INCORPORATION OF COWPEA LEAVES *(VIGNA UNGUICULATA)* IN THE DEVELOPMENT OF TRADITIONAL RECIPES

Verma Anisha[1] and Naaz Heena[2]

[1]Associate Professor, Department of Food and Nutrition, College of Community Science, ANDUAT, Kumarganj, Ayodhya

[2]Research Scholar, Department of Food Nutrition and Public Health, College of Community Science, SHUATS, Preyagraj

Corresponding Author

Dr.Anisha Verma

Associate Professor, Department of Food and Nutrition, College of Community Science, ANDUAT, Kumarganj, Ayodhya

Abstract

The present study are undertaken with the objective incorporation of cowpea leaves in the development of traditional recipes as well as to evaluate organoleptic quality, determine the nutritive value of the prepared products. Five different recipes *Sev, Cheela, Pakora, Gatta* and *Mathri* were made by incorporating cowpea leaves at 10 percent, 20 percent and 30 percent incorporation level refers as T_1, T_2 and T_3 respectively. Sensory evaluation of prepared products was done by using nine point Hedonic scale based score card. The nutritive value of the prepared products was determine using standard procedure given by AOAC, 2010. The experiment was replicated four times and the data obtained during investigation were statistically analysed using analysis of variance (ANOVA) and critical difference (CD) techniques. Treatment T_3 (main ingredient and fresh Cowpea leaves ratio was 70:30) was highly acceptable in terms of flavour, taste, colours and overall acceptability. Among the five products treatment T_3 (30 percent of fresh cowpea leaves incorporation level) had the highest amount of calcium, iron and carotene. It is therefore, concluded that the Cowpea leaves can be incorporated in various recipes to increase their nutritive value.

Keywords: Cowpea, incorporation, Hedonic scale, Nutritive value, Ingredients

Introduction

Cowpea (*Vigna unguiculata* (L.) Walp.) is an important legume in many developing countries **(Adam and Baidoo, 2008).** The cowpea young leaves are also consumed by humans in numerous Africans and Asian countries. The leaves are often served boiled, but are also consumed fried or fresh in relish. Drying is a common way of preserving cowpea leaves, but canning techniques and polythene bag packaging of fresh leaves have also been studied **(Singh *et. al.* 1997).** In Java, Indonesia, bean leaves are eaten raw in salads. In South Africa, bean leaves are commonly eaten by the black people as a cooked green called morogo or m'fino. Some peoples dry the bean leaves in the sun to store for the dry season **(Bittenbender *et. al.* 1977).** The cowpea leaves are usually cooked whole, along with petioles and parts of the stem; and, if the plant had flowered before it was picked, the flowers are also included. Cooked cowpea leaves have at least two-thirds the protein, seven times the calcium, three times iron, half the phosphorus (none of which is bound in phytic acid) and several hundred times the beta carotene and ascorbic acid of the cooked seed. Based on fresh nutrient content, cooked cowpea leaves probably have the same thiamine, eight times the riboflavin, and five times the niacin of the cowpea seed. Beta carotene and ascorbic acid retention of cooked fresh leaves and cooked dried leaves using traditional or improved solar dehydration methods indicate that both bean and cowpea leaves are superior sources of these vitamins compared with other common Kenyan vegetables **(Bittenbender *et. al.* 1984).** In per 100gm of Cowpea leaves protein is about 3.4 gram, fat about 0.7 gram, mineral is about 1.6 gram, crude fibre 1.2 gram, carbohydrate is 4.2 gram, energy is about 38 kcal, calcium is about 290 milligram, phosphorus is about 58 milligram, iron is about 20.1 milligram carotene is 6,702 milligram, thiamine is about 0.05 milligram, riboflavin is about 0.18 milligram, niacin is about 0.6 milligram and vitamin C is about 4 milligram **(Gopalan *et. al.* 2020).** The present study are undertaken with the objective incorporation of Cowpea leaves in the development of traditional recipes as well as to evaluate organoleptic quality, determine the nutritive value of the prepared products.

Materials And Methods

The present investigation was conducted in the Nutrition Research Laboratory, Department of Foods and Nutrition,SHUATS, Allahabad U.P.

Development of Food Products:
Fresh cowpea leaves were selected, cleaned , chopped and used for the preparation of different products.Five products namely**,** *Sev, Cheela, Pakora, Gatta* and *Mathri* were developed by incorporating cowpea leaves on different level.The basic recipes was standardized and serve as control (T_0) Three treatments i.e incorporation of cowpea leaves on different level were referred as T_1 (90:10), T_2 (80:20) , and T_3(70:30) respectively for each of five products.Fresh cowpea leaves were collected from farm , clean, wash and used.

Sensory evaluation of prepared products: Sensory evaluation of the prepared products beverage for their acceptability was done on the day of production by a panel of twenty trained judges selected among the faculty members of Ethelind College of Community Science, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj. The judges were requested to evaluate the prepared products with the help of a score card based on the 9-point Hedonic Scale (Color and Appearance, Consistency, Taste and Flavor and Overall Acceptability) **(Srilakshami, 2018).**

Determination of the Nutritional composition of the prepared products : Moisture, ash, protein, fat, fiber, beta carotene , calcium and iron were analyzed as pre procedure given by AOAC,2010. Total carbohydrate was analyzed as per procedure given by (Tollen's test) AOAC,2010 .

Statistical analysis
The data was statistically analyzed using analysis of variance (two way classification) and critical difference technique **(Ray and Sharma 2011).**

RESULTS AND DISCUSSION

Sensory evaluation of prepared products was done by using nine point Hedonic scale based score card and presented in Table 1.

Sensory acceptability of the *Sev*

Sev (Table 1 and Fig.1**)** prepared from incorporation of cowpea leaves showed that significant influence on Colour & Appearance. The Colour & score was highest in treatment T_3 (8.5) followed by treatment T_1 (6.9), T_0 (7.7), and T_2 (8.1). Body & Texture score was highest in treatment T_3 (8.4) followed by treatment T_1 (7.0), T_0 (7.9), and T_2 (8.0). Taste & Flavour score was highest in treatment T_3 (8.75) followed by treatment T_0 (6.75), T_1 (7.75), and T_2 (8.2). Overall acceptability score was highest in T_3 (8.66) followed by treatment T_1 (6.8), T_0 (7.79), and T_2 (8.09) .Results indicates 30 percent incorporation level of fresh cowpea leaves in sev was liked every much by the panel member in comparison to others treatment.

Sensory acceptability of the *Cheela*

Results indicates that incorporation of cowpea leaves had significant influence on Colour & Appearance o*f cheela.* The highest score of colour and appearance was found in T_3 (8.5) followed by treatment T_0 (7.65), T_1 (8.05), T_2 (7.25). Body & Texture score was highest in treatment T_3 (8.4) followed by treatment T_2 (7.3), T_0 (7.9), and T_1 (8.0). Taste & Flavour score was highest in treatment T_3 (8.45) followed by treatment T_2 (7.15), T_1 (8.15), and T_2 (8.1). Overall acceptability score was highest in T_3 (8.44) followed by treatment T_0 (7.23), T_1 (7.88), and T_2 (8.06) **(Table 1 and Fig.2).** Results indicates 30 percent incorporation level of fresh cowpea leaves in *cheela* was liked every much by the panel member in comparison to others treatment.

Sensory acceptability of the *Pakora*

Incorporation of cowpea leaves in ***Pakora*** **(** Table 1 and **Fig.3)** had significant influence on Colour & Appearance, Body & Texture, Taste & Flavour and overall acceptability score was highest in treatment T_3 compared to followed by treatment T_0 , T_1 , and T_2.

Sensory acceptability of the *Gatta*

Incorporation of cowpea leaves had significant influence on the sensory acceptability of ***Gatta*** . Results indicate that as well as incorpration of leaves increase the acceptability of ***Gatta*** is also increased.It was found that Colour & Appearance, Body & Texture Taste & Flavour and Overall acceptability was highest in T_3, followed by treatment T_0 , T_1 , T_2 (Table 1 and Fig.4).

Sensory acceptability of the *mathari*

Incorporation of cowpea leaves in ***Mathri*** had significant influence on Colour & Appearance score was highest in T_3 (8.5) followed by treatment T_0 (7.25), T_1 (7.65), T_2 (8.05). Body & Texture score was highest in treatment T_3 (8.4) followed by treatment T_0 (7.3), T_1 (7.9), and T_2 (8.0). Taste & Flavour score was highest in treatment T_3 (8.45) followed by treatment T_0 (7.15), T_2 (8.1), and T_2 (8.15). Overall acceptability score was highest in treatment T_3 (8.44) followed by treatment T_0 (7.23), T_1 (7.88), and T_2 (8.06) (Table 1 and Fig.5).

Nutritional Composition of prepared products

Table 2 presents the nutrient content of various products formulated with different levels of cowpea leaf incorporation. The data indicate that increasing the proportion of cowpea leaves significantly enhances the calcium iron and beta carotene content of the products. Conversely, the levels of energy, protein, and fat show a significant decrease with higher leaf incorporation. Based on these findings, it can be concluded that the formulated products are a valuable source of iron, calcium.and beta carotene.According to Ndlovu and Afolayan (2008), cowpea leaves provide substantial amounts of iron, calcium, and provitamin A carotenoids. Similarly, Uusiku et al. (2010) emphasized the role of indigenous leafy vegetables, such as cowpea leaves, in alleviating micronutrient deficiencies, particularly in resource-limited populations.Thus, incorporating cowpea leaves into commonly consumed traditional snacks offers a promising strategy to enhance dietary iron, calcium, and beta-carotene intake through culturally acceptable foods.

conclusion

Based on the findings, it can be concluded that cowpea leaves can be successfully incorporated into the development of value-added food products. Among the prepared products (*Sev, Cheela, Pakora, Gatta, and Mathri)*, treatment T3 — with a 70:30 ratio of main ingredient to fresh cowpea leaves — was the most acceptable in terms of flavour, taste, colour, and overall sensory quality. The iron content in the developed products ranged from 7.87 to 10.13 mg/100g, calcium from 128.54 to 133.1 mg/100g, and beta-carotene from 2014.1 to 2017.54 µg/100g. These results indicate that increasing the level of cowpea leaf incorporation significantly enhances the iron, calcium, and beta-carotene content of the final products.

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RESULTS AND DISCUSSION

Table.1 Average sensory scores of control and treated sample of prepared products

Parameters	Colour & Appearance				Body & Texture				Taste & Flavour				Overall Acceptability			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
Sev	7.7	6.9	8.1	8.5	7.9	7.0	8.0	8.4	6.75	7.75	8.2	8.75	7.79	6.8	8.09	8.66
Cheela	7.65	8.05	7.25	8.5	7.9	8.0	7.3	8.4	8.1	8.15	7.15	8.45	7.23	7.88	8.06	8.44
Pakora	6.95	7.7	7.9	8.2	6.8	7.35	7.85	8.55	8.05	7.25	8.15	8.3	6.99	7.69	8.0	8.35
Gatta	7.4	8.15	8.2	8.3	7.7	8.1	8.15	8.35	8.0	8.05	8.3	8.7	7.6	8.0	8.1	8.3
Mathri	7.25	7.65	8.05	8.5	7.3	7.9	8.0	8.4	7.15	8.1	8.15	8.45	7.23	7.88	8.06	8.44

S = Significant ($p \leq 0.05$)

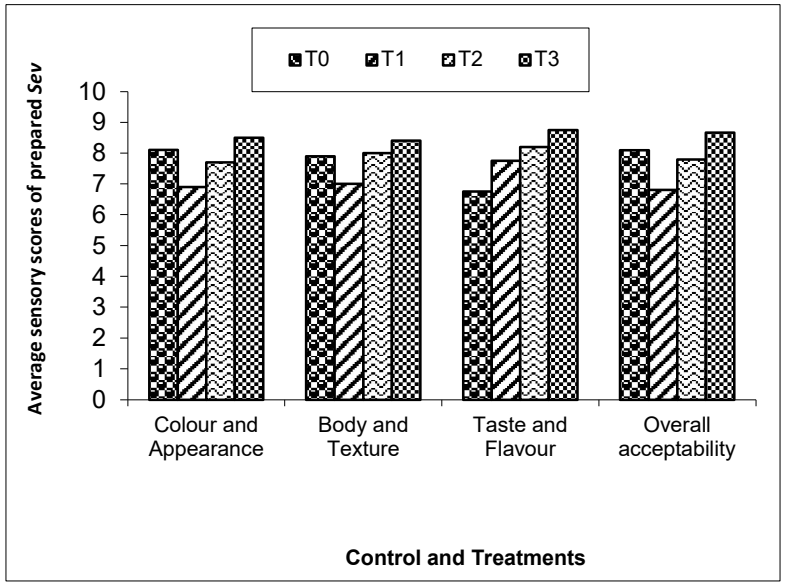

Fig 1 Average sensory scores of prepared *Sev.*

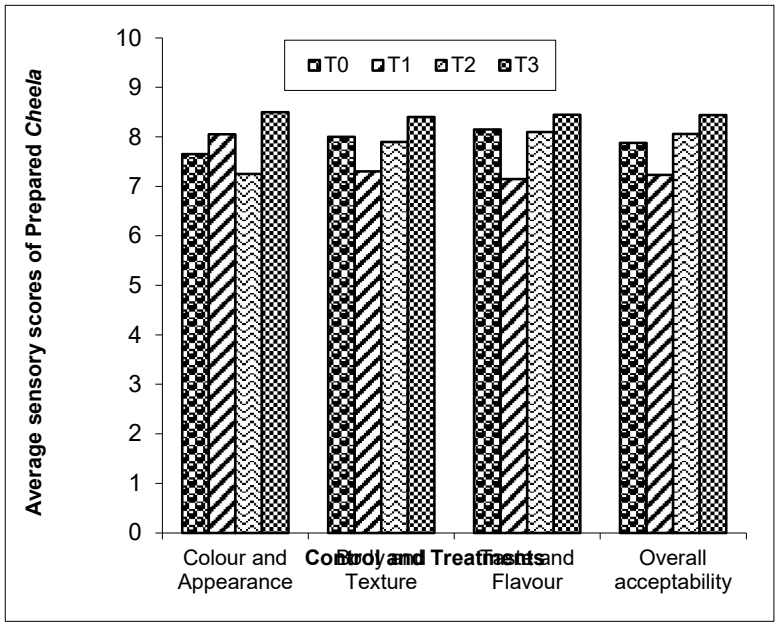

Fig 2 Average sensory scores of prepared *Cheela*

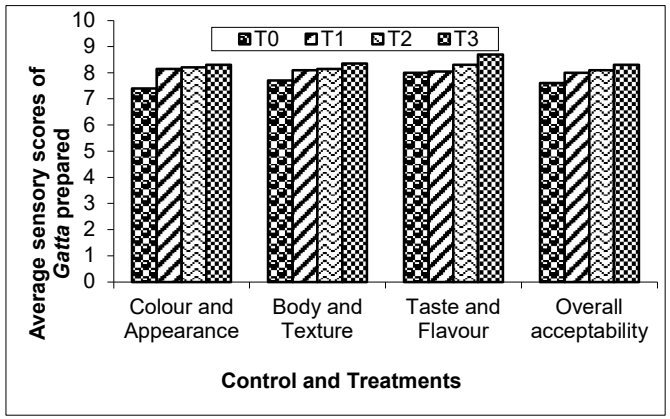

Fig 3Average sensory scores of prepared ***Pakora***

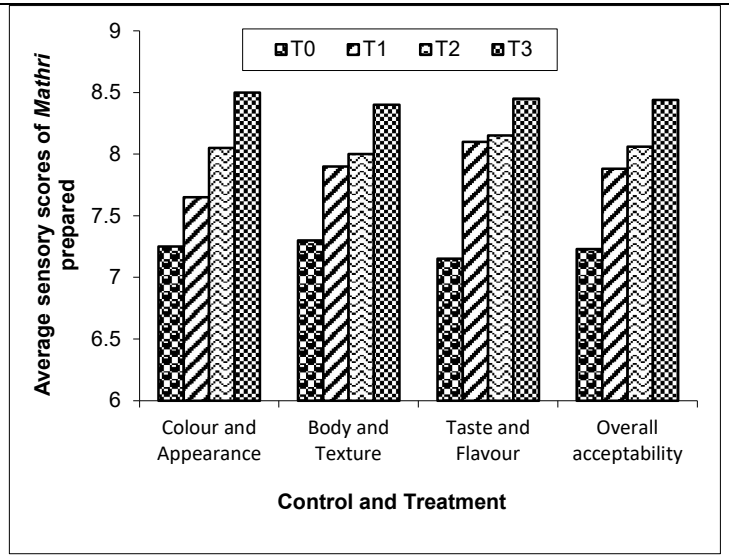

Fig 4 Average sensory scores of prepared *Gatta*

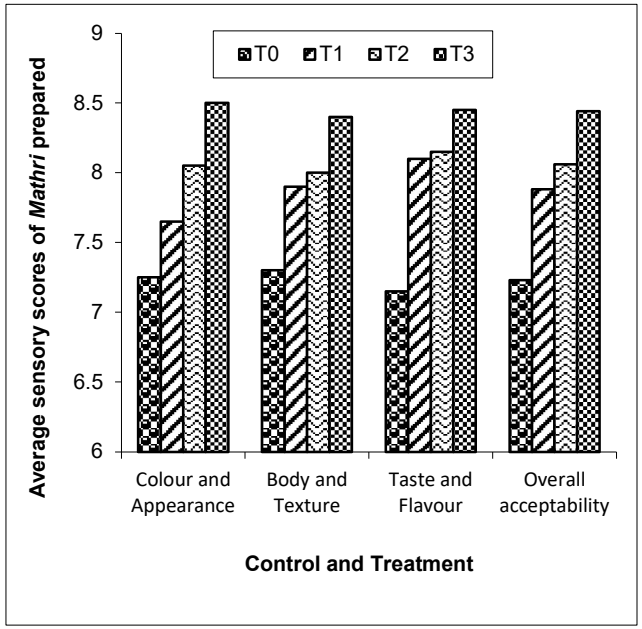

Fig 5 Average sensory scores of prepared *Mathri*

Table.2 Nutritive value of the prepared products incorporated cowpea leaves per 100 g (on the basis of raw ingredients):

Products / Nutrients	*Sev*				*Cheela*				*Pakora*				*Gatta*				*Mathri*			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
Energy(kcal)	555	522	488	455	467	441	398	364	602	566	533	499	467	441	398	364	595	559	526	492
Protein(g)	20.84	19.1	17.36	15.62	20.92	19.06	17.44	15.7	20.92	19.06	17.44	15.7	20.92	19.06	17.32	15.55	20.84	19.1	17.36	15.62
Fat (g)	20.61	20.12	14.63	14.14	15.61	15.11	14.62	14.13	25.61	25.11	24.62	24.13	10.61	10.12	9.63	9.14	15.61	15.12	9.63	9.14
CHO (g)	60.47	54.9	49.33	43.76	60.91	54.78	49.77	44.2	60.91	54.76	49.21	43.64	60.47	54.9	49.33	43.76	73.9	66.51	59.31	52.61
Calcium(mg)	62.9	86.3	109.7	133.1	60.69	81.74	105.14	128.54	60.69	81.74	105.14	128.54	62.9	86.3	109.7	133.1	23	56.3	79.7	103.1
Iron (mg)	5.69	7.17	8.65	10.13	5.36	6.81	8.29	9.77	5.36	6.81	8.29	9.77	5.69	7.87	8.65	10.13	5.69	7.17	8.65	10.13
Phosphorus(mg)	331.5	286.2	276.9	249.6	337	288.7	279.4	252.1	337	306.7	279.4	252.1	331.5	286.2	276.9	249.6	331.5	286.2	276.9	249.6
Carotene(µg)	6.94	677.14	1347	2017	3.5	673.7	1343.9	2014.1	3.5	673.7	1343.9	2014.1	6.94	677.14	1347	2017	6.94	677.14	1347	2017