International Journal of Food Science and Nutrition
www.foodsciencejournal.com
ISSN: 2455-4898
Received: 04-03-2021, Accepted: 05-04-2021, Published: 06-05-2021
Volume 6, Issue 3, 2021, Page No. 01-08

Formulation and evaluation of instant soup mix enriched with microgreens

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Abstract

Microgreens are young, tender, and immature greens with unique color, taste and flavor properties. Microgreens are considered as an important sources of vitamin, minerals and bioactive compounds. One of the major disadvantages of microgreens, is shorter shelf life of the fresh produce, dehydration can be one of the suitable techniques to preserve the microgreens. The current study was undertaken to understand consumer's preference towards microgreens and also to formulate and evaluate microgreens incorporated instant soup mix. The survey data revealed that the most widely preferred microgreens were the mungbean and peas. Microgreens incorporated in snacks was the most preferred followed by instant chutney powders and soup mix. On understanding the consumer trends, three kinds of microgreens (peas (*Pisum sativum*), mung beans (*Vigna radia) and* mustard (*Brassica juncea* L.)) were utilized in a ready-to-cook instant soup mix at three levels of incorporations 10%, 20% &30%. The sensory parameters of various samples were analyzed by semi-trained panelist using a 9-point hedonic scale. The results of sensory analysis revealed that the mustard microgreen (10%) incorporated soup mix had the highest overall acceptability and it also had highest ranking in terms of taste, appearance and flavor attributes. Secondly mung bean microgreen incorporated at 30% level was widely accepted by the panelists. The current study concludes that microgreens can acts as potential ingredient that can be utilized in the instant soup mix with acceptable organoleptic properties.

Keywords: microgreens, preference, instant soup

Introduction

Microgreens are young immature greens that are harvested immediately after the emergence of the cotyledon leaves. These young greens are excellent sources of bioactive compounds. Microgreens are also called as vegetable confetti or microherbs. A microgreen can be grown under soil or hydroponic pads, and all that it requires is a flat tray to grow the products. They require sufficient amount of moisture and they can grow under artificial lightings or through natural sunlight. The harvesting period of microgreens is about 7 to 21 days (Treadwell *et al*, 2020) [1].They have a unique color, texture, flavor, and they are harvested when the first true leaves are developed. Microgreens have higher antioxidant value when compared to sprouts.

The young and tender leaves are nutritionally superior, they are excellent sources vitamin E, beta-carotene, and ascorbic acid levels (Ghoora *et al*, 2020) [2]. Different microgreens contain significantly varying amounts of vitamins and minerals. (Xiao *et al*, 2012) [3]. The class of microgreens under the *Brassicaceae* family contain significant amount of polyphenol compounds (Sun *et al*, 2014) [4].

Microgreens are specialty crops that have unique sensory properties, they are gaining importance due to its freshness and they have unique color and flavor properties. Consumer's get more attracted to microgreens when the astringency and bitterness is less. Texture and flavor attributes are the key features of microgreens that had increased the liking towards these immature greens. (Caracciolo *et al*, 2020) [5].

The change towards modern lifestyle has led to significant changes in food consumption pattern of the people. Less time is being spent for cooking food at home due to various reasons like long working hours, women at house started going for work, this has significantly increased the demand for ready-to-eat / ready-to-cook instant food products. Working women are the key population who seem to be most attracted by these convenience foods as it could save their time during the cooking process. (Sunder Srinivasan & Kiran Murlidhar Shende, 2019) [6].

Hence the aim of the current study was to understand consumer's preference towards microgreens and to develop an instant soup mix enriched with microgreens (peas (*Pisum sativum*), mung beans (*Vigna radia) and* mustard (*Brassica juncea* L.).

Methodology

Survey on consumer's preference towards microgreens.

A stuructured questionnaire which can be self-administered was created to evaluate consumer's preference level towards various kinds of microgreens and related products. The questionnaire was mailed to 300 people through online mode following the norms of convenience sampling.

Procurement of ingredients

The raw materials such as the microgreen seeds (mustards, peas, and mung bean), other ingredients like onion powder, cumin powder, garlic powder, mung dhal powder, pepper powder, corn starch, spices and salt for seasoning were purchased from a local market in Chennai city.

Cultivation, Growth and harvest of microgreens: A widened tray was used as a base material. The tray was partially filled with soil, it was moistened with water. The seeds were spaciously spread over the soil, and the seeds were sprinkled with water to keep it under a moist state. Once after spreading, the seeds were partially covered with soil or hydroponic pads for to 2-3 days under dark conditions. During this stage the seeds need to be moistened at regular intervals to prevent it from drying out. The germination period for seeds is about 1 to 3 days. After the 3rd, day the trays containing the germinated seeds were kept under the exposure of sunlight until harvest. Between 7 to 15 days, when the first true leaves emerge from the seeds, the microgreens were harvested. The harvesting of the microgreens was done by cutting using sterile scissors. The microgreens were washed immediately to avoid any contamination of the produce.

Fig 1: Mustard Microgreens

Fig 2: Mung bean Microgreen

Preparation of Microgreen powders: The Microgreens once freshly harvested, was thoroughly washed to avoid any contamination with soil. The excess moisture was removed, and the microgreens were dried under the sun for 2-3days. The greens were then partially roasted and ground into coarse powders.

Formulation of Instant soup mix incorporated with microgreens

The microgreen powders were incorporated in the instant soup mix at 10%.20%&30% levels. The composition for instant soup mix is given under Table 2 and the steps in preparation of instant soup mix is explained in Fig 3.

Table 1: Product code for microgreen Incorporated Instant soup mix

Soup Powder Samples	Product Code
Mustard microgreen soup powder (10%)	MMGS1
Mustard microgreen soup powder (20%)	MMGS2
Mustard microgreen soup powder (30%)	MMGS3
Mung bean microgreen soup powder (10%)	MBSP1
Mung bean microgreen soup powder (20%)	MBSP2
Mung bean microgreen soup powder (30%)	MBSP3
Peas microgreen soup powder (10%)	PMGS1
Peas microgreen soup powder (20%)	PMGS2
Peas microgreen soup powder (30%)	PMGS3
Peas, Mustard, and Mung bean microgreen soup powder (30%)	MMPS1
Control sample soup Mix	CS

Table 2: Composition of Microgreen (MG) enriched soup mix (Per 100g)

Ingredients (g)	Control sample	Instant soup mix with 10% MG incorporation	Instant soup mix with 20% MG incorporation	Instant soup mix with 30% MG incorporation
Onion powder	20	20	20	10
Mung dhal powder	30	20	10	10
Microgreen powder	-	10	20	30
Cumin powder	10	10	10	10
Garlic powder	10	10	10	10
Pepper powder	7.5	7.5	7.5	7.5
Corn flour	10	10	10	10
Salt	7.5	7.5	7.5	7.5
Other spices	5	5	5	5

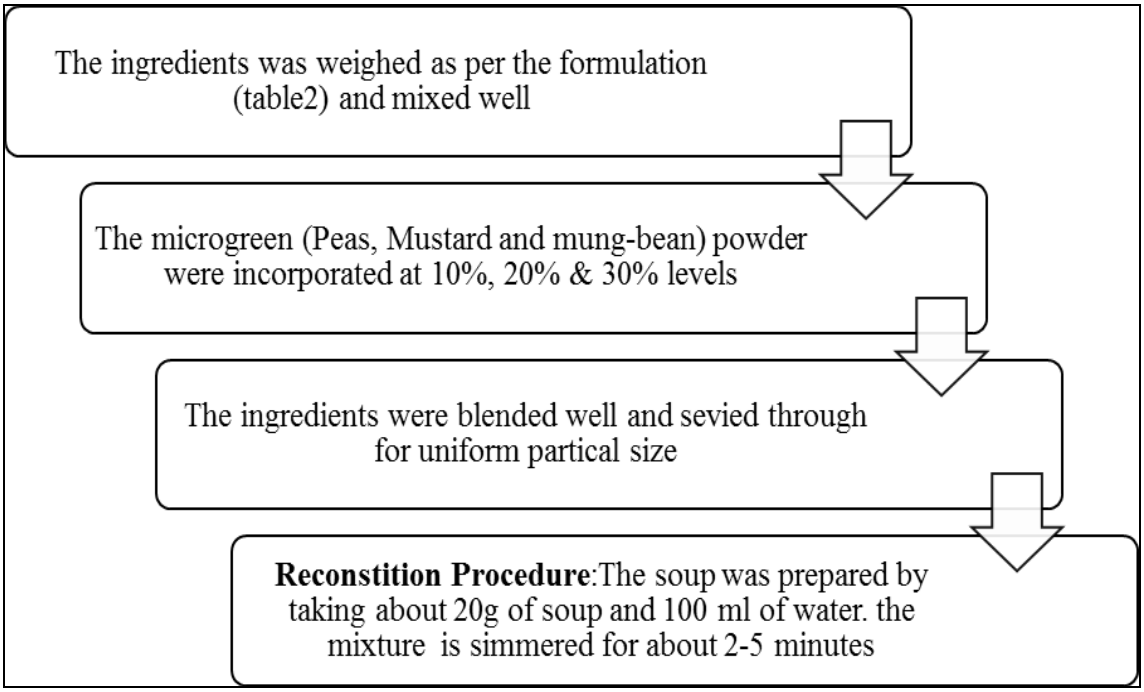


Fig 3: Preparation of Instant soup mix

Sensory analysis

Sensory analysis was carried out for all sample variations by using a 9-point hedonic rating scale. Seven semi-trained panelists participated in the study to carry out the evaluation process. The panelists were provided with an sensory evaluation sheet, each of the soup sample were analyzed based on six sensory attributes- Taste, color, appearance, consistency, flavor, and overall acceptability. The samples were presented in a randomized order to the panel members. Potable drinking water was given to the panel members to be used in between the testing period if needed.

Statistical analysis

The survey data was analyzed for descriptive statistics. The data for sensory evaluation were reported in the form of Mean and Standard deviation. One way ANOVA was carried out to analyze if there were any significant difference in the sensory parameters of various soup samples. Data analysis was done using Microsoft excel 2010.

Results and discussion

Survey on consumer's preference towards microgreens

A structured questionnaire which was mailed to 300 people from a known email database fetched 145 respondents with a response rate of 48.3%. It was found that majority of the respondents were female (81.4%) and about 18.6% were male. The key participants of the study were students in the age group of 18 to 25 years (85%). The working professionals who participated in the study were 15 %.

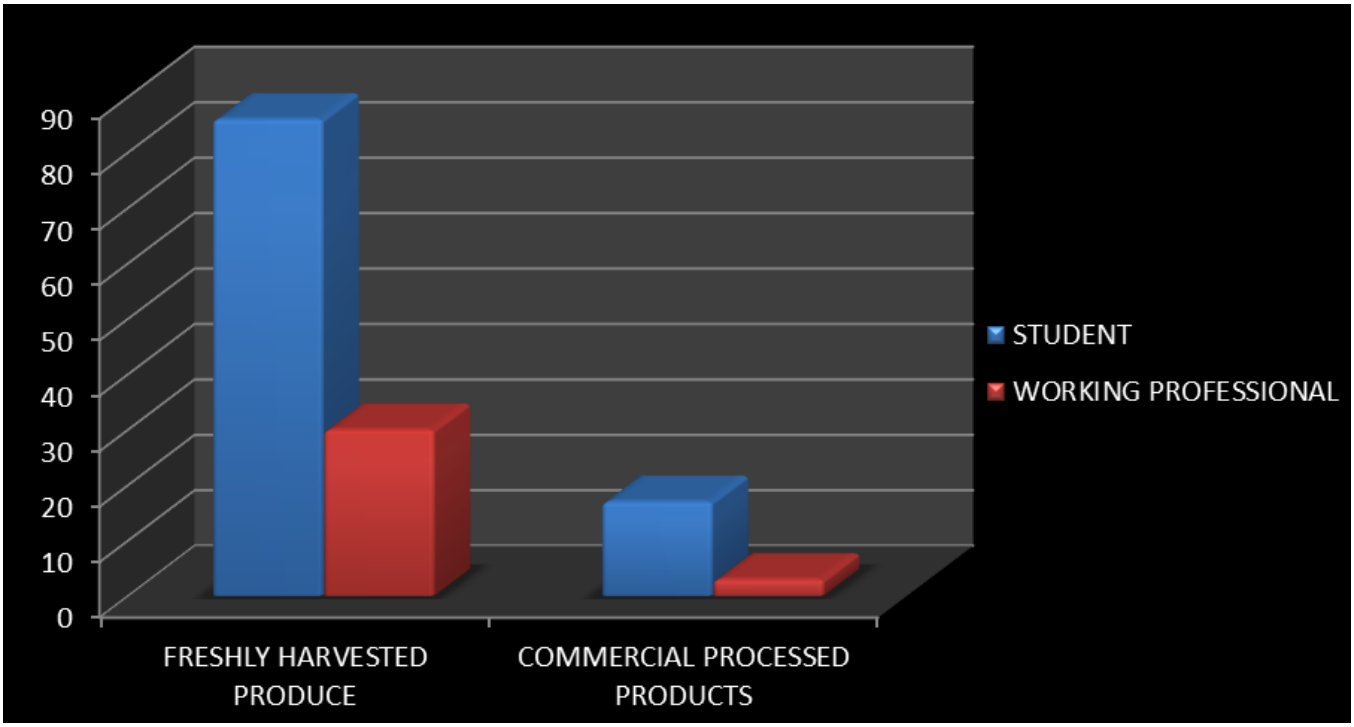
It was seen that the majority of the respondents (71.1%) were aware of the term microgreens and about 15.2% of the respondents were not aware of these young vegetable greens. The results of the present study can be compared to results of a pilot study on microgreens by Nivedha V& Lakshmy Priya S (2018) [7], were it was found that majority of the respondents were not aware of microgreens. Therefore it can be seen that the awareness rate have significantly increased.

Preference towards microgreens and related products

Nutritional aspects (85.5%) and taste attributes (34.5%) were the key drivers that has increased the preference levels of microgreens. From the graphical representation (Fig 4) it can be seen that 85.5% respondents preferred to consume microgreens in its natural form, while 13.8% preferred microgreens in its processed forms. One of the main reasons to choose commercially produced forms could be convenience.

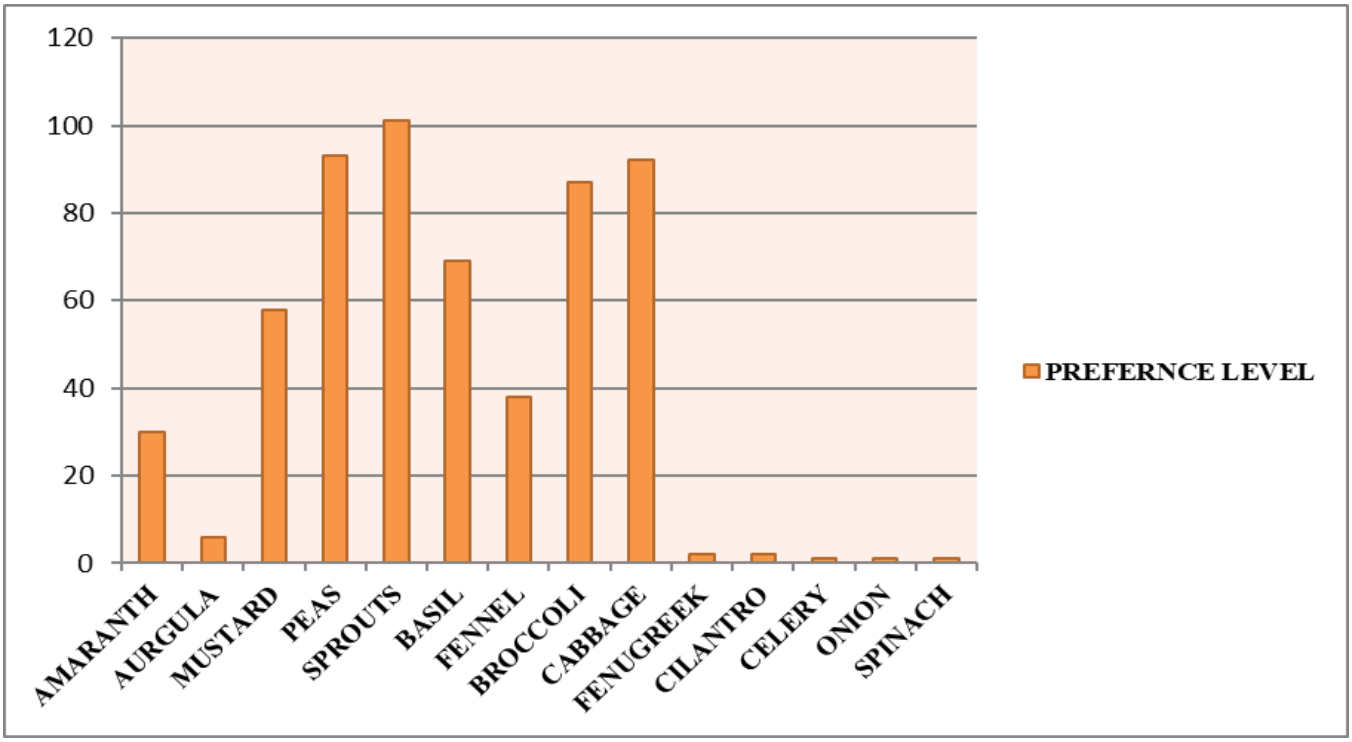
Various microgreens and related products were shortlisted under this study to evaluate its preference level. The graphical representation (Fig 5) clearly depicts that mungbean sprouts (69.7%) and peas (67%) were given the highest preference. The microgreens like cabbage (65.9%),

broccoli (60%) and mustard (58%) the class of greens under the Brassicaceae family were given secondary and significant importance. About 20% – 26% of the population have a liking towards fennel and amaranth greens. The least preferred microgreens were the arugula, fenugreek, celery and spinach.



*n=145(Number of respondents)

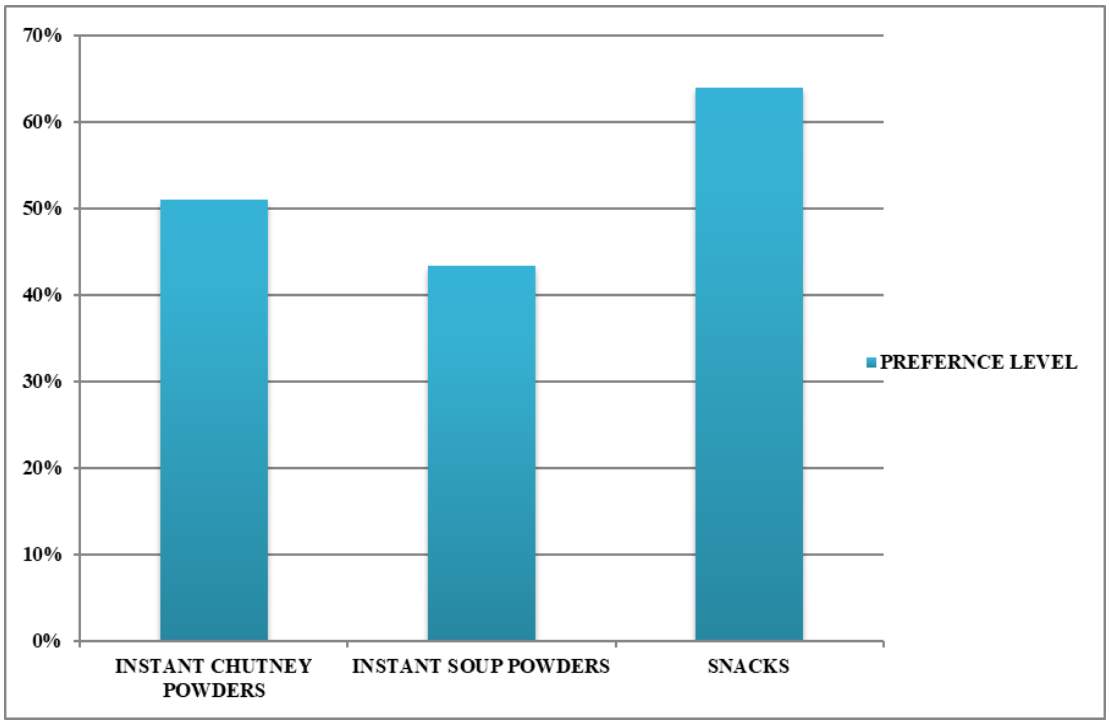
Fig 4: Preferred form of microgreen



*n=145(Number of respondents)

Fig5: Preference level of microgreens

Microgreen incorporated in snacks products (64%) had a high preference level followed by instant chutney powders (51%) and instant soup powders (43%). Some of the challenging factors such as shorter shellife of the products (42.8%) and less availabilty of commercial microgreen products (40.7%) were seen to be the key reasons that restricts the use of microgreens and related products.



*n=145(Number of respondents)

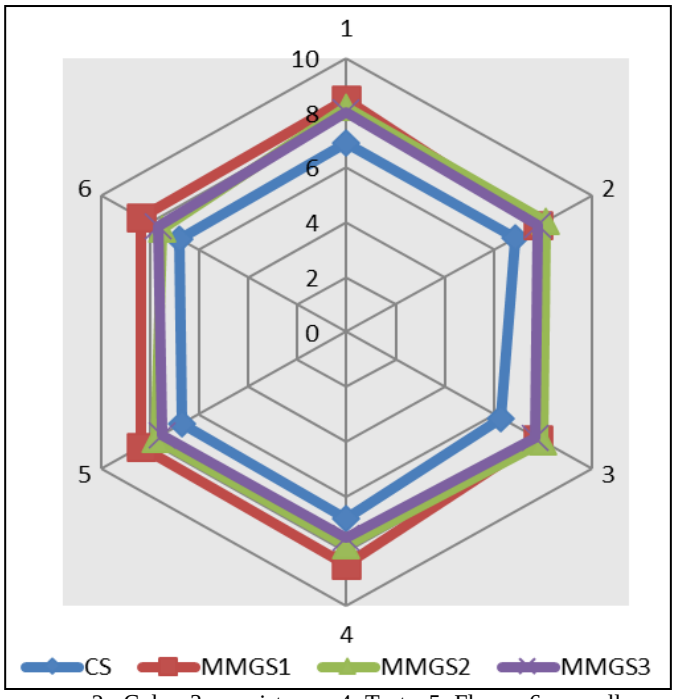
Fig 6: Preference level towards microgreen related products

Sensory parameters of microgreen incorporated instant soup mix

The comparison of sensory attributes such as taste, appearance, color, consistency, flavor and overall acceptability were made among the microgreen enriched soup mix prepared at three level of incorporations 10%,20% and 30%.

Group1: Instant soup mix prepared with the incorporation of mustard microgreens.

The mustard microgreens (*Brassica juncea L*) were incorporated in an instant soup mix at three levels of variations (10%, 20% and 30%). From the sensory evaluation it can be revealed that the sample MMGS1 (10%) ranked higher in terms of appearance (8.5±0.53), taste (8.5±0.75), flavor (8.4± 0.3) and overall acceptability (8.4±0.53) in comparison to that of the control sample and other variations (MMGS1 & MMGS2). Consistency is an important attribute in a soup and it can be seen that the sample MMGS2 had a good consistency (8±0.57). One way ANOVA for the sensory properties of mustard microgreen enriched soup mix revealed that there is no significant difference ($p<0.05$) among the experimental samples.



*1=Appearance, 2= Color, 3=consistency, 4=Taste, 5=Flavor, 6=overall acceptability

Fig 7: Sensory parameters of mustard microgreen incorporated soup mix

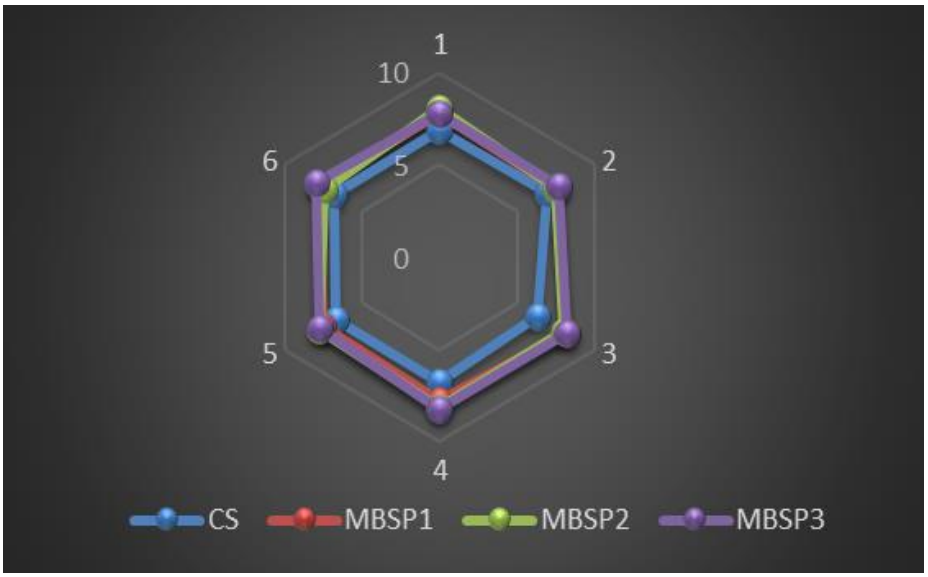
Table 3: Sensory scores for Instant soup mix prepared with microgreens

Product Parameters	CS	MMGS1	MMGS2	MMGS3	MBSP1	MBSP2	MBSP3	PMGS1	PMGS2	PMGS3	MMPS1
Appearance	6.9±0.48	8.5±0.53	8.2±0.48	8±0.57	7.8±0.37	8.1±0.37	7.8±0.69	7.5±0.53	8±0.57	7.5±0.53	7.1±0.37
Color	6.9±0.89	7.8±0.89	8.1±1.06	7.8±1.06	7.5±0.78	7.5±0.78	7.7±0.95	7.8±0.69	7.4±0.78	7.8±0.69	7±0.57
Consistency	6.3±0.48	7.8±0.69	8±0.57	7.7±0.95	8.2±0.75	8±0.81	8.2±0.75	6.8±0.89	6.7±0.95	7.1±0.89	6.7±0.95
Taste	6.8±0.37	8.5±0.75	7.8±0.37	7.5±0.78	7.8±0.69	8.1±0.37	8.2±0.75	7.2±0.48	7.5±0.78	7.7±0.75	7.5±0.98
Flavor	6.7±0.75	8.4±0.3	7.8±0.69	7.5±0.97	7.5±0.78	7.8±0.37	7.7±1.11	7.7±1.11	7.8±0.69	7.7±0.95	7.7±0.48
Overall Acceptability	6.8±0.69	8.4±0.53	7.5±0.78	7.7±1.11	7.7±0.95	7.4±0.53	8±0.81	7.4±0.53	7.2±0.75	7.7±0.48	7.5±0.53

*Values are Mean ± SD

Group 2: Instant soup mix prepared with the incorporation of mung bean microgreens

The mungbean microgreen soup powder was prepared at different proportions (10%, 20% and 30%) and was analyzed for its organoleptic properties. The sample MBSP3 had the highest ranking in terms of taste attribute (8.2±0.75) in comparison to other variations. All the three samples had an optimum consistency. The sample MBSP2 was widely preferred in terms of appearance (8.1±0.37) and it was the most accepted sample in terms of flavor profile (7.8±0.37). Among the three samples, MBSP3 (30%) had the highest overall acceptability (8±0.81) in comparison to the control sample (6.8±0.69) and the other two variations. One ANOVA way conducted for the sensory attributes of the instant soup mix enriched with mung bean microgreen, revealed that there was no significant differences ($p<0.05$) among the experimental samples.

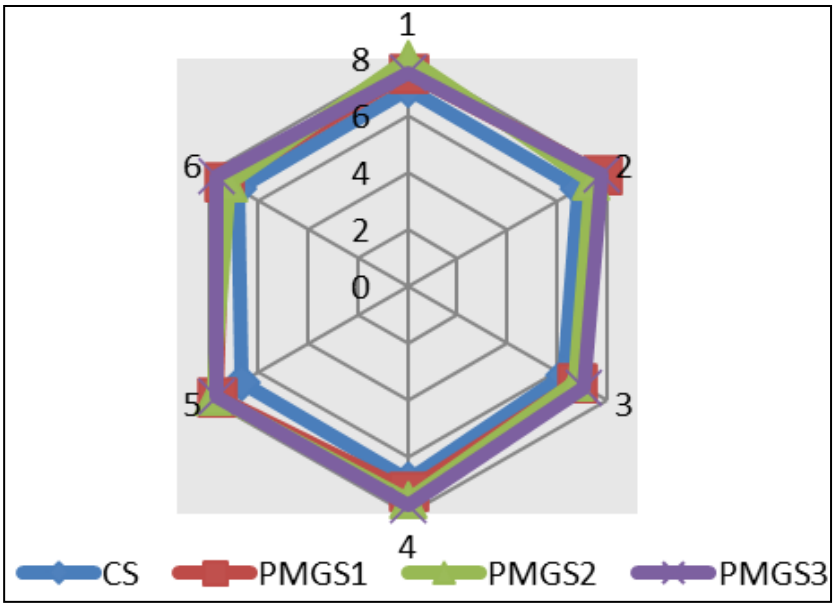


*1=Appearance, 2= Color, 3=consistency, 4=Taste, 5=Flavor, 6=overall acceptability

Fig 8: Sensory attributes of mungbean microgreen incorporated soup mix

Group 3: Instant soup mix prepared with the incorporation of pea microgreen

For the instant soup mix prepared with the incorporation of pea microgreen. The sample PMGS3 had wide acceptance (7.7±0.48) in comparison to that of the other variations and control sample. The flavor profile of PMGS2 (7.8±0.69) was highly preferred by the panelists compared to other samples and this sample also had higher ranking in terms of appearance (8±0.57). The sample PMGS3 (7.7±0.75) had the highest taste acceptance in comparison to other variations. The consistency of pea microgreen soup samples was comparatively less to that of the other groups. Therefore the desired viscosity of the soup samples can be increased by using alternative thickening agents such as potato starch. One way ANOVA for the sensory attributes of pea microgreen enriched soup mix revealed that there is no significant difference ($p<0.05$) among the experimental samples.



*1=Appearance, 2= Color, 3=consistency, 4=Taste, 5=Flavor, 6=overall acceptability

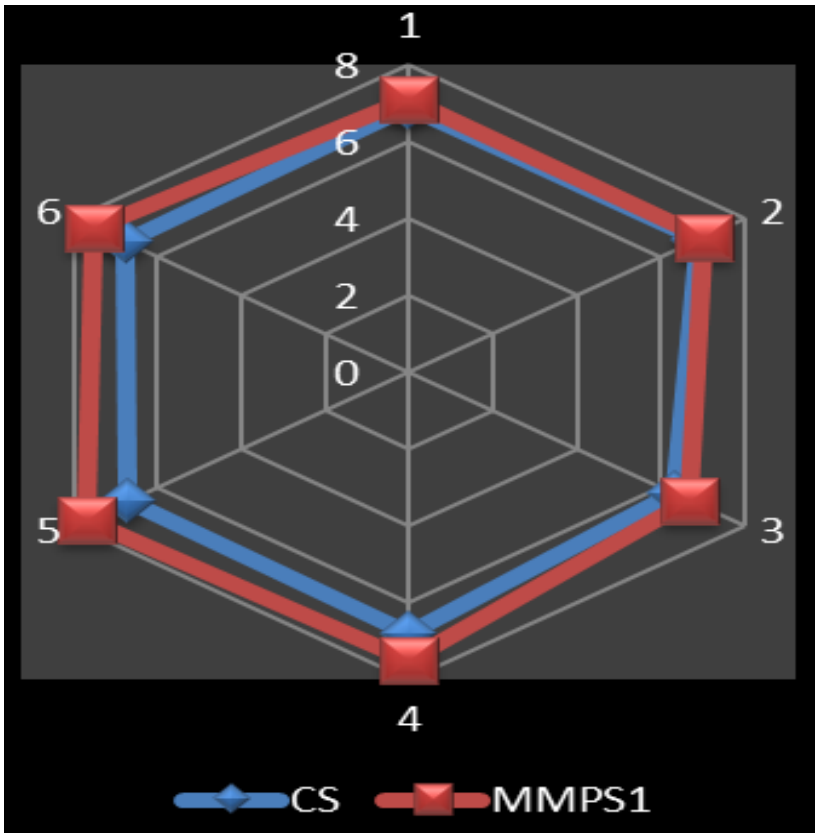
Fig 9: Sensory acceptability of pea microgreen incorporated soup mix

Group 4: Instant soup mix prepared with a combination of microgreens

An instant soup mix was prepared using a combination of mustard, peas and mung beans. The mean values of various *sensory attributes such as appearance (7.1±0.37), color* (7±0.57), consistency (6.7±0.95), Taste (7.5±0.98) and overall acceptability (7.5±0.53) had higher ranking in comparison to that of the control sample.

Overall acceptability of the soup samples

Among the various group of soup samples prepared using a variety of microgreens,the sample MMGS1 (10%) had the highest ranking followed by MBSP3(30%) in terms of overall acceptability compared to control sample and other sample groups. Therefore from the sensory analysis it can be concluded that the instant soup mix prepared using mustard microgreen at 10% level had wide acceptance by the consumer panelists. (Table4)



*1=Appearance, 2= Color, 3=consistency, 4=Taste, 5=Flavor, 6=overall acceptability

Fig 10: Sensory parameters of microgreen incorporated soup mix

Table 4: Sensory scores of overall acceptability among different groups

Product code	Overall acceptability
CS	6.8±0.69
MMGS1	8.4±0.53
MBSP3	8±0.81
PMGS3	7.7±0.48
MMPS1	7.5±0.53

*Values are Mean ± SD

Conclusion

Changes in lifestyle modifications has increased the demand for ready-to-cook convenience foods. Microgreens are one such food category that act as potential ingredient to be added in convenience foods due to its nutritional superiority and excellent organoleptic properties. On undertaking an online survey it was found that mung bean and peas were the most preferred microgreens. The incorporation of microgreens in snacks was given the highest market preference followed by instant chutney and soup powders. Therefore in the present study microgreens (Mustard, Peas & Mung bean) were incorporated in an instant soup mix and its sensory attributes were analyzed. The mustard microgreens are good sources of allyl isothiocyanates and due to this they have strong flavor properties. The mustard microgreen incorporated at 10% level in an ready-to-cook soup mix had the highest overall acceptability and it was widely accepted sample in terms of appearance, flavor and taste. Therefore this study strongly recommends the usage of microgreens in soups due to its well acceptable sensory characteristics and nutritional properties.

References

1. Treadwell D, Hochmuth, R., Landrum L, Laughlin W. Microgreens: A Specialty Crop. EDIS, 2020.
2. Ghoora MD, Babu DR, Srividya, N. Nutrient composition, oxalate content and nutritional ranking of ten culinary microgreens. Journal of Food Composition and Analysis,2020:91:103495.
3. Xiao Z, Lester G, E. Luo Y, Wang Q. Assessment of Vitamin and Carotenoid Concentrations of Emerging Food Products: Edible Microgreens. Journal of Agricultural and Food Chemistry,2012:60(31):7644-7651.
4. Sun J, Xiao Z, Lin L, Lester GE, Wang Q, Harnly JM *et al*. Profiling Polyphenols in Five Brassica Species Microgreens by UHPLC-PDA-ESI/HRMS. Journal of Agricultural and Food Chemistry,2013:61(46):10960-10970.
5. Caracciolo F, El-Nakhel C, Raimondo M, Kyriacou MC, Cembalo L, De Pascale S *et al*. Sensory Attributes and Consumer Acceptability of 12 Microgreens Species. Agronomy,2020:10(7):1043.
6. Srinivasan S, Shende KM. A Study on the Benefits of Convenience Foods to Working Women. ATITHYA: A Journal of Hospitality, 2015.
7. Nivedha V, Lakshimi Priya S. Comparative study of microgreens with mature greens incorporated ready-to-eat chutney powders. International Journal of Food Science and Nutrition,2018:3(6):171-175.