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Nutritional and Organoleptic Evaluation of Dehydrated Cabbage Powder Incorporated in *Sev*

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***Abstract* – The objectives of the study was to develop value added products by utilizing cabbage-by- products, cabbage stems and outer leaves. Cabbage has been reported to contain high amount of fibre and bioactive components with high antioxidant activity. However, outer leaves and stems are discarded and treated as wastes and may only be used in animal feeds and fertilizers. It is interesting to convert the residue into a value added product. Cabbage stems and outer leaves were dried and grinded in order to produce cabbage powder. Dehydrated cabbage powder was added at 5, 10 and 15% into the sev. All the samples were subjected to sensory and physiochemical evaluation. Nutritional value of the product was improved with the incorporation of dehydrated cabbage powder.**

***Keywords* – Cabbage, Analytical Analysis, Dehydration, Sensory Characteristics, Value Added.**

I. INTRODUCTION

Cabbage (*Brassica oleracea or B. oleracea var Capitata, var. tuba*) is a member of the genus *Brassica* and the mustard family, *Brassicaceae.* Several other cruciferous vegetables (sometimes known as colecrops) are considered cultivars of *B. oleracea,* including broccoli, collard greens, Brussels sprouts, kohlrabi and sprouting broccoli. Vegetables are good sources of natural antioxidants and dietary fiber. Among vegetables white cabbage has been used for years in human nutrition due to its high anti-oxidant, polyphenol, dietary fiber, mineral and low calorie content. The main constitutes of white cabbage are carbohydrates, and around 1/3rd of these carbohydrates composed of dietary fiber and 2/3rd low molecular weight carbohydrates [11] All cabbage vegetables contain sulforaphan, which are a sulphorous and an effective anti-carcinogenic matter. [7] Observed the beneficial effect of Brassica vegetables on human health somewhat linked to phytochemicals. They prevent oxidative stress, induced detoxification enzymes, stimulate immune system, decrease the risk of cancers, inhibit malignant transformation and carcinogenic mutations as well as, reduce proliferation of cancer cells. Brassica vegetables contain a lot of valuable metabolites, which are effective in chemoprevention of cancer, what has been already documented by numerous studies. Cooking vegetables does not inactivate the effect of glucosinolates; they are also hydrolyzed by microflora in the human intestinal tract and are thus still bioavailable in cooked vegetables. In many cases, however, upto 40% of outer leaves and core of cabbage are discarded and treated as a waste and may be used for fertilizer and animal feeds. Processing these residues, which contain dietary fibre and antioxidants, could therefore add much value to the products. [5] Produced high dietary fibre powder from outer leaves of cabbage and reported that the powder contained approximately 41-43% total dietary fibre (dry basis). To maximize, the value of cabbage residues, the overall processing steps must be well defined to obtain the desired physical and nutritional quality. Drying, as one of the most important steps to produce dietary fibre powder, can often damage fruit and vegetable quality, especially their antioxidants. In addition to drying, pretreatments with chemicals or blanching to inhibit various undesirable enzymatic reactions may be required to improve the final quality of the product. Blanching naturally causes some changes to sensory and nutritional qualities of the products. It was reported that blanching could preserve phenolic compounds during subsequent drying since blanching lead to inactivation of phenolic compounds [12].

II. MATERIALS AND METHODS

2.1. *Procurement of Raw Materials: -*

The raw materials for the product development were collected from the Women's Hostel kitchen of SHIATS.

2.2. *Preparation of Dehydrated Powder:*

Kitchen waste
(Cabbage outer leaves and stems)
↓
Washing
Blanching for 3 min with water containing 2% salt & 10% citric acid
↓
Drain out with excess water
↓
Spreading on flat aluminium tray
↓
Tray drying at 60° - 65° for 15 hours
Dehydration till the moisture become 6 – 8 %
↓
Grinding into powder
↓
Storage (At ambience temperature in dry place)
[10]

2.3. *Development of Food Products:*

Three food products *(sev)* were prepared with cabbage dehydrated powder. For food product, the basic recipe

(control T_0) had three variations, T_1, T_2, T_3 respectively, where the amount of one or more ingredients was varied.

2.4. Nutritional Composition of Fresh and Dehydrated Powder of Cabbage -

Proximate analysis - Chemical estimation of moisture, ash, protein, fat, fiber and carbohydrate, mineral content was done by using standard procedures [1].

2.5. *Sensory Evaluation-*

Sensory evaluation of the food products for their acceptability was done by a panel of 5 judges. The score card based on the 9 point Hedonic Scale was used for sensory evaluation on the basis of evaluation of attributes like Colour and Appearance, Body and Texture, Taste & Flavour and Overall Acceptability [9].

2.6. *Statistical Analysis-*

Analysis of variance technique (ANOVA), Critical Difference and t-test were used to analyse the data [3].

2.7. *Determination of Nutritive Value:*

The nutritional value obtained by the chemical analysis of the fresh and dehydrated stems and leaves will be computed as well as food composition tables by [2] will be used to determine the nutritive value of the product prepared.

III. Results and Discussions

The proximate composition of fresh and dehydrated outer leaves and stems of cabbage are shown in table 1. The main component, apart from moisture was carbohydrates. The crude protein content of the fresh cabbage was estimated to be 0.83g and in dehydrated powder it was 19.02g. The results also showed that outer leaves and stems have negligible amount of fat and this makes them good for health [4]. The results showed that the ash content of the fresh vegetable was 0.62g and 5.87g in dehydrated powder. Similar results were noted by [6]. [8] Also stated that the loss of dry matter was one possible reason for an increase in dietary fibre in cooked carrots.

Table 2 shows result of organoleptic evaluation of "*sev*" with and without incorporation of fresh grated cabbage outer leaves and stems and dehydrated powder. Results showed that the overall acceptability was highest in T_1 (8.3) followed by T_0 (8.1), T_2 (7.7) and T_3 (6.9) for fresh cabbage sev and for dehydrated powder *sev* T_1 (8.4) followed by T_0 (8.2), T_2 (7.8) and T_3 (7.0) respectively and there was a significant difference, ($P<0.05$) between the control and treatments. The overall acceptability of T_1 was significantly better than control (T_0).

IV. Conclusion

It is concluded that fresh and dehydrated cabbage outer leaves and stems can be successfully incorporated in *sev*.

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Table: 1. Nutritional composition of fresh and dehydrated cabbage outer leaves and stem as per 100g

Nutrients	Fresh cabbage stem	Dehydrated cabbage powder
Moisture %	90.7	7.85
Ash (g)	0.62	5.87
Protein (g)	0.83	19.02
Fat (g)	0.3	0.8
Carbohydrate (g)	5.15	44.28
Iron (mg)	0.8	11.34
Dietary fiber (g)	2.4	22.3

Table 2. Average sensory score of different parameters in control and treated sample of dehydrated cabbage stems powder "Sev"

Parameters	T_0	T_1	T_2	T_3	Result
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	
Colour and appearance	8.1 ± 0.10	8.4 ± 0.10	7.8 ± 0.10	7.3 ± 0.35	S
Body and texture	8.2 ± 0.14	8.4 ± 0.10	7.9 ± 0.10	7.1 ± 0.19	S
Taste and flavour	8.3 ± 0.10	8.6 ± 0.05	7.8 ± 0.10	6.7 ± 0.15	S
Overall acceptability	8.2 ± 0.40	8.4 ± 0.05	7.8 ± 0.05	7.0 ± 0.05	S