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Prathyusha Vasipalli
Department of Food Science and Technology, College of Agricultural Engineering, JNKVV, Jabalpur, Madhya Pradesh, India

Pratibha Parihar
Department of Food Science and Technology, College of Agricultural Engineering, JNKVV, Jabalpur, Madhya Pradesh, India

Priti Jain
Department of Food Science and Technology, College of Agricultural Engineering, JNKVV, Jabalpur, Madhya Pradesh, India

KC Mahajan
Department of Food Science and Technology, College of Agricultural Engineering, JNKVV, Jabalpur, Madhya Pradesh, India

Corresponding Author:
Prathyusha Vasipalli
Department of Food Science and Technology, College of Agricultural Engineering, JNKVV, Jabalpur, Madhya Pradesh, India

Changes in quality parameters during storage of pretreated onion paste

Prathyusha Vasipalli, Pratibha Parihar, Priti Jain and KC Mahajan

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Abstract
This study was aimed to investigate the effects of pre-treatment and storage periods on the quality parameters of onion paste. The paste contains the natural flavor and health benefits, rather than artificial food flavoring substances and it can be used to prepare processed products. The processing of the onion paste which are preferred by the consumer, have long shelf life and involve low cost of production. Hence, it is necessary to maintain the quality and to increase shelf life of the products and generate an easy technology, which can be used in our agro climatic and processing conditions. Thus, in the investigation, a systematic approach was followed to store the different pretreated onion paste.

Keywords: Onion paste, preservatives, pre-treatment, quality parameter, storage condition

Introduction
The onion (*Allium cepa* L.), is the most common vegetable of the genus Allium, also known as the bulb onion or common onion. World productions of onions are about 25 million tonnes. It is an important condiment widely used in all households all the year round for flavouring the dishes. The green leaves and immature and mature bulbs are eaten raw or used in preparation of vegetables. As a foodstuff they are usually served cooked, as a vegetable or part of a prepared savoury dish, but can also be eaten raw or used to make pickles or chutneys. The small bulbs one pickled in vinegar. These are also considered as valuable medicinal plants i.e. this is important commercial crop with versatile applications. The pungency in onion is due to a volatile oil known as allyl-propyl disulphide. Recent research has suggested that onions in the diet may play a part in preventing heart disease and other ailments. Onion bulb is rich in phosphorus, calcium and carbohydrates.

In India post harvest losses has been accounted as one of the major problem in most of the vegetables including onion. Verma and Singh (2004) [13] reported overall losses in vegetables up to 25 per cent of total production. Severe loses occur because of poor transportation facilities, lack of know-how, poor management and improper market facilities or due to careless handling of the produce by farmers, market intermediaries and consumers (Gauraha and Thakur, 2008 [3]; Singh *et al.*, 2008 [11]). The study by Karim and Wee (1996) [7] had revealed that well managed post-harvest activities for vegetables led to higher yields and profits to producers. It is therefore, important that the post-harvest practices be given as much attention as production practices.

The ambient conditions (temperatures above 20 °C) for onion storage are not ideal since these storage conditions increase germination, qualitative and quantitative losses of stored onion. The optimum storage condition for fresh onion is 8~12 °C and a relative humidity of 65~70%; however, these conditions are difficult to maintain in the crypts for fresh onion. In addition, fresh onion is negatively affected by temperatures below 12 °C and higher rates of germination occur when temperatures exceed 20 °C. Therefore, many issues are associated with onion storage.

To solve these problems, onions are used as onion paste. Onion paste has a spicy taste and flavor similar to fresh onion, but non-enzymatic browning can occur as well as microbial gas production during onion paste storage. Some changes affect the unique flavor of onion and its properties. Therefore, this study investigated the effects of pre-treatment and storage periods on the quality parameters of onion paste.

Materials and Methods

Raw Materials

Agrifound Light Red Varieties of onion were procured from Horticulture Farm, JNKVV, Jabalpur, MP, India. Analytical grade chemicals were used for analysis, which were available in laboratory of Food Science Department.

Preparation of onion paste

Matured and graded onion bulbs were manually selected and cleaned by removing the outer skin and roots with the help of knife. Then, they were chopped and passed through crusher for fine onion paste. Onion paste was divided into lots for mixing of various preservatives i.e. salt of 1.5%, palm oil of 5%, citric acid of 0.3% and sodium-meta bisulfate of 0.3%.

Storage conditions

The pretreated onion paste was packed in glass containers for storage period of 2 months at refrigeration condition (4.4ºC) for storage. All samples were analyzed for quality measurement after 0, 15, 30, 45, 60 days. The data obtained from various experiments were statistically analyzed. Pretreated samples were also compared with control sample at each storage interval.

Physico-chemical analysis of Onion paste

Moisture Content

The moisture content of onion paste was determined according to the method of A.O.A.C (1992) [2].

Total soluble solids

The total soluble solids (TSS) of samples were measured at room temperature by Hand refractometer. 20 ^{0}C temperatures was set as a standard.

Pyruvic acid

Pyruvic acid of the sample was determined by using standard pyruvic acid method as given by Schwimmer S and Weston WJ (1981) [10].

Microbial examination

Microbiological analysis was done by pour plate method described by ICMSF (1992) [4]. All samples were analyzed for the populations of bacteria and total mould load. Results were expressed by using colony counter. Number of colonies were counted and expressed as per g or ml of sample.

Sensory evaluation

The sensory quality characteristics i.e. overall acceptability of the products such as colour and appearance, taste, texture, flavour were evaluated by panel of 15 participants including faculty member and students of department using nine point hedonic scale as described by Amerine *et al*. (1965) [1].

Results and Discussion

Effect of pretreatments and storage periods on the moisture content of onion paste

Moisture plays important role in storage of the food product. The effect of different pretreatments and storage periods on the moisture content of onion paste is shown in figure 1. Maximum moisture content was found of 86.64% in 1.5% salt pretreatment at initial stage of storage. Whereas, minimum moisture content (85.67%) was found in the sample treated with citric acid at 60 days of storage. Moisture content decreased with increases the storage period in all treated onion paste. Chemical treatments affected the moisture content of onion paste significantly. Onion paste samples treated with 1.5% salt had the highest moisture content compared to the treated ones during storage. This might be due to permeability to water vapour. Similar finding was reported by Javeed *et al*. (2015) [6] to show the effect of quality parameters of developed ginger garlic paste during storage.

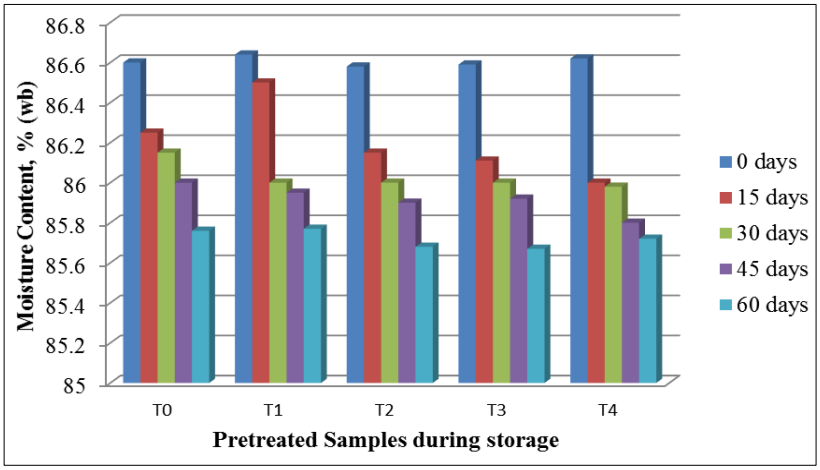
Control sample of Onion Paste

Salt treated Onion Paste

Palm Oil treated Onion Paste

Citric acid treated Onion Paste

Sodium-meta bisulfate treated Onion Paste



T0= Control, T1= Salt (1.5%), T2= Palm oil (5%), T3= Citric acid (0.3%), T4= Sodium-meta bisulfate 0.3%

Fig 1: Effect of pretreatments on moisture content of onion paste during storage

Effect of pretreatments and storage periods on the total soluble solids of onion paste

The figure 2 showed that TSS content of stored onion paste gradually decreased with increasing the storage period. Maximum (13.80^{0}Brix) and minimum (12.0^{0}Brix) TSS content was found in control sample at initial stage of storage. TSS content was statistically at par among all processing variables during storage. Significant difference was found in TSS content of stored onion paste. The decrease in total soluble solids might be due to activity of fermentation. Similar finding reported by Ramadevi *et al*. (2010) [9] for changes in quality and chemical parameter of onion bulbs during storage.

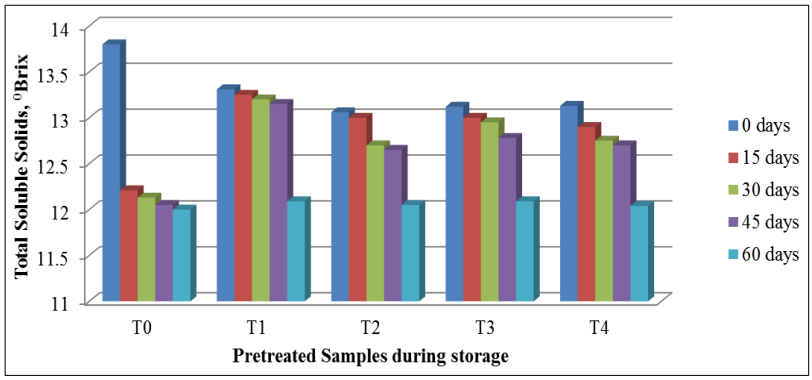


Fig 2: Effect of pretreatments on total soluble solids of onion paste during storage

Effect of pretreatments and storage periods on the pyruvic acid content of onion paste

The change in pyruvic acid content of onion paste is presented in figure 3. The figure showed that the pyruvic acid gradually increased in all treated onion paste during storage. Maximum pyruvic acid content (43.89 mg/100g) was found in pretreatment of sodium-meta bisulphate at 60 days of storage. Whereas minimum pyruvic acid content (42.64 mg/100g) was found in control sample at initial stage of storage. Pyruvic acid content increased with respect to the fresh onion paste during the storage at different processing variables of paste. During storage the pyruvic acid content also varied with changes in dry matter varieties and sulfur nutrition. Similar findings were reported by Sharma and Yong (2016) [8] in the study of effect of different storage temperature on chemical composition of onion.

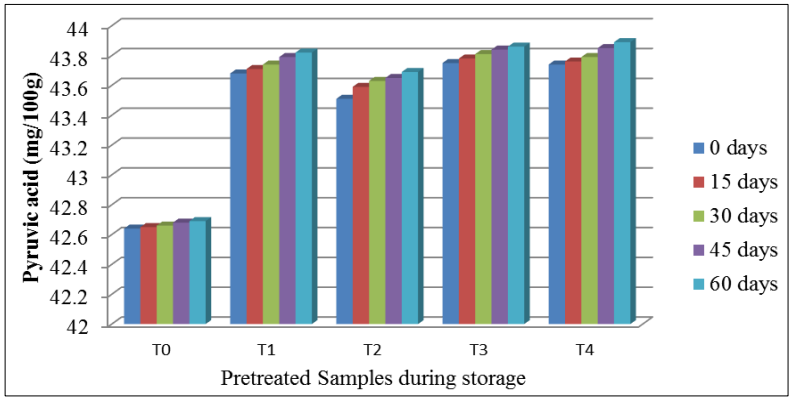


Fig 3: Effect of pretreatments on Pyruvic acid of onion paste during storage

Effect of pretreatments and storage periods on microbial count of onion paste

Microbial is an essential component of food safety. Microbial count of onion paste is presented in figure 4. Maximum number of microbial counts was found ($3.1x10^2$ Cfu/g) in control sample at 60 days of storage period. Whereas, minimum microbial counts was found in all samples treated with different preservatives at initial stage of storage. Microbial count increased with increasing the storage period of onion paste. The data showed that among all the treatments, citric acid treatment were significantly superior to control growth of microbes. This might be due to acidic media of paste. Similar findings were showed by Topno *et al.* (2013) [12] for microbial evaluation of ginger garlic paste in retort pouches.

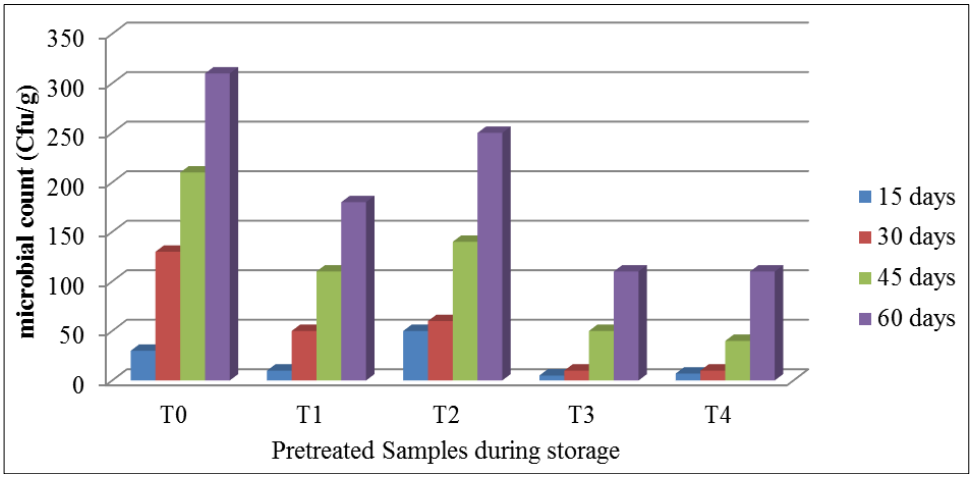


Fig 4: Effect of pretreatments on microbial count of onion paste during storage

Effect of pretreatments and storage periods on overall acceptability of onion paste

Quality is a combination of characteristics that have significance in determining the degree of acceptability of the product to a consumer. The variation in overall acceptability of onion paste was observed for various samples in figure 5. Maximum rank for overall acceptability of onion paste was found to be 8.53 in pretreatment of citric acid at initial stage of the storage whereas, minimum rank (4.29) was found in pretreatment of oil according to hedonic scale at 60 storage days. Hence, acceptable limits during 45 days of storage all treated onion paste varieties were accepted but oil except oil treated sample and control sample, all sample were acceptable for 45 storage days. Acceptability of stored onion paste decreased with increased in storage period. Onion paste treated with citric acid at refrigeration condition was significantly superior to other treatments. This might be due to changes of colour, flavor and texture of onion paste. Similar finding was explained by Jasim Ahmed *et al.* (2001) [5] for physico- chemical and storage characteristics of garlic paste.

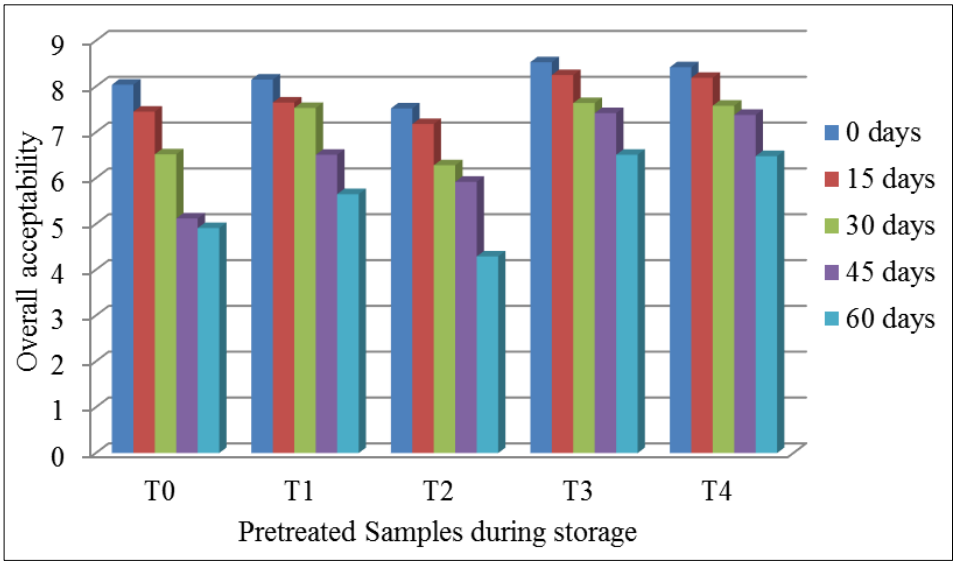


Fig 5: Effect of pretreatments on overall acceptability of onion paste during storage

Conclusion

In this investigation, onion paste was treated with various preservatives i.e. salt of 1.5%, palm oil of 5%, citric acid of 0.3% and sodium-meta bisulfate of 0.3%. The pretreated onion paste was packed in glass containers for storage period of 2 months at refrigeration condition (4.4ºC) for storage. Results were concluded that the use of two preservatives i.e. citric acid of 0.3% and sodium-meta bisulfate of 0.3% was better than others. Hence, appropriate processing at the time of gluts, can be profitable to the farmers, besides making available the nutrients to the Indian dietaries, thus meeting nutritional security of the population.

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