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Preservative Effect of Pomegranate Peel Extract on the Keeping Quality of Cream Based Fat Spread

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ABSTRACT

Pomegranate peel, which is a waste, is a potential source of polyphenolic compounds having antioxidative and antimicrobial properties. Therefore, utilization of pomegranate peel extract as a natural preservative in cream based spread presents a scope of imparting its health benefits to the consumers. The pomegranate peel extract (PPE) was added at 1% level on fat basis in the spread and storage studies were conducted to analyse the preservative potential of PPE on the keeping quality of the spread. The storage studies indicated PPE incorporated spread had antioxidation ability and %RSA comparable to BHA. The test sample had a shelf life of 2 months due to antimicrobial effect of the extract, in contrast to control sample having 1-month shelf life at refrigeration temperature.

Key words: *pomegranate peel extract, shelf life, polyphenols, antioxidant, antimicrobial agent*

INTRODUCTION

Pomegranate (*Punica granatum*) fruit has shown an explosion of interest during the last decade and has gained a tremendous popularity, because of its numerous health effects. In fresh weight, the peel and internal membranes of the pomegranate represent 50% on average. This has lead to an increase in the waste effluents in many countries, where factory of juice production were installed (USA, Spain, India, China). This waste is mainly composed of peel of the pomegranate peel which is a very potential source of active principles like phenolic compounds with total phenol content of 147.8 mg GAE/g DW[11]. It is also recognized for its many health promoting qualities and apparent wound healing properties[2], anticancer property[5], antiatherosclerotic and antioxidative capacities[15].The cream and butter based spreads are high fat products (40-80%) with high water activity due to its higher moisture content of (30-50%). The sensory quality of the spread is greatly affected during storage period due to oxidation of fat.

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It not only deteriorates the quality of the fat rich foods and brings about chemical spoilage; it also produces free radicals and reactive oxygen species (ROS) which are reportedly associated with carcinogenesis, mutagenesis, inflammation, ageing and cardiovascular diseases[13]. With the growing awareness among the consumers the use of natural preservatives in the foods is gaining importance. Though the use of chemical preservative such as BHA is permitted in the fat rich products, the use of natural antioxidants improves the safety of the food and thus adds value to the product. Similarly, natural antimicrobial ingredients will help in controlling spoilage and pathogenic microorganisms.

Toxicological effects of synthetic substances together with consumer preference for natural products have resulted in increased interest for the search and use for natural preservatives from fruits and vegetables that might help attenuate spoilage reactions. Considering the popularity of cream based spreads and beneficial as well as antioxidative and antimicrobial properties of active principles of pomegranate peel, the present work was carried out to study the preservative effect of PPE on the keeping quality of cream based fat spread.

MATERIAL AND METHOD

The FFA content in spread sample was determined as % oleic acid adopting the procedure of AOAC[1]. The peroxide value was also determined by the method of AOAC[1]. Antioxidant activity was measured using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) dye, as per the procedure described by Shimada *et al*[12]. Oiling off was analyzed by the method of de Man[3]. The total number of viable bacteria in sample was enumerated by the standard plate count method using milk agar[4]. The plates were incubated at 37˚C for 48 hours and after that enumeration was done.

RESULTS AND DISCUSSION

Shelf life of any food product is governed by the extent of progression of deteriorative changes that occur during storage. Several decomposition and formation processes of chemical and biochemical nature are initiated from the onset of storage which ultimately renders the product unacceptable after a certain period of storage.The PPE was added as natural preservative to cream based spread at 1% level of the fat to study its effect on shelf life of the spread. In addition, the synthetic preservative i.e BHA (2ppm, antioxidant agent) and potassium sorbate (0.05%) and sodium benzoate (0.05%) (antimicrobial agent) containing sample was also studied to observe the comparative effect. The results are presented in the following sections.

FFA (% Oleic acid)

Free fatty acids analysis serves as a measure of hydrolytic rancidity in the fat rich products. The study was conducted to determine the effect of storage days and different treatments on the FFA content in the fat spread during storage period. The results are delineated in Figure 1. The results show that the FFA content increased with the increase in storage days in all the spread samples. The increase in FFA content has been reported by Reddy *et al*[10]., while studying storage life of *chakka* based butter spread. These researchers have also attributed the rise in FFA content of spread to the continuous lipolytic breakdown as a result of high microbial count with the progress in storage period. A low value of FFA in NP sample evidenced the antimicrobial potential of the extract and hence less lipolytic breakdown in the spread showing.

Peroxide value (m eq. KOH/1000 g Fat)

The changes in peroxide value in the spread samples during storage are shown in Figure 2. The figure shows the changes in peroxide value (expressed as milli equivalent KOH/ 1000 g fat) as affected by the preservative treatments during storage period. As depicted in Figure, the increase in peroxide value was fastest and significantly (p<0.05) high in control during the progress of storage period while the NP sample had the values at par with the SAA sample throughout its shelf life indicating that PPE was comparable with BHA in controlling the oxidative rancidity. Kanatt *et*

al[6]., also reported that PPE was effective in controlling oxidative rancidity in chicken products.

Antioxidant activity (%RSA)

Antioxidant activity of the samples was measured during storage to study the effect of treatments on the antioxidant activity of the spread samples and the results are presented in Figure 3a and b. It is evident from the figure that %RSA of the samples was significantly affected by the given treatments. The antioxidant activity of fresh control sample was observed to be 12.20 %RSA which may be contributed by the olive oil incorporated in the spread. While the fresh spread with NP and SAA samples had a significantly high antioxidant activity than control sample with 82.10 and 82.33 %RSA respectively. Studies of Li *et al*[7]., have shown that PPE had markedly higher antioxidant capacity than the pulp extract in scavenging the superoxide anion radical. Kanatt *et al*[6]., also reported that Pomegranate peel extract (PE) showed excellent antioxidant activity during 2-3 weeks refrigerated storage of chicken products.

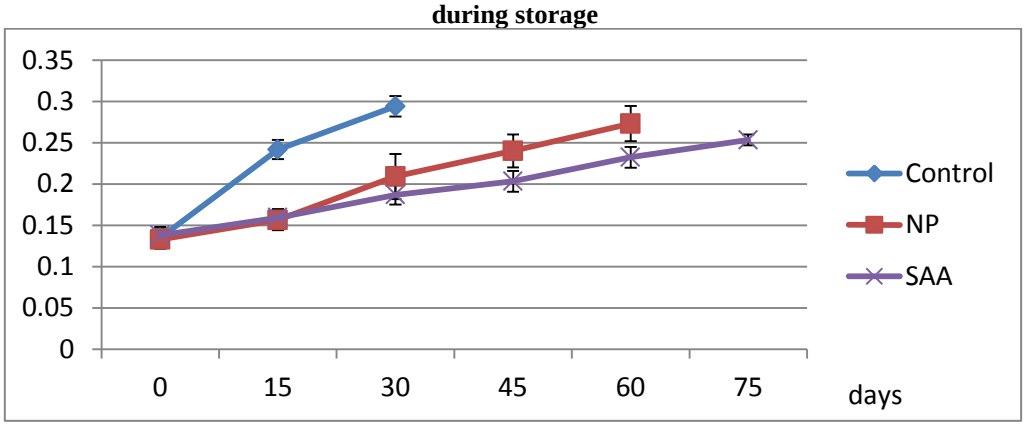
Oiling off (%)

The samples with different treatments were analyzed to study their effect on the oiling off in the samples during storage. The findings are presented in Figure 4. It results reveal that the control sample having a shelf life of 30 days did not show any significant increase in oiling off during storage. Sample NP was found to a have an insignificant increase in oiling off upto 45 days of storage while on 60th day, the increase in oiling off was significant with 1.44 per cent when compared to 0th day. SAA sample also had an insignificant increase in oiling off from 1.01 to 1.16 per cent till 45th day. On 75th day of storage the oiling off significantly increased to 1.47 per cent in SAA. The gradual non significant increase in oiling off upto 45 days implies that the spread possessed good emulsion stability upto 45 days thereafter slight destabilization of the emulsion started which may be due to compositional degradation of the spread leading to oil separation. It was observed that there was no significant difference in the oiling off in the samples subjected to different treatments. This shows that the treatments have no influence on emulsion. The results are in accordance with those reported by Patange *et al*[8], in ghee based low fat spread.

Total bacterial count (log_{10} cfu/g)

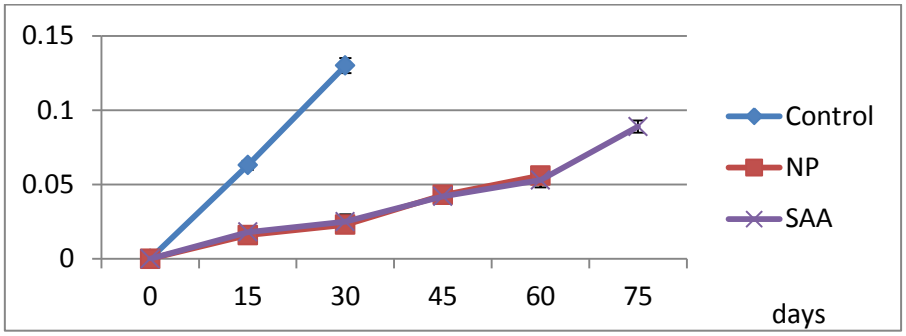
The cream based spread samples were plated using standard plate count milk agar for estimating the total bacterial count and the results are presented in Figure. 5.The study shows that the incorporation of PPE in spread could enhance shelf life of cream based spread upto 60 days under refrigeration conditions when compared to control sample with a shelf life of 30 days. Tarkhasi[14] reported that compared with the control sample, PPE in treated samples delayed the growth of Total Viable Count during the storage period of Edible Coating Containing Pomegranate Peel Extract silver carp fillets. There are similar reports about antimicrobial effect of natural antioxidant on quality and shelf life of fish fillet during refrigerated storage[9].

Fig. 1: Effect of storage days and treatments on the FFA (% Oleic acid) of the cream based fat spread during storage



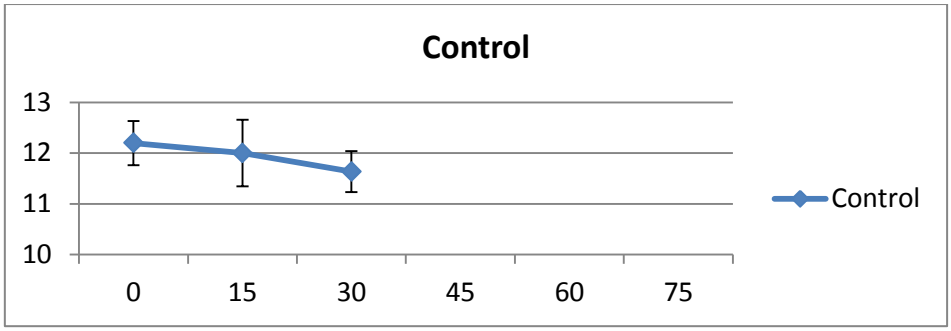
Control- containing no preservative, NP- sample containing pomegranate peel extract (PPE) (1% on fat basis), SAA- sample containing sodium benzoate (0.05%) and potassium sorbate (0.05%) and BHA (0.02). Sample composition 20.65% milk fat, 14.35% olive oil, 5% rice bran oil, 1.25% salt, 0.2% xanthan gum

Fig. 2: Effect of preservatives on peroxide value (m eq. KOH/Kg Fat) of cream based fat spread during storage



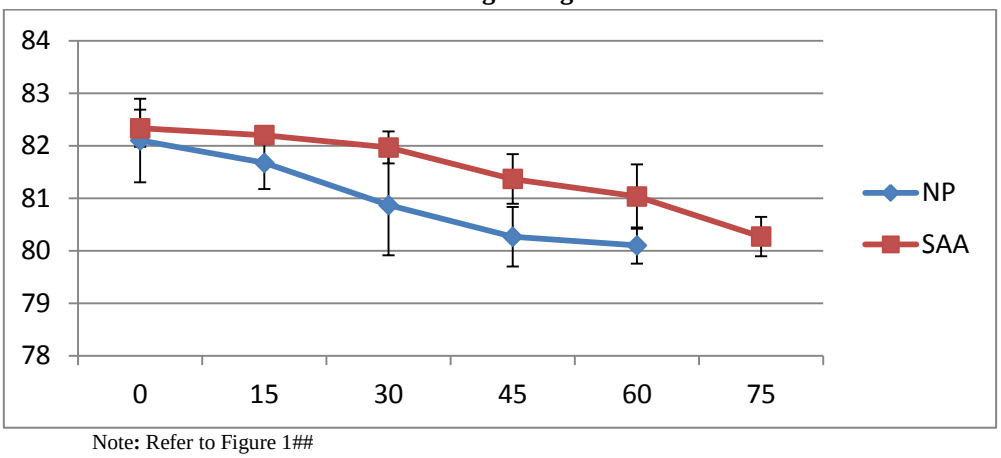
Note: Refer to Figure 1##

Fig. 3a: Effect of preservatives on antioxidant activity (%RSA) of cream based fat spread (control) during storage



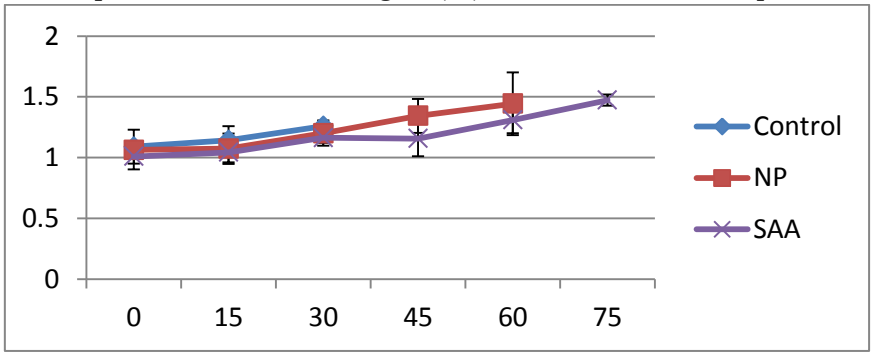
Note: Refer to Figure 1##

Fig. 3b: Effect of preservatives on antioxidant activity (%RSA) of cream based fat spread (NP and SAA) during storage



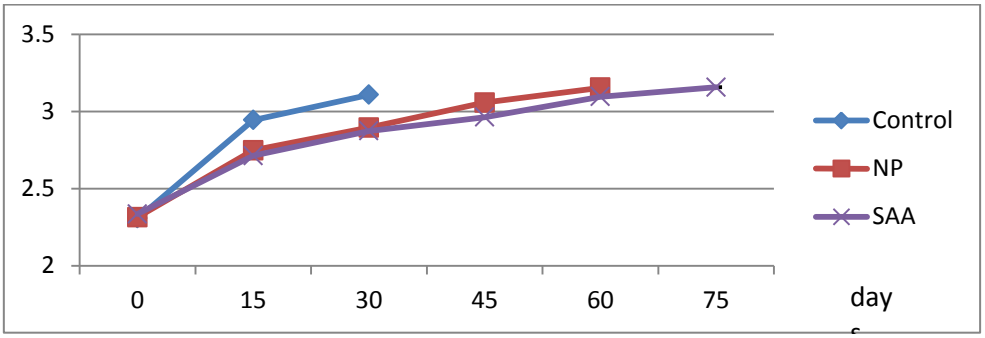
Note: Refer to Figure 1##

Figure 4: Effect of preservatives on the oiling off (%) of the cream based fat spread during storage



Note: Refer to Figure 1##

Fig. 5: Effect of preservatives on Total Bacterial Count (log_{10} cfu/g) of cream based fat spread during storage



Note**:** Refer to Figure 1##

CONCLUSION

PPE has a potential to serve as a natural preservative and enhance the shelf life of the food products. Utilization of pomegranate peel for this purpose can solve the problem of both waste disposal as well as food preservation.

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