Study & quality evaluation of candy prepared by using Ash Gourd (*Benincasa hispida*.).

ABSTRACT

The present investigation was carried out with title **'Study & quality evaluation of candy prepared by using Ash Gourd (*Benincasa hispida*.)'** at the Post-Harvest laboratory, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh during the session 2021-22 with a view to study the shelf life of products and to find out the best product based on organoleptic test. The treatments were dried in sun and observations were recorded at 4 various days of storage *viz.* 10 days, 30 days, 45 days, 60 days. Under this experiment, overall, 9 treatments were taken based on results obtained during the present investigation on ash gourd candy, treatment combination T_6 (Ash gourd in 72º Brix Honey) had maximum value for colour and appearance score (7.80), flavour and taste score (9.50), overall acceptability score (7.50), shelf life (41.00). Therefore, T_6 (Ash gourd in 72º Brix Honey) is found to be the best treatment combination in overall parameters and best for preparation of candy using ash gourd.

Keywords: *Ash gourd, Candy, Organoleptic, Shelf life.*

INTRODUCTION

By leveraging its diverse agro-climatic conditions, India produces more than 90 different types of fruits and vegetables. India has just supplanted Brazil as the world's top fruit grower, and it is currently the world's second-largest producer of veggies behind China. In 2019, the country produced 177.18 million tonnes of vegetables and 93.64 million tonnes of fruits, which represents a proportion of the global vegetable production of 15.8%. It was one among the top five producers of more than 80% of agricultural products worldwide, but it also experiences close to 25% of its production going to waste. (**Source: statistics on horticulture at a glance, 2017**). Processing accounts for 2.2% of all horticultural products. Amounting to around Rs. 7000 yearly in monitory values, 20 to 30% of horticultural produce is lost each year as a result of insufficient post-harvest processing. A significant portion of the farmer's profit has also been lost as a result of this enormous loss, which also deprives the nation and the farmer

of labour and resources. The management of post-harvest losses is crucial. One strategy for reducing post-harvest losses is to preserve the produce. Typically, objective criteria including the commodity's general look, taste, and texture are used to determine the post-harvest shelf life. These procedures often combine observations from the senses, biochemistry, mechanics, and colorimetry (optical). A technique for prolonged storage is preservation. Botanically known as *Benincasa hispida* is one of the well-known plants belonging *Cucurbitaceae* family. It is the only member of the genus *Benincasa.* The fruit is covered in a fuzzy coating of fine hairs when young. The immature melon has thick white flesh that tastes sweet. By maturity, the fruit loses its hairs and develops a waxy coating, giving rise to the name wax gourd. The wax coating helps to give the fruit a long shelf life of up to a year. The wax gourd can be stored for many months, much like winter squash. Ash gourds of the Indian subcontinent have a white coating with a rough texture (hence the name ash gourd). Southeast Asian varieties have a smooth waxy texture. In India, the wax gourd is recognized for its medicinal properties in the ayurvedic system of medicine (Gopalakrishnan, 2001). It also has significance in spiritual traditions of India and Yoga, where it is identified as a great source of prana. In northern India it is used to prepare a candy called petha. In South Indian cuisine, it is traditionally used to make a variety of curries, including a stew made with a yogurt base. Ash gourd production in India is around 108.96 million tons in year 2019, Uttar Pradesh ranks first in production followed by Bihar, Jharkhand and Rajasthan (Source: NHB, Ministry of Agriculture & Farmers Welfare (DAC&FW), Govt. of India: 2019-20). Ash gourd comprises 96% water and is very low in calories, fat, protein, and carbs. One 3.5-ounce (100-gram) portion of raw ash gourd offers low calories: 13 calories, Protein: less than 1 gram, Carbohydrates 3 grams, Fiber 3 grams, Fat less than 1 gram, Vitamin C 14% of the Daily Value (DV), Riboflavin 8% DV, Zinc 6% DV. (Source: Data Food Central, USDA, 2012). It also contains smaller amounts of iron, magnesium, phosphorus, copper, and manganese, as well as various other B vitamins. Still, these amounts typically don’t exceed 3% of the nutrients’ DVs. In addition to vitamin C, ash gourd is a good source of flavonoids and carotenes, two antioxidants believed to help protect your body against cell damage and certain conditions like type 2 diabetes and heart disease (Boris *et al*., 2019). Currently, ash gourd’s antioxidant content is thought to be the main reason behind most of its purported benefits (Mandal *et al*., 2012).

The best time to harvest fruits, vegetables, and ornamentals depends on whether they are good for eating or looking at. However, after harvest, they will degrade because they are live, organic things. Depending on the products' overall rate of metabolism, the rate of deterioration varies widely among them, but for many it can be quick. The pace of post-harvest deterioration, for instance, has little impact in marketing chains where fruit is moved quickly from the farm to the consumer. However, the distance between farm and market is growing as production areas are farther away from population centers. By extending the marketing periods into fewer windows of time, the intentional storage of some produce to increase return on investment prolongs the time between farm and end consumer. Keeping these above point the

present investigation was undertaken with objectives to study the shelf life of products and to find out the best product based on organoleptic test of ash gourd candy.

MATERIAL AND METHODS

Experimental site

The present investigation entitled "Study & quality evaluation of candy prepared by using Ash Gourd (*Benincasa hispida*.)" was done to understand the effect of different treatment combination of ash gourd for making candy and its effect on organoleptic quality and shelf life. The details of the materials used, and the procedures adopted in the investigation, which was carried out at Post-Harvest Laboratory, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj during the session 2021-22 are described under the following heads.

Materials used

Ash gourd (*B. hispida*) fruit were collected from local market of Prayagraj, which was first cleaned properly from tap water and seeds were separated manually, fruits were cut into pieces and prepared for different treatments. The fruit pulp was extracted and soaked in lime. In the present investigation the design used for analysis of variables were Completely Randomized Block Design (CRBD) comprising 4 replications in terms of days of storage *viz.* 10 day (initial day), 30 days, 45 days, 60 days and nine treatment combinations was prepared by the ingredients given below in table 1.

Table 1 Treatment details

Treatment notion	Treatment combination
T_1	Ash gourd in 64º Brix Sugar syrup
T_2	Ash gourd in 68º Brix Sugar syrup
T_3	Ash gourd in 72º Brix Sugar syrup
T_4	Ash gourd in 64º Brix honey
T_5	Ash gourd in 68º Brix honey
T_6	Ash gourd in 72º Brix honey
T_7	Ash gourd in 64º Brix Jaggery
T_8	Ash gourd in 68º Brix Jaggery
T_9	Ash gourd in 72º Brix Jaggery

Methods Incorporated

Candy is affected by several independent variables, *viz*., sample solution ratio, solution concentration, duration of osmosis, solution temperature, sample shape and size as well as dependent variables such

as solute gain, mass reduction, water loss, etc. Figure 1 depicts the flowchart of preparation of candy. The washed fruits are peeled and sliced into pieces, by various treatment combination followed by drying and after different storage period evaluated for organoleptic analysis and shelf life.

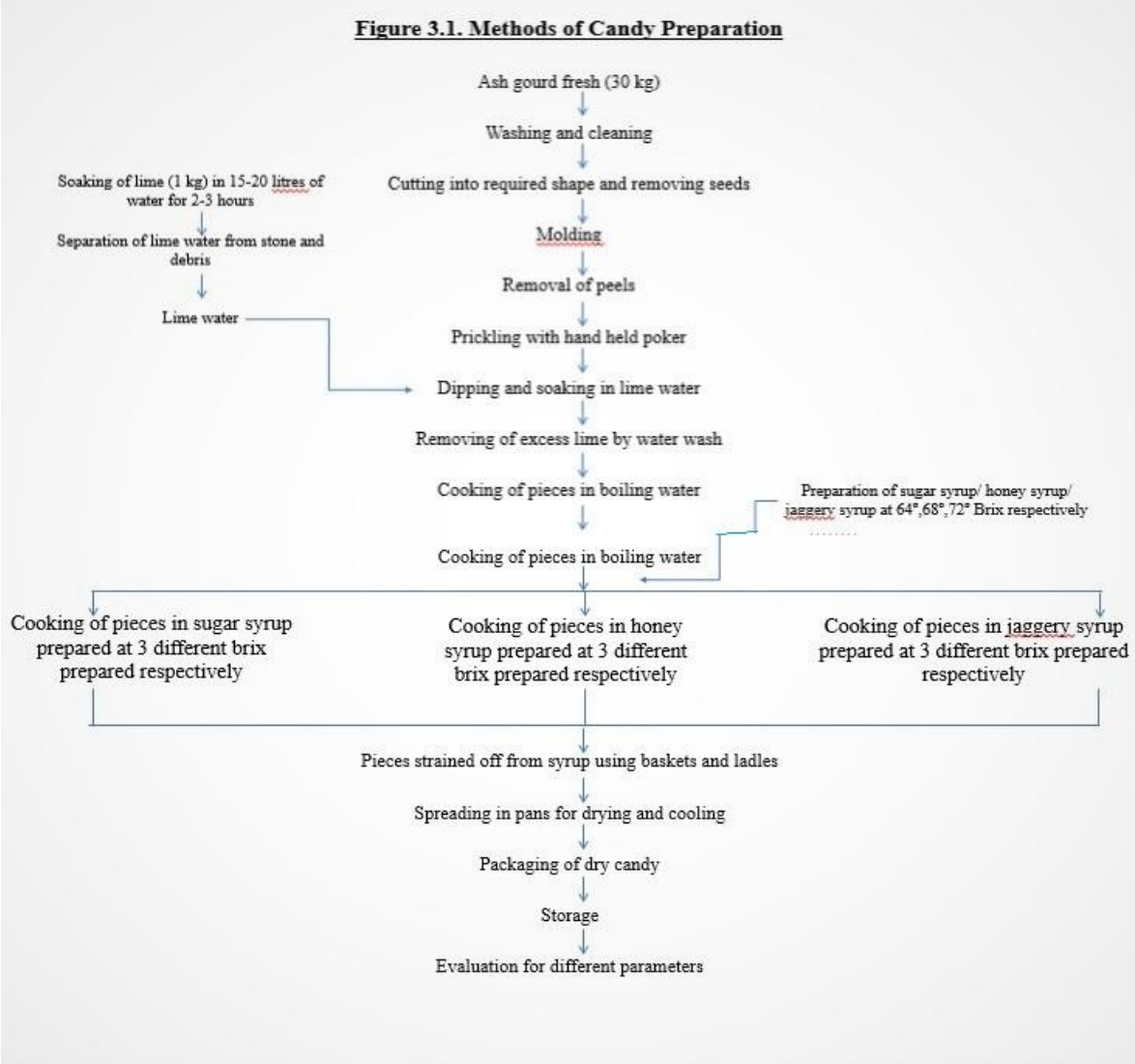

Figure 1. Method of Preparation of Candy.

Organoleptic Evaluation and Statistical Analysis

Prepared fruit candy was evaluated for appearance and color, overall acceptability and shelf life were rated on 9-point Hedonic Scale. The data were statistically analysed by the method suggested by Fisher and Yates, 1963.

RESULTS AND DISCUSSION

The organoleptic analysis deals with evaluation of color and appearance, flavor and taste score and overall acceptability of ash gourd candy present among the different treatment at different days of storage. The data recorded showed significant differences and is shown in table 2.

At 10 days of storage of ash gourd candy, color and appearance score was significantly maximum recorded in treatment T_6 with value of 8.50, While minimum score was recorded in T_1 with value of 7.50. After 30 days of storage of ash gourd candy, color and appearance score was significantly maximum recorded in treatment T_6 with value of 8.20, While minimum score was recorded T_1 with value of 7.00. After 45 days of storage of ash gourd candy, color and appearance score was significantly maximum recorded in treatment T_6 with value of 8.00 followed by T_9 with value of 7.80, While minimum score was recorded T_1 with value of 6.50 After 60 days of storage of ash gourd candy, color and appearance score was significantly maximum recorded in treatment T_6 with value of 7.80 followed by T_9 with value of 7.50, While minimum score was recorded T_1 with value of 6.20.

At 10 days of storage of ash gourd candy, flavor and taste score was significantly maximum recorded in treatment T_6 with value of 8.50 followed by T_4 with value of 7.80, However minimum score was recorded T_2 with value of 5.00. After 30 days of storage of ash gourd candy, flavor and taste score was significantly maximum recorded in treatment T_6 with value of 8.80 followed by T_4 with value of 8.00, However minimum score was recorded T_1 with value of 5.10. After 45 days of storage of ash gourd candy, flavor and taste score was significantly maximum recorded in treatment T_6 with value of 9.20 followed by T_4 with value of 8.20, However minimum score was recorded T_2 with value of 5.30. After 60 days of storage of ash gourd candy, flavor and taste score was significantly maximum recorded in treatment T_6 with value of 9.50 followed by T_4 with value of 8.50, However minimum score was recorded T_2 with value of 5.50.

At 10 days of storage of ash gourd candy, overall acceptability score was significantly maximum recorded in treatment T_6 with value of 9.00 followed by T_5 with value of 8.50, However, minimum score was recorded T_3 with value of 6.50. After 30 days of storage of ash gourd candy, overall acceptability score was significantly maximum recorded in treatment T_6 with value of 8.50 followed by T_5 with value of 8.00, However, minimum score was recorded T_3 with value of 6.10. After 45 days of storage of ash gourd candy, overall acceptability score was significantly maximum recorded in treatment T_6 with value of 8.00 followed by T_4 with value of 7.50, However, minimum score was recorded T_3 with value of 5.80. After 60 days of storage of ash gourd candy, overall acceptability score was significantly maximum recorded in treatment T_6 with value of 7.50 followed by T_5 with value of 7.00, However, minimum score was recorded T_3 with value of 5.40. All the parameters *viz.*, color and appearance; flavor and taste and overall acceptability score of ash gourd candy is affected by its chemical composition and due to various treatment combination used. Therefore, the variation in ranges

for different treatment and at different days of storage was observed. Similar results were reported for overall acceptability score in ash gourd candy was reported by Mujumdar *et al.* (2008); Singh *et al.*, (2011); Sailaja and Parameshwari (2018); Nguyen *et al.*, (2019); Pradhan *et al.*, (2022).

Table 2. Effect of various treatment combinations on Colour and Appearance score; Flavor and taste, Overall acceptability score of ash gourd candy at different days of storage.

Treatment notation	Treatment combination	Color and Appearance score				Flavor and Taste score				Overall acceptability Score			
		Storage period (Days)											
		10 days	30 days	45 days	60 days	10 days	30 days	45 days	60 days	10 days	30 days	45 days	60 days
T_1	Ash gourd in 64° Brix Sugar syrup	**7.50**	**7.00**	**6.50**	**6.20**	6.00	6.30	6.50	6.80	7.00	6.50	6.50	6.10
T_2	Ash gourd in 68° Brix Sugar syrup	8.50	8.00	7.75	7.50	**5.00**	**5.10**	**5.30**	**5.50**	7.50	6.50	6.10	5.90
T_3	Ash gourd in 72° Brix Sugar syrup	8.50	7.50	7.30	6.85	5.40	5.60	6.00	7.00	**6.50**	**6.10**	**5.80**	**5.40**
T_4	Ash gourd in 64° Brix honey	7.50	7.20	7.00	6.90	7.80	8.00	8.20	8.50	8.50	8.00	7.50	7.00
T_5	Ash gourd in 68° Brix honey	7.50	7.00	6.80	6.50	7.00	7.60	8.10	8.50	8.50	8.00	7.40	7.00
T_6	Ash gourd in 72° Brix honey	**8.50**	**8.20**	**8.00**	**7.80**	**8.50**	**8.80**	**9.20**	**9.50**	**9.00**	**8.50**	**8.00**	**7.50**
T_7	Ash gourd in 64° Brix Jaggery	7.50	7.00	6.80	6.30	7.00	7.30	7.50	8.00	7.00	6.80	6.40	6.00
T_8	Ash gourd in 68° Brix Jaggery	8.00	7.80	7.50	7.20	6.90	7.30	7.60	8.00	8.00	7.60	7.10	6.80
T_9	Ash gourd in 72° Brix Jaggery	8.50	8.10	7.80	7.50	7.30	7.70	8.10	8.50	8.00	7.50	7.30	7.00
'F' Test		**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
C.V.		**2.32**	**1.96**	**1.51**	**2.25**	**2.00**	**2.28**	**1.64**	**2.54**	**2.10**	**2.23**	**2.02**	**2.07**
S.E.(d)		**0.09**	**0.07**	**0.05**	**0.08**	**0.07**	**0.08**	**0.06**	**0.10**	**0.08**	**0.08**	**0.07**	**0.07**
C.D. at 5%		**0.27**	**0.21**	**0.16**	**0.23**	**0.20**	**0.23**	**0.18**	**0.29**	**0.24**	**0.24**	**0.20**	**0.20**

Values in Red: **Minimum**
Values in Green: **Maximum**

At 10 days of storage of ash gourd candy, shelf-life value was significantly maximum recorded in treatment T_6 with value of 88.00 days followed by T_9 with value of 85.00 days, however minimum shelf life was recorded T_1 with value of 63.00 days. After 30 days of storage of ash gourd candy, shelf-life value was significantly maximum recorded in treatment T_6 with value of 62.00 days followed by T_9 with value of 61.00 days, However, minimum shelf life was recorded T_1 with value of 40.00 days. After 45 days of storage of ash gourd candy, shelf-life value was significantly maximum recorded in treatment T_6 with value of 49.00 days followed by T_9 with value of 48.00 days, However, minimum shelf life was recorded T_1 with value of 27.00 days. After 60 days of storage of ash gourd candy, shelf-life value was significantly maximum recorded in treatment T_6 with value of 41.00 days followed by T_9 with value of 40.00 days, However, minimum shelf life was recorded T_1 with value of 21.00 days. Shelf life of ash gourd candy (given in table 3) is affected by its chemical composition and due to various treatment combination used. Similar results were reported for colour and shelf life in ash gourd candy was reported by Mujumdar *et al.* (2008); Singh *et al.*, (2011); Sailaja and Parameshwari (2018); Nguyen *et al.*, (2019); Pradhan *et al.*, (2022).

Table 3. Effect of various treatment combinations on shelf life of ash gourd candy at different days of storage.

Treatment notation	Treatment combination	Shelf life			
		Storage period (Days)			
		10 days	30 days	45 days	60 days
T_1	Ash gourd in 64° Brix Sugar syrup	**63.00**	**40.00**	**27.00**	**21.00**
T_2	Ash gourd in 68° Brix Sugar syrup	72.00	53.00	40.00	32.00
T_3	Ash gourd in 72° Brix Sugar syrup	84.00	63.00	49.00	40.00
T_4	Ash gourd in 64° Brix honey	67.00	46.00	31.00	24.00
T_5	Ash gourd in 68° Brix honey	68.00	48.00	36.00	30.00
T_6	Ash gourd in 72° Brix honey	**88.00**	**62.00**	**49.00**	**41.00**
T_7	Ash gourd in 64° Brix Jaggery	69.00	47.00	30.00	22.00
T_8	Ash gourd in 68° Brix Jaggery	76.00	53.00	39.00	30.00
T_9	Ash gourd in 72° Brix Jaggery	85.00	61.00	48.00	40.00
'F' Test		**S**	**S**	**S**	**S**
C.V.		**2.19**	**1.70**	**2.10**	**2.28**
S.E.(d)		**0.82**	**0.45**	**0.41**	**0.36**
C.D. at 5%		**2.37**	**1.30**	**1.18**	**1.03**

Values in Red: **Minimum**
Values in Green: **Maximum**

CONCLUSION

Based on results obtained during the present investigation on ash gourd candy, treatment combination T_6 had maximum value for colour and appearance score (7.80), flavour and taste score (9.50), overall acceptability score (7.50), shelf life (41.00). Therefore, T_6 (Ash gourd in 72º Brix Honey) is found to be the best treatment combination in overall parameters and best for preparation of candy using ash gourd.

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