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Innovations in Enhancement of Nutritional Value of commonly consumed Street Food Aloo Tikki

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Abstract

Introduction Street food refers to foods and beverages which are arranged and sold by the sellers on places like streets, festival areas and consumed by the customers there and then. Street food is the food which is widely consumed and has become an integral part of community life in urban as well as rural areas. Street food has become a prominent feature of the diet of youngsters, especially in the developing countries. Street foods have a long and colourful history. As *aloo tikki* is prepared by crisp potato patties, loaded with curd, laced with some condiments, garnished with some leaves, it is the most popular street food.

Objectives

1. To analyse the nutrient content of commonly consumed street food *Aloo Tikki*
2. To suggest innovations for enhancement of nutritional value of *Aloo Tikki*

Methodology The *aloo tikki* vended on the streets of Naraingarh town was generally made from potatoes and other starches. For the enhancement of nutrient contents of this commonly consumed street food, green vegetables, pulse products and sprouts were used. Standardised recipe was kept as control and two innovative versions were prepared under same conditions. Nutritive value comparison and cost analysis were carried out for findings and conclusive suggestions.

Results The results exposed the comparison of macronutrients among control and innovative a*loo tikkis* i.e. *haryali* and sprouted *dal aloo tikkis* and graphically displays that not much difference has occurred in energy, carbohydrates and fat content whereas there has been an acceleration in protein content of innovative recipes. It was analysed that usage of locally available green vegetables, pulses and their sprouts, pulse products like roasted gram flour supply additional protein value to *aloo tikki* without negatively impacting its taste and texture. The accelerations of micronutrients namely β carotene, calcium and iron can be accredited to the addition of green vegetables like spinach, green peas, coriander etc., pulses and their products like *moong dal* sprouts, roasted gram powder etc.

Keywords: Street foods, enhancement, nutritional, dietary interventions, innovation, consumption, appropriate changes

Introduction

Street vended foods are outlined as those ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers within the streets and different public places for immediate consumption or consumption at later time while not any further process or preparation (WHO, 1996, WHO, 2010).

The ready availability, taste, reasonable cost, marketing strategies and peer pressure make street food common with children and adolescents. Street foods are well-informed to maximize the speed, efficiency and conformity. The menu is kept limited and standardized essentially to lessen the waiting time so that the customers eat quickly and leave (Kaushik, 2011). Street food chains are attaining acceptance with nuclear families. Since these street foods are cheap yet available and amenable by the common people, while being unique and resourceful, they have the added benefits that not only the people from the country of origin but also the foreigners with an assortment of nationalities and races can try them easily without unwillingness (Kim, 2003).

In spite of copious advantages offered by street foods, numerous health hazards are also linked with this sector. Foods sold by street vendors have a poor nutritional quality. This supposition is related to the prospect of quick profit and use of cheaper raw materials. This consists of energy dense means, rich in saturated fats and sugar, with variable quantity and quality of protein and poor in vitamins. Since foods could also be connected with the expansion of chronic non-communicable diseases, because of high quantities of carbohydrates and fat. In the latest past, the main challenges in public health were protein-energy malnutrition, specific micronutrient deficiencies, and contagious disease (WHO, 2002).

The nutritional cost of street vended foods depends on the ingredients used and how they are prepared, stored and sold, as occurs with additional foods. It is essential to have a high-quality understanding of the type and nutritional value of street foods since their consumption in many countries has become well-established in habitual eating patterns and may influence the growth of chronic non-communicable diseases and other nutrition-related conditions in the population (Steyn et. al.; 2013, Haslam and James; 2005 Lobstein, Baur and Uauy; 2006).

Successful dietary interventions by use of street foods, like a vegetable added to *idlies* or omelette are shown to result in culturally applicable changes that do not increase the price of the food item so much and simultaneously recovering the nutritional content of the food (Tinker, 1987). To ensure the nutritional quality of the diet of people who consume street foods, it is important that the nutritional composition of each street food should be analysed and reported. There is also a dire need for quantitative information on the nutrient content of street foods to measure the nutritional quality of different types of these foods and their contribution to the energy and nutrient intake of various population teams in order to help identify particular foods or ingredients that in terms of composition and consumption, could provide potential as vehicles for nutritional interventions (Draper, 1996).

Objectives

1. To analyse the nutrient content of commonly consumed street food *Aloo Tikki*
2. To suggest innovations for enhancement of nutritional value of *Aloo Tikki*
3. To innovate, develop and commoditize new products, processes and services in street food business
4. To contribute to overall health of our community particularly youngsters

Review of Literature

According to Bellemare (2017), over 2 million fast food restaurants operated in China in 2014, including franchise and chain operators of all sizes and independently Chinese-style Fast-Food facilities. The majority of the enterprises were small and independent facilities that got engaged in the traditional Chinese-style fast foods. In latest years, the fast-food income grew at an annual rate of about 13.0 percent. Currently, China has more than 2 million fast food amenities that generated 94,218 million US dollar revenue earned in 2013 (Wang et al., 2007).

Those who produce or sell street foods are mostly small-scale units that form part of growing unofficial sector in the developing countries. Since most of the rapidly increasing urban population in third world countries has

not been absorbed into the formal labour market, this group of people has taken up a range of self-employed, income-generating activities, both legitimate and illegitimate such as street food hawking, which form the informal sector, sometimes called the tertiary sector or bazaar economy (Alimi, 2016).

Nago et al. (2010) carried out a study to evaluate the food, energy, macronutrients and micronutrients contribution of out-of-home foods in school-going adolescents in Contonou, Benin. The study indicates that in Contonou, more than 40 percent of fat and carbohydrate came from street foods. Daily fat intake from street foods was higher in the affluent group, 20-30 percent, compared with 15 percent in the low-SES group.

Kamaliya (2006), in his study planned to enrich commercially available bread with wheat bran and analysed its nutritional merit to find out its possible uses in the dietary management of people suffering from various chronic diseases. Good quality raw materials were purchased from the local market of Vallabh Vidhyanagar and Anand. One method of bread preparation was selected through market and literature survey. Both the breads (EB-Experimental Bread and CB-Control bread) were analysed for only moisture (AOAC, 1970). However, the carbohydrate and energy value were reduced in EB as compared to CB, both the situations have beneficial effect on chronic diseases. Calcium, phosphorous and iron content were estimated 2 to 3 times higher in EB as compared to CB, which is again beneficial in some deficiency diseases and even to healthy human beings.

Vasavada and Dave (2006), in a study made different variation in ingredients for preparing *dhokla* and it was compared with the traditional *dhokla* for its nutritive value. Customary *dhokla* (A) was prepared by using rice, black gram dal, bengal gram dal, curd and salt. Variations were made using dry corn (B) and *kodri* (*varagu)* (C) instead of rice. Total amount and rest of ingredients and procedure were kept same. Carbohydrate content was maximum in sample (A), free amino acid, protein, iron, thiamine, riboflavin and fat were highest in sample (B), while calcium content was maximum in sample (C). It was found that variations of corn improved free amino acid, protein, iron, riboflavin and thiamine values of *dhokla*. It was also moderately acceptable. Its texture was very good but the flavour and taste were found average. Variation of kodri improves calcium and other nutrient in comparison to traditional sample. Its acceptability was highest. Its colour and flavour were found highest compared to other two samples. It was also concluded that both the modification was found highest in nutritive value and in acceptability.

The present study advocates the use of soaked, germinated and sprouted process pulses as an ingredient for making street food as several studies shows the processing of pulses is of primary importance in improving their nutritive value. In germinated and sprouted pulses, the ascorbic acid content increases manifold after 48 hours germination. The riboflavin, niacin, choline and biotin contents of all pulses enhance during germination. Phytic acid is the main storage variety of phosphorus in cereals and legumes which chelates minerals and prevents their intestinal amalgamation; several pre-processing treatments such as soaking, fermentation, germination, lessen the phytic acid content in grains (Gupta, Gangoliya, & Singh, 2015; Rasane, Jha, Kumar, & Sharma, 2015). Vegetables were added which improved the micronutrients, good look and increased flavour.

Methodology

Street food provides nourishment and nutrition to major groups of the population and helps to keep food sanctuary stable. Food innovation is the developmental procedure of new food products and production processes in order to discover more nutritious food products. To maximize food's flavour and nutrition, we understand cooking terms and learn basic techniques, start with high quality ingredients, if possible fresh ingredients; don't need to be the most expensive food. Overcooking can demolish flavour and nutrients. Cooking can't recover poor-quality foods, but it can improve the flavours of high-quality foods. As per routine procedures, the *aloo tikki* vended on the streets of Naraingarh town was observed to be generally made from potatoes and other starches. Keeping the above-mentioned points in view for the enhancement of nutrient contents of this recipe, green vegetables and sprouted pulses were used. The approach followed was to increase information from the adjacent composition of the innovative recipes. Based on information of basic human nutritional requirements for 15-20 age group obtained from literature, improved recipes were formulated.

A. Control or Standardized Recipe

Standardization of recipe is the most important control tool for ensuring that less wastage of food is done. The food service sets certain criteria for standardization of its recipe including customers demand and effective use of its resources to meet those demands. Its advantages include the same consistency of food is prepared every time, uniform nutrient content, same food cost and regulated inventory control. Product taste and appearance is also same regardless of the cook. Table 1 depicts all the ingredients used to prepare the control *aloo tikki* recipe.

Fig. 1 Control *Aloo Tikki*

Table 1: Ingredients for Control *Aloo Tikki*

Sr. No.	Ingredients	Amount (g/ml)
1.	Boiled Potatoes	150.00
2.	Coriander Leaves	20.00
3.	Grated Ginger	2.50
4.	Green Chilli	1.00
5.	Garam Masala	3.75
6.	Red Chlli Powder	1.25
7.	Chaat Masala	1.25
8.	Corn Starch	10.00
9.	Bread Crumbs	10.00
10.	Salt	2.50
11.	Oil	10.00

Method for preparation of Control *Aloo Tikki* :

1. Peeled the boiled potatoes and mashed them with a masher.
2. Cooled the potatoes and added the chopped coriander leaves, grated ginger, chopped green chilli, garam masala, chaat masala, salt, red chilli powder.

3. Added two tea spoons of rice flour or corn starch and two teaspoons bread crumbs.
4. Bound the mixture together to make two balls.
5. Flattened them.
6. Heated oil in a non-stick pan and shallow fried on medium heat.
7. Flipped and fried on both sides until golden and crisp (Figure 1).

B. Development of Innovative *Aloo Tikki* Recipes

Steps taken for nutritional enhancement of *aloo tikki* in the present study were:

1. Addition of raw material

2. Change in processing method

1. Addition of raw material

Micronutrient deficiencies remain major public health problem in developing countries in both rural and urban contexts with deficiencies of vitamin A, vitamin C, calcium and iron. So, addition of any leafy items like spinach, pumpkin, coriander, mushroom, carrot, sprouted *dal*, *paneer*, corn, lentils are excellent and good source of micronutrients. The present study has thus incorporated fresh spinach leaves, coriander leaves and green peas as first innovative recipe of *aloo tikki* (Table 2).

Table 2: Addition of Raw Material

Sr. No.	Food Item	Added Ingredients
1.	***Aloo Tikki***	Spinach Moong dal Sprouts Green Peas Black Gram Powder

2. Change in processing method

The present study advocates the use of soaked, germinated and sprouted process pulses as an ingredient for making *aloo tikki* as per several research studies which show this technique is of prime importance in improving their nutritive value (Table 3). In germinated and sprouted pulses, the ascorbic acid content increases manifold after 48 hours germination. The riboflavin, niacin, choline and biotin contents of all pulses amplify during germination.

Table 3: Change in Processing Method

Sr. No.	Food Item	Change in Processing Method
1.	***Aloo Tikki***	Pulses were soaked and germinated

Fig. 2 Innovative I *Haryali Aloo Tikki*

Tables 4 and 5 below are the list of ingredients wisely selected to prepare innovative and suggestive nutrient modifications of *aloo tikki*. Table 4 shows the ingredient composition of *haryali aloo tikki* while table 5 is for sprouted *dal aloo tikki*.

Table 4: Ingredients for Innovative I *Haryali Aloo Tikki*

Sr. No.	Ingredients	Amount (g/ml)
1.	Boiled Potatoes	150.00
2.	Fresh Spinach	30.00
3.	Green Peas	30.00
4.	Green Chilli	1.00
5.	Coriander Leaves	20.00
6.	Grated Ginger	2.50
7.	Garam Masala	3.75
8.	Red Chilli Powder	1.25
9.	Chaat Masala	1.25
10.	Corn Starch	10.00
11.	Bread Crumbs	10.00

12.	Salt	2.50
13.	Oil	3.00

Method for Preparation of Innovative I (*Haryali Aloo Tikki*) :

1. Removed the thick stems, washed and wiped off the extra water of spinach on a kitchen paper. Finely chopped the spinach leaves.
2. Washed the green peas. Boiled the green peas in a cup of water with a little bit of salt till they get tender.
3. Removed the stem, washed and finely chopped the green chillies.
4. Mashed the green peas thoroughly.
5. Peeled off and mashed the boiled potatoes thoroughly.
6. Now added mashed potatoes, peas, spinach, chopped coriander leave, and all the spices. Mixed well.
7. Added corn flour and mixed well again.
8. Made two balls out of the green mixture. Pressed them slightly to flatten.
9. Pre-heated an OTG at 180^0 C. Greased the bottom of the baking dish with a little oil. Now placed green patties on the dish and baked them with both heaters on until crisp and brown (Figure 2).

Fig. 3 Innovative II Sprouted *Dal Aloo Tikki*

Table 5: Ingredients for Innovative II Sprouted *Dal Aloo Tikki*

Sr. No.	Ingredients	Amount (g/ml)
1.	Boiled Potatoes	150.00
2.	Sprouted *Moong Dal*	25.00
3.	Roasted Black Gram Powder	10.00
4.	Grated Ginger	2.50
5.	Green Chilli	1.00
6.	Coriander Leaves	20.00

7.	Chat Masala	1.25
8.	Red Chilli Powder	1.25
9.	Mango Powder	1.25
10.	Roasted Jeera Powder	1.25
11.	Salt	2.50
12.	Oil	3.00

Method for preparation of Innovative II Sprouted *Dal Aloo Tikki* :

1. Peeled the boiled potatoes and mashed in a bowl.
2. Mixed ginger, green chilli, sprouted dal, coconut powder, roasted black gram powder, red chilli powder, roasted jeera powder, chat masala, chopped green coriander, mango powder and salt as per taste.
3. Mixed well and made two small balls and flattened them.
4. Kept patties in fridge for ten to fifteen minutes.
5. Pre-heated an OTG at 180^0 C. Greased the bottom of the baking dish with a little oil. Now placed green patties on the dish and baked them with both heaters on until crisp and brown (Figure 3).

Although various strategies have been explored in order to mitigate this problem, little efforts have been made to utilize the easy to prepare, readily available, cheap and convenient street vended foods to help in solving these problems. So, addition of any leafy items like spinach, pumpkin, coriander, mushroom, carrot, sprouted *dal*, *paneer*, corn, lentils were excellent and good source of micronutrients.

Results

The main purpose was to develop a product with adequate amount of energy, protein and micronutrients and lesser amount of fat. The approach followed was to increase information from the adjacent composition of the innovative street food sample. Based on information of basic human nutritional requirements for 15-20 age group obtained from literature, improved *aloo tikki* recipes were formulated. The results of improved nutritional value of *aloo tikki* are discussed below and analysis is in accordance with the acceptability responses of the respondents.

A. Nutritional Value Calculation of Control and Innovative Recipes

The present study prescribed the nutritional value calculation of all three *aloo tikki* recipes. For the enhancement of nutrient contents of this commonly consumed street food, different green vegetables and pulses / pulse products were used. Processing had been altered by incorporation of baking instead of frying method. In the improved *aloo tikki* samples, adequate amount of protein, carbohydrates, fats and micronutrients were present. The results are discussed in tables 6 to 8.

Table 6 shows the macronutrients and micronutrients present in controlled *aloo tikki* sample. The results of the proximate composition show energy per serving of controlled *aloo tikki* is 336.76 kcal. The amount of carbohydrates present in a single serving is 49.74 grams while protein is 6.2 grams and fat counts to 11.94 grams. However, the micronutrient contribution comprises of carotene 1517.52 µg, vitamin C 53.57 mg, calcium 55.22 mg and iron is 1.67 mg.

Table 7 exposed that by addition of spinach and green peas, macronutrients as well as micronutrients have grown accordingly. Energy per serving of innovative recipe I i.e. *haryali aloo tikki* was 315.06 kcal, carbohydrate 56.44 grams, protein 8.9 grams, fat 5.31 grams, carotene 3216.42 µg, calcium 86.12 mg and iron 3.12 mg. As per the responses from taste panellists, it is reasonable to suggest that the improved *aloo tikki* was acceptable by most of the respondents. The main purpose was to develop a product with adequate amount of

energy, protein and micronutrients and lesser amount of fat. The nutritive value analysis has clearly met the aim in all aspects. Reduction in fat content can be easily correlated with the use of baking method.

Table 8 displayed that by addition of sprouted *dal* , micronutrients as well as macronutrients got hiked. Energy per serving of innovative recipe II i.e. sprouted *dal aloo tikki* was 264.77 kcal with carbohydrate content of 54.21 grams, protein equal to 12.42 grams, fat 4.45 g, vitamin A 1552.37 µg, vitamin C 53.91 mg, calcium 111.49 mg and iron 3.34 mg. This table shows that amount of protein has doubled as compared to control recipe due to addition of sprouts. Sprouts are also rich source of calcium and iron thus they have increased these two minerals too. Addition of sprouts had made the dish tasty as per the responses of subjects in addition to making it nutritious. In germinated and sprouted pulses, the ascorbic acid content boosts manifold after 48 hours germination. The riboflavin, niacin, choline and biotin contents of all pulses increase during germination. Phytic acid is the major storage form of phosphorus in cereals and legumes which chelates minerals and prevents their intestinal absorption; several pre-processing treatments such as soaking, fermentation, germination reduce the phytic acid content in grains.

Table 6: Nutritional Value Calculation of Control (*Aloo Tikki*)

Sr. No.	Ingredient	Quantity (g/ml)	Energy (g)	Carbohydrate (g)	Protein (g)	Fat (g)	Carotene (µg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
1.	Boiled Potatoes	150	145.5	33.9	2.4	0.15	36.0	25.5	15.0	0.72
2.	Coriander Leaves	20	8.8	1.2	0.64	0.08	1383.6	26.4	36.8	0.24
3.	Grated Ginger	2.5	1.67	0.30	0.05	0.02	1.0	0.15	0.5	0.08
4.	Green Chilli	1	0.72	0.075	0.014	0.015	4.3	0.27	0.75	0.11
5.	Garam Masala	3.75	26.55	1.86	0.96	1.11	0	0	0	0
6.	Red Chilli Powder	1.25	3.07	0.39	0.19	0.07	8.62	1.25	0	0.08
7.	Chat Masala	1.25	1.75	0.21	0.06	0.07	0	0	0.075	0.1
8.	Corn Starch	10	34.2	6.62	1.11	0.36	9	0	1	0.23
9.	Bread Crumbs	10	24.5	5.19	0.78	0.07	0	0	1.1	0.11
10.	Salt	2.5	0	0	0	0	0	0	0	0
11.	Oil	10	90.0	0	0	10.0	75.0	0	0	0
	Total		**336.76**	**49.745**	**6.204**	**11.945**	**1517.52**	**53.57**	**55.225**	**1.67**

Table 7: Nutritional Value Calculation of Innovative I (*Haryali Aloo Tikki*)

Sr. No.	Ingredient	Quantity (g/ml)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Carotene (µg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
1.	Boiled Potatoes	150	145.5	33.9	2.4	0.15	36.0	25.5	15.0	0.72
2.	Fresh Spinach	30	7.8	0.87	0.6	0.21	1674.0	8.4	21.9	0.34
3.	Green Peas	30	27.9	4.77	2.16	0.03	24.9	2.7	6.0	0.36
4.	Coriander Leaves	20	8.8	1.2	0.64	0.08	1383.6	26.4	36.8	0.24
5	Grated Ginger	2.5	1.67	0.30	0.05	0.02	1.0	0.15	0.5	0.08
6.	Green Chilli	1	0.72	0.075	0.014	0.015	4.3	0.27	0.75	0.11
7.	Garam Masala	3.75	26.55	1.86	0.96	1.11	0	0	0	0
8.	Chilli Powder	1.25	3.07	0.39	0.19	0.07	8.62	1.25	0	0.08
9.	Chat Masala	1.25	1.75	0.21	0.06	0.07	0	0	0.075	0.1
10.	Mango Powder	1.25	5.6	1.06	0	0.13	0	0.2	3.0	0.75
11.	Bread Crumbs	10	24.5	5.19	0.78	0.07	0	0	1.1	0.11
12.	Salt	2.5	0	0	0	0	0	0	0	0
13.	Oil	3	27.0	0	0	3.0	75.0	0	0	0
14.	Corn Starch	10	34.2	6.62	1.11	0.36	9.0	0	1.0	0.23
	Total		**315.06**	**56.445**	**8.964**	**5.315**	**3216.42**	**64.87**	**86.125**	**3.12**

Table 8: Nutritional Value Calculation of Innovative II (Sprouted *Dal Aloo Tikki*)

Sr. No.	Ingredient	Quantity (g/ml)	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Carotene (µg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
1.	Boiled Potatoes	150	145.5	33.9	2.4	0.15	36.0	25.5	15.0	0.72
2.	Sprouted Dal	25	64.0	10.8	7.1	0.25	18.2	0	23.7	0.85
3.	Black Gram Powder	10	3.6	6.09	1.71	0.53	18.9	0.3	20.2	0.46
4.	Coriander Leaves	20	8.8	1.2	0.64	0.08	1383.6	26.4	36.8	0.24
5.	Grated Ginger	2.5	1.67	0.30	0.05	0.02	1.0	0.15	0.5	0.08
6.	Green Chilli	1	0.72	0.075	0.014	0.015	4.3	0.27	0.75	0.11
7.	Mango Powder	1.25	4.21	0.8	0.03	0.09	0.25	0.012	0.97	0.56
8.	Roasted Jeera Powder	1.25	4.45	0.45	0.23	0.18	6.5	0.03	13.5	0.14
9.	Red Chilli Powder	1.25	3.07	0.39	0.19	0.07	8.62	1.25	0	0.08
10.	Chat Masala	1.25	1.75	0.21	0.06	0.07	0	0	0.075	0.1
11.	Salt	2.5	0	0	0	0	0	0	0	0
12.	Oil	3	27.0	0	0	3.0	75.0	0	0	0
	Total		**264.77**	**54.215**	**12.424**	**4.455**	**1552.37**	**53.912**	**111.495**	**3.34**

Table 9: Comparison of Macronutrients of Control and Innovative *Aloo Tikki* Recipes

Recipe	Carbohydrate (g)	Protein (g)	Fat (g)
Control *Aloo Tikki*	**49.75**	**6.20**	**11.94**
Haryali Aloo Tikki	**56.44**	**8.96**	**5.31**
Sprouted *Dal Aloo Tikki*	**54.21**	**12.42**	**4.45**

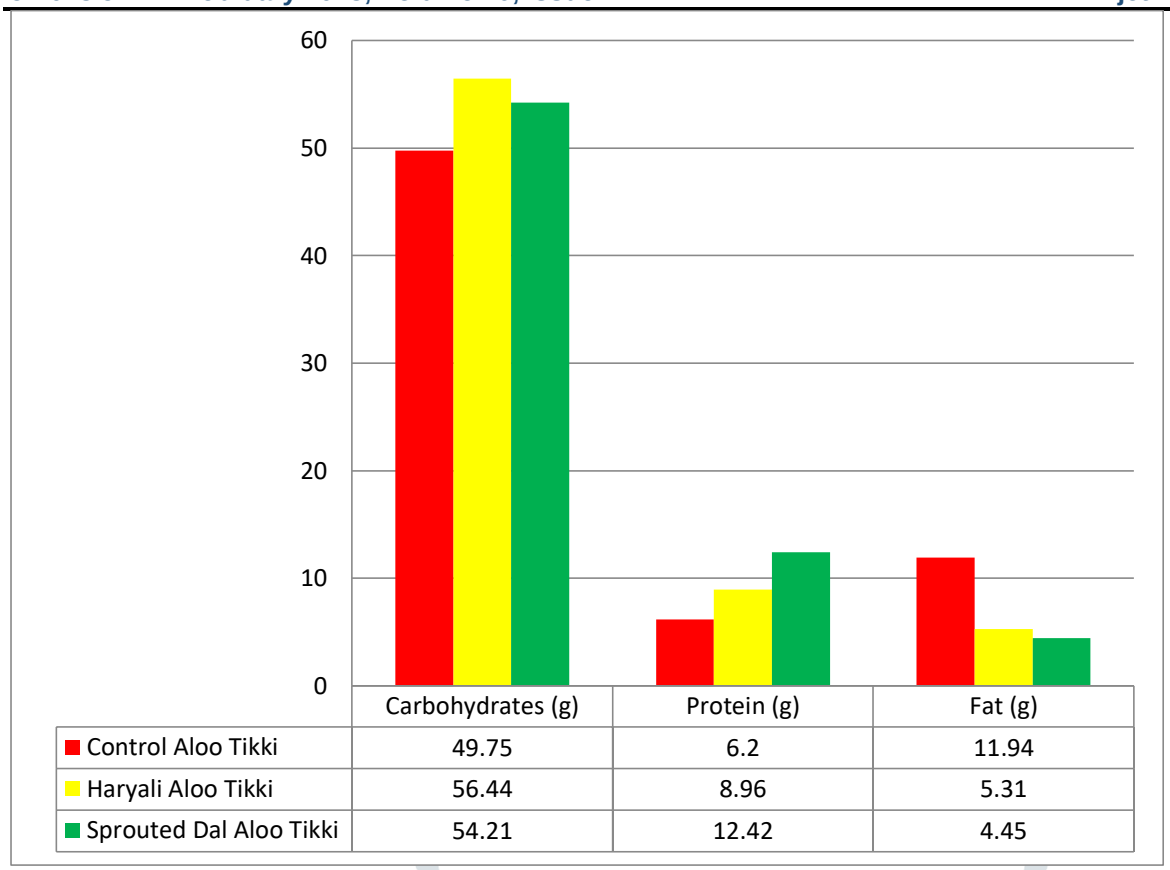


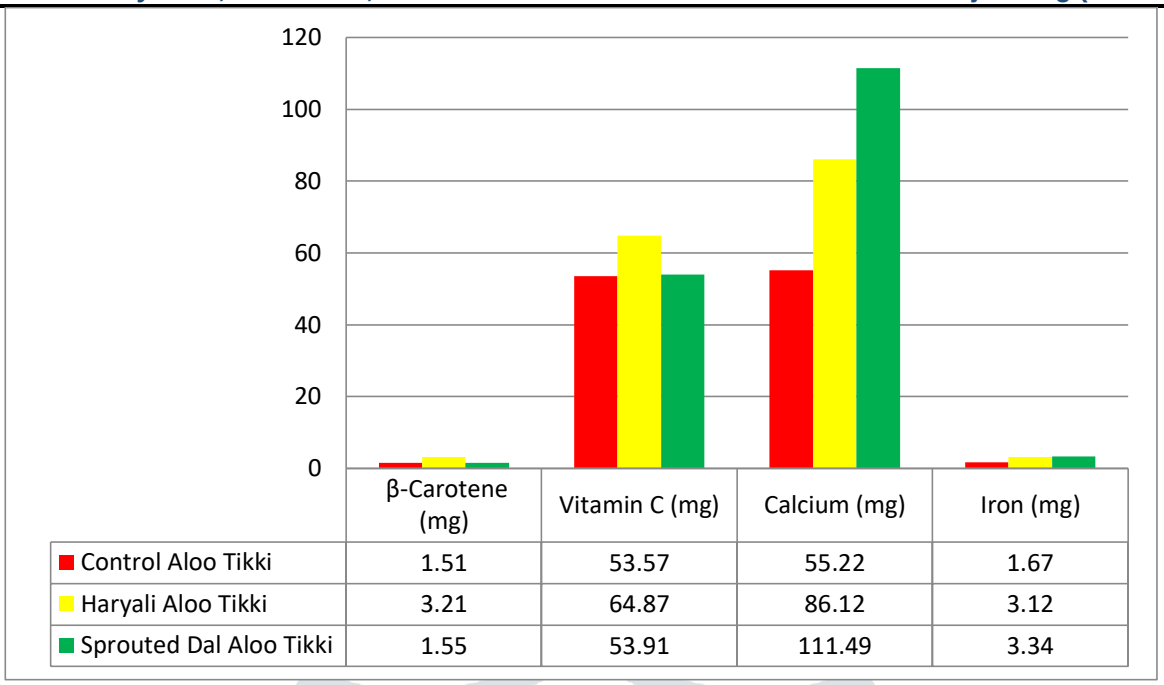
Fig. 4 Macronutrients Comparison of Control and Innovative *Aloo Tikki* Recipes

Table 9 and Figure 4 exhibit that there is not much difference in carbohydrate content of all three *aloo tikki* recipes with 49.75g, 56.44g and 54.21g carbohydrates respectively present in control, *haryali* and sprouted *dal aloo tikki*. However, the protein values have shown a hike of 1.5 to 2 times due to addition of new raw ingredients viz. green vegetables, pulses and pulse products in the innovative recipes. Sprouted *dal aloo tikki* clearly has double amount of protein as compared to the control recipe. A favourable decline has been observed in fat amount due to usage of baked *aloo tikki* in place of fried ones. This technique has made the consumption of *aloo tikki* guilt free without altering the taste as well as appearance.

Table 10: Comparison of Micronutrients of Control and Innovative *Aloo Tikki* Recipes

Recipe	β-Carotene* (mg)	Vit. C (mg)	Calcium (mg)	Iron (mg)
Control *Aloo Tikki*	**1.51**	**53.57**	**55.22**	**1.67**
Haryali Aloo Tikki	**3.21**	**64.87**	**86.12**	**3.12**
Sprouted *Dal Aloo Tikki*	**1.55**	**53.91**	**111.49**	**3.34**

*The β-carotene content has been converted into milligrams so as to attain uniformity of bar graph.



	β-Carotene (mg)	Vitamin C (mg)	Calcium (mg)	Iron (mg)
Control Aloo Tikki	1.51	53.57	55.22	1.67
Haryali Aloo Tikki	3.21	64.87	86.12	3.12
Sprouted Dal Aloo Tikki	1.55	53.91	111.49	3.34

Fig. 5: Micronutrients Comparison of Control and Innovative *Aloo Tikki* recipes

Table 10 and Figure 5 show that β carotene was more than double i.e. 3.21 mg in *haryali aloo tikki* due to addition of green vegetables like spinach and peas in it for making the patties as compared to control *aloo tikki* i.e. 1.51 mg. Vitamin C content however is almost at par in all the three recipes in the range of 53 to 65 mgs. Calcium amount has also accelerated in both the innovations with 55.22 mg, 86.12 mg and 111.49 mg present in control, *haryali* and sprouted *dal aloo tikki* recipes respectively. An increment was also evident in case of iron present in innovative recipes in comparison to the standardised recipe. The iron content of control *aloo tikki* recipe was 1.67 mg, followed by 3.12 mg in *haryali aloo tikki* and 3.34 mg in sprouted *dal aloo tikki*.

B. Cost Analysis of Control and Innovative *Aloo Tikki* Recipes

Tables 11 to 13 and Figure 6 show the cost comparison of control *aloo tikki* recipe. The cost has come out to Rs.8.95 per serving for the control aloo tikki while for *haryali aloo tikki* recipe it is Rs. 10.25 and one serving of sprouted *dal aloo tikki* costs Rs. 10.95

Table 12 displays that first innovative recipe of *haryali aloo tikki* had a little raise in cost as compared to control recipe but this was full of fresh vegetables and was very delicious. These green *tikkis* were made with spinach, peas and potatoes and flavored with mild spices. Vibrant green because of the peas and spinach, these *tikkis* were healthy and nutritious as they were rich in iron, calcium and vitamins.

Table 13 exposed the cost of sprouted *dal tikki* that was Rs.10.95. Sprouted *moong dal aloo tikki* are yummy, healthy and a natural protein source for a vegetarian. It is a delicious, mouth-watering appetizer and filling cutlets that can be eaten for breakfast or as a light evening snack. It can also be a good option for kids' lunch boxes. It is full of protein because sprouts increased the nutrient value.

Table 11: Cost Analysis of Control *Aloo Tikki*

Sr. No.	Name of the Ingredients	Quantity (g/ml)	Price per kg/unit	Cost (Rs.)
1.	Boiled Potatoes	150	30.00	4.50
2.	Coriander Leaves	20	---	---
3.	Grated Ginger	2.5	80.00	0.20
4.	Green Chilli	1	---	---
5.	Garam Masala	3.75	400.00	0.50
6.	Chaat Masala	1.25	700.00	0.87
7.	Red Chilli Powder	1.25	240.00	0.30
8.	Corn Starch	10	35.00	0.35
9.	Bread Crumbs	10	100.00	1.00
10.	Oil	10	110.00	1.10
11.	Salt	2.5	20.00	0.13
			Total Cost	**8.95**

Table 12: Cost Analysis of Innovative I (*Haryali Aloo Tikki*)

Sr. No.	Name of the Ingredients	Quantity (g/ml)	Price per kg/unit	Cost (Rs.)
1.	Boiled Potatoes	150	30.00	4.50
2.	Fresh Spinach	30	25.00	0.75
3.	Green Peas	30	40.00	1.20
4.	Coriander Leaves	20	---	---
5.	Grated Ginger	2.5	80.00	0.20
6.	Green Chilli	1	---	---
7.	Garam Masala	3.75	400.00	0.50
8.	Red Chilli Powder	1.25	240.00	0.30
9.	Chaat Masala	1.25	700.00	0.87
10.	Mango Powder	1.25	100.00	0.12
11.	Bread Crumbs	10	100.00	1.00
12.	Oil	3	110.00	0.33
13.	Salt	2.5	20.00	0.13
14.	Corn Starch	10	35.00	0.35
			Total Cost	**10.25**

Table 13: Cost Analysis of Innovative II (Sprouted *Dal Aloo Tikki*)

Sr. No.	Name of the Ingredients	Quantity (g/ml)	Price per kg/unit	Cost (Rs.)
1.	Boiled Potatoes	150	30.00	4.50
2.	Sprouted Dal	30	110.00	3.30
3.	Roasted Black Gram Powder	10	70.00	0.70
4.	Coriander Leaves	20	---	---
5.	Grated Ginger	2.5	80.00	0.20
6.	Green Chilli	1	---	---
7.	Mango Powder	1.25	100.00	0.12
8.	Roasted Jeera Powder	1.25	400.00	0.50
9.	Red Chilli Powder	1.25	240.00	0.30
10.	Chaat Masala	1.25	700.00	0.87
11.	Salt	2.5	20.00	0.13
12.	Oil	3	110.00	0.33
			Total Cost	**10.95**

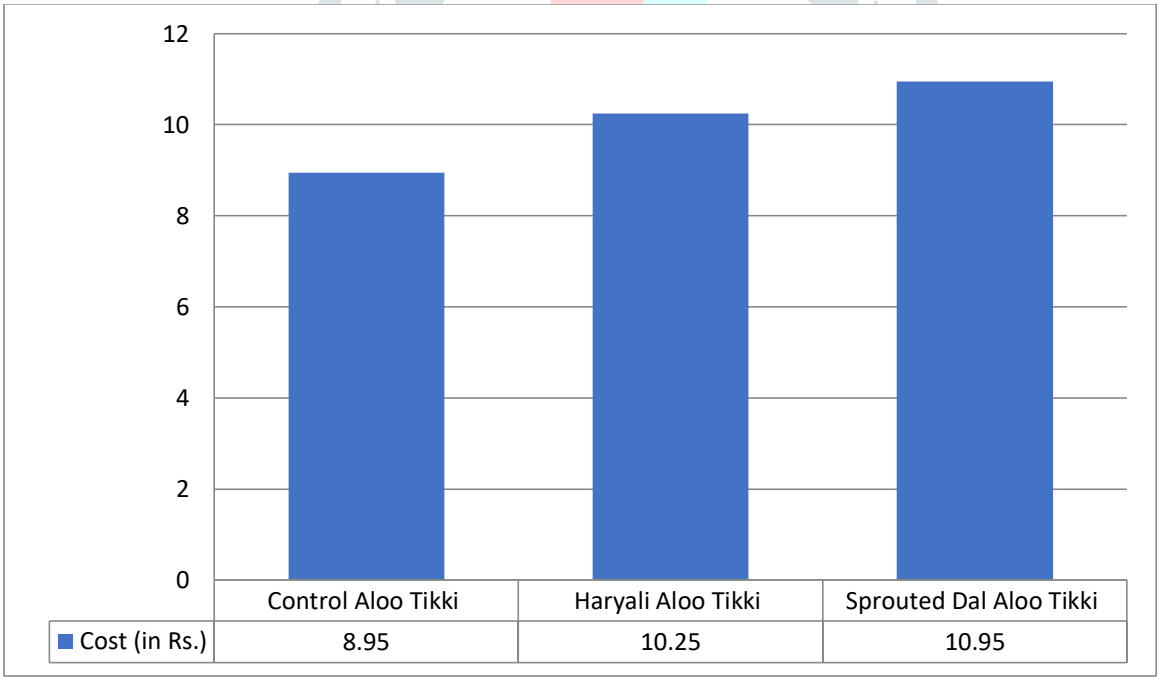


Fig. 6: Comparison of Cost of Control and Innovative *Aloo Tikki* Recipes

Table 14 and Figure 6 display the cost comparison between control and innovative *aloo tikki* recipes and shows that the cost of control *aloo tikki* recipe was Rs.8.95 while cost of *haryali aloo tikki* has come out to be Rs.10.25 and sprouted *dal aloo tikki* ranged to Rs.10.95. Although innovative *aloo tikki* recipes has got a little increase in cost but their nutritional value has shown a great boost in essential nutrients. These innovative and suggestive modifications have additionally made the *aloo tikki* snack to be more mouth-watering, tasty as well as healthier option thereby making it more nutritious for our youngsters who are the most frequent consumers of street foods.

Table 14: Cost Comparison of Control and Innovative *Aloo Tikki* Recipes

Recipe	Cost (Rs.)
Control *Aloo Tikki*	8.95
Haryali Aloo Tikki	10.25
Sprouted *Dal Aloo Tikki*	10.95

Conclusion

The results exposed the comparison of macronutrients among control and innovative a*loo tikkis* i.e. *haryali* and sprouted *dal aloo tikkis* and graphically displays that not much difference has occurred in energy, carbohydrates and fat content whereas there has been an acceleration in protein content of innovative recipes. Firstly, baking has been introduced in place of frying so as to make the innovative recipes less fatty in addition to being nutritious. Secondly, new substances as raw materials have been judicially selected to increase the protein and reduce the excessive calories of control recipe for its nutritional enhancement. This infers that usage of locally available green vegetables, pulses and their sprouts, pulse products like roasted gram flour supply additional protein value to *aloo tikki* without negatively impacting its taste and texture. The accelerations of micronutrients namely β carotene, calcium and iron can be accredited to the addition of green vegetables like spinach, green peas, coriander etc., pulses and their products like *moong dal* sprouts, roasted gram powder etc. It is worth mentioning here that germination technique has also contributed to this enhancement in terms of nutritive gains as well as crunchiness of texture. It is a general conception that one has to invest much more in terms of finances if you wish to gain more nutrition. But the cost comparison of this study has clearly establish this fact that one can get better nutritive value at a very minimal investment and in some cases nil differential investment is required even. Rather these innovations have collectively improved the organoleptic properties of the finished products as per responses from the taste panellists. Hence, there seems to be a dire need for enhancement of nutritional quality of commonly consumed street foods for combating the micronutrient deficiencies silently prevalent amongst our youth.

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