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# Formulation and Sensory Evaluation of Fenugreek Microgreens Incorporated Instant Chutney Powders

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## ABSTRACT

The major challenge of the present era is to maintain good quality of food. In the present research, ready-to-eat instant chutney powders were prepared using varying proportions of fenugreek microgreen powders. All developed instant chutney powders were subjected to sensory evaluation. The mean sensory scores of chutney powders showed that the sensory scores for all the attributes i.e., appearance, color, flavor, taste, texture and overall acceptability were ranged from 6.20 to 9.00, 6.40 to 8.93, 6.26 to 9.00, 6.60 to 8.93, 6.67 to 9.00, 6.26 to 8.93. It was observed that control instant chutney powder revealed highest acceptability index (99.61%) followed by FCP1 (93.70%), FCP2 (88.22%), FCP3 (83.24%), FCP4 (78.87%) and FCP5 (71.09%), indicating that FCP1 was the best formulation among all formulations of fenugreek microgreens incorporated instant chutney powders. Microgreens are abundant in nutrients and also have potential to enhance the nutritional quality of the human diet. Utilizing these nutrient rich microgreens can be a good alternative to combat the numerous deficiencies, which are prevalent in today's populations.

**Keywords** Instant chutney powders, Fenugreek, Microgreens, Sensory evaluation.

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## INTRODUCTION

Green leafy vegetables forms an important component of healthy diets world-wide (FAO 2014) and their consumption is advocated to be on the rise due to increased consumer awareness regarding the health benefits of green Leafy vegetables in their diets (Rai *et al.* 2006, Rocha and Morais 2007). Greens are rich sources of phytochemicals, especially the bioactive compounds which provides protection against diseases (Slattery *et al.* 2000, Nakahara *et al.* 2002, Islam 2006, Pollock 2016). Mostly, ascorbic acid, carotenoids, chlorophyll, polyphenols and other phytochemicals are present in plenty in greens

**Table 1.** Formula for the development of fenugreek microgreens incorporated instant chutney powders. Note : All ingredients were measured in grams.

| Ingredients | CCP | FCP1 | FCP2 | FCP3 | FCP4 | FCP5 |
|---|---|---|---|---|---|---|
| Microgreen powder | 0.0 | 5.0 | 10.0 | 15.0 | 20.0 | 25.0 |
| Black gram dhal | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 |
| Bengal gram dhal | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Cumin powder | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Coriander seeds | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 |
| Garlic | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 |
| Tamarind powder | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Chili powder | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| Common salt | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |

CCP: Control instant chutney powder
FCP1: 5% fenugreek microgreen incorporated instant chutney powder
FCP2: 10% fenugreek microgreen incorporated instant chutney powder
FCP3: 15% fenugreek microgreen incorporated instant chutney powder
FCP4: 20% fenugreek microgreen incorporated instant chutney powder
FCP5: 25% fenugreek microgreen incorporated instant chutney powder

(Rodriguez-Amaya *et al.* 2007). Aside from other health implications greens also contribute to higher antioxidant activities.

Basically, green leafy vegetables are highly perishable so these can deteriorate easily. During storage several changes can occur in their phytochemical content as well as sensory quality attributes like color, appearance, texture, taste and flavor (Barrette *et al.* 2010).

Now-a-days, leafy vegetables are available in fresh cut forms in the developed countries such as ready-to-eat packaged salads or greens due to their convenience factor (Hedges and Lister 2005). Other forms of green leafy vegetables are gaining interest as microgreens, which is more popular in western diet. Microgreens form the target of high-end markets for fresh produce as specialty greens due to their nutritional content, special health benefits and strong flavors, colors along with tender textures (Xiao *et al.* 2012, Aggarwal and Aggarwal 2013). The demand for such greens is also gaining interest in the developing countries where there is a need to adapt indigenous and traditional green leafy vegetables as a part of health-promoting strategies for good nutrition and wellness of the population.

Fenugreek (*Trigonella foenum-graecum* L.) is a commonly used indigenous green leafy vegetables. Fenugreek belongs to Fabaceae family which is a self-pollinating leguminous plant, extensively found in the semi-arid regions of India, Mediterranean region, North Africa and Europe. Fenugreek is widely used for culinary and medicinal purposes since decades.

Furthermore, greens deteriorate very rapidly after harvesting because of their perishable nature which will become unfit for consumption and moreover, one way to preserve these greens is to dehydrate them by which they can be preserved for longer time and nutrients can be attained in concentrated forms later these dehydrated greens can be utilized in the preparation of various ready to eat food adjuncts. In the present study an attempt has been made to prepare ready to eat instant chutney powders with the incorporation of dehydrated fenugreek microgreens.

## MATERIALS AND METHODS

The present study was conducted at Department of Foods and Nutrition, Post Graduate and Research Center (PGRC), Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad (India).

**Preparation of raw materials :** Fenugreek (*Trigonella foenum-graecum* L.) microgreens were grown in trays using vermicompost enriched soil under ambient conditions. Fenugreek seeds was purchased from local market of Hyderabad, India (Shamshabad, Hyderabad). The seeds were soaked in potable water. Pre-soaking leads to quicker germination and more even growth of microgreens. After that, the seeds were sown in trays with even depth. The trays were covered for first 3 days for good germination. After that, these trays were exposed to light and water was sprinkled

**Table 2.** Mean sensory scores of fenugreek microgreen incorporated instant chutney powders. Note: Values are expressed as mean ± standard deviation of fifteen determinations.

| Sample | Appearance | Color | Flavor | Taste | Texture | Overall acceptability |
|---|---|---|---|---|---|---|
| CCP | 9.00±0.00$^{a}$ | 8.93±0.26$^{a}$ | 9.00±0.00$^{a}$ | 8.93±0.26$^{a}$ | 9.00±0.00$^{a}$ | 8.93±0.26$^{a}$ |
| FCP1 | 8.60±0.51$^{a}$ | 8.60±0.51$^{ab}$ | 8.20±0.77$^{b}$ | 8.87±0.35$^{a}$ | 8.40±0.83$^{b}$ | 7.93±0.46$^{b}$ |
| FCP2 | 8.13±0.64$^{b}$ | 8.26±0.70$^{b}$ | 7.46±0.83$^{c}$ | 8.73±0.45$^{a}$ | 7.73±0.70$^{c}$ | 7.33±0.48$^{c}$ |
| FCP3 | 7.53±0.74$^{c}$ | 7.73±0.70$^{c}$ | 7.07±0.59$^{cd}$ | 7.73±0.46$^{b}$ | 7.60±0.74$^{c}$ | 7.29±0.49$^{c}$ |
| FCP4 | 7.46±0.92$^{c}$ | 7.60±0.91$^{c}$ | 7.00±0.53$^{d}$ | 6.73±0.47$^{c}$ | 7.00±0.65$^{d}$ | 6.80±0.41$^{d}$ |
| FCP5 | 6.20±0.41$^{d}$ | 6.40±0.51$^{d}$ | 6.26±0.46$^{e}$ | 6.60±0.51$^{c}$ | 6.67±0.49$^{d}$ | 6.26±0.46$^{e}$ |
| Mean | 7.82 | 7.92 | 7.50 | 7.93 | 7.73 | 7.43 |
| SE (m) | 0.114 | 0.108 | 0.112 | 0.113 | 0.106 | 0.100 |
| CD | 0.442 | 0.459 | 0.434 | 0.307 | 0.458 | 0.315 |
| CV% | 7.79% | 7.98% | 7.96% | 5.34% | 8.16% | 5.85% |

Means within the same column followed by a common letter do not differ significantly at ($p \leq 0.05$)
CCP : Control instant chutney powder
FCP1: 5% fenugreek microgreen incorporated instant chutney powder
FCP2: 10% fenugreek microgreen incorporated instant chutney powder
FCP3: 15% fenugreek microgreen incorporated instant chutney powder
FCP4: 20% fenugreek microgreen incorporated instant chutney powder
FCP5: 25% fenugreek microgreen incorporated instant chutney powder

two times in a day. All microgreens were harvested after 10-12 days when their cotyledon leaves were fully open and true leaf was about to come. The roots were removed and leaves were cleaned. All the microgreens were subjected to blanching prior to drying to deactivate the enzyme activity as well as to retain more color. After that all blanched microgreens were placed in tray drier at 52±2°C for 5-6 hrs. After completion of drying, microgreens were cooled, powdered and packed in high-density polyethylene (HDPE) re-sealable bags for further use. All other required ingredients were purchased from local market to prepare instant chutney powders.

**Development of instant chutney powders :** Six types of instant chutney powders were prepared. Control chutney powder (CCP) was prepared using ingredients mentioned in Table 1. Instant chutney powders prepared from fenugreek microgreens with different formulations were given the names as FCP1, FCP2, FCP3, FCP4 and FCP5 (Table 1). All the formulations were compared with control chutney powder as shown in Fig.1. All the ingredients were weighed individually. Ingredients like black gram dhal, bengal gram dhal, cumin and coriander seeds were dry roasted separately to develop good flavor. All the roasted ingredients, garlic, tamarind were powdered and mixed together in blender, salt and different proportions of each microgreens powders were added. Prepared instant chutney powders were served with a popular breakfast dish – idli.

**Sensory analysis :** Sensory analysis was done by a semi-trained panel of 15 members using a 9 point hedonic scale (Meilgaard *et al.* 1999). They compared all the formulated instant chutney powder and given scores according to their perception. Statistical analysis (One-way Anova) was performed for the obtained responses and one best formulation was selected for further studies.

## RESULTS AND DISCUSSION

**Sensory analysis of fenugreek microgreens incorporated chutney powder :** Sensory analysis involves the inspection of a food product by the senses viz. sight, smell, taste and touch for various quality attributes like appearance, color, flavor, aroma, taste, texture and sound (Sharif *et al.* 2017).

Instant chutney powders (n=6) were prepared using varying proportions of fenugreek microgreen powders. All developed instant chutney powders were subjected to sensory evaluation. The sensory

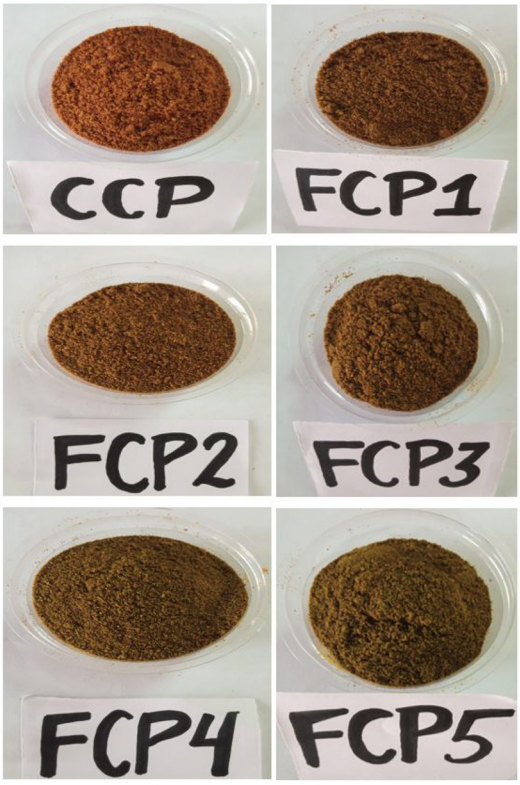


**Fig. 1.** Formulations of chutney powders.

evaluation results of control instant chutney powders (CCP) and fenugreek microgreen incorporated instant chutney powders (FCP1, FCP2, FCP3, FCP4 and FCP5) are given in Table 2.

The mean sensory scores of fenugreek microgreen incorporated instant chutney powder showed that the sensory scores for all the attributes i.e., appearance, color, flavor, taste, texture and overall acceptability were ranged from 6.20 to 9.00, 6.40 to 8.93, 6.26 to 9.00, 6.60 to 8.93, 6.67 to 9.00, 6.26 to 8.93 (Table 2).

**Appearance :** Appearance is the main sensory attribute which is perceived by the human senses and plays a very important role in final selection of food. The appearance of a food can increase or decrease the appetite which will resulting in pleasure or depression. With respect to the control instant chutney powder (9.00), 5% fenugreek microgreen incorporated instant chutney powder i.e., FCP1 (8.60) had highest acceptability for appearance followed by FCP2 (8.13), FCP3 (7.53), FCP4 (7.46) and FCP5 (6.20).

**Color :** Color is the main attribute in the selection or rejection of any food items. The acceptable sensory scores of fenugreek microgreen incorporated instant chutney powder for color was higher in FCP1 (8.60) than FCP2 (8.26), FCP3 (7.73) and FCP4 (7.60) and FCP5 (6.40) when compared with control instant chutney powder (8.93).

**Flavor :** Flavor is sensory attribute which is used to denote the sensations of odor, taste and mouthfeel. After control instant chutney powder (9.00), FCP1 (8.20) showed highest scores for flavor followed by FCP2 (7.46), FCP3 (7.07), FCP4 (7.00) and FCP5 (6.26). The taste scores of fenugreek microgreen incorporated instant chutney powder showed that when compared to FCP2 (8.73), FCP3 (7.73) and FCP4 (6.73), FCP1 (8.87) had higher score while FCP5 (6.60) had lower scores with respect to control instant chutney powder (8.93).

**Texture :** Texture is considered as a combination of multiple senses i.e. touch, mouthfeel and sight. The mean sensory scores of fenugreek microgreen incorporated instant chutney powder for texture when compared with the control instant chutney powder (9.00), was highest for FCP1 (8.40), then for FCP2 (7.73), FCP3 (7.60), FCP4 (7.00) and FCP5 (6.67).

**Overall acceptability :** In terms of overall acceptability scores, the highest score was observed for FCP1 (7.93) followed by FCP2 (7.33), FCP3 (7.29), FCP4 (6.80) and FCP5 (6.26) with respect to control instant chutney powder (8.93).

**Acceptability index :** Acceptability index of the tested samples was calculated from the obtained scores and it was observed that control instant chutney powder revealed highest acceptability index (99.61%) followed by FCP1 (93.70%), FCP2 (88.22%), FCP3 (83.24%), FCP4 (78.87%) and FCP5 (71.09%), indicating that FCP1 was the best formulation among all formulations of fenugreek microgreens incorporated instant chutney powders (Fig. 2).

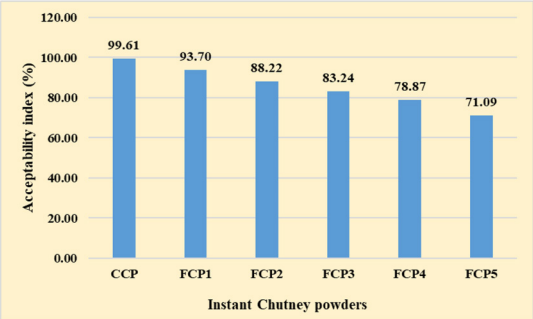


**Fig. 2.** Acceptability index (%) fenugreek microgreen incorporated instant chutney powders.

The sensory analyses was conducted by Nivedha and Priya (2018) to compare microgreens and mature greens chutney powder. It was found that microgreens incorporated chutney powder was more preferred compared to mature greens incorporated chutney powder. Among all chutney powders, the radish microgreen chutney powder was found to be highly acceptable whereas the mustard mature green chutney powder was found to be least acceptable by the respondents. The protein content was also found more in microgreens than the mature green, which was almost twice than mature part. Among all microgreens, beet microgreen chutney powder showed the highest protein content whereas amaranth mature green chutney powder was observed to have the lowest protein content.

From the present study it can be concluded that microgreens have a very shorter shelf life because of their perishable nature, so these can be dehydrated by possible technique. After dehydrating can be incorporated in different ready-to-eat food adjuncts like chutney powders and soup mixes which will enable the benefits of microgreens for a prolonged duration. All formulations (FCP1, FCP2, FCP3, FCP4 and FCP5) of fenugreek microgreens incorporated chutney powders were in the acceptable range and fell in the category of "like slightly" to "like extremely". As concentration of fenugreek microgreen was increased, the sensory scores was decreased significantly. Because of the high acceptability of the developed ready-to-eat fenugreek microgreens incorporated chutney powders, the outcome of this study can be useful in formulation of such type of more microgreens incorporated food products. Moreover, microgreens can be a future food because of their health benefits and nutrient content so like these products has the capability to perform well in the market in this upcoming era.

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