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Sensory acceptability, nutrient composition and cost of leaf mix powder Urad dal badi

[*1] Singh Richa, [2] Gupta Alka, [3] Singh Shipra
[1, 3] M.Sc. Student, Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India
[2] Assistant Professor, Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

Abstract
To complete a healthy diet plan one should consider the nutrition of leaf mix powder. Leaf mix powder from moringa, chickpea and tamarind are a best way to found the nutrient. The objective to assess the organoleptic attributes nutritive value and cost of the prepared healthy food product. The value added product was prepared in three different combinations by replacing the amount of urad dal with leaf mix powder i.e. sensory evaluations of the Urad dal badi were done by the 9 point hedonic scale based score card. T_1 97.5:2.5, T_2 95:5 and T_3 92.5:7.5. The nutritive of the prepared product was calculated using food composition table. The experiment was replicated three times and the data obtained during experiment were statistically analyzed using analysis of variance (ANOVA) and critical difference (CD) techniques. Sensory evaluation of prepared product T_1 was highly acceptable on the basis of overall acceptability for *Badi*. The treatment T_1 was found to have the highest nutritive value with increase in protein (40.42g), fat (29.51g), calcium(1379.63mg), iron(23.71mg) and fibre (50.59g) and cost was decreased marginally in all treatment of prepared product comparatively control. So it was concluded from the results that the value addition of incorporation of leaf mix powder at different level can improve the nutritional quality of food products thereby enhancing the nutritive value of the product as well as provide variety in the diet for the improvement of health related issues.

Keywords: leaf mix powder, urad dal, nutritive value, cost and healthy food

Introduction
Ready-to-cook has all the ingredients prepared/semi-cooked, and requires one to follow the process given in the package to actually cook and bring the dish together. *Moringaoleiferais* universally refered to as the *miracle plant* or the tree of life.*M.Oleifera* leaf has been used an alternative food source tocombat malnutrition, especially among children and infants (Anwar *et al.*, 2007) [2]. In some part of the world, *M. Oleifera* is referred to as the 'drum stick tree' or the 'horse radish tree'. (Anwar and Bhanger, 2003; Prabhu *et al.*, 2011) [1, 8]. Its leaves (weight per weight) have the calcium equivalent of four times that of milk, the vitamin C content is seven times that of oranges, while its potassium is three times that of bananas, three times the iron of spinach, four times the amount of vitamin A in carrots, and two times the protein in milk (Kamal, 2008) [7]. *M. Oleifera*leavesare also good source of phytonutrients such as carotenoids, tocopherols and ascorbic acid (Saini *et al.*, 2014) [10]. *Moringaoleifera* is not only an important source of naturally occurring antioxidant (Dillard and German 2000) [4]. Ancient medicinal system relies on several plant products used by traditionally human communities in many parts of the world for different diseases. *M. oleifera* leaves can be used successfully in its dried state or powdered form for the purpose of making different types of meals and porridge diets mostly aiming pregnant expectant mothers, nursing mothers, infants and young children, as well as adults of all age groups mostly due to their nutritional and medicinal properties. Chickpea (*Cicerarientinum* L.) and lentil (Lens culinarisMedik.) are cool-season annual pulse crops that belong to the Leguminosae family. Chickpea leaves are a good source of carbohydrates and protein, together constituting about 80% of the total dry seed mass in comparison to other pulses. Chickpea leaves are cholesterol free and is a good source of dietary fibre, vitamins and minerals. Chickpea leaves have been and is being consumed by humans since ancient times owing to its good nutritional and functional food with potential beneficial effects on human health. Tamarind (*Tamarindusindica Linn.*) (Hindi-Imli) is found throughout most of the tropical regions. *T. Indica* leaves are very rich in minerals, potassium, phosphorus, calcium and magnesium. Tamarind leaves is extensively used in the Indian system of medicine, Ayurveda. Tamarind leaves preparations are universally recognized as refrigerants in fevers and as laxatives. The fruit pulp is used as a digestive, a remedy in bile disorders, to alleviate sunstroke, in datura poisoning and alcoholic intoxication. A renewed interest in 'natural preservation' appears to be stimulated by present food safety concerns, growing problems with microbial resistance and rise in the production of minimal processed food joined with 'green' image policies of food industries (Chen *et al*., 2013) [3].

Materials and Methods
The present Study was conducted in the research laboratory of Foods Nutrition and Public Health department, ECHs, SHUATS, Allahabad. All the required raw materials were

purchased from the local market of Allahabad.

Leaf mix powder was prepared by using some processing technique such as moringa, chickpea and tamarind leaves were soaked cleaned all the leaves and made them free from dust and all the foreign material which can be harmful for human consumption. Wash out all the grains using water and keep them for drying in dehydrator at 60^0C to 65^0C for a day. When drying have been done keep all dried leaves individually in a mixer for making leaf powder one by one. When mixing has been done, collect all the leaf powder and make them for use after sieving. After processing all three types of leaf powder (moringa leaves 40%, chickpea leaves 30% and tamarind leaves 30%) were used in different rations for the preparation of urad dal badi.

The control T_0 and three different treatments were prepared in which control (T_0) was prepared by using 100% Urad dal while three other treatment were prepared by utilization of urad dal and leaf mix powder like T_1 97.5:2.5, T_2 95:5 and T_3 92.5:7.5. The experiment was replicated 3 times to get an average value. Sensory evaluation of the urad dal badi for their acceptability was done by a panel of judges. The score card based on the 9 point Hedonic Scale (Srilakshmi, 2007) [9]. The nutritive value of prepared products was calculated by using the value of per 100 grams of each raw ingredient. (Gopalan *et al.,* 2015) [6]. Costs of the prepared badi were calculated taking into account the cost of individual raw ingredients used in the preparation of food products as the prevailing market price. The data was statistically analyzed by using analysis of variance (two way classification) and critical difference technique. A significant difference between the treatments was determined by using CD (Critical difference) test. Gacula and Singh (2008) [5].

Results and Discussion

Organoleptic Evaluation of the Prepared Leaf Mix Powder Products

Table 1: Average sensory scores of control and treated sample of *Urad dal Badi*.

Control and Treatments	Colour and Appearance	Body and Texture	Taste and Flavor	Overall Acceptability
T_0	8.66	8.53	8.6	8.46
T_1	8.56	8.4	8.63	8.43
T_2	8.13	8.1	8.6	7.6
T_3	7	7.06	7.13	6.83
F-test	S	S	S	S
C.D	0.26	0.03	0.24	0.07

The data illustrated in the above table pertaining to the average sensory scores of different parameters in control and treated samples of *dal Badi*, clearly indicates that in terms of colour and appearance T_1(8.56) had the highest score followed by T_0 and T_3. T_1 had the highest score in other parameters i.e. overall acceptability making it quite obvious that the *dal badi* incorporated with dehydrated leaf mix powder (40% Moringa leaves, 30%Chickpea leaves, 30%Tamarind leaves) did have a green effect on the colour of *dal badi.* T_1 had the highest score in body and texture (8.4) and taste and flavour (8.63) making it obvious that the *dal badi incorporation* of 2.5 percent leaf mix powder (Moringa leaves, Chickpea leaves and Tamarind leaves) improved taste and flavour and body and texture of the *dal badi.* Sensory evaluation showed that Badi was acceptable up to 2.5 percent level of incorporation, (with Moringa leaves, Chickpea leaves, and Tamarind leaves).

Nutritive Value of Prepared Product Control and Best Treatment (nutrient/100g)

Table 2: Average percentage of nutrients in control and best treatment sample of Urad dal badi

Treatments	Energy (kcal)	Protein (g)	Fat (g)	CHO (g)	Calcium (mg)	Iron (mg)	Fiber (g)
T_0	708.13	40.14	29.41	114.31	1379	23.11	42.08
T_1	706.37	40.42	29.51	114	1379.63	23.71	50.59

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The table 2. shows the average nutritional composition of *Urad dal badi* with incorporation of dehydrated leaf mix powder (moring leaves, chickpea leaves and tamarind leaves). Result show that the nutrients content i.e. energy, protein, fat, carbohydrate, calcium, iron and fiber with addition of dehydrated leaf mix powder. Protein, fat, calcium, iron and fiber increased with addition of dehydrated leaf mix powder. Except energy and carbohydrate all the nutrients content of experimental best treatment of *Urad dal badi* were better than control. Nutrient composition was improved for dietary fiber, protein, fat, energy and minerals calcium and iron after value addition of leaf mix powder at different levels. Dehydrated leaf mix powder was found superior in nutrition quality compare to without added leaf mix powder.

Cost of the Badi Based on the Raw Materials

The total cost of *Urad dal badi* per 100g of dry ingredients at the prevailing cost of the raw materials was T_0 is Rs. 11.5 for treatment, T_1 is Rs. 11, $T_2$is Rs. 10.5and T_3 is Rs. 10. It is therefore concluded that the control T_0 has the highest cost and T_1, T_2 and T_3 has the lowest cost because the incorporation level of Urad dal did decrease the cost of the prepared products marginally.

Conclusion

It is concluded that the Leaf mix powder (moringa leaves, chickpea leaves and tamarind leaves) enhance the nutritive value of Badi. Most of the Indian Snacks like Badi can be successfully incorporated with Leaf mix powder to enhance the sensory properties of the product. Sensory evaluated of prepared product T_1 (97.5% Urad dal + 2.5% leaf mix powder) was highly acceptable on the basis of overall acceptability for Badi. Cost was decreased marginally in all treatment of prepared products comparatively control.

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