pinni* when packed in cardboard boxes, but changes were slower in *pinni* when packed in polystyrene tray. *Pinni* packaged in polystyrene tray stored at  $30\pm 1^\circ\text{C}$ , in the presence rosemary extract, was stable for 28 days and have shelf life 14 days more than control sample.



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Rosemary Extract;  
Shelf-Life.

### Introduction

*Pinni* is a very popular traditional milk-cereal based sweetmeat in three northern states of India *viz.*,

Punjab, Haryana and Delhi. It is a dark brown coloured composite milk based sweet having granular texture. The nutritional quality of *pinni* is

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very high because it contains solids from milk as well as from wheat or gram flour, nuts, dry fruits etc. Fat, protein, minerals and energy content of this product is high. Conventionally, *pinni* is considered as an ideal food for the young, pregnant and lactating women<sup>1</sup> considering its high nutritive value.

Like other milk product *pinni* also have limited shelf life about 10 days packed in high density polythene pouches.<sup>2</sup> Because of its high fat content and non-acidic nature, surface yeasts and moulds mostly cause spoilage in *pinni* which manifests as fermentative, acidic as well as rancid smell also observed during storage. Hot and humid conditions of tropical countries also aggravate the spoilage reactions. For enhancement of shelf life of *pinni* two natural preservatives *viz.*, cardamom powder and rosemary extract were added and the samples were packaged in cardboard containers and polystyrene trays and stored at 30±1 °C.

Preservation can be done by many ways and thermal treatment in conjunction with sugar is the most acceptable means to preserve the milk based indigenous sweets. Several other methods like drying (freeze, drying, vacuum, drying) reduction in water activity (through incorporation of sugar and humectants), and addition of preservatives have been attempted for shelf life enhancement. So far thermal treatment and sugar play vital role in determining the shelf life of sweets. Different products can be listed in this category such as kalakand, milk cake, peda, burfi, kheer, payasam, etc. Sugar alcohols including sorbitol are known to provide bulkiness, improving texture and mouth-feel and thus serve as sugar replacers particularly in products where heat treatment required.

Use of potassium sorbate at the rate 0.1 % as preservative extends the shelf life of burfi by 60 days as reported by<sup>3</sup> whereas potassium sorbate added @ 0.20 and 0.25 % in kalakand enhanced the shelf life of product from 3 to 24 and 15 days stored at 30°C respectively.<sup>4</sup> Saxena *et al.*,<sup>2</sup> Addition of 0.05 or 0.10% sorbic acid or 0.05% potassium sorbate in *pinni* helped to enhance the shelf-life to 30 days under ambient conditions.

With the increase in global demand in increase in cheap, non-toxic and natural food preservatives,<sup>5</sup>

and<sup>6</sup> reported that using cardamom and rosemary extract it is possible to extend the shelf-life of perishable food products. This study was aimed to investigate the efficacy of cardamom and rosemary extract to enhance the shelf life of *pinni*.

## Materials and Methods

### Raw Materials

Fresh pooled buffalo milk obtained from Livestock Research Centre, ICAR-NDRI, Karnal, was standardized to 6.5% fat and 8.5% SNF. Food grade cane sugar (sucrose) and cardamom powder were obtained from the local market. Wheat flour of Aashirvad brand was procured from local market it contained 11.8 % protein, 1.7% fat and 75.1 % carbohydrate. Buffalo milk ghee was obtained from Experimental Dairy of the Institute and it contained was 99.5% fat and 0.5 % moisture. Rosemary extract was provided by M/s Zakini Biotech private limited (Chamrajnagar, Karnataka, India).

### Preparation of *khoa*

*Khoa* samples were produce from buffalo milk using the method of 7Bhatele (1983) with some modification.

### Preparation and Compositional Analyses of *pinni*

In present study each batch of approximately 2 kg of *pinni* was prepared in triplicate for each experiment. Ghee (539.68g) was taken in a heavy bottom pan then heated to 90°C then wheat flour (681.6g) was added. Roasting of wheat flour was done at 90°C till typical roasted flavour and color was developed. The *khoa* (400g) was then added accompanied by continuous stirring to break the large lumps into small granules. Roasting was continued and sugar was added and stirred to properly mix the ingredients. After this stage heating was discontinued and the mixture was allowed to cool to room temperature (30°C). Cardamom powder was added @ 2.5 % and rosemary extract 200 mg and then using an hand operated moulded, cylindrical shape the product was moulded into 25 g each. The proximate composition of the *pinni* in terms of moisture,<sup>8</sup> fat,<sup>8</sup> protein,<sup>9</sup> sucrose<sup>8</sup> and ash<sup>8</sup> was estimated.

### Packaging of *Pinni*

Packaging materials for *pinni* was cardboard boxes 15 x 12 x 15 (L x B x H) cm<sup>3</sup> were obtained from the resident market of Karnal, Haryana and Polystyrene

(PS) trays (thickness: 4.5 mm; WVTR: 1.96 g/m<sup>2</sup> - 24 h; OTR: 26 mL/m<sup>2</sup> - 24 h) were procured from M/s Elixir Technologies, Bangalore. Trays were sealed with Polyamide-Polyethylene films.

#### Use of Natural Preservers

Natural preservatives *viz.* cardamom powder and rosemary extract were tested to enhance the shelf-life of *pinni*. In developed product was added with cardamom powder and rosemary extract at the level of 2.5% and 100 ppm, respectively.

#### Storage

The *pinni* samples packed in different packing materials were shifted to an incubator kept at 30±1°C for 28 days and samples were taken at regular gaps for examination. When overall acceptance score was very low drawing of samples for analysis was stopped.

#### Physico-Chemical Characteristics

Samples of *pinni* were taken at regular periods and examined for physico-chemical (moisture, water activity, tyrosine value, free fatty acids, thiobarbituric acid).

#### Moisture Content

Moisture content were tested as per methods given in.<sup>8</sup>

#### Water Activity

Water activity was studied using water activity meter Aqua Lab (Model Series 3 TE).<sup>10</sup>

#### Tyrosine Value

The tyrosine content of *pinni* was determine by using a method given by.<sup>11</sup>

#### Free Fatty Acids

FFA content of *pinni* was determine by the method prescribed by.<sup>12</sup>

#### Thiobarbituric Acid Value

The amount of oxidation of fat in *pinni* was studied in terms of TBA value as described by.<sup>13</sup> Two g sample was weighed into a beaker to which 50 ml of 20 per cent TCA and 50 ml of distilled water (at 30°C) were added and held for 10 min. The contents were filtered through a Whatman No. 1 filter paper. To 5 ml of clear filtrate taken in a test tube, 5 ml

of 0.01M thiobarbituric acid solution (144 mg TBA in 100 ml distilled water) was added, the test tube was shaken well and incubated in a boiling water bath for 30 min. The tube was then cooled and optical density (OD) of the coloured solution was measured at 532 nm. The TBA values were expressed in terms of optical density.

#### Statistical Analysis

The data produced from present study was examined using ANOVA from defining difference in mean using SAS ver. 5.3 (SAS Institute Inc., Cary, NC).

#### Results and Discussion

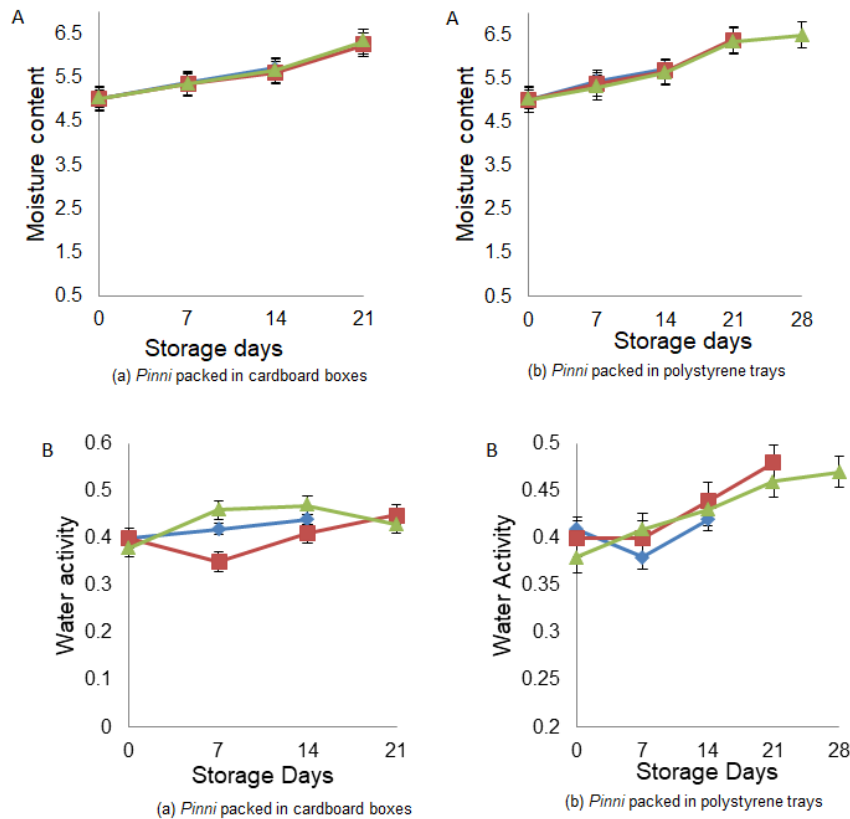
The nearby composition of the *pinni* was found to be moisture 5.2% ± 0.34 fat 36.74% ± 0.33, protein 9.13% ± 0.5, sucrose 40.67% ± 0.45 and ash 1% ± 0.5.

#### Changes in Physico-Chemical characteristics of *pinni* during Storage

Physico-chemical qualities changes in *pinni* during storage are depicted in Figure. 1 and 2. During storage moisture content of *pinni* is increased. Moisture content of *khoa* based sweets is a very serious influence in decay as it is directly related to various enzymatic and biochemical reactions. Moisture has a very crucial role on the shelf – life of product as far as microbiological activity and biochemical reactions and the suitability of the *khoa*-based sweets are concerned. Moisture content (%) was found to increase from initial value of 5.02 to 5.72 of control *pinni* samples after 14 days of storage and 5.01 to 6.25 and 5.02 to 6.33 in case of cardamom and rosemary extract added *pinni* samples after 21 days of storage in cardboard boxes. Similar effects were seen on PS tray packed control and cardamom added *pinni* samples although moisture content increased from initial value of 5.02 to 6.5 after 28 days of storage in rosemary added *pinni* samples when packed in PS trays. According to study the extent of moisture evaporation from burfi samples was different from samples packed in different packing materials. However opposite trend of falling moisture rate during storage were observed in different products *viz.*, milk cake,<sup>14</sup> burfi,<sup>4</sup> kalakand,<sup>15</sup> peda<sup>16</sup> and doda burfi.<sup>17</sup> Changes in water activity ( $a_w$ ) of *pinni* packed in cardboard boxes and PS trays stored at 30±1°C are graphically depicted in Fig. 1. Water activity was found to increase from initial value

of 0.40 to 0.44 and 0.40 to 0.45 in case of control and cardamom added *pinni* samples respectively after 14 and 21 days of storage in cardboard boxes. Similar effects were seen on PS trays packed both *pinni* samples. However, water activity was found to increase from initial value of 0.38 to 0.43 after

21 days and 0.38 to 0.47 after 28 days in rosemary added *pinni* samples when packed in cardboard boxes and PS trays respectively. Significant ( $p < 0.05$ ) effect of addition of rosemary extract and cardamom was observed after 14 days in both the packaging materials.



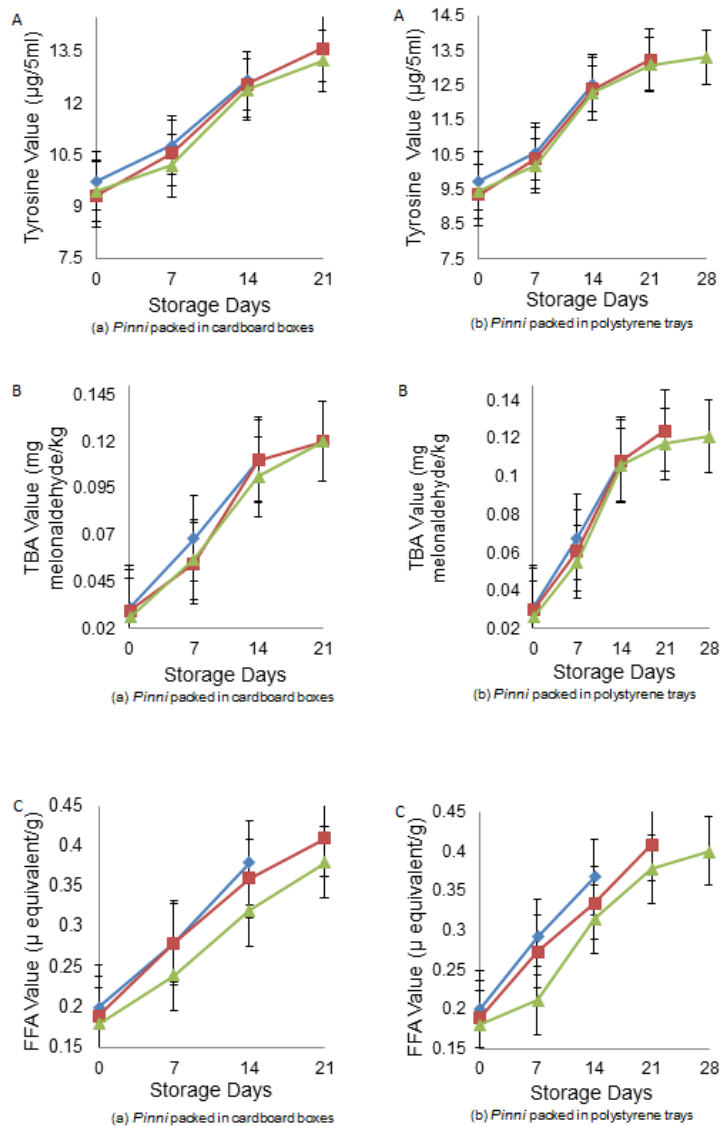
**Fig.1: Effect of natural preservatives and packing methods on Physico-chemical characteristics of *pinni* during storage at  $30 \pm 1^\circ\text{C}$  (A: Moisture; B: Water activity) (◆ Control sample, ■ Cardamom added and ▲ Rosemary added *pinni* sample)**

Control samples packed in cardboard box shows highest rise in free fatty acid (FFA), tyrosine value and TBA value during storage (Fig. 2). A significant effect of addition of cardamom and rosemary extract addition was found on tyrosine content. These findings are also agreed with previous work on *khoa* by<sup>18</sup> and burfi by.<sup>19</sup> Thiobarbuturic acid (TBA) value indicates the extent fat oxidation in *pinni* during storage. During storage, TBA value of *pinni* increased significantly ( $p < 0.05$ ) with time in cardboard boxes at  $30 \pm 1^\circ\text{C}$  after 21 days of storage.

This increasing trend was relatively lesser in samples packed in PS trays. Addition of different herbs was detected to have significant ( $p < 0.05$ ) effect on TBA value of *pinni* when packed in cardboard boxes and PS trays. Availability of free oxygen in cardboard boxes is a reason of higher rate of lipid oxidation as well as other biochemical reaction in control samples as compared to cardamom and rosemary extract added samples. Because, lower barrier properties of cardboard boxes. TBA values significantly increase with time in stored *khoa* samples also, containing

different antioxidants as reported by.<sup>20</sup> Similar study was also done by<sup>16</sup> for lal peda. Changes in FFA content of *pinni* packed in cardboard boxes and PS trays and stored at  $30\pm 1^\circ\text{C}$  are depicted in Fig. 2. Addition of cardamom and rosemary extract was observed to have significant ( $p < 0.05$ ) effect on FFA content of *pinni* when packed in cardboard boxes and PS trays. The minimum increase in FFA was noted in rosemary extract added samples when packed in PS trays as compared to cardamom added as well

as control sample. This could be probably due to antioxidative properties of carnosic acid (CA) present in rosemary extracts. The result also corroborates findings of other workers who had also noted increase in free fatty acid content in different dairy products with increase in temperature and duration of storage.<sup>21</sup> Similar results are reported by<sup>20</sup> in *khoa* free fatty acid content increased significantly with the advance of storage period.



**Fig.2: Effect of natural preservatives and packaging techniques on biochemical variables of pinni during storage at  $30\pm 1^\circ\text{C}$  (A: Tyrosine value; B: TBA value, C: Free Fatty Acid value) (◆ Control sample, ■ Cardamom added and ▲ Rosemary added *pinni* sample)**

### Conclusion

The present study attempted for enhancement of shelf life of *pinni* by adding two natural preservatives and by using different packaging interference. From the results access, it is clear that there was a continuous increase in moisture content and water activity at different extent in all the *pinni* samples packed in different packing materials. Increase in TBA value, tyrosine value and free fatty acid content was observed in all samples of *pinni*, increase was higher in control sample packed in cardboard box as compared to cardamom and rosemary extract added samples. It was concluded that the storage - life of *pinni* when packed in polystyrene trays with rosemary extract was 28 days at 30 °C which was improved to 14 days more than control sample.

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### Conflict of Interest

The authors do not have any conflict of interest.

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