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Development and Nutritional Profiling of Commonly Used and Underutilized Vegetables Incorporated Instant Powders

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ABSTRACT

Background: Presently, due to changing in life style of the people and desire for more leisure time, there is considerable change in food habits with a strong demand for processed food products. This trend has also resulted in huge demand for processed vegetables in markets for use in convenience foods, dry salad mixes, dehydrated soups, pizzas, *etc*. Interestingly, the literature on utilization of vegetables for preparation of chutney powder is not available. Thus, there exists a need to develop suitable technology for the development of vegetable based instant chutney powder that will not only check the losses but also generate additional revenue for the growers.

Methods: The work was done in the year 2019-2020. The vegetables were collected from the local market at Rajendranagar of Telangana state. After the preliminary processing, the vegetables were blanched and with different formulations 3 best selected powders were analyzed.

Result: The results of the study found that addition of vegetables and underutilized green leafy vegetables improved the sensory quality, protein, crude fiber, in incorporated instant chutney powder than the control sample.

Key words: Functional properties, Instant powders, Nutritional properties, Physical, Sensory evaluation.

INTRODUCTION

According to the report, losses of fresh vegetables in India were projected to range from 2 to 23 per cent, with an average overall loss of roughly 12 percent between production and consumption (IIHR 2014). According to Adams (1981), blanching is a crucial step in preparing vegetables for canning, freezing and dehydrating.Comparing the beetroot powder made using the lyophilizer to all other drying techniques, it had the highest total phenolic content (0.58 mg gallic acid eq/g), betalain content (4.89 mg/g) and antioxidant activity (DPPH free radical scavenging activity) (95.31 per cent) (Bunkar *et al.,* 2020). According to Kavitha *et al.* (2013), eating green leafy vegetables has been linked to a lower risk of developing chronic metabolic illnesses. Vitamins A, C, B9 (folic acid), calcium, magnesium, iron, proteins, lipids, carbs, fibre, ash, calcium, vitamins, thiamine, riboflavin and niacin are all abundant in Basella alba (Deshmukh *et al.,* 2014). According to Chandra *et al.,* (2019), its ant has therapeutic value. Jyothirmayi *et al.* (2006) created a quick raw tamarind powder by combining salt, the ideal ratio of spice powders and dry raw tamarind powder.

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METERIALS AND METHODS

Sensory evaluation of instant powders (Meilgaard *et al.,* 1999).

Analysis of physical properties of instant powders

Colour (Hunter Lab, 2013), particle size distribution (Sahini *et al.,* 2017), bulk density and tapped density (Narayana and Narasinga 1982), flowability and cohesiveness (Jinapong *et al.,* 2008), determination of titratable acidity, determination of total soluble solids (TSS) (Kathiravan *et al*., 2014), water activity (Abramovie *et al*., 2008).

Analysis of functional properties of instant chutney powders

Water absorption indexand Water solubility index by Anderson *et al.*, (1969), Water retention capacity Beugre

et al. (2014), Oil retention capacity Beugre *et al.* (2014), Hydrophilic-Lipophilic Index (HLI) (Njintang *et al.,* 2001).

Nutritional characteristics of instant chutney powders

Estimation of moisture, ash, protein as per AOAC (2005), estimation of fatestimated (AOAC, 1997), Estimation of crude fibre was determined (AOAC, 1990), Computation of carbohydrates and energy (AOAC, 1980).

Analysis of anti-nutritional properties of instant powders

Total phenolic compounds (Slinkard and Slingleton, 1997), Total flavonoid content (Meda *et al.,* 2005) Tannins estimation (AOAC 2004).

Analysis of vitamin C and total carotenoids content in instant powders

Estimation of ascorbic acid (vitamin C) AOAC, (2000), total carotenoids (Rajyalakshmi *et al.,* 2001) and Statistical analysis of data: (Snedecor and Cochran, 1983).

RESULTS AND DISCUSSION

Physical properties of instant chutney powders

Colour

It was observed that all colour parameter of control instant powder (CNCP) were higher than the two experimental samples, indicating that incorporation of blanched vegetable powder has resulted in drastic decrease in colour values.

Particle size distribution

The particle size of CNCP was ranged from 168 to 170 µm with a mean value of 170 µm, was highest followed by CBCP (165 µm) and CVCP (158 to 160 µm). The lower particle size in experimental sample was due to addition of balanced vegetables.

Bulk density

Bulk densities of the instant powders were 0.56±0.00 g/ cm^3(CNCP), 0.51±0.00 g/cm^3(CBCP) and 0.59±0.00 g/cm^3 (CVCP). The highest bulk density was recorded for CVCP, whereas the lowest was recorded in CBCP.

Tapped density

Tap densities of instant powders were 0.44±0.00g/cm^3, 0.45±0.00g/cm^3 and 0.39±0.00g/cm^3 for CNCP, CBCP and CVCP respectively.

Flowability and cohesiveness

The flowability and cohesiveness of the instant powders were evaluated in terms of Carr index (CI) and Hausner ratio (HR) respectively. Carr index for CNCP, CBCP and CVCP was 19.27%, 23.56% and 21.23% respectively. Hausner's ratio for CNCP, CBCP and CVCP was 0.78%, 1.88% and 1.28% respectively.

Titratable acidity

The titratable acidity of CNCP, CBCP and CVCP was 0.56±0.01g/L, 0.78±0.01g/L and 0.47±0.00g/L respectively.

Total soluble sugars (TSS)

The TSS content of CNCP was 4.73±0.05ºbrix and CBCP was 2.23±0.05ºbrix and CVCP was 3.63±0.05ºbrix respectively.

Water Activity

The water activity of CNCP, CBCP and CVCP was 0.45±0.00, 0.46 ±0.00 and 0.45±0.00 respectively.

Functional parameters of instant powder

Water absorption index (WAI) and Water solubility index (WSI)

The WAI values of instant powders ranged from 5.05 to 5.56 ml/g. The WAI of the CNCP, CBCP and CVCP were 5.44±0.02 ml/g, 5.05±0.02 ml/g and 5.56±0.01 ml/g respectively. The WSI values were 0.56±0.01% (CNCP),0.57±0.01% (CBCP), 0.46±0.01% (CVCP) respectively.

Oil absorption capacity (OAC)

The OAC of CNCP, CBCP and CVCP was 3.12±0.01 g/g, 2.23±0.00g/g and 2.56±0.01 g/g respectively.

Water holding capacity (WHC)

The WHC of CNCP, CBCP and CVCP was 6.03±0.01 g/g, 5.78±0.00 g/g and 5.24±0.01 g/g respectively.

Oil holding capacity (OHC)

The oil holding capacity values of CNCP, CBCP and CVCP obtained was 4.26±0.01 g/g, 3.84±0.02 g/g and 3.08±0.01 g/g respectively.

Hydrophilic-Lipophilic Index (HLI)

The hydrophilic-lipophilic index values of CNCP, CBCP and CVCP obtained was 1.27±0.00, 1.31±0.00 and 1.80±0.00 respectively.

Nutritional composition of the instant powders

Moisture

The moisture content of CNCP was 7.34±0.04%, CBCP was 4.85±0.03% and CVCP was 5.24±0.02% with statistically significant difference at $p \leq 0.05$ between the samples.

Ash

The ash content of instant powders varied from 9.85% to 5.67%. The ash content of CNCP, CBCP and CVCP was 5.67±0.01%, 9.85±0.02% and 7.36±0.01% respectively.

Protein

The protein content of CNCP, CBCP and CVCP was 10.23±0.01%, 16.24±0.02% and 12.87±0.01% respectively.

Fat

The fat content of CNCP, CBCP and CVCP was 5.34±0.02%, 3.25±0.03%, 4.23±0.01% respectively.

Crude fibre

The crude fibre of CNCP, CBCP and CVCP was 10.51±0.01%, 12.86±0.01%, 17.23±0.01% respectively.

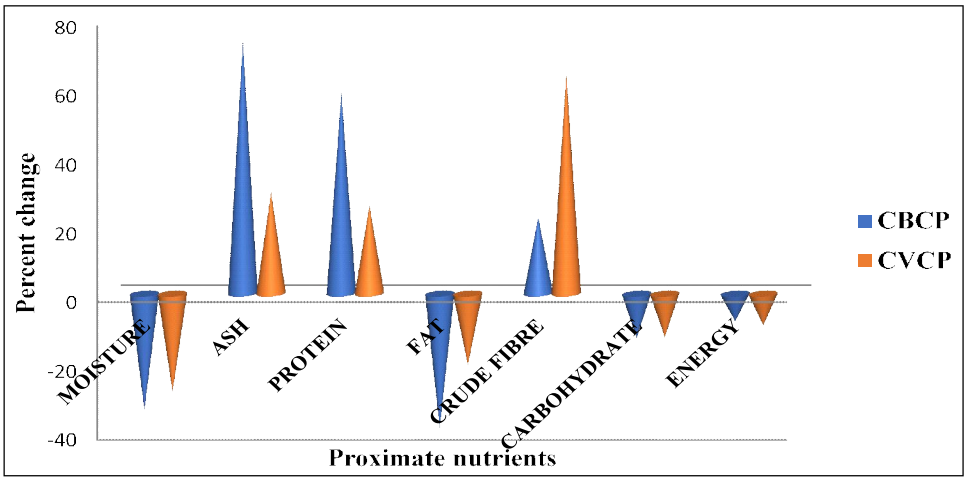

Fig 1: Per cent change of proximate in instant powders.

Note: CBCP: Carrot and beet root leaves (1:2) incorporated instant powder; CVCP: Cabbage, basella, spinach (1:1:1) incorporated instant powder.

Carbohydrates

The carbohydrate content of CNCP, CBCP and CVCP was 60.96±0.03%, 53.05±0.02% and 53.20±0.07% respectively.

Energy

The energy content of CNCP, CBCP and CVCP was 332.80±0.08 Kcal/100g, 306.00±0.01 Kcal/100gand 302.00±0.02 Kcal/100 g respectively.

The graphical representation of Fig 1 it clearly denotes that, when compare to control (CNCP) there was decrease in moisture (39.92%), fat (39.13%), carbohydrates (12.97%) and energy (8.05%) in CBCP, whereas increase in ash (73.32%), protein (58.74%) and crude fibre (22.3%) was observed in CBCP due to incorporation of dried carrot and beetroot leaf powder.

Anti nutritional characteristics of instant powders

Total phenols content (TPC)

The total phenols in instant powders of CNCP, CBCP and CVCP were 3.78±0.00 mg/100 g RE, 5.91±0.00 mg/100 g RE and 4.63±0.00 mg/100 g RE respectively.

Flavonoids

The flavonoids content of CNCP, CBCP and CVCP was 1.18±0.00 mg/100g RE, 1.19±0.00 mg/100 g RE and 1.17±0.00 mg/100g RE respectively.

Tannins

The tannins content in CNCP, CBCP and CVCP was 0.48±0.01 mg/100 g, 0.75±0.01 mg/100 g and 0.64±0.01 mg/100 g respectively.

Vitamin C and total carotenoids

Vitamin C

The vitamin C content of CNCP, CBCP and CVCP was 32.54±0.01 mg/100g, 35.33±0.01 mg/100 g and 37.23±0.00 mg/100 g respectively.

Total Carotenoids

The total carotenoids of instant powders were 30.25±0.00 mg/100 g(CNCP), 39.22±0.00 mg/100 g (CBCP) and 41.67±0.01 mg/100 g (CVCP) respectively.

The physical parameters like colour parameter was higher for a* value of CNCP (28.53±0.00) shows that the control samples is more red and decreased values of CBCP (24.25±0.02). The results clearly showed that the L* value was high in CNCP (13.27±0.02) followed by CBCP (-15.24±0.02). The b* value was highest in control sample (13.58±0.02) than that of other CBCP (-8.54±0.02) experimental sample. The results showed that E* value was also high in control sample (34.27±0.02) than the experimental sample CBCP (29.87±0.02).

The particle size of CNCP was ranged from 168 to 170 µm with a mean value of 170 µm was highest followed by CBCP (165 µm). The lower particle size in experimental sample was may be due to addition of blanched vegetables. The bulk density was decreased 8.92% in CBCP and also there was decrease. There was increase in tapped density noted in CBCP (2.27%) when compared with that of control. It was evident from the values of Carr index that CNCP showed good flowability characteristics whereas CBCP were having fair flowability. It could be observed from the values of Hausner's ratio that all the instant powders were having intermediate cohesiveness. There was a 39.28% increase in titratable acidity in CBCP when compared with that of control (CNCP). The TSS was reduced in experimental samples than control sample. The percent decrease of TSS in CBCP was 52.85% when compared CNCP.

The water activity of CNCP, CBCP was 0.45±0.00, 0.46 ±0.00 with no statistical significant difference at 5% level.The WAI of the CNCP, CBCP were 5.44±0.02 ml/g, 5.05±0.02 ml/g respectively. There was 7.16% decrease in WAI in the CBCP. When compared with control 1.78% increase of WSI was seen in CBCP. When the experimental samples were

compared with control sample the percent decrease in OAC was 28.52% (CBCP). There was 4.14% (CBCP) decrease in WHC when compare to control sample.The oil holding capacity values of CNCP, CBCP obtained was 4.26±0.01 g/g, 3.84±0.02 g/g respectively. The hydrophilic-lipophilic index values of CNCP, CBCP obtained was 1.27±0.00, 1.31±0.00 respectively. When compare to control (CNCP) there was decrease in moisture (39.92%), fat (39.13%), carbohydrates (12.97%) and energy (8.05%) in CBCP, whereas increase in ash (73.32%), protein (58.74%) and crude fibre (22.3%) was observed in CBCP due to incorporation of dried carrot and beetroot leaf powder.

The anti-nutritional factors like total phenol content (TPC), total flavonoids, tannins were estimated in selected instant chutney powders and the values for CNCP, CBCP were 3.78±0.00 mg/100 g RE, 5.91±0.00 mg/100 g RE respectively. The flavonoids of CNCP, CBCP were 1.18±0.00 mg/100 g RE, 1.19±0.00 mg/100 g RE respectively. The tannins in CNCP, CBCP were 0.48±0.01 mg/100 g, 0.75±0.01 mg/100 g.The vitamin C of CNCP, CBCP was 32.54±0.01 mg/100 g, 35.33±0.01 mg/100 g. There was increase in CBCP (8.57%) when compared to that of control (CNCP) sample. The increase in vitamin C content in experimental samples was may be due to incorporation of green leafy vegetable which are naturally rich in vitamin C. The total carotenoids were 30.25±0.00 mg/100 g (CNCP), 39.22±0.00 mg/100 g (CBCP). There was an increase of total carotenoids in CBCP (29.65%) when compared with control (CNCP). The total carotenoids were 30.25±0.00 mg/100g (CNCP), 39.22±0.00 mg/100 g (CBCP).

CONCLUSION

According to the research, it is recommended to include instant powders in your diet on a regular basis because they contain vegetables, green leafy vegetables and underutilised green leafy vegetables, all of which have a host of health benefits and work as antioxidants, anticarcinogens and immune boosters. Hepatic triglyceride, blood pressure and heart disease levels are significantly reduced. It also has a high nutritional value.Therefore, it is advised that vegetables like carrot, basella alba, cabbage, as well as underutilised green leafy vegetables like carrot leaves and beetroot leaves, be included in the daily diet. Compared to commercially available powders, the newly designed instant powders are less expensive and simpler to make.

Author contributions

J. Prasoona conducted the experimentation, analysed the data and wrote the manuscript. B. Anila Kumari conceived the idea, oversaw the research and edited the manuscript. The research and data analysis have been overseen by Supta Sarkar. With statistical analysis, V. Kavitha Kiran and R. Swamy provided assistance. The finished manuscript has received the unanimous approval of all authors.

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