

Enrichment of products utilizing dehydrated uncommon green leafy vegetables

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ABSTRACT

The study was aimed to utilization of dehydrated green leafy vegetables for value added products development. Total seven green leafy vegetables were selected and analyzed for nutrient content. On the basis of high mineral content cauliflower green was selected for incorporation for product development *i.e.* *Shev, Chakali, Kharapra, Papad* and *Bundi*. Acceptability test was carried out by Hedonic test. Developed product was also analyzed for nutrient content. The result showed the among all selected vegetables cauliflower leaves exhibits highest mineral content in dehydrated form *i.e.* iron (234.12 mg/100g) and calcium (6504.62 mg/100g). Cauliflower leaves in dehydrated form was highly accepted at 10 per cent incorporation level in all product. The nutrient content of products was ranged for protein (12.12 to 20.95 g/100g), fiber (3.15 to 8.94 g/100g), iron (26.63 to 43.57 mg/100g), calcium (708.36 to 780.67 mg/100g), ascorbic acid (1.88 to 3.16mg/100g) and β -carotene (297.17 to 401.02ug/100g), respectively.

Key Words : Green leafy vegetables, Bundi, Cauliflower leaves, Iron, Calcium

INTRODUCTION

Green Leafy Vegetables (GLV) play an important role in human nutrition. They are made up of cellulose, hemi-cellulose and pectin substances that give them their texture and firmness (Mohammed and Sharif, 2011). They provide adequate amount of dietary fibers, minerals, vitamins and other nutrients. Apart from the variety which they add to the menu (Asaolu *et al.*, 2012), they are valuable sources of nutrients especially, contribute substantially to minerals, vitamins, fibers, proteins and other nutrients which are usually in short supply in daily diets. Vitamins are important for human health and among the vitamins, vitamin C is an essential micronutrient required for normal metabolic functions of the body. Vitamin C is the major water-soluble antioxidant in the human body. Not only does a vitamin C intake markedly reduce the severity of a cold, it also effectively prevents secondary viral or bacterial complications (Rahman *et*

al., 2006). Being rich in nutrients the leaves of the vegetables may be utilized for the purpose of enrichment of nutritional products (Oguntona and Oguntona, 1985). Green leafy vegetables constitute an indispensable constituent of human diet. These vegetables if not preserved within few days after harvest it will begin to decay. Dehydration is a simple method of preservation of green leafy vegetables. While it is of great importance to produce dehydrated vegetables without marked loss of nutrients during preparation and dehydration, green leafy vegetables are available for short duration but after dried, can be stored for long time (Awogbemi and Ogunleye, 2001). Hence, attempt was made on Enrichment of Products utilizing dehydrated uncommon greenleafy vegetables

METHODOLOGY

The various uncommon green leafy vegetables *i.e.* Drumstick Leaves, Amranthus Spinosus, Amranthus

Paniculatus, Cauliflower Leaves, Mustered Leaves, Bathua Leaves, Beetroot Leaves were procured from local market of Nanded city. Fresh, green undamaged, non-insect infested green leafy vegetables were sorted before washing the leaves. Cleaned vegetables were washed chopped and oven dried at 80 °C for 8 to 10 hours and powder was prepared till it ground to pass through a 40 mesh sieve and stored in airtight containers for further use. Dehydrated uncommon green leafy vegetables and enriched products were analyzed for proximate composition. The developed value added products were analyzed for its proximate composition, mineral content. The mineral analyzed were calcium, magnesium and iron. The developed products were also analyzed β -carotene and Vitamin-C. Five value added products *i.e.* Shev, Chakali, Kharapara, Papad and Bundi were prepared by incorporating different proportion of dried vegetables. In different variations main ingredient was partly replaced by uncommon green leafy vegetables powder. The per cent incorporation was 10, 15, 20, 25 and 30 per cent. The value added products were evaluated by selected panel members for various organoleptic sensory parameters were developed. All the selected panel members were requested to evaluate the recipes by using nine point scales hedonic the responses (Shrilaxmi, 2001).

RESULTS AND DISCUSSION

The chemical composition of dehydrated uncommon green leafy vegetables is presented in Table 1. The moisture content of the vegetables ranged from 11.77 to 19.80mg/100g. Highest being in *Amaranthus paniculatus* and lowest in Cauliflower leaves. Green leafy vegetables are fair source of protein but dehydrated leafy vegetables contained high amount of protein. Dehydrated cauliflower leaves contained high amount of protein (21.87g/100g) than the other selected vegetables. Cauliflower leaves showed the highest crude fiber values (7.59g/100g) and lowest was found to be in mustered leaves (3.57 g/100g). However, it is also reported that vegetables which has high fiber content. Carbohydrate content high in Mustured leaves *i.e.* 58.95g/100g and low in Cauliflower leaves *i.e.* 42.04g/100g. The values of ash content on dry weight basis ranged between 5.60 to 13.52 g/100g highest in cauliflower leaves (13.52g/100g) and lowest in Mustured leaves (5.60mg/100g).

The result of the analysis for minerals and vitamins content of the dehydrated green leafy vegetables are presented in Table 2. The iron content of the dehydrated leafy vegetables ranged between 26.51 mg/100g (Drumstick leaves) to 234.12 mg/100g (Cauliflower leaves). However, calcium content of the dehydrated green leafy vegetables was found to be higher in

Table 1 : Proximate composition of uncommon dehydrated green leafy vegetables

| Dry leafy vegetables | Moisture (g/100 g) | Protein (g/100 g) | Fat (g/100 g) | Fiber (g/100 g) | Carbohydrate (g/100g) | Ash (g/100g) |
|---|--------------------|-------------------|---------------|-----------------|-----------------------|--------------|
| Drumstick leaves (<i>Moringo oleifira</i>) | 13.78 | 16.55 | 2.41 | 4.40 | 50.4 | 9.52 |
| Amranthus spinosus (<i>Amranthus S.</i>) | 12.91 | 13.94 | 2.43 | 5.68 | 48.67 | 10.44 |
| Amranthus paniculatus (<i>Amranthus P.</i>) | 14.79 | 16.77 | 2.78 | 6.21 | 42.44 | 12.16 |
| Cauliflower leaves (<i>Brassica oleraceabotrytis</i>) | 13.37 | 21.87 | 2.12 | 7.59 | 42.04 | 13.52 |
| Musteredseed leaves (<i>Brassica gulcea</i>) | 12.48 | 12.40 | 2.02 | 3.57 | 58.95 | 5.60 |
| Bathua leaves (<i>Chenopodium album</i> Linn) | 11.77 | 17.40 | 1.91 | 4.89 | 51.58 | 10.46 |
| Beetroot leaves (<i>Bata vulgaris</i>) | 12.80 | 12.43 | 1.72 | 4.54 | 54.04 | 10.47 |

Table 2 : Mineral and vitamin content of uncommon dehydrated green leafy vegetables

| Dry leafy vegetables | Calcium (mg/100 g) | Iron (mg/100gm) | Ascorbic Acid (mg/100g) | β -Carotene (mg/100 g) |
|---|--------------------|-----------------|-------------------------|------------------------------|
| Drumstick leaves (<i>Moringo oleifira</i>) | 5620.62 | 26.51 | 18.21 | 6868.66 |
| Amranthus spinosus (<i>Amranthus S.</i>) | 7852.02 | 196.53 | 12.24 | 3966.66 |
| Amranthus paniculatus (<i>Amranthus P.</i>) | 6610.82 | 102.11 | 15.24 | 16485.66 |
| Cauliflower leaves (<i>Brassica oleraceabotrytis</i>) | 6504.62 | 234.12 | 12.54 | 2737.33 |
| Musteredseed leaves (<i>Brassica gulcea</i>) | 1372.18 | 88.27 | 08.61 | 2831.66 |
| Bathua leaves (<i>Chenopodium album</i> Linn) | 1145.22 | 99.21 | 08.34 | 2454.23 |
| Beetroot leaves (<i>Bata vulgaris</i>) | 3731.12 | 101.37 | 16.31 | 7866.66 |

Table 3 : Sensory scores of traditional food products with incorporation of fresh Cauliflower leaves

| Variations | | Mean value of sensory score | | | | | |
|---------------------|-----------------|-----------------------------|---------|---------|-------|------------|-----------------------|
| Dry leaves products | Incorporation % | Colour | Texture | Flavour | Taste | Appearance | Overall acceptability |
| Shev | 10 | 7.86 | 7.93 | 7.93 | 7.66 | 8.00 | 7.66 |
| Chakali | 10 | 8.06 | 7.86 | 7.73 | 8.00 | 7.86 | 7.73 |
| Kharapara | 10 | 7.93 | 7.73 | 7.73 | 8.06 | 8.00 | 7.80 |
| Papad | 10 | 7.86 | 7.80 | 7.66 | 7.86 | 8.00 | 7.66 |
| Boondi | 10 | 7.66 | 7.53 | 7.53 | 7.86 | 7.66 | 7.73 |

Table 4 : Nutritional composition of traditional food products with incorporation of dry Cauliflower leaves

| Nutrient | Shev | Chakali | Kaharapara | Papad | Boondi |
|------------------------------|--------|---------|------------|--------|--------|
| Moisture (g/100 g) | 10.32 | 12.19 | 5.16 | 8.35 | 10.07 |
| Protein (g/100 g) | 20.95 | 12.52 | 12.12 | 14.23 | 20.42 |
| Fat (g/100 g) | 8.42 | 8.21 | 11.24 | 13.45 | 8.29 |
| Fibre (g/100 g) | 4.96 | 4.34 | 3.15 | 4.09 | 8.94 |
| Carbohydrate (g/100g) | 51.43 | 59.91 | 66.59 | 56.76 | 48.36 |
| Ash (g/100gm) | 3.92 | 2.83 | 1.74 | 3.12 | 3.92 |
| Iron (mg/100 g) | 28.87 | 28.36 | 43.57 | 26.63 | 28.87 |
| Calcium (mg/100 g) | 724.36 | 708.36 | 720.10 | 780.67 | 724.36 |
| Ascorbic Acid (mg/100g) | 3.16 | 1.88 | 1.98 | 2.01 | 3.16 |
| β -Carotene (mg/100 g) | 401.02 | 317.68 | 297.17 | 323.93 | 401.02 |

Amranthus spinosus leaves (7822.02 mg/100g) and lower in Bathua leaves (1145.22mg/100g). The values for ascorbic acid in these vegetables ranged from 08.34mg/100gm (Bathua leaves) to 18.21mg/100g (Drumstick leaves). Further the levels of β -carotene in the dehydrated leafy vegetables ranged between 2454.23ug/100g (Bathua leaves) to 16485.66ug/100g (*Amranthus spinosus*).

Table 3 showed that the sensory scores of various traditional food products with incorporation of dried cauliflower leaves. Shev, Chakali, Kharapara, Papad and Bundi were developed in six variations *i.e.* 0%, 10%, 15%, 20%, 25% and 30%. Highly accepted variation was 10% incorporation of cauliflower leaves. Colour recorded highest marks for Chakali (8.06) and lowest for Bundi (7.66). Flavour recorded highest score for Shev (7.93) and lowest for Bundi (7.53), taste recorded highest score for Kharapara (8.06) and lowest for Shev (7.66). However overall acceptability score was recorded high for Kharapara.

Nutrient composition of developed products with incorporation of dries cauliflower leaves in various traditional products indicated in Table 4. The result showed that the protein content ranged from 12.12 to 20.95 g/100g, iron, calcium, ascorbic acid and β -carotene ranged from 26.63 to 43.57 mg/100g, 708.36 to 780.67mg/100g,

1.88 to 3.16mg/100g and 297.17 to 401.02 ug/100g, respectively.

Conclusion:

The study concluded that among all selected vegetables cauliflower leaves exhibits highest mineral content in dehydrated form *i.e.* iron (234.12 mg/100g) and calcium (6504.62 mg/100g). Cauliflower leaves in dehydrated form was highly accepted at 10 per cent incorporation level in all product. The nutrient content of dehydrated green leafy vegetables products was ranged for protein (12.12 to 20.95 g/100g), fiber (3.15 to 8.94 gm/100g), iron (26.63 to 43.57 mg/100g), calcium (708.36 to 780.67 mg/100g), ascorbic acid (1.88 to 3.16mg/100g) and β -carotene (297.17 to 401.02ug/100g), respectively.

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