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Enhancing the nutritional quality of two commonly consumed Indian snacks *Khakhra and Ladoo* with potassium rich apricots and their quality evaluation

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Abstract
Introduction: Elevated blood pressure (hypertension) remains an extraordinarily common and important risk factor for cardiovascular and renal diseases, including stroke, coronary heart disease, heart failure, and kidney failure Well-established dietary modifications that lower hypertension are reduced salt intake, weight loss, and moderation of alcohol consumption (among those who drink). Over the past decade, increased potassium intake and consumption of dietary patterns based on the "DASH diet" have emerged as effective strategies that also lower hypertension.
Rationale: Dried apricot was selected based on its nutritional quality and high potassium content, considering its nutritional efficacy as a component of DASH diet.
Objectives: Incorporation of apricot at different % levels in the formulation of two basic snacks of India i.e. *laddoo* and *khakhra*. The products were studied for their organoleptic and nutritional parameters.
Materials and Methods: Standard recipes of laddoo and khakhra were selected and they were incorporated with apricots using different percentage compositions. Nutritional analysis was done, and organoleptic evaluation was done using hedonic scale.
Results: Products incorporated with 20-25% of apricots were most acceptable by the panel members having potassium content of 5.8 ± 0.05 and 6.0 ± 0.06%, in *laddoo* and *khakhra* respectively. Protein, fat and ash content of *khakhra* was found to be 6.04 ± 0.06, 5.79 ± 0.11 and 1.84 ± 0.05% respectively. Protein, fat and ash content of *laddoo* was found to be 5.56± 0.12, 10.05 ±0.08 and 1.34 ±0.04% respectively.
Conclusion: Considering the potassium content and nutritional and organoleptic evaluation it was concluded that apricot incorporated products developed were acceptable by people and inclusion of such fortified common daily use snacks will help community to maintain a healthy life.

Keywords: Hypertension, DASH diet, Potassium, Apricot, Organoleptic evaluation, Nutritional composition

1. Introduction
Hypertension is an important public health problem in India and leads annually to 1.1 million deaths (uncertainity index 0.9-1.3 million). It is estimated to account for 10.8 per cent of all deaths and 4.6 per cent of all Disability Adjusted Life Years (DALYs) in the country [1]. Globally also, hypertension is the most important risk factor for death and disease burden and is estimated to be responsible for 9.4 million deaths and 7.0 per cent DALYs [2].
Several guidelines published in 2013 have refocused international attention on hypertension. [3, 4, 5, 6]. A crucial focus in all these guidelines is both the achievement of optimum blood pressure (BP) as well as overall reduction in cardiovascular (CV) risk. These can be achieved by combination of a range of interventions: (i) lifestyle changes (increased physical activity, increased consumption of fruits and vegetables, sodium restriction, weight management, alcohol abstinence and smoking/tobacco cessation); (ii) drugs to lower BP (calcium channel blockers-CCBs, diuretics, angiotensin converting enzyme inhibitors-ACEI, angiotensin receptor blockers-ARBs, beta-blockers, *etc.*) and to lower lipids using statins [3].
Important lifestyle or environmental factors are dietary excess of sodium and fat, dietary deficiency of potassium and fibre, alcohol intake, physical inactivity, and psychosocial stress [7]. Obesity, especially, truncal obesity are powerful proximate determinants of high BP, also in Indians [8], and lifestyle influences on their genesis are well known. Major lifestyle factors influencing hypertension management and amenable to control are shown in Table 1

Lifestyle measures, are a crucial step in hypertension management. Dietary Approaches to Stop Hypertension (DASH) study showed that a diet low in sodium and high in fruits, vegetables, and calcium is helpful in treating hypertension [9].

Table 1: Dietary and lifestyle changes that modify blood pressure

	Level of evidence	Recommendations
Dietary sodium intake	++	<100mmol (2.3g) of sodium per day.
Dietary potassium intake	++	>120mmol (4.7g) of potassium per day
Omega-3 polyunsaturated fat	++	Increase omega-3 fat intake from natural resources
Overall healthy dietary patterns	++	An overall healthy diet: DASH diet (USA), Mediterranean Diet (Europe), Omish diet (USA), Indian vegetarian diet
Dietary calcium magnesium	+/-	Increase dietary calcium and magnesium intake through natural sources
Saturated fat, omega-6 unsaturated Fat, monounsaturated fat	+/- to +	Low saturated fat diet for reducing the cardiovascular risk
Protein, total protein, animal protein, Vegetable protein	+/- to +	Increase vegetable protein in place of carbohydrates
Carbohydrate	+	Amount and type of carbohydrate uncertain
Fibre	+	High fibre diet
Cholesterol	+/-	Low cholesterol diet to reduce cardiovascular risk
Exercise	+	At least 30 min of moderate activity most days of the week
Alcohol intake	++	Moderation of alcohol intake to <2 drinks/per day in men and <1drink/per day in women in those who take alcohol
Stress Management	+/-	Yoga, meditation, progressive relaxation techniques

Source: Strategies for initial management of hypertension. Indian J Med Res. Nov 2010: 132(5): 531 - 542

1.1 Increased potassium intake

High potassium intake is associated with reduced BP. Although data from individual trials have been inconsistent, three meta-analyses of these trials have documented a significant inverse relationship between potassium intake and BP in non-hypertensive and hypertensive individuals [10].

In the meta-analysis by Whelton *et al* [11] average systolic and diastolic BP reductions associated with increase in urinary potassium excretion of 2 g/d (50mmol/d) were 4.4 and 2.5 mm Hg in hypertensive and 1.8 and 1.0 mm Hg in non-hypertensive individuals. Available data suggest that increased potassium has beneficial effects on BP in the setting of salt intake that is low.

Potassium reduces BP to a greater extent in blacks than in whites. A study from India reports similar BP reduction with potassium supplementation as observed in the Caucasian whites [12].

Because a high potassium intake can be achieved through diet rather than pills and because potassium derived from foods is also accompanied by a variety of other nutrients, the preferred strategy to increase potassium intake is to consume foods such as fruits and vegetables rich in potassium, rather than supplements. In the DASH trial, the two groups that increased fruit and vegetable consumption both lowered BP [13].

Dietary Approaches to Stop Hypertension (DASH) was a program by the National Institutes of Health, USA [9, 13, 14] This series of three large controlled trials tested the effects of dietary patterns on BP. The first trial was a randomized feeding study that compared 3 dietary patterns. [9]. Of the 3 diets studied, the most effective diet, now called the DASH diet, emphasized fruits, vegetables, and low-fat dairy products; included whole grains, poultry, fish and nuts; and was low in fats, red meat, sweets, and sugar-containing beverages. Accordingly, it was rich in potassium, magnesium, calcium, and fiber and was low in total fat, saturated fat, and cholesterol; it also was slightly high in protein.

Apricot is one of the best sources of potassium and its intake is less as compared to other food products. So this study was conducted to develop potassium rich products made from apricot.

Incorporation of apricot in the commonly used food products will ensure greater intake of potassium by the hypertensive patients which ultimately will help in maintaining blood pressure and thus treating and preventing the condition of hypertension.

2. Materials and methods

The local market of Rajpura, Punjab was selected to purchase the apricot. It was then peeled and kept in oven for drying, at a temperature of 200 ± 10 °C for ~ 5 min. The dried apricot was then powdered and used for the development of *laddoo* and *khakhra*. The potassium rich apricot powder was incorporated in basic two snacks of India i.e. *laddoo* and *khakhra*, in different ratios.

2.1 Khakhra

Standardized recipe of the *khakhra* had the ingredients, wheat flour 100g, oil 2 tsp and flavouring agents. *Khakhra* incorporated with apricot were prepared using wheat flour and apricot powder blends in the proportion of 100:0, 90:10, 85:15 80:20 and 75:25.

Wheat flour, apricot powder and oil were used in the above mentioned amounts and mixed properly to make dough. This dough was then divided into small balls and was rolled evenly to make very thin *khakhra* of 8-10 cm diameter. 8-10 *khakhra* were developed using 100g of raw material. The *khakhra* were then roasted on medium flame for 2 minutes each and were packed in an air tight container.

2.2 Laddoo

Standardized recipe of the *laddoo* had the ingredients, wheat flour 100g, oil 4 tsp and sugar 50g. *Laddoo* incorporated with apricot were prepared using wheat flour and apricot powder blends in the proportion of 100:0, 90:10, 85:15 80:20 and 75:25.

Wheat flour, apricot powder and oil were used in the above mentioned amounts and mixed properly. The mixture was roasted until golden brown color and was then cooled for 2 min and pressed by hand to obtain round *laddoo* of 3 - 4 cm diameter while still hot and packed. 10-11 *laddoo* were developed using 100g of raw material.

2.3 Sensory evaluation of the apricot products

The different apricot products were evaluated sensorily to find the maximum acceptable level of incorporation by a panel of 15 semi-trained judges using 9- point Hedonic scale following the method of Peryam and Pilgrim [15]. The products were evaluated for their appearance, color, texture, taste, flavour

and overall acceptability.

2.4 Nutritional analysis
After completing the sensory evaluation of products, the best acceptable products of the *laddoo* and *khakhra* were nutritionally analysed. The products were analysed for the ash, moisture, fiber, carbohydrate and potassium content. (AOAC, 2010**)** Protein was estimated by Lowry's method. Soxhlet was used for fat estimation.

2.5 Statistical analysis
The data pertaining to sensory evaluation and nutritional composition of the products was analyzed using the analysis of variance (ANOVA) technique while paired *t*-test was used to compare different parameters between the control and apricot incorporated products [16]

3. Results and discussion
Khakhra incorporated with 20% of apricots (Sample 3) and *Laddoo* incorporated with 25% of apricots (Sample 4) was most acceptable by the panel members. (Table 2 and 3) Biochemical estimations were done of the most acceptable products. Potassium content of the products was found to be 5.8 ± 0.05 and 6.0 ± 0.06 %, in *laddoo* and *khakhra* respectively. Protein, fat and ash content of *khakhra* was found to be 6.04 ± 0.06, 5.79 ± 0.11 and 1.84 ± 0.05% respectively. Protein, fat and ash content of *laddoo* was found to be 5.56± 0.12, 10.05 ±0.08 and 1.34 ±0.04% respectively. Moisture and fiber content in *khakhra* were 8.09 ± 0.06 and 1.06 ± 0.04% respectively. Moisture and fiber content in *laddoo* were 3.47 ±0.04 and 1.19 ±0.02% respectively. (Table – 4)

Table 2: Sensory scores of Apricot *khakhra*

Sample	Apricot incorporation %	Appearance	Colour	Texture	Taste	Flavor	Overall acceptability
Control	0	7.6 ± 1.29	7.26 ± 1.27	7.16 ± 1.66	7.73 ± 1.53	6.86 ± 1.59	7.03 ± 1.71
Sample 1	10	7.76 ± 1.32	7.53 ± 1.35	7.76 ± 1.39	7.3 ± 1.13	7.36 ± 1.46	7.43 ± 1.37
Sample 2	15	7.83 ± 1.09	7.9 ± 1	7.6 ± 1.53	7.42 ± 1.14	7.6 ± 1.44	7.66 ± 1.23
Sample 3	20	7.33 ± 0.90	7.7 ± 0.99	7.6 ± 1.22	7.76 ± 1.23	7.6 ± 1.33	7.73 ± 0.90
Sample 4	25	7.43 ± 1.11	7.6 ± 1.05	7.66 ± 1.44	7.63 ± 1.23	7.63 ± 1.28	7.6 ± 1.22

Mean values ± standard deviation (n = 15)

Table 3: Sensory scores of Apricot *laddoo*

Sample	Apricot incorporation %	Appearance	Colour	Texture	Taste	Flavor	Overall acceptability
Control	0	6.93 ± 1.38	6.8 ± 1.08	6.86 ± 1.06	6.53 ± 1.35	6.4 ± 1.63	6.66 ± 1.23
Sample 1	10	7.06 ± 1.03	7.06 ± 0.96	6.93 ± 0.88	7.33 ± 0.97	6.86 ± 1.24	7.2 ± 1.01
Sample 2	15	7.06 ± 1.03	7.33 ± 0.97	7.26 ± 1.09	7.63 ± 0.89	7.26 ± 1.43	7.5 ± 1.05
Sample 3	20	7.4 ± 1.18	7.46 ± 0.99	7.3 ± 1.03	7.86 ± 0.83	7.4 ± 1.18	7.53 ± 0.83
Sample 4	25	7.13 ± 0.99	7.4 ± 0.91	7 ± 1.41	7.76 ± 0.86	7.2 ± 1.08	7.7 ± 0.79

Mean values ± standard deviation (n = 15)

Table 4: Nutritional composition of (Sample 4) of apricot products

Sample	Moisture%	Fat%	Ash%	Protein%	Dietary fibre%	Carbohydrate%	Potassium %
Khakhra	8.09 ± 0.46	5.79 ± 0.11	1.84 ± 0.15	6.04 ± 0.16	1.06 ± 0.04	76.98 ±0.49	*0.60 ± 0.06*
Laddoo	3.47 ±0.34	10.05 ±0.08	1.34 ±0.14	5.56± 0.12	1.19 ±0.02	78.19±0.54	*0.58 ± 0.05*

Mean values ± standard deviation (n=3)

4. Conclusion
Apricot incorporated products developed in this study were acceptable by people and inclusion of such fortified common daily use snacks will help community to maintain a healthy life. Also considering the nutritional importance of apricot in terms of potassium content, its suitability of incorporation into traditional and convenience products and value addition will be helpful for hypertension patients for maintaining the blood pressure level. Work in pursuit of this strategy includes continuing efforts to ensure food fortification, supplementation, and healthy lifestyle measures to prevent and treatment the global condition for hypertension.

5. Conflict of interest
No conflict of interest reported.

6. References

1. Institute for Health Metrics and Evaluation. India high blood pressure. Available from http://www.healthmetricsandevaluation.org/search-gbd-data, accessed on March 17, 2014.
2. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, *et al*. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012; 380:2224-60.
3. Mancia G, Fagard R, Narkiewicz K, Redon J, Zanchetti A, Bohm M, *et al*, Task Force Members. ESH/ESC guidelines for the management of arterial hypertension; the Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and the European Society of Cardiology (ESC). J Hypertens. 2013; 31:1281-357.
4. Go AS, Bauman MA, Coleman King SM, Fonarow GC, Lawrence W, Williams KA, *et al*. An effective approach to high blood pressure control: a science advisory from the American Heart Association, the American College of Cardiology, and the Centers for Disease Control and Prevention. Hypertension 2014; 63:878-85.
5. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, *et al*. 2014 evidence-based guidelines for the management of high blood pressure in adults: report from the panel members appointed to the Eight Joint National Committee (JNC8). JAMA 2014; 311:507-20.
6. Weber MA, Schiffrin EL, While WB, Mann S, Lindholm LH, Kenerson JG, *et al*. Clinical practice guidelines for the management of hypertension in the community: a statement by the American Society of Hypertension and

the International Society of Hypertension. J Clin Hypertens (Greenwich) 2014; 16:14-26.
7. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, *et al.* Seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure. Hypertension. 2003; 42:1206-52.
8. Gupta R. Defining hypertension in the Indian population. Natl Med J India. 1997; 10:139-43.
9. Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM, *et al.* A clinical trial of the effects of dietary patterns on blood pressure: DASH Collaborative Research Group. N Engl J Med. 1997; 336:1117-24.
10. Appel LJ, Brands MW, Daniels SR, Karanja N, Elmer PJ, Sacks FM. American Heart Association. Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. Hypertension. 2006; 47:296-308.
11. Whelton PK, He J, Cutler JA, Brancati FL, Appel LJ, Follmann D, *et al*. Effects of oral potassium on blood pressure. Meta-analysis of randomized controlled clinical trials. JAMA.1997; 277:1624-32.
12. Patki PS, Singh J, Gokhale SV, Bulakh PM, Shrotri DS, Patwardhan S. Efficacy of potassium and magnesium in essential hypertension: a double-blind, placebo controlled, crossover study. BMJ.1990; 301:521-3.
13. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D, *et al.* DASH-Sodium Collaborative Research Group. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. N Engl J Med. 2001; 344:3-10.
14. Vollmer WM, Sacks FM, Ard J, Appel LJ, Bray GA, Simons-Morton DG, *et al.* for the DASH-Sodium Trial Collaborative Research Group. Effects of diet and sodium intake on blood pressure: subgroup analysis of the DASH-sodium trial. Ann Intern Med. 2001; 135:1019-28.
15. Peryam DR, Pilgrim JF. Hedonic scale method of measuring food preferences. Food Technol. 1957; 11(9):9-14
16. Snedecor GW, Cochran WG. Statistical methods. Ames: Iowa State University Press, 1989.
17. AOAC Official Methods of Analysis, 13 TH Ed., Association of Official Analytical Chemists, Washington DC, 2010.