International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(4): 2778-2781

Received: 14-05-2018
Accepted: 25-06-2018

Harshitha SB
Department of Post-Harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi- 591218, University of Horticultural Sciences, Bagalkot, Karnataka, India

Manjula Karadiguddi
Department of Post-Harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi- 591218, University of Horticultural Sciences, Bagalkot, Karnataka, India

Laxman Kukanoor
Department of Post-Harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi- 591218, University of Horticultural Sciences, Bagalkot, Karnataka, India

K Ramachandra Naik
Department of Post-Harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi- 591218, University of Horticultural Sciences, Bagalkot, Karnataka, India

Chaya P Patil
Department of Microbiology, Kittur Rani Channamma College of Horticulture, Arabhavi- 591218, University of Horticultural Sciences, Bagalkot, Karnataka, India

HP Hadimani
Department of Vegetable Sciences, Kittur Rani Channamma College of Horticulture, Arabhavi- 591218, University of Horticultural Sciences, Bagalkot, Karnataka, India

Correspondence
Harshitha SB
Department of Post Harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi- 591218, University of Horticultural Sciences, Bagalkot, Karnataka, India

Standardization of protocol for the preparation of pumpkin fortified biscuits

Harshitha SB, Manjula Karadiguddi, Laxman Kukanoor, K Ramachandra Naik, Chaya P Patil and HP Hadimani

Abstract
Present experiment was conducted with an objective to standardize the protocol for the preparation of pumpkin fortified biscuits. The pumpkin powder and pulp was incorporated into the standard recipe to replace wheat flour at levels of 5, 10, 15 and 20 per cent in the preparation of biscuits. Physico chemical analysis reveals that combination of 20 per cent pumpkin powder and 80 per cent refined wheat flour was best nutritionally compared to all treatments whereas result of sensory evaluation revealed that the 15 per cent addition of pumpkin powder has shown higher score for taste, texture and it was highly accepted by the judges. However, a declining trend in acceptability was observed above 15 per cent level of pumpkin powder. No microbial growth was observed, indicating product is stable and safe for the consumption.

Keywords: Pumpkin, fortified biscuits, pumpkin powder, physico chemical, sensory

Introduction
Pumpkin (*Cucurbita moschata* D.) is an important vegetable crop grown all over the world; it is annual or perennial, climbing or trailing herb grown for its young shoots, flowers, fruits and seeds. In India, pumpkin is the principal ingredient of several culinary vegetables utilized at immature and mature stage. About 90 per cent of the total pumpkin is produced within six months (January-June) only. It is a seasonal crop that has been used both as human as well as animal feed.

Pumpkin is rich source of pectin, mineral salts, carotene, vitamins and other substances that are beneficial to human health (Jun *et al*. 2006) [8] so does the powder produced from pumpkin. Epidemiological evidence suggests that a diet rich in carotenoids is associated with enhancement of immune response and reduction of the risk of degenerative diseases such as cancer, cardiovascular diseases, atherosclerosis, cataracts and age related macular degeneration (Gonzalez *et al*., 2001: Rodriguez, 2003) [3, 16]. There is an increasing demand for the bakery products especially biscuits, as these are all time snack product consumed by people irrespective of their ages. So an attempt was made to incorporate the pumpkin powder and pulp in the biscuits to increase its nutritional and health benefits and to know the best combination which is highly acceptable by consumer.

In this study we took 9 treatments, T_1 as control in which only wheat flour was used and for other treatments, the wheat flour was replaced with pumpkin powder in the standard recipe in the proportion of 5, 10, 15 and 20% representing T_2, T_3, T_4 and T_5 and pumpkin pulp in the proportion of 5, 10, 15 and 20% representing T_6, T_7, T_8 and T_9.

Material and Methods
Pumpkin fruits of uniform size, maturity, free from visible damages were purchased from the Belagavi vegetable market. The sugar powder, refined wheat flour, milk powder, hydrogenated fat (Dalda) and baking powder were purchased from the local market of Gokak, Belagavi district.

Preparation of pumpkin powder and pulp for biscuits
Pumpkin fruits were washed, peeled, sliced with sharp knife and grated using hand grater. Grated shreds were blanched for 7 minutes in boiling water and cooled. Blanched pumpkin shreds were spread evenly on the trays to a thickness of 10 mm. These trays were loaded into electric drier which was maintained at 60 ºC temperature and dried for 12 hours.

After complete drying, dried shreds were collected and powdered using mixer to fine texture. Some shreds of pumpkin pulp blanched for 7 minutes, dried at 60 ºC for 15 minutes to remove excess moisture and was used for treatments 6, 7, 8 and 9.

Preparation of pumpkin fortified biscuits

A fine cream was prepared by mixing sugar with dalda. Required quantity of refined wheat flour, pumpkin powder or pulp, milk powder, sugar, salt and baking powder were sieved on the working table. Refined wheat flour and pumpkin powder/ pulp were blended to the mixture and were kneaded to soft and smooth dough. The dough was made into small, uniformly round balls and placed on baking trays. The baking was performed in an oven at the temperature of 200 ºC for 15 minutes. Biscuits were taken out, cooled and packed in LDPE pouches, labeled and stored in ambient condition for further studies.

Physicochemical analysis of pumpkin fortified biscuits

Pumpkin fortified biscuits were analyzed for physicochemical parameters like width and thickness, measured using digital vernier caliper by placing biscuits in between the measuring arms of the instrument and values were recorded in centi meter. Moisture content was measured using moisture analyzer (Model: P1019319, A & D Company Limited, Japan). One gram of sample was placed in the sample dish and dried in the electric moisture analyzer until it automatically showed constant moisture in percentage and expressed in percentage. Water activity by digital water activity meter (Model: Novasia AG, Switzerland). Ascorbic acid by reduction of 2,6-dichlorophenol indophenols (2,6-DCPIP) by ascorbate (AOAC, 1990) [1], β-carotene was measured using petroleum ether by spectrophotometer method (Ranganna, 2003) [15]. The per cent reducing and total sugars were estimated using 3, 5-Dinitro Salicylic Acid (DNSA) method (Miller, 1972) [12], per cent crude fibre was estimated by using dilute sulphuric acid (Ranganna, 2003) [15]. Sensory analysis of freshly prepared biscuits was carried out by a semi-trained panel of judges consisting of teachers and post-graduate students of Kittur Rani Channamma College of Horticulture, Arabhavi. The sensory characters like colour and appearance, texture, taste, flavour and overall acceptability were evaluated on a nine point hedonic scale (Ranganna, 2003) [15]. The total bacterial and fungal count in pumpkin fortified biscuit samples were evaluated as per the method of Harrigan and Mccance (1996) [6].

Results and Discussion

Results reveal that the width of the pumpkin fortified biscuits increased slightly as the level of incorporation of pumpkin powder and pulp increased. The maximum width (4.66 cm) was found in T_9 where 20 per cent pumpkin pulp was added because of presence of high crude fibre, increased mass and better binding strength of pumpkin powder and pulp. (Table 1). Similar results were noticed by Joel *et al.* (2014) [7] in full fat soya fortified cookies, Handa *et al.* (2012) [5] in cookies fortified with fructoligosaccharide and Mahmood *et al*. (2008) [11] in cookies fortified with vitamin A however thickness of biscuits was found to be non-significant among the treatments. Similarly moisture content and water activity were also increased with increasing level of substitution of pumpkin powder and pulp. The maximum moisture content (5.75%) and water activity (0.38) was recorded in T_5 where 20 per cent pumpkin powder was used. This may due to increased surface area of pumpkin powder which has high moisture holding capacity resulted in increase in moisture content as the level of incorporation of pumpkin powder increased (Table 1).

The data presented in table 2 reveals that β -carotene content of pumpkin fortified biscuits increased with the increased level of incorporation of pumpkin powder and pumpkin pulp. The maximum β –carotene (3.97 mg/100g) and ascorbic acid content (1.73 mg/100g) was recorded in T_5 as the level of fortification increased. Whereas minimum β –carotene and ascorbic acid content was noticed in control. The data clearly reflect a significant variation in β-carotene and ascorbic acid content of biscuits was due to supplementation of pumpkin powder and pulp in different proportions. Similar results have been noticed by Kulkarni and Joshi (2013 and Kumar *et al*. 2015) [9, 10] in pumpkin powder fortified cookies and Sudipta and Sumithra (2015) [17] in bakery products enriched with pumpkin powder. Per cent reducing, total sugar and crude fibre content of biscuits increased slightly as level of substitution of pumpkin powder and pulp increased. The maximum reducing sugar (10.94%), total sugar (12.54%) and crude fibre (0.96%) were recorded in T_5 and minimum was found in control where no fortification was done (Table 2). This could be due to initial high fibre content of pumpkin powder and pulp (Gopalan *et al*., 2000) [4], on the other hand refined wheat flour has a poor source of fibre in comparison to fruit and vegetable powders (Peter and John, 2012) [13].

Sensory analysis of pumpkin fortified biscuits reveals that scores for colour and appearance was increased as the level of fortification of pumpkin powder increased, whereas scores for texture, taste and overall acceptability was increased initially up to the fortification level of 15 per cent pumpkin powder however above that scores were decreased. When compared to powder incorporated biscuits. Pulp incorporated biscuits showed much less scores in all the parameters this is because of the charring and browning of pulp during baking which affect the taste and overall acceptability of biscuits. Highest score for colour and appearance (8.73) was found in T_5 but with respect to texture (8.45), taste (8.71) and overall acceptability (8.44) were observed in T_4,while lowest score was recorded in T_9 (Table 3 and Fig 1). These results are also in conformity with the studies of Kulkarni and Joshi (2013) [9] and Kumar *et al*. (2015) [10] in pumpkin powder fortified biscuits, Pongjanta *et al*. (2006) [14] and Sudipta and Sumithra (2015) [17] in bakery product enriched with pumpkin powder.

Microbial evaluation of pumpkin fortified biscuits for total bacterial count and total fungal count was carried out. Irrespective of the treatments, no microbial growth was observed. Hence the results are not tabulated. Biscuits were found stable and safe for consumption. This may be due to the reason that water activity of these products was in the range of 0.31 to 0.37 (Table 1) for different treatments. The water activity values of biscuits were below the recommended range for growth of bacteria (a_w<0.91) and moulds (a_w<0.81) and this range was not favorable for the growth of micro-organisms (Chirife and Buera, 1999) [2].

Table 1: Influence of treatments on width, thickness, moisture and water activity of pumpkin fortified biscuits.

Treatments	Width (cm)	Thickness (cm)	Moisture (%)	Water activity (a_w)
T_1	4.31	1.41	4.10	0.31
T_2	4.40	1.42	4.58	0.33
T_3	4.43	1.43	4.78	0.34
T_4	4.44	1.43	5.19	0.36
T_5	4.52	1.44	5.75	0.38
T_6	4.54	1.44	2.19	0.32
T_7	4.58	1.44	2.89	0.34
T_8	4.58	1.44	3.57	0.35
T_9	4.66	1.46	3.95	0.37
Mean	4.49	1.43	4.11	0.35
S.Em±	0.01	NS	0.05	0.014
C.D. @ 1%	0.02		0.18	0.05

Table 2: Influence of treatments on ascorbic acid, β –carotene, reducing sugar, total sugar and crude fibre content of pumpkin fortified biscuits

Treatments	Ascorbic acid (mg/100g)	β –carotene (mg/100g)	Reducing sugar (%)	Total sugar (%)	Crude fibre (%)
T_1	0.98	2.38	9.33	10.42	0.24
T_2	1.31	2.98	10.01	11.23	0.35
T_3	1.52	3.26	10.23	11.51	0.64
T_4	1.65	3.69	10.63	12.03	0.81
T_5	1.73	3.97	10.94	12.54	0.96
T_6	1.01	2.72	10.00	11.13	0.45
T_7	1.13	3.22	10.11	11.35	0.56
T_8	1.22	3.31	10.34	11.64	0.75
T_9	1.35	3.59	10.41	11.85	0.86
Mean	1.32	3.24	10.22	11.52	0.63
S.Em±	0.06	0.03	0.07	0.07	0.01
C.D. @ 1%	0.24	0.11	0.28	0.29	0.06

Table 3: Influence of treatments on sensory evaluation (9 point hedonic scale) of pumpkin fortified biscuits

Treatments	Colour and appearance	Texture	Taste	Overall acceptability
T_1	8.22	8.00	8.02	7.77
T_2	8.42	8.26	8.36	8.32
T_3	8.53	8.34	8.53	8.23
T_4	8.61	8.45	8.71	8.44
T_5	8.73	8.40	8.25	8.16
T_6	8.24	8.20	8.12	7.94
T_7	8.15	8.12	8.33	7.75
T_8	8.02	8.02	8.10	7.61
T_9	7.83	7.81	7.60	7.53
Mean	8.30	8.18	8.22	7.97
S.Em±	0.10	0.10	0.09	0.08
C.D. @ 1%	0.39	0.32	0.35	0.26

T_1: 100% refined wheat flour
T_2: 05% Pumpkin powder + 95% refined wheat flour
T_3: 10% Pumpkin powder + 90% refined wheat flour
T_4: 15% Pumpkin powder + 85% refined wheat flour
T_5: 20% Pumpkin powder + 80% refined wheat flour
T_6: 05% Pumpkin pulp + 95% refined wheat flour
T_7: 10% Pumpkin pulp +90% refined wheat flour
T_8: 15% pumpkin pulp+ 85% refined wheat flour
T_9: 20% pumpkin pulp + 80% refined wheat flour

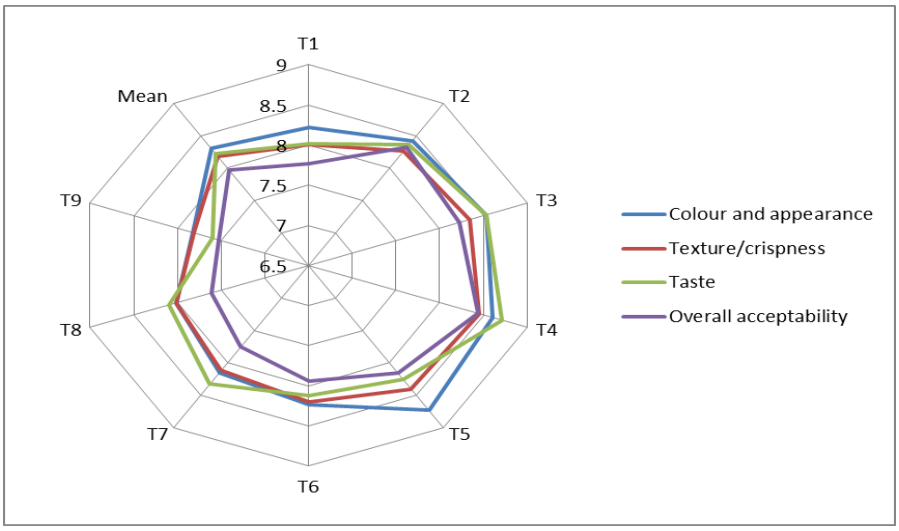

Fig 1: Influence of treatments on sensory evaluation (9 point hedonic scale) of pumpkin fortified biscuits

Conclusion

Based on all the observations it can be concluded that organoleptically acceptable and nutritionally superior pumpkin fortified biscuits can be prepared by the combination of 15 per cent pumpkin powder and 85 per cent refined wheat flour (T_4) and it is followed by T_5 (20% pumpkin powder + 80% refined wheat flour).

Acknowledgement

We are thankful to the department of Post Harvest Technology, KRCCH Arabhavi and University of Horticultural Sciences, Bagalkot for providing all the facilities required for the study.

References

1. AOAC. Official methods of analysis from association of official analytical chemists. Hortwits W. (ed). Association of official analytical chemists, Washington, D.C. USA, 1990.
2. Chirife J, Buera P. Water activity-water or glass dynamics and control of microbiological grown in foods. Critical Rev. Food Science and Nutrition. 1999; 36:465-513.
3. Gonzalez E, Montenegro MA, Nazareno MA, Lopez de Mishima BA. Carotenoid composition and vitamin A value of an Argentinian squash (*Cucurbita moschata*). Archivos Latino Americanos de Nutricion. 2001; 51:395-399.
4. Gopalan C, Sastri R, Balasubramanian BV. Nutritive value of Indian foods. Indian council of medical research, Hyderabad, 2000.
5. Handa C, Goomer S, Siddhu A. Physicochemical properties and sensory evaluation of fructoligosaccharide enriched cookies. Journal of Food Science and Technology. 2012; 49(2):192-199.
6. Harrigan WF, Mccance ME. Laboratory Methods in Microbiology. Academic press, London, 1996, 4-16.
7. Joel N, Fatima K, Stephen F. Production and quality assessment of enriched cookies from whole wheat and full fat soya. European Journal of Food Science and Technology. 2014; 2(1):19-28.
8. Jun H, Lee CH, Song GS, Kim YS. Characterization of the pectic polysaccharides from pumpkin peel. LWT - Food Science and Technology. 2006; 39:554-561.
9. Kulkarni AS, Joshi DC. Effect of replacement of wheat flour with pumpkin powder on textural and sensory qualities of biscuit. International Food Research Journal. 2013; 20(2):587-591.
10. Kumar P, Dorcusmasih, Chitra S. Development and quality evaluation of pumpkin powder fortified cookies. International Journal of Science, Engineering and Technology. 2015; 3(4).
11. Mahmood S, Butt MS, Anjum FM, Nawaz H. Baking and storage stability of retinyl acetate (vitamin A) fortified cookies. Pakistan Journal of Nutrition. 2008; 7(4):586-589.
12. Miller GL. Use of Dinitro salicylic acid reagent for determination of reducing sugar. Ann. Chem. 1972; 31:426-428.
13. Peter IA, John IE. Quality evaluation and cake making potential of sun and oven dried carrot fruit. International Journal of Bioscience. 2012; 10(2):19-27.
14. Pongjanta J, Naulbunrang A, Kawngdang S, Manon T, Thepjaikat T. Utilization of pumpkin powder in bakery products**.** Journal of Science and Technology. 2006; 28(1):71-79.
15. Ranganna S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw Hills Publishing Co. Ltd. New Delhi, 2003.
16. Rodriguez ADB. Enhancing the carotenoid levels of foods through agriculture and food technology. Food Africa, Internet Forum: Internet Paper for Food Nutrition and Health 2003, 31.
17. Sudipta D, Soumitra B. Production of pumpkin powder and its utilization in bakery products development: a review. International Journal of Research in Engineering and Technology. 2015; 4(5):478-481.