The changes on the chemical and sensory properties during storage of the carica seeds powder

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Abstract. Carica fruit is a main commodity in the Dieng plateau. The seeds was one of the by-products in the processing of the carica fruit cocktail. The seeds has high content of antioxidants, so that it could be consumed as functional beverage. The objectives of this study were: to examine the changes in chemical and sensory properties of carica seed powder during storage at different packaging types, storage temperature and storage time. The processes involved in carica seed powder production were; soaking with citric acid, boiling, fermentation with an R. oligosporus containing inoculum, drying, roasting, and mixing the roasted seeds with dried jackfruit at ratio of 3: 1. The packaging used in this study were glass bottle and aluminum foil. The products were stored at 35, 45, and 55ºC; and analyzed for its chemical and sensory characteristics at every 5 d for 20 d. Results of the study showed that: 1) Products packaged in glass bottles had higher antioxidant activity than that of aluminum foil; while vitamin C was lower than that of glass bottles; 2) An increase in storage temperature from 35ºC to 55ºC caused a decrease in vitamin C, antioxidant activity, astringent after-taste, fruity flavor, and preferences i.e.; 10.89, 4.58, 8.64, 3.69, and 2.71%; respectively; while an increase in brown color intensity of 10.68%; 3) Product stored for up to 20 d causes a decrease in vitamin C, antioxidant activity, brown color intensity, bitter taste, astringent after-taste, fruity flavor, and preferences i.e.; 82.43, 64.21, 19.65, 24.89, 10, 12.47, and 18.51%; respectively.

Keywords : carica pubescens, L, seed powder, chemical properties, sensory properties,

BACKGROUND

As a major commodity in Dieng, Central Java, Indonesia, Carica fruit contains high in vitamin C, vitamin K, flavonoids, antioxidants, and dietary fiber. Carica fruit which has a tough texture with acid, sweet, and fruity taste. It can only be consumed after processing. Carica fruit has been processed into cocktails by around 300 SMEs in Wonosobo. One of the side products of Carica cocktail which until now has not been utilized is Carica seeds. Research on processing of carica seed has never been done. The preliminary study indicates that carica seeds was rich in antioxidant content but bitter-astringent tastes that are less acceptable to consumers. The fermentation process using commercial inoculums containing R. oligosphorus (0,2%; t=75h) could reduce the bitter taste of carica seeds. The addition of carica seeds with dried jackfruit could improve the sensory quality. The ratio carica seed powder : dried jackfruit = 72% : 28%. This product can be consumed as functional beverage because its has high in antioxidant. To extend shelf life and facilitate transportation and distribution, products were packaged with several package alternatives, such as glass jar and aluminum foil. The physicochemical and sensory properties of product will decrease during storage, so that the profile of the degradation rate of the product during storage needs to be observed. The data obtained can be used as a reference for determining the shelf life of product.

The objective of this research was to examine the changes in chemical and sensory properties of carica seed powder during storage at different packaging types, storage temperature and storage time.

MATERIALS AND METHODS

Materials

Carica fruit and jack fruit was obtained from Wonosobo district. Other ingredients (sugar, commercial inoculums) were obtained from a local market in Purwokerto central Java.

Method

The stages of this research were :

1. Preparing materials, tools and other instruments
2. Making products with the optimum formula (results from previous research)
3. Packing the product in glass jar and laminated aluminum foil
4. Storing the product in an incubator with a temperature of 35, 45, and 55oC
5. Analyze the physicochemical and sensory properties of the productat storage for 5, 10, 15, and 20 days
6. Analize the physicochemical properties : water, vitamin C, antioxidant activity and Sensory properties : brown color, bitter taste, astringent aftertaste, fruity flavor, overall acceptability
7. data processing, data discussion, and conclusions

The production of carica seed powder

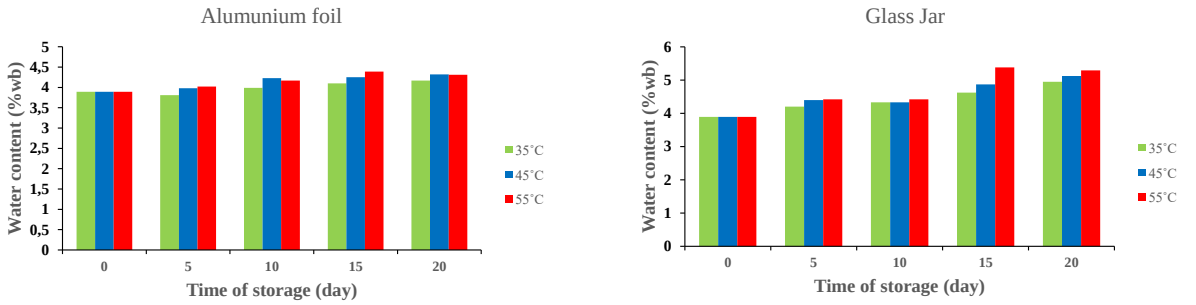
Carica seeds were obtained from the waste of cocktails production by SMEs in Wonosobo. Carica seeds were separated from fruit flesh by washing with running water. 3 kg of carica seeds were soaked with 9 L of citric acid solution of 0.20%w/v for 1 hour. After draining, carica seeds were steamed for 1 hour over medium heat. For the application of the submerged fermentation method, after cooling, carica seeds were immersed in 9 L of water containing 0.2%w/v of commercial inoculum (La Prima) for a certain time (2-10 days). For the application of the solid-state fermentation method, after being cooled, carica seeds were mixed with 0.2%w/v commercial inoculum (La Prima), packed in perforated plastic (dimensions of length x width x height = 20cm x 20cm x 0.5cm), then fermented for a certain time (1-5 days). Fermented carica seeds were dried with a cabinet dryer (60°C of temperature). Dried Carica seeds were ground with a blender and sifted with a 60 mesh sieve to produce carica seed powder.

RESULT AND DISCUSSION

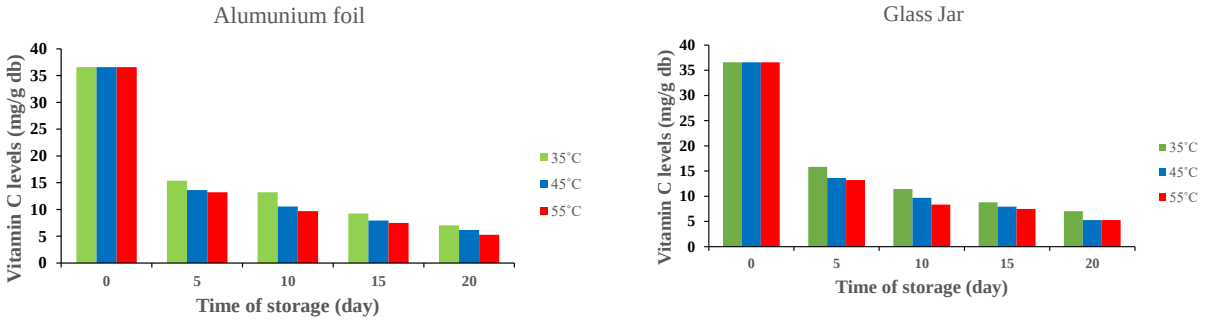
The result showed that : The physicochemical and sensory properties (vitamin C, antioxidant activity; bitter taste, astringent aftertaste, fruity flavor, overall acceptability) decreased with the length of storage time and the higher in storage temperature, while water

content increased. There was no significant difference in the physicochemical properties of the products packed in glass jar and aluminum foil. The decrease in physicochemical properties of products in laminated aluminum foil packaging was slightly higher than glass jar. Graph of the physicochemical and sensory properties profile of the products stored in different package, storage temperature, and storage time can be seen in Figure 1 and Figure 2.

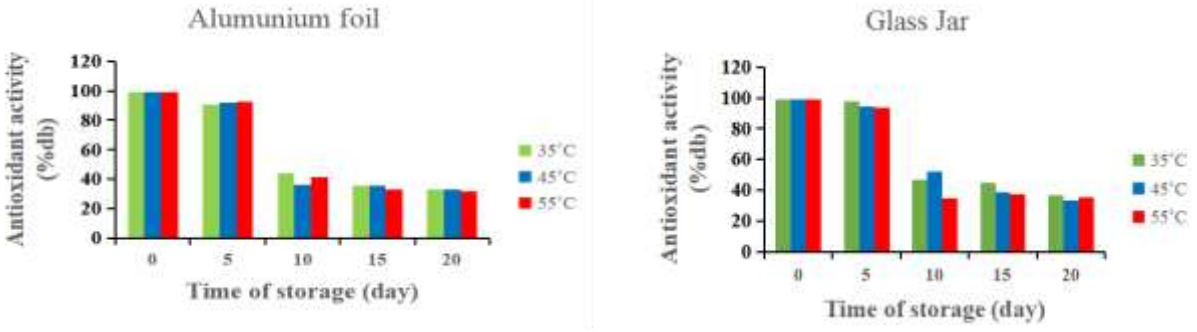
The water vapor transmission rate, packaging permeability, and stability to light and heat affects to deterioration rate of product during storage (Wong and Lim, 2016). The increase in water content is due to the high hygroscopic properties of product. Carica seed powder has a small diameter and large surface area. At higher storage temperatures, the permeability of the packaging and the rate of water vapor transmission increases, so that the water content of product becomes higher (Wong et al., 2020). The decrease in vitamin C and antioxidant activity during storage is affected by oxygen, light, and heat (high storage temperature). Vitamin C and antioxidant compounds are easily oxidized during storage (Shishir et al., 2018).



(a) Water

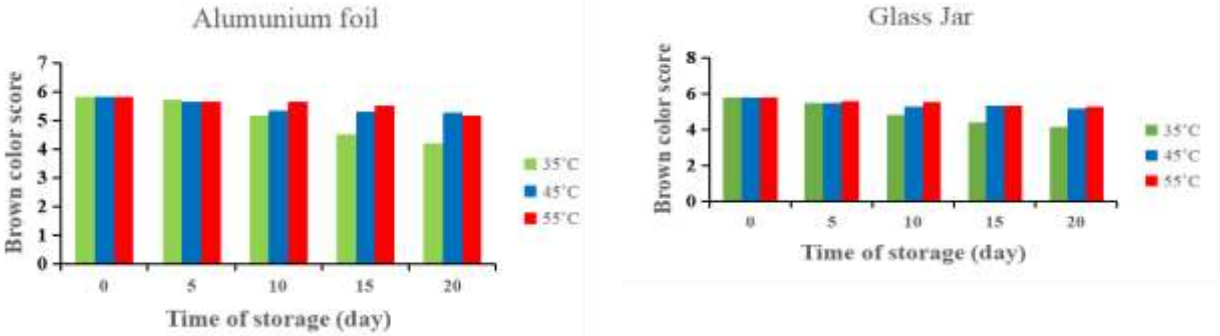


Vitamin C

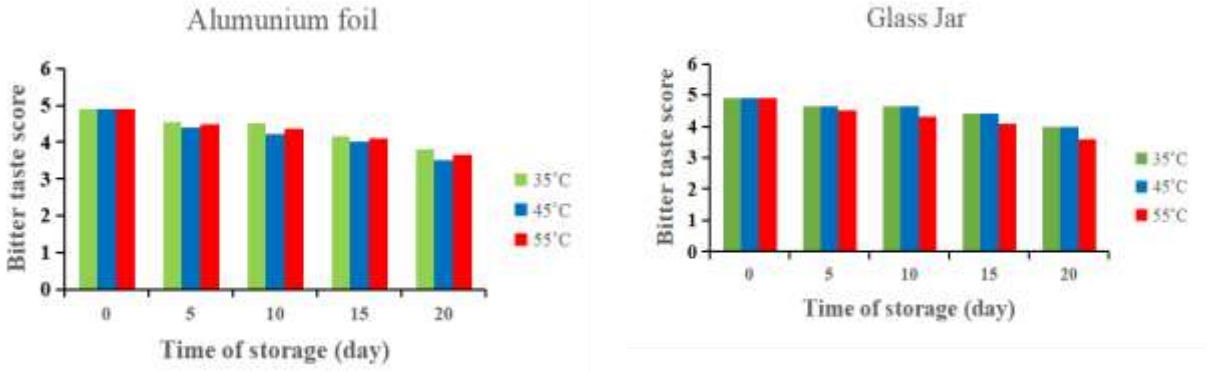


© Antioxidant activity

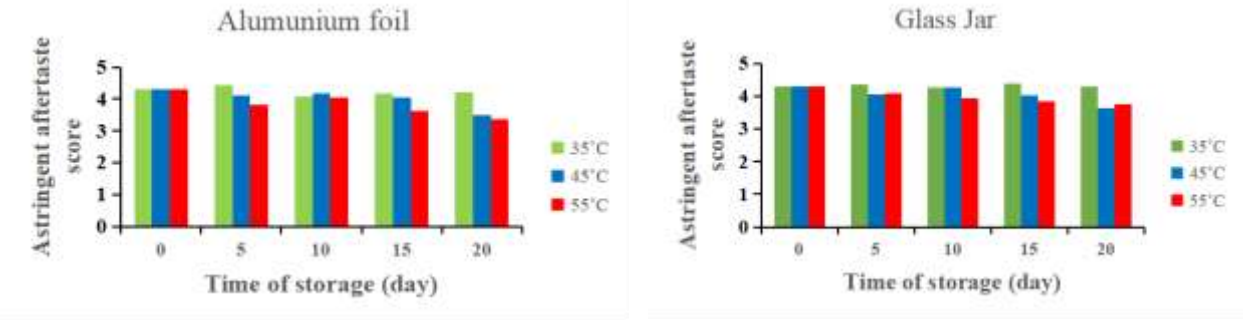
Figure 1. The physicochemical profile of carica seed powder during storage



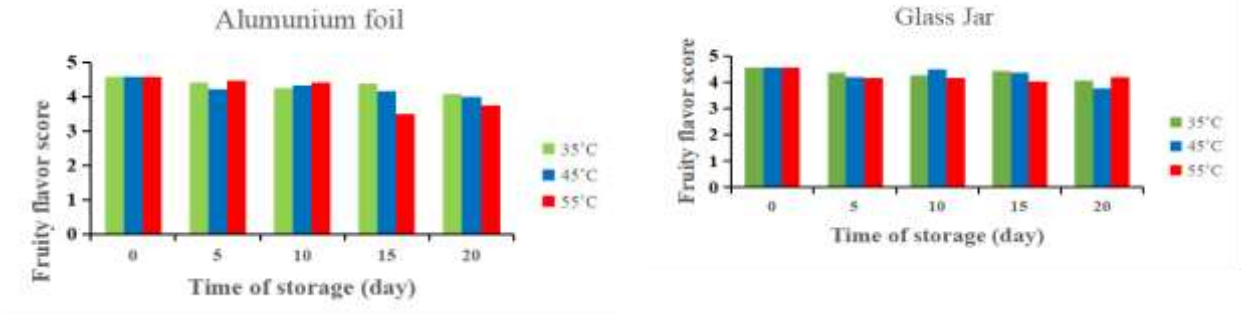
(a)Brown color



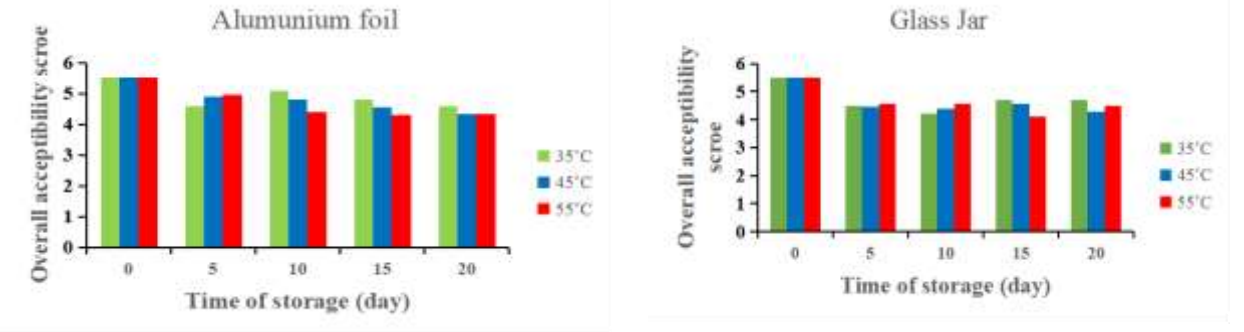
(b)Bitter taste



(c) astringent aftertaste



(d)fruity flavor



(e)overall acceptibility

Figure 2. The sensory profile of carica seed powder during storage

The increase in storage temperature cause increase of intensity of brown color. Its due to one of the compounds resulting from the oxidation of vitamin C is brown furfural (Wong and Lim, 2016). The decrease in the brown color intensity of product during storage is due to the decrease of antioxidant. Some antioxidant compounds such as terpenoids are brown in color. Most of antioxidant compounds has bitter taste. The decrease in bitter taste and astringent

aftertaste during storage due to the decrease of antioxidants. The decrease in fruity flavor was cause by the loss of volatile compounds during storage, mainly at high temperatures. The decrease in overall acceptability was due to the decrease on strength of taste, flavor and mouthfeel of product

CONSLUSIONS

The decline in quality during storage of carica seed powder was caused by the increase in water content and the decrease in vitamin C, antioxidant, color, bitter and astringent aftertaste, and fruity flavor. To maintain quality stability during storage, it is necessary to add food additives which could prevent oxidation and loss of flavor such as ascorbic acid, antioxidants (BHA / BHT / TBHQ), and maltodextrin.

REFERENCES

Badan Pusat Statistik. 2016. *Kabupaten Wonosobo Dalam Angka: Wonosobo: BPS Kabupaten Wonosobo*

Erminawati, Astuti SD, Novitasari I, Suri A. 2020. Formula optimization of functional beverage made from Carica seeds. *IOP Conf. Ser.: Earth Environ. Sci.* 443 012051. doi:10.1088/1755-1315/443/1/012051

Simigortis. 2009. Identification of phenolic Compounds from The Fruits of The Mountain Papaya Vasconcellea pubescens a. dc. Grown in Chile by Liquid Chromatography-uv- Detection- Mass Spectrometry. *Journal Food Chemistry* 115: 775-784.

Yashin A, Yashin Y, Xia X, Nemzer B. 2017. Antioxidant Activity of Spices and Their Impact on Human Health: A Review. *Antioxidants*, *6*,70:1-18. doi:10.3390/antiox6030070.

Laily AN.2011. Karakterisasi *Carica pubescens* Berdasarkan Morfologi, Kapasitas Antioksidan, dan Pola Pita Protein di Dataran Tinggi Dieng. *Tesis*. Universitas Sebelas Maret, Surakarta. (*On-line*). http://biosains.mipa.uns.ac.id/C/C0901/C090102.pdf. Diakses 30 Agustus 2020.

Nout MJR dan Kiers JL. 2005. Tempe fermentation, innnovation and functionality: update into the third milenium. *Journal of Applied Microbiology* 98: 789-805.

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The 3rd International Conference on Multidisciplinary Approaches for Sustainable Rural Development (ICMA-SURE); Theme : Interdisciplinary approaches and applied technologies for sustainable rural-environmental resources based on local wisdoms before and during COVID-19 pandemic; Purwokerto, 18-19 November 2020





BACKGROUND

Carica is a main commodity, indigenous fruit from Dieng plateau

It rich in Vit C, K, flavonoid, antioxidant, & dietary fiber

It can only be consumed after processing

One of the processed carica is cocktails which is made from unripe fruit

The use of over-ripe fruit and by product of cocktails production (pulp, seed) have not been carried out

Carica seeds rich in antioxidant (fenol, alkaloid,terpenoid, saponine), but has bitter & astringent flavor

The fermentation process using commercial inoculums containing R. oligosphorus (0,2%; t=75h) could reduce the bitter taste of carica seeds.

The addition of carica seeds with dried jackfruit could improve the sensory quality. The ratio carica seed powder : dried jackfruit = 72% : 28%

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This product can be consumed as functional beverage because its has high in antioxidant

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To extend shelf life and facilitate transportation and distribution, products were packaged with several package alternatives, such as glass jar and aluminum foil

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The physicochemical and sensory properties of product will decrease during storage, so that the profile of the degradation rate of the product during storage needs to be observed. The data obtained can be used as a reference for determining the shelf life of product

OBJECTIVE

The objective of this research was to examine the changes in chemical and sensory properties of carica seed powder during storage at different packaging types, storage temperature and storage time.

Research Stages

1. Preparing materials, tools and other instruments

2. Making products with the optimum formula (results from previous research)

3. Packing the product in glass jar and laminated aluminum foil

4. Storing the product in an incubator with a temperature of 35, 45, and 55oC

5. Analyze the physicochemical and sensory properties of the productat storage for 5, 10, 15, and 20 days :
   - Physicochemical properties : water, vitamin C, antioxidant activity
   - Sensory properties : brown color, bitter taste, astringent aftertaste, fruity flavor, overall acceptability

6. data processing, data discussion, and conclusions

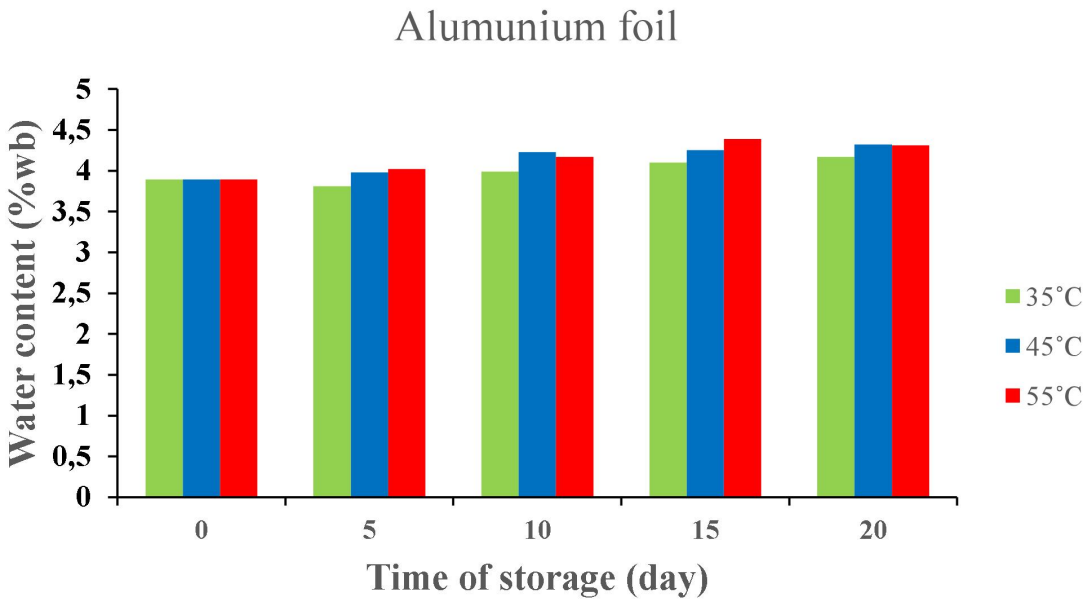
RESULT

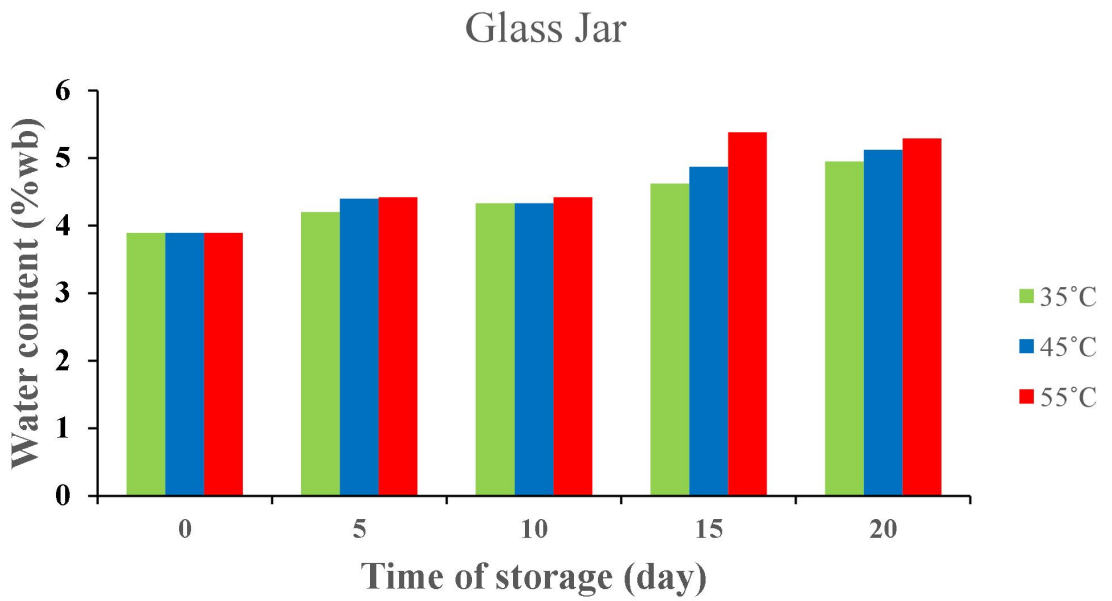
The result show that :

1. **The physicochemical and sensory properties (vitamin C, antioxidant activity; bitter taste, astringent aftertaste, fruity flavor, overall acceptability) decreased with the length of storage time and the higher in storage temperature, while water content increased.**
2. **There was no significant difference in the physicochemical properties of the products packed in glass jar and aluminum foil**
3. **The decrease in physicochemical properties of products in laminated aluminum foil packaging was slightly higher than glass jar.**

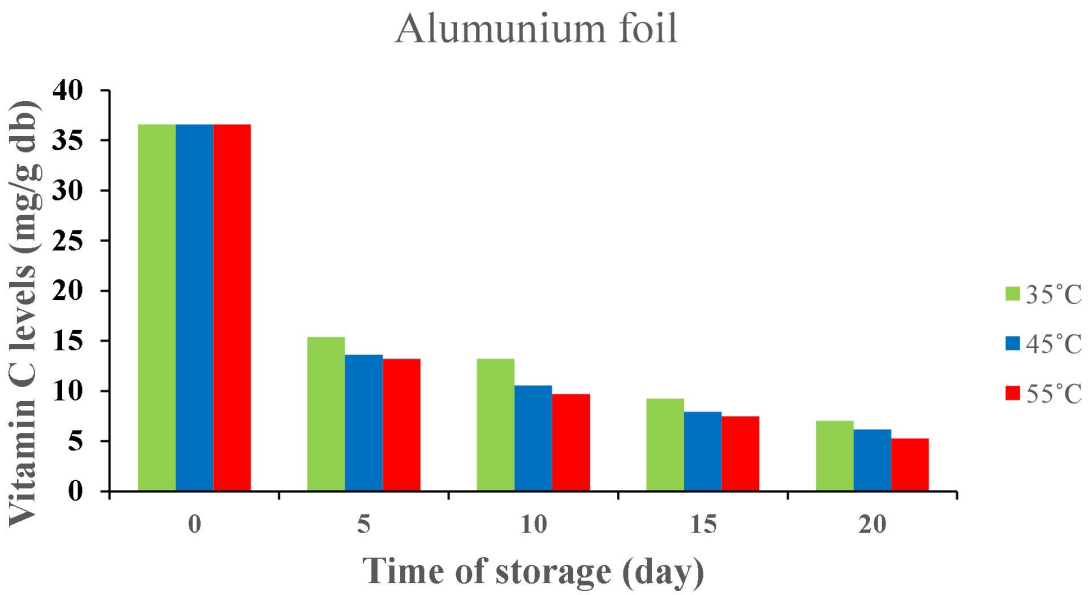
(Graph of the physicochemical and sensory properties profile of the products stored in different package, storage temperature, and storage time can be seen below)

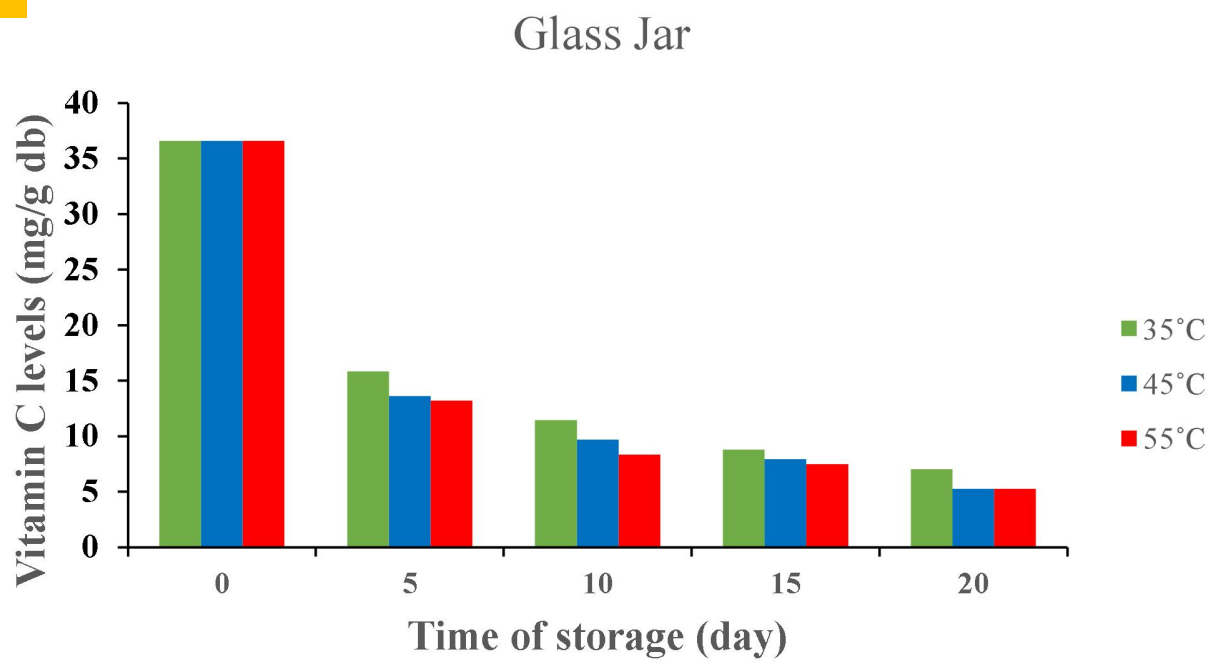
Water



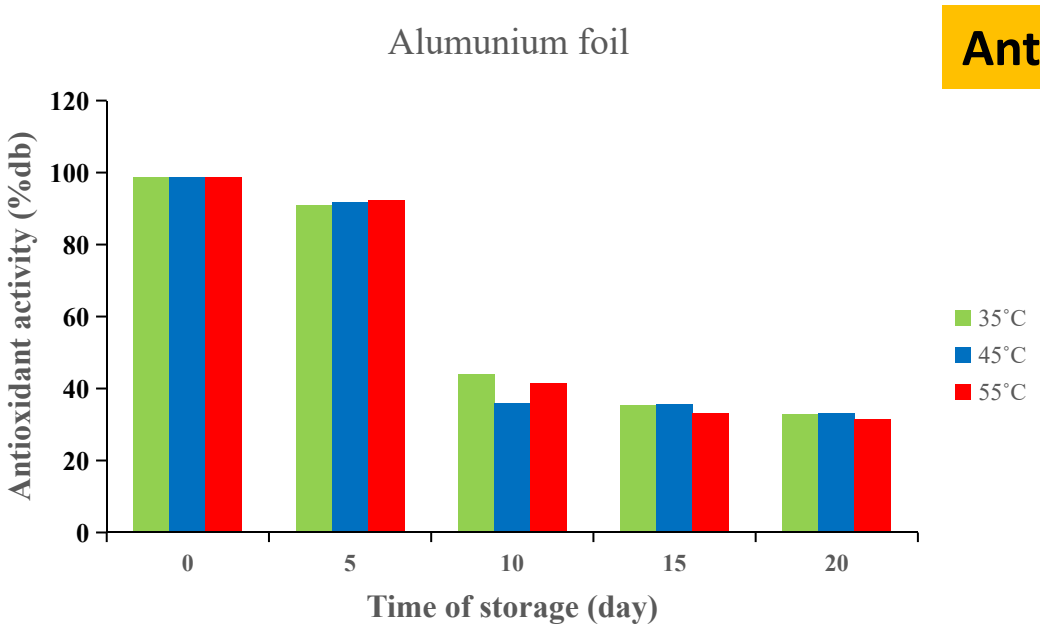


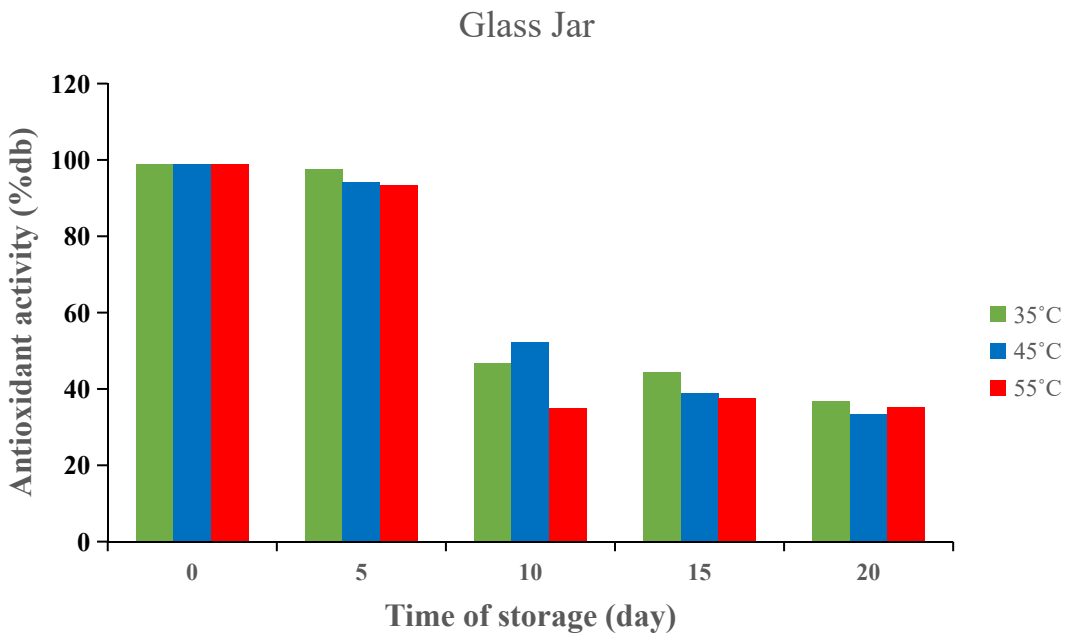
Vitamin C



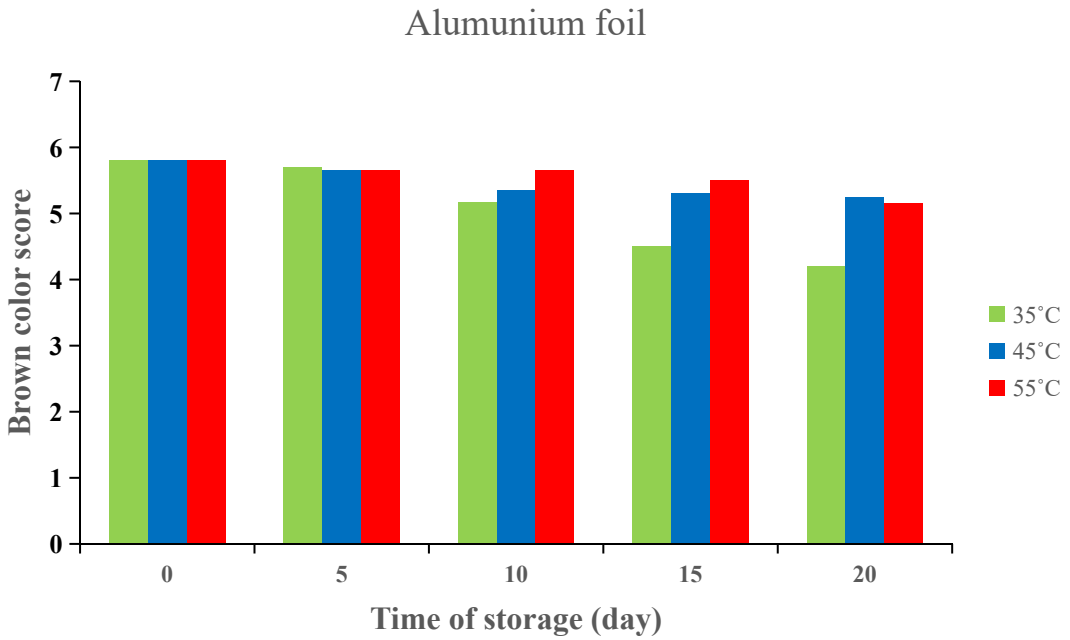


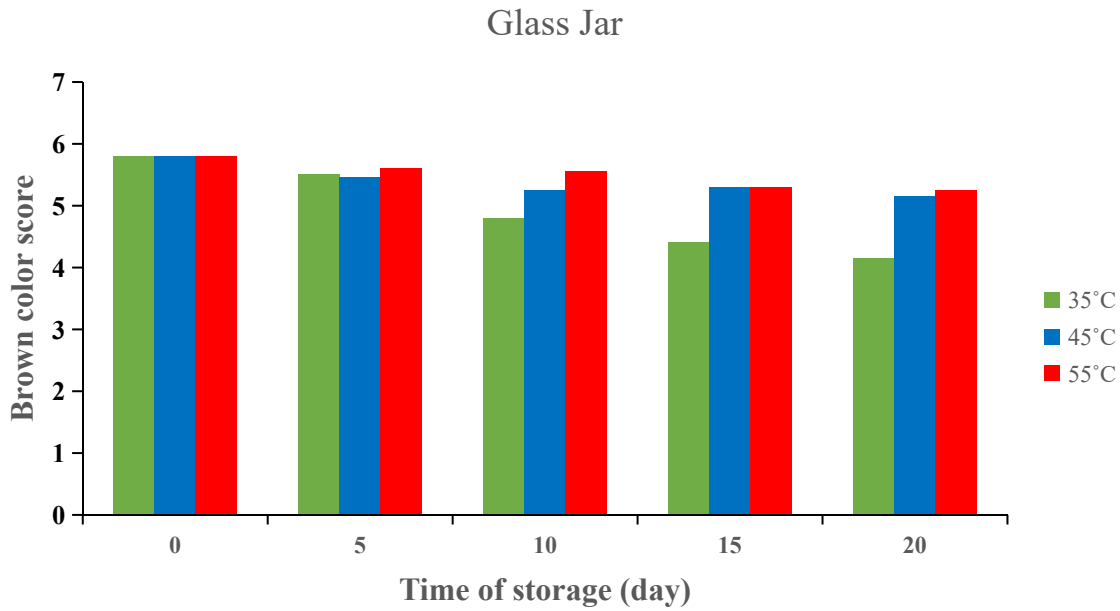
Antioxidant activity



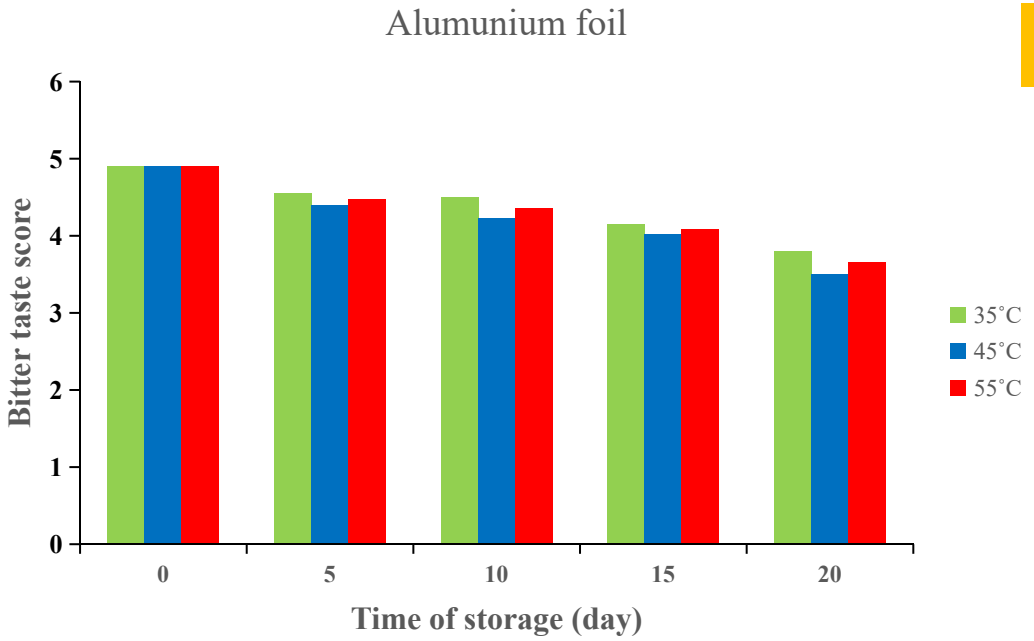


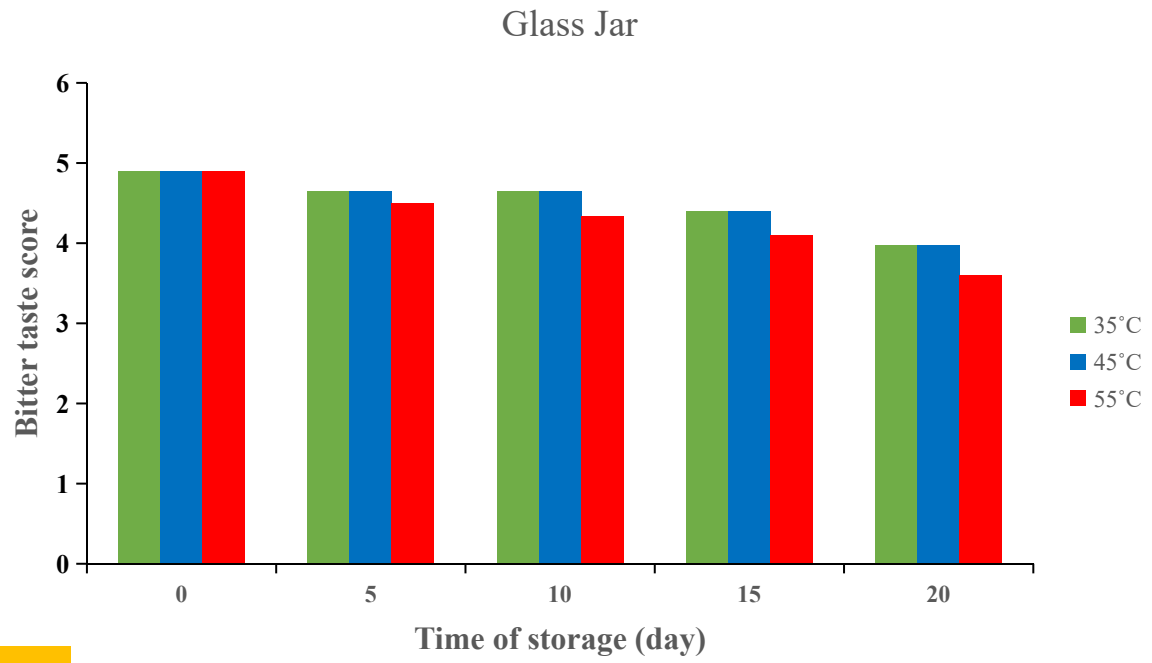
Brown color



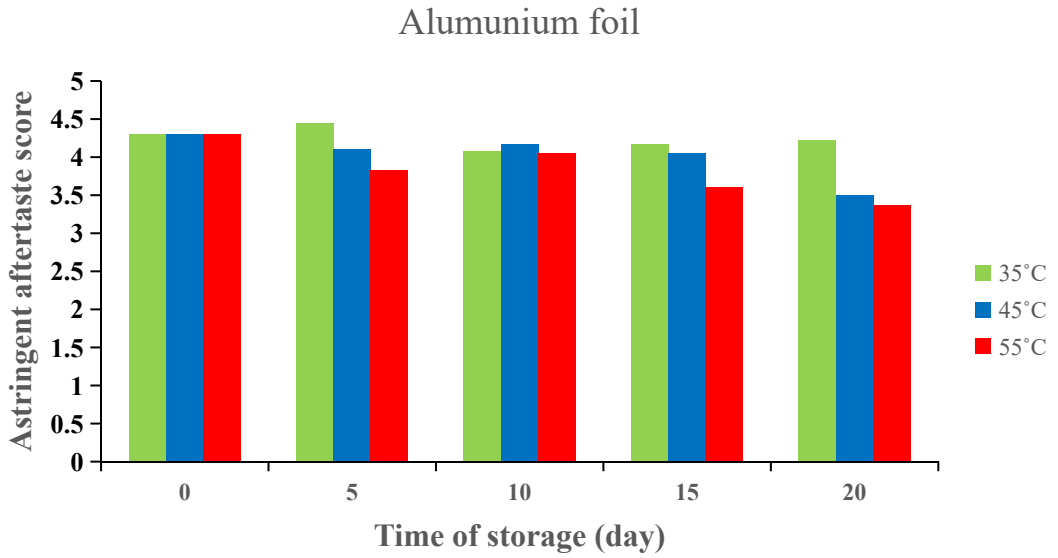


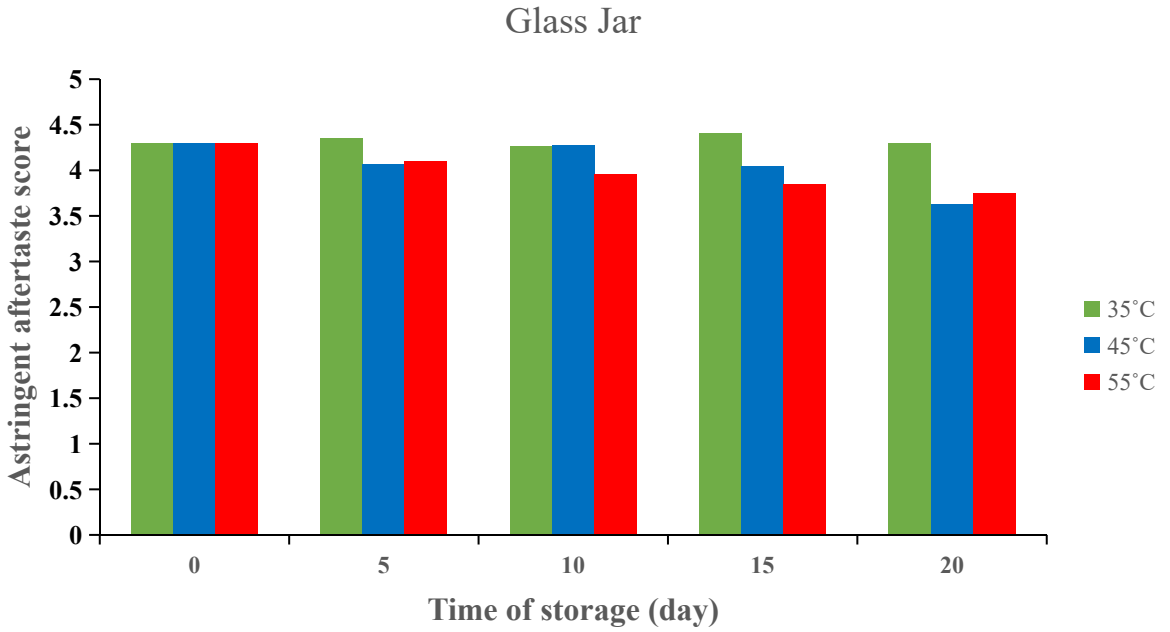
Bitter taste



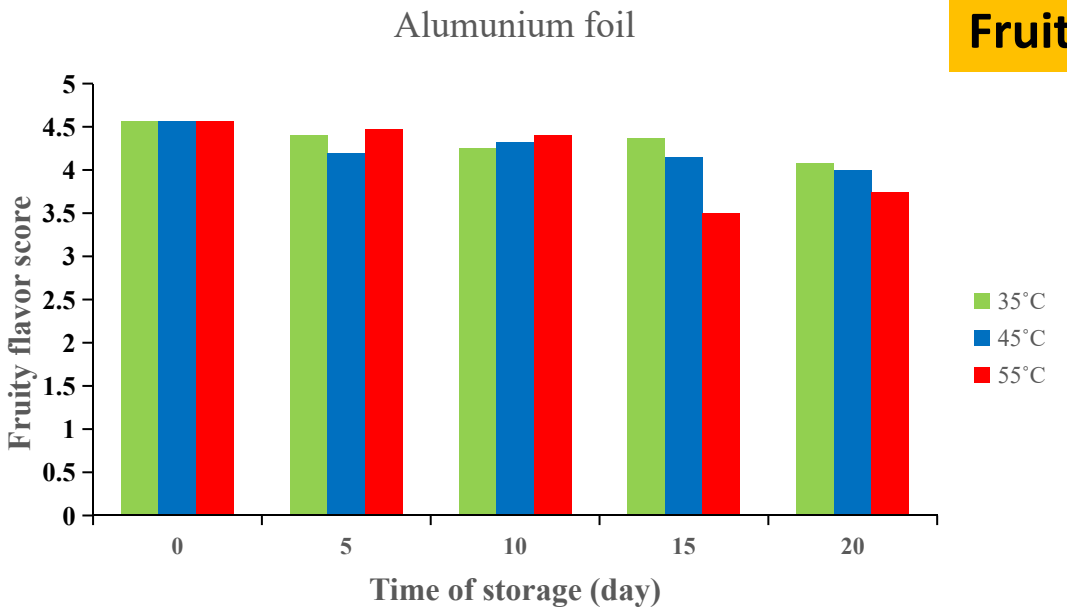


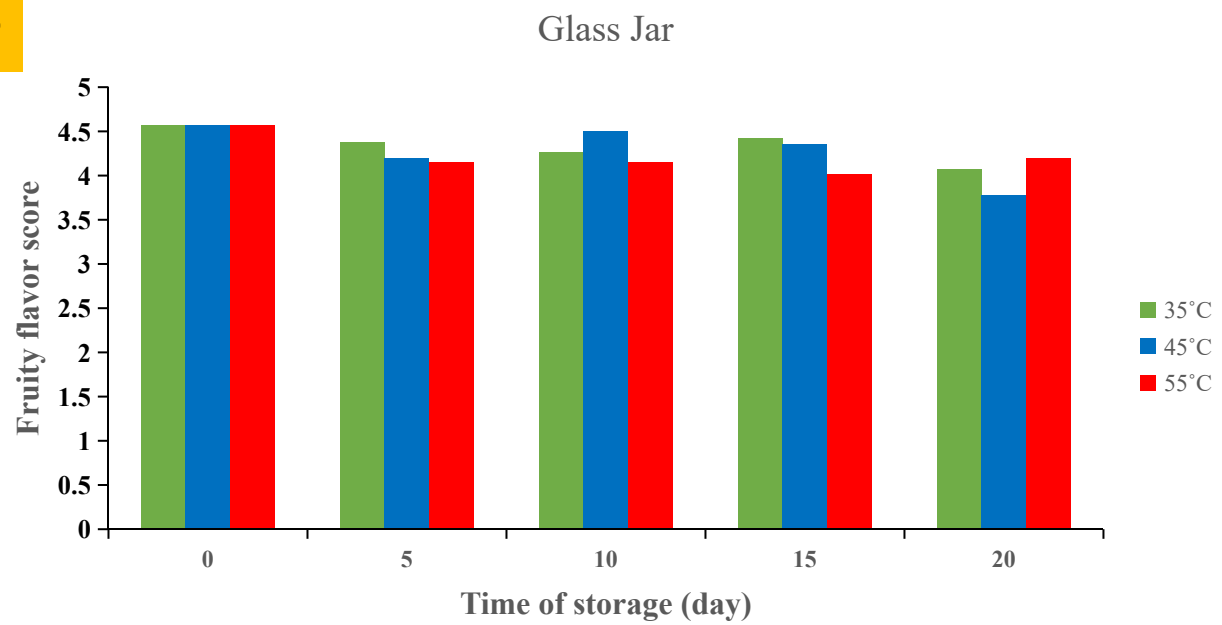
Astringent aftertaste



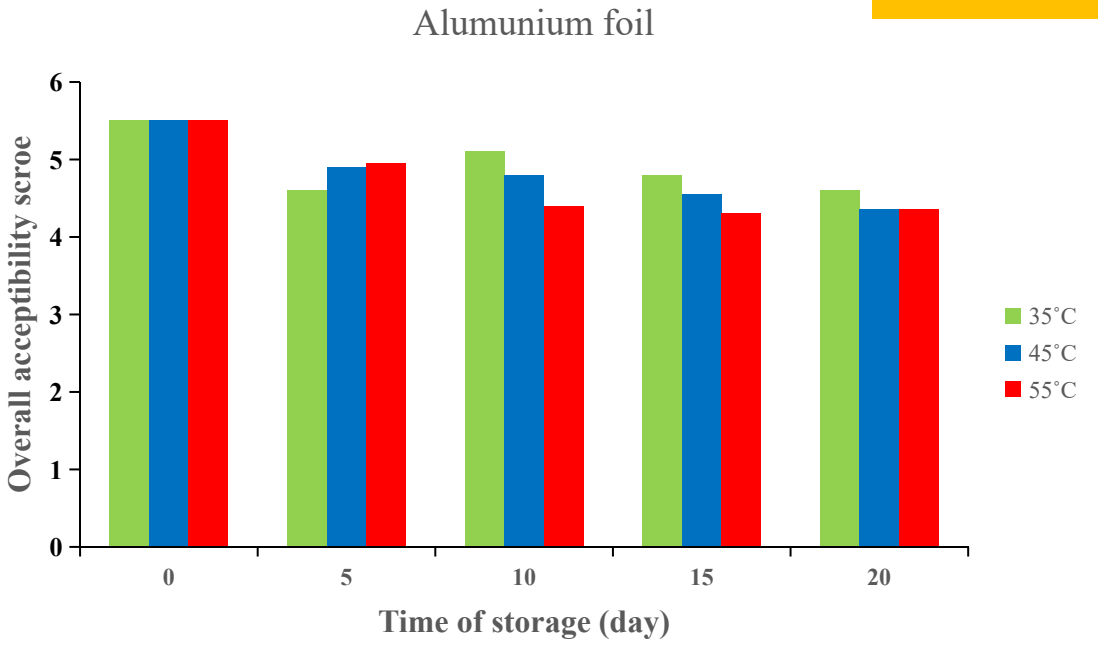


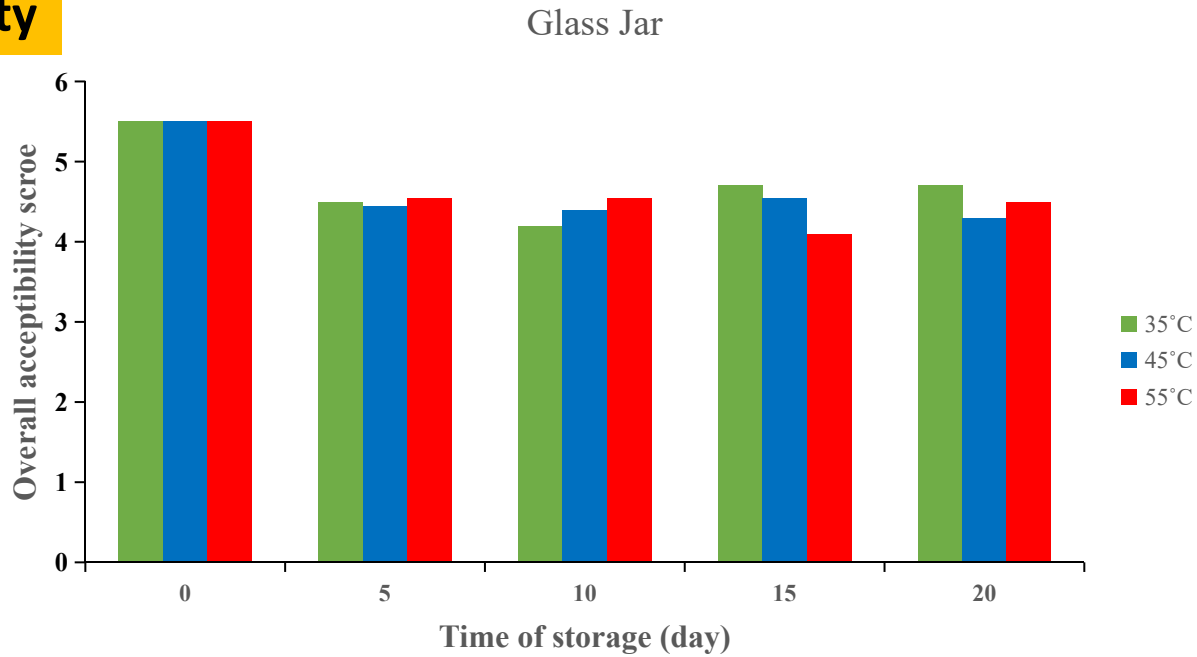
Fruity flavor





Overall acceptibility





DISCUSSION

1. *The water vapor transmission rate, packaging permeability, and stability to light and heat affects to deterioration rate of product during storage (Wong and Lim, 2016)*
2. *The increase in water content is due to the high hygroscopic properties of product. Carica seed powder has a small diameter and large surface area. At higher storage temperatures, the permeability of the packaging and the rate of water vapor transmission increases, so that the water content of product becomes higher (Wong et al., 2020)*
3. *The decrease in vitamin C and antioxidant activity during storage is affected by oxygen, light, and heat (high storage temperature). Vitamin C and antioxidant compounds are easily oxidized during storage (Shishir et al., 2018)*

DISCUSSION

1. *The increase in storage temperature cause increase of intensity of brown color. Its due to one of the compounds resulting from the oxidation of vitamin C is brown furfural (Wong and Lim, 2016)*
2. *The decrease in the brown color intensity of product during storage is due to the decrease of antioxidant. Some antioxidant compounds such as terpenoids are brown in color*
3. *Most of antioxidant compounds has bitter taste. The decrease in bitter taste and astringent aftertaste during storage due to the decrease of antioxidants.*
4. *The decrease in fruity flavor was cause by the loss of volatile compounds during storage, mainly at high temperatures.*
5. *The decrease in overall acceptability was due to the decrease on strength of taste, flavor and mouthfeel of product*

CONCLUSION

1. The decline in quality during storage of carica seed powder was caused by the increase in water content and the decrease in vitamin C, antioxidant, color, bitter and astringent aftertaste, and fruity flavor.
2. To maintain quality stability during storage, it is necessary to add food additives which could prevent oxidation and loss of flavor such as ascorbic acid, antioxidants (BHA / BHT / TBHQ), and maltodextrin.


Serbuk Minuman Biji Carica
PodangMas
Kaya Antioksidan, Serat Pangan, & Vitamin C
200g
EXPIRE DATE
Komposisi
Cara Penyajian

Thank You