



# NON ENZYMATIC BROWNING OF AONLA POWDER PREPARED USING DIFFERENT DRYING METHODS DURING STORAGE

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## Abstract

Effect of Drying methods i.e., Cabinet Tray Dryer, Hot air dryer and Osmo - air drying at 60°C, 70°C and 80°C giving pretreatments blanching and Blanching + sulphiting on non-enzymatic browning of Aonla Powder during 180 days of Storage at room temperature were investigated. Recently, osmotic dehydration technique has gained more attention due to its potential application in the food processing industry. Aonla has acquired wide popularity all over the world for its medicinal properties. Minimum browning was observed in osmo-air dried aonla and maximum in hot air oven dried aonla powder. There was significant elevation in the values of browning over the storage period.

**Keywords:** Blanching, Osmo - air drying, Aonla Powder, dehydration and Browning.

## Introduction

Indian gooseberry, also known as aonla and amla (*Emblca officinalis* or *Phyllanthus emblica Gaertn*), is a subtropical deciduous tree belonging to the family Euphorbiaceae. It is said to be native of tropical Asia and found growing wild in tropical forests and hill slope regions of India. Being a seasonal crop, aonla fruits are available only for a short period of the year and are highly perishable in nature. Due to highly astringent and acidic taste, fruits are not always welcomed by consumers in fresh form. Thus, the delicately flavoured aonla fruits could be utilized for preparation of candy, dried chips, powder, chutney, pickles and murabba. There are several techniques for dehydration of different fruits. Recently, osmotic dehydration technique has gained more attention due to its potential application in the food processing industry. Aonla has acquired wide popularity all over the world for its medicinal properties. Its fruits are used in traditional Indian system of medicines, like ayurvedic, due to its therapeutic values (Agarwal and Chopra, 2004). The growing popularity for alternate medicines, health foods, and herbal products are enhancing the demand for aonla fruit.

The processing of amla can be traditional or through the use of new methods of processing. There are popular household recipes in India for converting fresh amla into wide range of preparations, but this is reducing with busy life style (Pathak, 2003). Processing amla fruit to murabbas, pickle, juice, syrup, squash and dehydrated powders can extend the shelf life of the amla fruit (Shafiq *et al.*, 2009).

## Materials and Methods

Fully mature aonla fruits of 'Banarasi' variety was harvested and properly washed with clean running water to remove the adhering dust particles and to reduce the microbial

flora present on the surface of the fruits. After this, aonla fruits were blanched in boiling water (90±2°C for 10 min). Blanched aonla was immediately put in cold water for two min. then, the fruits was dipped in a solution of 0.1 per cent potassium metabisulphite for 10 minutes. The fruit was drained and pits were removed manually. Thereafter, the fruit was subjected to different drying treatments.

## Osmo-air drying

The fruit pieces after removal of pits was dipped in 70° Brix sugar solution for 17 hours at 50°C, drained, washed to remove adhering sugar, air dried and kept in hot air oven at 65°C till no further moisture loss occurred. Aonla powder prepared after dehydration by different methods was packed in 300 gauge polythene bags. Packets of 100gm powder was prepared these packets was wrapped in brown paper and stored in room at room temperature for a period of 0, 30, 60, 90, 120, 150 and 180 days. Studies were carried out to evaluate the non enzymatic browning of the Aonla powder prepared using Mature aonla fruits, variety 'Banarasi' under the drying process by Cabinet tray dryer, Hot air dryer and Osmo - air drying at 60°C, 70°C and 80°C giving pretreatments such as blanching and Blanching + sulphiting.

## Non- enzymatic browning

5 gm fruit pulp (0.05 gm dried powder) was dissolved in 40 ml of 30 % ethyl alcohol. The resulting solution was kept overnight and filtered next day to obtain a clear solution. The color intensity of solution was measured at 440 nm using 60 % aqueous ethyl alcohol as blank. The increase in absorbance of the sample at 440 nm was taken as a measure of Non enzymatic browning.

**Acid digestion:** 1 gm sample was taken in a 100 ml conical

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flask. To this, 25 ml diacid mixture ( $\text{HNO}_3:\text{HClO}_4::5:1$ , v/v) was added and kept overnight. This was digested the next day on a hot plate till clear white precipitates settled down at the bottom of the flask. The crystal was dissolved in double distilled water and was used for determination of phosphorus.

### Results and Discussion

It was observed that the browning for the sample held at 60°C temperature and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.036 to 0.052 % for controlled (C), 0.047 to 0.062 % for blanched (B) and 0.038 to 0.054 % for blanching + sulphiting (B+S) under cabinet tray dryer. It was observed that the lowest browning 0.036 % was found for the controlled held at 60°C for 180 days of storage period and highest browning 0.047 % was found for the blanching held at 60°C before storage (initial stage of storage). The variations in browning with storage period are shown in Fig 1.

In hot air drying, the browning for the sample held at 60°C temperature and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.039 to 0.055 % for controlled, 0.046 to 0.061 % for blanched, and 0.044 to 0.060 % for blanching + sulphiting. It was observed that the lowest browning 0.039 % was found for the controlled held at 60°C for 180 days of storage period and highest browning 0.044 % was found for the blanching held at 60°C before storage (initial stage of storage). The variations in browning with storage period are shown in Fig 2.

In osmo- air drying, the browning for the sample held at 60°C temperature, and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.026 to 0.041 % for controlled, 0.033 to 0.048 % for blanched, and 0.029 to 0.041 % for blanching + sulphiting. It was observed that the highest browning 0.033 % was found for the blanching held at 60°C for 180 days of storage period and lowest browning 0.026 % was found for the controlled held at 60°C before storage (initial stage of storage). The variations in browning with storage period are shown in Fig 3. Non-enzymatic Browning increased with the increase in six months of storage duration. It might be due to condensation of tannins into brown pigments. Singh *et al.*, (2010) also reported that browning increased gradually in Intermediate moisture baby corn with increase in storage period of 60 days. Similar findings were obtained by Ahlawat (2007) in osmotically dehydrated aonla during 60 days of storage period.

It was observed that the Browning for the sample held at 70°C temperature, and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.034 to 0.051 % for controlled, 0.045 to 0.059 % for blanched, and 0.039 to 0.052 % for blanching + sulphiting under cabinet tray dryer. It was observed that the highest Browning 0.045 % was found for the blanching held at 70°C for 180 days of storage period and lowest Browning 0.034 % was found for the controlled held at 70°C before storage (initial stage of storage). The variations in Browning with storage period are shown in Fig 4.

In hot air drying, the browning for the sample held at 70°C temperature, and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.038 to 0.053 % for controlled, 0.049 to 0.064 % for blanched, and 0.042 to 0.056 % for blanching + sulphiting. It was observed that the highest browning 0.049 % was found for the blanching held at 70°C for 180 days of storage period and lowest browning 0.038 % was found for the controlled held at 70°C before storage (initial stage of storage). The variations in browning with storage period are shown in Fig 5.

In osmo- air drying, the browning for the sample held at 70°C temperature, and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.024 to 0.038 % for controlled, 0.032 to 0.047 % for blanched, and 0.027 to 0.040 % for blanching + sulphiting. It was observed that the highest browning 0.032 % was found for the blanching held at 70°C for 180 days of storage period and lowest browning 0.024 % was found for the controlled held at 70°C before storage (initial stage of storage). The variations in browning with storage period are shown in Fig 6.

It was observed that the browning for the sample held at 80°C temperature, and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.031 to 0.050 % for controlled, 0.041 to 0.058 % for blanched, and 0.034 to 0.051 % for blanching + sulphiting under cabinet tray dryer. It was observed that the lowest browning 0.031 % was found for the controlled held at 80°C for 180 days of storage period and highest browning 0.041 % was found for the blanching held at 80°C before storage (initial stage of storage). The variations in browning with storage period are shown in Fig 7.

In hot air drying, the browning for the sample held at 80°C temperature, and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.033 to 0.054 % for controlled, 0.045 to 0.062 % for blanched, and 0.038 to 0.053 % for blanching + sulphiting. It was observed that the lowest browning 0.033 % was found for the controlled held at 80°C for 180 days of storage period and highest browning 0.045 % was found for the blanching held at 80°C before storage (initial stage of storage). The variations in browning with storage period are shown in Fig 8.

In osmo- air drying, the browning for the sample held at 80°C temperature, and stored for 0, 30, 60, 90, 120, 150, and 180 days respectively was found to be in the range of 0.020 to 0.033 % for controlled, 0.028 to 0.044 % for blanched, and 0.022 to 0.038 % for blanching + sulphiting. It was observed that the highest browning 0.028 % was found for the blanching held at 80°C for 180 days of storage period and lowest browning 0.020 % was found for the controlled held at 80°C before storage (initial stage of storage). The variations in browning with storage period are shown in Fig 9.

### Conclusion

Blanching with KMS exhibited superior quality over hot water blanching. Osmo-air drying was more effective as compared to hot air oven drying method. Minimum browning was observed in osmo-air dried aonla and maximum in hot air

oven dried aonla powder. There was significant elevation in the values of browning over the storage period. It could be attributed to faster degradation of ascorbic acid and formation of brown color in dried products at room temperature while at low temperature, non availability of oxygen might have prevented oxidation process that could have slowed down browning.

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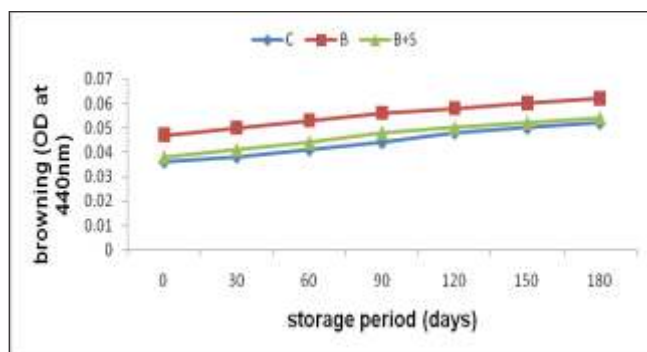
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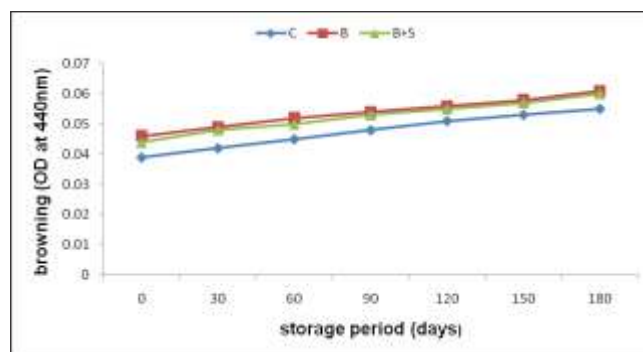
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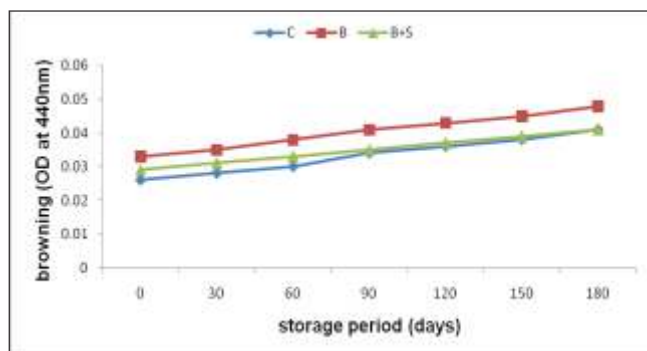
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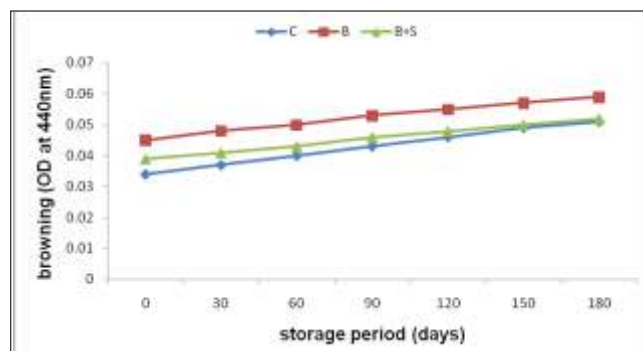
**Fig 1:** Effect of storage period on browning (OD at 440nm) of aonla powder at 60°C under cabinet tray dryer



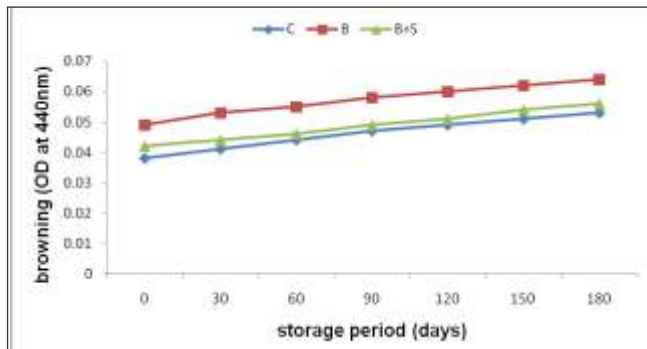
**Fig 2:** Effect of storage period on browning (OD at 440nm) of aonla powder at 60°C under hot air dryer



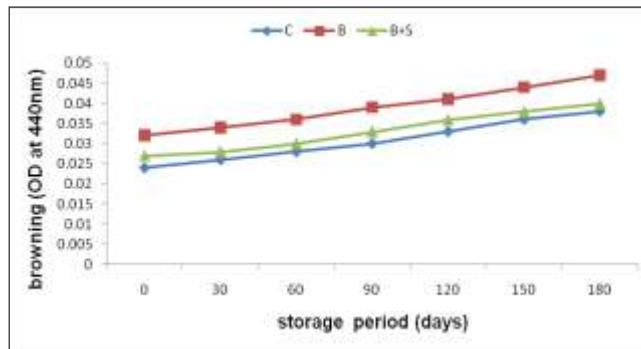
**Fig 3:** Effect of storage period on browning (OD at 440nm) of aonla powder at 60°C under osmo-air drying



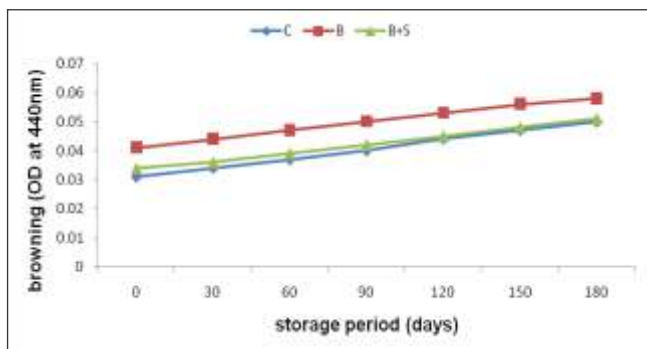
**Fig 4:** Effect of storage period on browning (OD at 440 nm) of aonla powder at 70°C under cabinet tray dryer



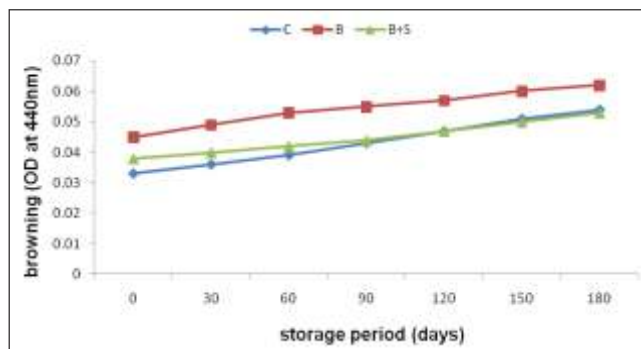
**Fig 5: Effect of storage period on browning (OD at 440nm) of aonla powder at 60°C under hot air dryer**



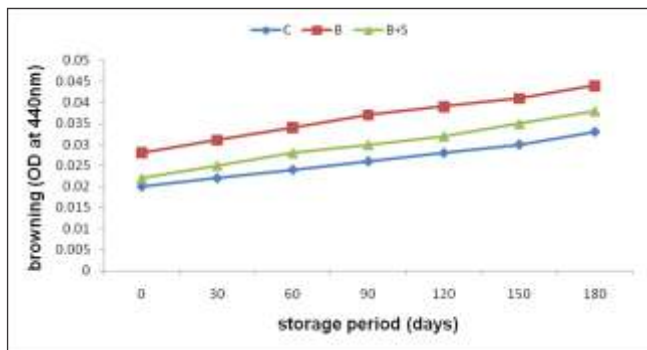
**Fig 6: Effect of storage period on browning (OD at 440nm) of aonla powder at 70°C under osmo-air drying**



**Fig 7: Effect of storage period on browning (OD at 440nm) of aonla powder at 80°C under cabinet tray dryer**



**Fig 8: Effect of storage period on browning (OD at 440nm) of aonla powder at 80°C under hot air dryer**



**Fig 9: Effect of storage period on browning (OD at 440nm) of aonla powder at 80°C under osmo-air drying**