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Study on preparation procedure and storage study of water chestnut burfi blended with cashew nut kernel

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Abstract
The present study was undertaken with the objective of preparation procedure of burfi storage study and acceptable sensory properties. The experiment was laid out in Completely Randomized Design in which 11 treatments tested in 3 replications. The different recipe combination of water chestnut powder, cashew nut powder, sugar and water in 11 treatments were taken to standardize the recipe. Sensory evaluation was done on 9 point Hedonic scale in terms of appearance, flavour, texture, moisture, sweetness and overall acceptability. The results was clearly indicated that the highest score of 8.05 under T_9 the recipe, *i.e.* T_9-55 parts water chestnut powder by weight + 45 parts cashew nut kernel while lowest score 6.71 was reported the treatment T_2-90 parts water chestnut powder + 10 parts cashew nut kernels. The maximum storability of water chestnut burfi was observed in treatment T_9 and T_{10} for 9 days, which was significantly superior to all other treatments. The minimum storability was recorded in treatment T_0 for 4 days.

Keywords: Water chestnut burfi, appearance, flavour, texture, moisture, sweetness, cashew nut kernel

Introduction
Burfi is most popular khoa based sweet all over India. Khoa is responsible for desired texture of burfi (Dharmadhikari, 2002) [5]. There are many varieties of burfi, depending on the ingredients mixed with it, viz., besan burfi (made with gram flour), kaju barfi (made with cashew nuts), pista burfi (made with pistachio) etc., and fruits added to it, viz., mango burfi, coconut burfi etc. (Navale *et al.*, 2014) [8]. Water chestnut burfi is more common and liked by individuals among these value-added items or dishes.

It is white and light cream with a solid body colour and smooth texture with very fine grains. A lot of variation in chemical composition, sensorial and rheological properties is found in commercial samples of burfi.

Water chestnut (*Trapa bispinosa* Roxburg.) is an annual aquatic plant which belongs to the family 'Trapaceae'. It is also known as Singhara in Hindi, Paniphal in Bengali and Singoda in Gujrati. The origin of water chestnut is considered to be India, China and Eurasia. It is extensively grown in Madhya Pradesh, Uttar Pradesh, Bihar, Orissa, West Bengal, Jharkhand, Karnataka and Jammu and Kashmir. It is grown in shallow water fields, lakes, ponds and swampy lands in tropical and sub-tropical countries (Takano and Kadono, 2005). In India, it is used in many ways such as vegetables, powder, and juice, eaten raw and streamed. The dried water chestnut kernels made into flour by grinding called 'Singhara atta' which is used in fasting days for the preparation of different items or Phalahar diet on Hindus fasting days, the traditional Indian 'Navratri' festival (Chandana *et al.,* 2013) [2]. Water chestnut burfi may be become best value added products and nutritional products in all over India. The water chestnut is easily available in local areas and the burfi is the best utilization of water chestnut kernel to commercialization in the market.

Experimental methods
Water chestnut, cashew nut, milk and sugar were collected from the local market of Telibandha, Raipur. Eleven treatment combinations were studied and each treatment was replicated three times. Water chestnut and cashew nut powder were weighed as per the combination of treatments. Burner was kept on a medium flame during entire process.

Firstly, ghee was heated in a pan and chestnut powder was fried until it colour changes to light brown. In another pan, water and milk was boiled together, after that sugar and cardamom was added and then fried chest nut powder and cashew nut powder was added and blend well with continue stirring until it reaches to the perfect consistency. When blended mixture starts coagulating Total soluble solids was determined by using Hand Refractometer. Plate was greased with ghee and coagulated material was poured into plate for setting down to give it a form of burfi. After 10 minutes, when coagulated material cooled down and set properly it was cut into diamond shape. Sensory analysis was carried out on 9 point Hedonic scale to judge for appearance, flavour, texture, moisture, sweetness and over all acceptability.

Experimental analysis

The water chestnut burfi prepared by different procedure was subjected to analysis for determination of total soluble solids (%), storability of water chestnut burfi (days), total weight of prepared product (g), weight loss during storage(%) and organoleptic score of water chestnut burfi.

Total soluble solids (%)

The TSS of water chestnut burfi was ranged from 38.6 to 78.5%. Treatment had highest total soluble solids T_{10} (78.5%). While the lowest total soluble solids T_0 (38.6%) which are significantly different from each other.

Storability of burfi (days)

The maximum storability of water chestnut burfi was observed in treatment T_9 and T_{10} for 9 days, which was significantly superior to all other treatments. The minimum storability was recorded in treatment T_0 for 4.3 days.

Total weight of prepared product (g)

The total weight of the prepared product was recorded to be the maximum in treatment T_2 (409.99g) followed by T_3 (407.01g). The minimum weight of the prepared product was reported in the treatment T_5 (281.55g).

Weight loss during storage (%)

Total weight loss per cent of water chestnut blended burfi was observed in the treatment T_0 (18.50%), which was significantly higher than all other treatments. The minimum weight loss per cent was recorded in treatment T_{10} (8.41%).

Organoleptic score of water chestnut burfi

The processed product was evaluated on the basis of organoleptic score at the time of preparation for various sensory characteristics such as colour and appearance, flavour, sweetness, texture, moisture and overall acceptability in different treatment combinations.

The maximum score of appearance was obtained by T_9 and T_{10} with score 8.05 and 8.02 respectively. . The minimum score was showed T_2 which scored 6.71.

The flavour score shows that the maximum score received by T_{10} and T_7 which is 8.3 and 8.0 respectively. Whereas T_2 obtained the minimum score of 6.3.

The sweetness score observed that the maximum score obtained by T_7 and T_9 which is 8.3 and 8.1 respectively. Whereas the minimum score was obtained by T_0 which is 6.5.

The maximum score was obtained by T_8, T_9 and T_{10}, with the highest score of 8.2, 8.1 and 8.1 respectively. While the minimum score was received by T_1 which scored 6.1.

The maximum score of moisture was received by T_9 and T_{10} which scored highest of 8.3 and 8.2 respectively. The minimum score was showed T_2 which score of 6.5.

The highest score of overall acceptability was 8.05 under T_9 the recipe, *i.e.* T_9-55 parts water chestnut powder by weight + 45 parts cashew nut kernel while lowest score 6.71 was reported the treatment T_2-90 parts water chestnut powder + 10 parts cashew nut kernels.

Table 1: Storability of water chestnut burfi blended with cashew nut kernels

Treatments	Storability (Days)
T_0-100 parts Chestnut powder +0 parts Cashew nut	4.3
T_1-95 parts Chestnut powder +5 parts Cashew	5.3
T_2-90 parts Chestnut powder +10 parts Cashew nut	5.7
T_3- 85 parts Chestnut powder +15 parts Cashew nut	5.7
T_4-80 parts Chestnut powder +20 parts Cashew nut	6
T_5-75 parts Chestnut powder +25 parts Cashew nut	5.3
T_6- 70 parts Chestnut powder+30 parts Cashew nut	6.7
T_7- 65 parts Chestnut powder +35 parts Cashew nut	7.7
T_8- 60 parts Chestnut powder +40 parts Cashew nut	6.7
T_9- 55 parts Chestnut powder+45 parts Cashew nut	9
T_{10}- 50 parts Chestnut powder +50 parts Cashew nut	9
Mean	6.484
SE±	0.2843
CD	0.8337
CV	7.5826

Table 2: Effect of different levels of water chestnut and cashew nut kernels on organoleptic score of water chestnut burfi

Treatment	Appearances	Flavour Sweetness	Texture	Moisture	Overall	Acceptability	Rating
T_0- 100 parts Chestnut powder +0 parts Cashew nut	7.5	7.3	6.5	6.1	7.1	6.9	Like slightly
T_1-95 parts Chestnut powder +5 parts Cashew nut	7.16	7.3	7.0	7.0	6.5	6.99	Like slightly
T_2-90 parts Chestnut powder +10 parts Cashew nut	6.16	6.3	7.1	7.0	7.0	6.71	Like slightly
T_3- 85 parts Chestnut powder +15 parts Cashew nut	6.26	6.6	7.3	7.1	6.8	6.81	Like slightly
T_4-80 parts Chestnut powder +20 parts Cashew nut	6.33	6.5	6.8	7.1	7.1	6.76	Like slightly
T_5-75 parts Chestnut powder +25 parts Cashew nut	6.6	6.8	7.3	7.5	6.8	7.0	Like slightly
T_6- 70 parts Chestnut powder+30 parts Cashew nut	6.7	7.6	6.6	7.3	7.5	7.14	Like slightly
T_7- 65 parts Chestnut powder +35 parts Cashew nut	7.5	8.0	8.3	8.0	7.6	7.88	Like moderately
T_8- 60 parts Chestnut powder +40 parts Cashew nut	8.16	7.6	7.60	8.2	7.8	7.87	Like moderately
T_9- 55 parts Chestnut powder+45 parts Cashew nut	8.16	7.6	8.1	8.1	8.3	8.05	Like very much
T_{10}- 50 parts Chestnut powder +50 parts Cashew nut	7.8	8.3	7.7	8.1	8.2	8.02	Like very much

Summary and conclusion

Total soluble solids was recorded highest in treatment T_{10} and lowest was in T_0. The maximum storability of water chestnut burfi was observed in treatment T_9 and T_{10} for 9 days and minimum was recorded in treatment T_0 for 4.3 days. The maximum weight of the prepared product in treatment T_2 (409.99g) followed by T_3 (407.01g) and minimum was reported in the treatment T_5 (281.55g). Total weight loss per cent of water chestnut blended burfi was observed in the treatment T_0 (18.50%) and minimum weight loss per cent was

recorded in treatment T_{10} (8.41%). On the basis of organoleptic score at the time of preparation was highest recorded 8.05 under T_9 the recipe, *i.e.* T_9-55 parts water chestnut powder by weight + 45 parts cashew nut kernel while lowest score 6.71 was reported the treatment T_2-90 parts water chestnut powder + 10 parts cashew nut kernels, which was significantly superior to all other treatments.

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