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Quality evaluation and value addition of Indian street food: Potato cutlet (Tikki)

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Abstract

In the present study an attempt has been made to get nutritionally aware about Potato cutlet (Tikki), and find out the variant ways to make them nutritious by loading healthy ingredients in the traditional recipe. The study was carried out with the aim of evaluation of Physico-chemical, functional, nutritional and organoleptic evaluation of one of this very famous Indian street food, by collecting its samples from street vendors and its comparison with control and value added samples which were prepared in the laboratory. Value addition was done by adding germinated seeds of green gram and chickpea. Value addition was helpful in improving the nutritional quality of Tikki in comparison to rest of the samples. It resulted a significant ($p \leq 0.05$) increase in the protein (12.60%) and fibre (1.85%) content. The peroxide value, free fatty acid was higher in street vendor samples i.e. (9.07 meg/kg) and (1.21% oleic acid).

Keywords: Tikki, sprouts, Physico-chemical analysis, proximate and sensory attributes

Introduction

It would be no exaggeration if I said that one of India's culinary glories is its comforting street food which offers a myriad of flavors with almost every street corner lined with mobile food vendors or street vendors or we can also say restaurants-on-wheels, selling delicious snack. When it comes to eating street food and one look for options, inadvertently ever so delectable potato-cutlet or *Aloo Tikki* pops up in our mind. *Aloo Tikki* is synonymous to street food in that sense. This snack is loved by millions in India and has many variants which differ from state to state. In the present study an attempt has been made to get nutritionally aware about these cutlets, and find out the variant ways to make them nutritious by loading healthy ingredients in the traditional recipe. Green gram sprouts or mung beans is considered as good source of protein in a cereals-based diet. Whole or split seeds are used to make dhal, soup or curries. Sprouting, like cooking, reduces anti-nutritional compounds in raw legumes. Raw lentils, for example, contain lectins, anti-nutritional proteins which can be reduced by sprouting or cooking. Sprouts are rich in digestible energy, vitamins, minerals, amino acids, proteins, and phytochemicals, as these are necessary for a germinating plant to grow. The study was carried out with the aim of assessing the effect of addition sprouts in the *Tikki* and comparison with control and value added sample on the bases of Physico-chemical, proximate, nutritional and sensory attributes.

Material and method

By keeping the perishability of this food into consideration, this study was conducted in two stages.

Stage-I: Sample collection

Samples of *Tikki* were procured from four different local street food vendors of Palampur city of Himachal Pradesh. The procured samples were analysed for physical parameters. After determining physical parameters, they were dried to make them moisture-free by placing them into hot air oven at a temp. of 60 °C for 8hrs and grounded into a fine powder. These samples were kept under air tight containers for further analysis.

Stage-II Sample preparation

Control and value-added sample were prepared in the laboratory. The basic ingredients used were potato (100% in case of control and 60% in case of value added), salt (1.7%), dry spice mix (2.5%) and green curry stuff (onion, garlic and ginger paste; 5:3:1). No sprouts were added in control sample, in case of value added sample 20% green gram sprouts and 20% of

bengal gram sprouts were added.

Batter of the cutlet was prepared by hand mixing of all the ingredients in the above-mentioned proportion. The batter was moulded into the shape of cutlets. Cutlets were shallow fried to golden brown in refined oil and turned repeatedly to avoid charring.

The prepared samples were analysed for physical parameters. After determining physical parameters, they were dried and stored in the same manner for the further analysis.

Weight in triplicate was measured on an electric scale. The length was measured using a measuring scale. Ten food sample of each treatment was taken. Thickness was taken at three different parts of Tikki i.e. top central and lower part using a vernier caliper.

Water Absorption Capacity and Oil absorption Capacity was analyzed by the method of Sosulski and Garratt (1976) [13] and Lin *et al.* (1974) [8], respectively.

The moisture content was determined by hot air oven drying, fat by Soxhlet extraction with petroleum ether, protein by automatic Kjeldahl method and total ash contents of the potato cutlets were estimated by muffle furnace as per AOAC. The prepared samples were determined for their nutritional analysis viz energy (O'shea and Maguire 1962) [10], starch (Clegg 1956) [5], Non-protein nitrogen (Pellet and young 1980) [11], true protein (Crude protein Nitrogen- NPN),

reducing sugars, non-reducing sugars, total sugars (Yemn and Willis 1954) , ADF and NDF (Van Soest and Wine 1967) [14], hemicellulose (NDF-ADF), peroxide value (AOAC 1999), free fatty acids (AOCS 1998) [3], anti-oxidant activity (Miliauskas *et al.* 2008), (Khalaf *et al.* 2004) [9].

Mineals like, Calcium and phosphorus was analyzed by the method of Chen *et al.* (1956) [4], iron and zinc were determined in the selected street foods. Determination of zinc and iron was done by using the atomic absorption spectrophotometer, Model 3100, Perkin Elmer. Calcium was detected by using the flame photometer, Mediflame, 127.

The samples were appraised organoleptically for the parameters like colour, taste, flavor, texture, and overall acceptability with the help of ten semi-trained panelists using a 9-point hedonic scale. The index of acceptance (IA%) was measured by using the following equation (Schumacher *et al.* 2010) [12].

Index of Acceptance (%) = M/9 X100

Where, M = the average of the evaluations carried out by the sensory panel.

The attained data was possessed to Analysis of Variance (ANOVA) using OP stat software and was interpreted at 5% level of significance ($p \leq 0.05$).

Results

Table 1: Physical and functional Properties of Tikki

Parameters	Control	Street vendor	Value Added	CD(P≤0.05)
Colour	Golden Brown	Golden Brown	Golden Brown	-
Shape	Round disc	Round disc	Round disc	-
Weight (g)	50.00	55.43	54.75	NS
Length (cm)	5.25	6.24	5.80	0.35
Thickness (inch)	0.48	0.42	0.50	0.06
Water Absorption Capacity(ml/g)	2.73	2.38	3.06	0.22
Oil absorption capacity (ml/g)	0.23	1.27	1.67	0.25

Table 2: Proximate composition

Parameters	Control	Street vendor	Value Added	CD(P≤0.05)
Moisture (%)	8.21	8.34	5.77	0.62
Crude ash (%)	5.48	3.63	5.60	1.08
Crude fibre (%)	0.78	1.44	1.85	0.33
Ether extract (%)	20.58	21.07	22.30	NS
Crude protein (%)	3.20	5.27	12.60	0.59
Total carbohydrates (%)	61.64	60.23	51.50	6.22

Table 3: Nutritional composition

Parameters	Control	Street vendor	Value Added	CD(P≤0.05)
NPN (%)	0.05	0.22	0.06	NS
True protein (%)	2.88	3.89	12.22	0.20
Energy (Kcal/100g)	444.27	451.69	459.03	NS
Starch (%)	34.39	23.36	18.82	NS
Reducing sugars (%)	2.23	1.50	6.32	2.42
Non- reducing sugars (%)	7.46	5.72	11.24	NS
Total sugars (%)	9.70	7.23	17.57	6.76
ADF (%)	6.92	7.25	7.72	1.92
NDF (%)	17.78	31.05	41.03	8.19
Hemi- cellulose (%)	10.86	23.80	33.31	6.55
Peroxide value (meq/kg)	6.44	9.07	1.61	0.93
FFA (%Oleic acid)	0.13	1.21	0.07	0.07
DPPH (% inhibition)	60.11	58.11	61.40	4.92

Table 4: Macro and micro mineral content

Parameters	Control	Street vendor	Value Added	CD(P≤0.05)
Iron (mg/100g)	4.04	4.11	16.11	0.28
Zinc (mg/100g)	1.00	1.02	1.52	0.22
Calcium (mg/100g)	20.31	23.12	47.79	4.64
Phosphorus (mg/100g)	93.98	91.64	134.23	1.04

Discussion

Physical and Functional properties

Table 1 depicts the physical and functional properties i.e. color, shape, weight, length, thickness, and functional properties i.e. water absorption capacity and oil absorption capacity of *Tikki* samples in various treatments.

Colour is the property subjected by an object of producing different sensations on the eye as it reflects or emits light. The color of control, street vendor, and value added sample of the *Tikki* was golden yellow, golden brown and golden yellow serially. The golden brown colour of the street vendor sample of the *Tikki* might be due to the repeated shallow frying of the *Tikki* that resulted the conversion of golden yellow colour to golden brown. However, the *Tikki* were round disc in shape.

Weight is referred as a body's relative mass/the quantity of matter occupied by it, giving rise to a downward force or the bulkiness of a thing, according to the data depicted in the table 2, the weight of the *Tikki* procured from street vendor was non-significantly ($p \leq 0.05$) higher than the rest of the samples when compared with each other. However, a non-significant ($p \leq 0.05$) difference was there in the control and value added samples of *Tikki*.

The difference in the thickness of the control, street vendor and value added sample was significant ($p \leq 0.05$) when compared with each other. Whereas, non-significant ($p \leq 0.05$) difference was observed in the thickness of control samples of *Tikki* when compared with value added sample of *Tikki*. However, a significant ($p \leq 0.05$) difference was there in the thickness of street vendor *Tikki*, when compared with control and value added sample.

The amount of water taken up by flour to achieve the desired consistency is referred as water absorption capacity. The variation in the water absorption capacity of samples was significant ($p \leq 0.05$) when compared with each other. However, it was maximum in the value added sample of *Tikki*.

Oil absorption capacity shows a defined correlation with emulsifying capacity for most proteins making it possible to predict emulsifying capacity simply. A significantly ($p \leq 0.05$) higher oil absorption capacity was observed in the value added sample of *Tikki* followed by street vendor and control sample.

Proximate composition

The proximate composition is an important parameter for getting knowledge related to the nutritional and biochemical characteristics of food. Major components like moisture, ash, crude fat, crude fiber, and crude protein content were included in the proximate composition. Table 2 depicts the proximate composition of control, a street vendor, and a value-added sample of *Tikki*.

As per the data depicted in the table 2, a significant increase is found in the moisture content, ash content and fiber content of value added samples, when compared with control and street vendor samples. This difference might have been due to variation in the shallow frying temperature which is found to have a significant influence on the moisture content of any

food sample. The fibre content was maximum in the value added *Tikki* followed by street vendor and control sample of *Tikki*. This might be due to the addition of sprouts in the value added *Tikki* as germination increases the fibre content in the food. Pulses are found to be a good source of protein for vegetarian people. The high protein content in value added *Tikki* might have been due to the addition of germinated green gram and Bengal gram.

There were no significant ($p \leq 0.05$) variation in the fat content of control, street vendor and value added *Tikki* when compared with each other. Which clearly indicates the equal absorption of fat by the *Tikki* at various treatments.

A significant ($p \leq 0.05$) variation existed in the carbohydrate content of value-added sample when compared with control and street vendor sample. However, the difference between control and street vendor sample was non-significant ($p \leq 0.05$).

Nutritional composition

Table 3 depicts the nutritional composition of samples. The NPN and energy content was non-significantly ($p \leq 0.05$) higher in the value added sample, followed by street vendor and control sample. This difference might have been due to variation among the raw ingredients used. Which might have been the reason, high amount of protein and ether extract was existed in the sample.

As far as the true protein content is concerned, it was maximum in the value added *Tikki* with a value of 11.85 per cent when compared with control and street vendor *Tikki* having 3.23, 4.79 per cent of protein. The variation in the protein content might have been due to slight variation of non-protein nitrogen content. There was a non-significant ($p \leq 0.05$) difference in the energy and starch content of samples at various treatments when compared with each other. Control had a value of starch content i.e. 34.39 per cent followed by street vendor and value added samples of *Tikki*. The higher starch content in the control, sample might have been due to variation in ingredients used.

As per the data, there was a significant ($p \leq 0.05$) variation in the total sugar content of control, street vendor and value added sample when compared with each other. However, the difference was non-significant ($p \leq 0.05$) between the sugar content of control and street vendor samples of *Tikki* during comparison. Total sugar content was significantly ($p \leq 0.05$) higher in the value added *Tikki* whereas found low in the *Tikki* procured from street vendor.

The high sugar content in the value added *Tikki* might have been due to addition of sprouts in the *Tikki*. This might be due to the reason that during germination hydrolysis of starch is there which converted to sugar as a result, it increases the sugar content in the seeds.

Dietary fibre constituent like ADF, NDF and hemicellulose was maximum in the value added sample of *Tikki* which might have been due to addition of sprouts and other vegetables in the *Tikki*.

The readings for peroxide value also differed significantly ($p \leq 0.05$) during comparison. It was maximum in the samples

procured from street vendor than the control and street vendor sample. The higher peroxide value of street vendor samples might have been due to the use of preheated or auto-oxidized oil by the vendor for frying of *Tikki*. The FFA content also differentiated significant ($p \leq 0.05$) in control, street vendor and value added sample when compared with each other.

Antioxidant activity (DPPH)

There was a non-significant ($p \leq 0.05$) difference in the DPPH content of control, street vendor and value added sample when compared with each other. DPPH was found non-significantly ($p \leq 0.05$) higher in the value added *Tikki* followed by *Tikki* procured from street vendor as well as control sample.

Macro and micro minerals of *Tikki*

The mineral analyzed in the control, street vendor and value added samples of *Tikki* were iron, zinc, calcium and phosphorus. According to the data depicted in the table 4, there were a significant increase in the mineral content with value addition.

All the analyzed minerals namely: Iron, zinc, calcium and phosphorus were maximum in the value added samples during their comparison with control and street vendor. This difference was significant during its comparison with control and street vended sample. However the variation was non-significant between control and street vended sample which clearly justify the fact that value addition has a desirable

impact in the increase of mineral content of the selected street foods.

Sensory evaluation

Sensory evaluation is "a scientific discipline used to invoke, detect, and interpret response to characteristics of foods perceived by the senses of sight, smell, taste, touch, and hearing".

The results of sensory evaluation are depicted in figure 1, The difference among the color scores of control samples was non-significant ($p \leq 0.05$) when compared with street vendor and value added samples of *Tikki*. This might have been due to the addition variation among the raw ingredients used.

As far as the acceptability of the *Tikki* at various treatment was concerned, there was a non-significant ($p \leq 0.05$) variation in the scores of value added, control and street vendor samples of *Tikki* when compared with each other. The scores were above 7.0 for each parameter i.e. color, flavor, taste texture and overall acceptability in case of every sample. As, we know the fact that *Tikki* is a widely acceptable snack for Indian people. However, these parameter were maximum, in case of value added sample, which clearly show that, sprouts has a significant influence on sensory acceptability of *Tikki*, in a healthy way. Which might have been due to the addition of pea, green gram and Bengal gram sprouts as have a valuable role in making the fried food tastier and crispier causing desirable colour, texture and taste.

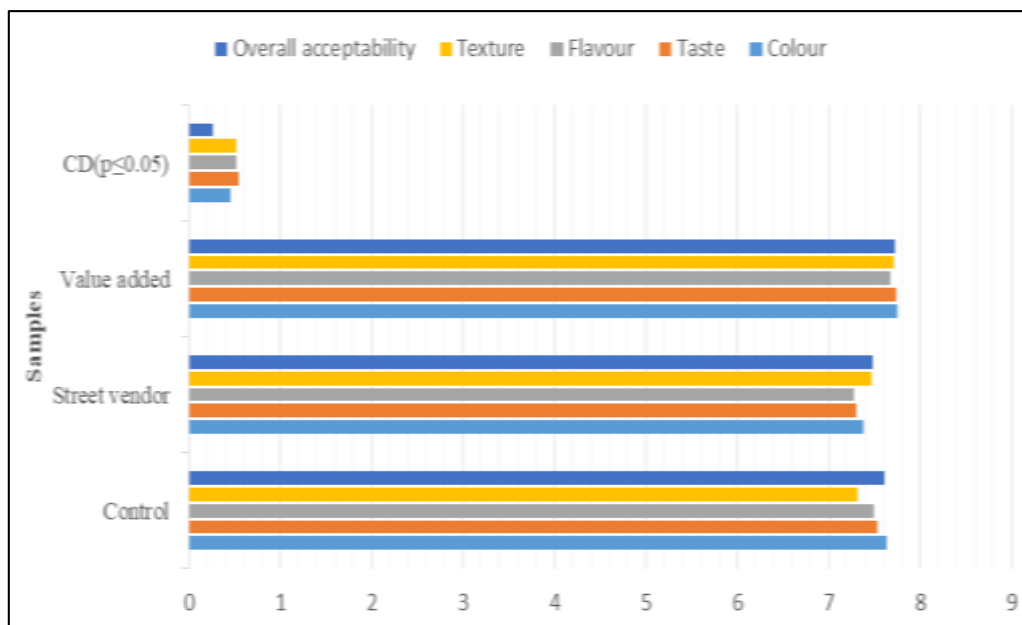


Fig 1: Sensory Evaluation of *Tikki*

Conclusion

From the above data shows that the incorporation of sprouts in the *Tikki* has a notable influence on protein, fibre and other nutrients. Hence, we can conclude that the nutritive value of these foods can be improved by added healthy ingredients i.e. sprouts in the *Tikki* to make these foods healthy as well as tasty at the same time.

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