An analysis of Antioxidant and Anti-Microbial Properties of The Vegetable Chunks

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Abstract

The current research is focused on the development of a ready-to-cook food or nutrigenomic food. We're all aware with the phrase "wadi," which refers to a collection of distinct types of pulses. Wadi eating is quite popular in rural areas, but there is a huge demand for these wadi in the current circumstances because they are quick to prepare and take less time to eat. Working women, on the other hand, face a significant challenge in meeting their fundamental nutrient requirements, which are met by eating vegetables. Vegetable chunks are a designed product created from mixed vegetables and soybean seeds that are high in protein, lipids, calcium, vitamins, and other minerals.

Both the product having high antioxidant property and also having excellent shelf life because of preservation method used is best for the product.

Keywords: vegetables chunks, antioxidant, antimicrobial, Ficus carica, ready to cook

Introduction

Because of increased globalisation and westernisation, life styles and eating habits have shifted, making it increasingly difficult to meet all of the body's nutritional needs through daily meals (Jain, R. and Goomer, S., 2016) In today's world, the number of working women is steadily increasing.

The biggest issue for working women is a lack of time to cook or prepare healthy meals such as green vegetables and other traditional foods that are essential for a healthy lifestyle. Unbalanced diets with low vegetable intake and low consumption of complex carbohydrate and dietary fibre are estimated to cause 2.7 million deaths each year, according to a 2007 world health report, and are among the top 10 risk factors contributing to mortality (Dhandevi, P.E.M. and Jeewon, R., 2015). According to a global vegetable census, 402 vegetable crops are grown worldwide, spanning 69 families and genres. Vegetables in the daily diet have been linked to improved overall health and vision, as well as a lower risk of cancer, heart disease, diabetes, anaemia, and gastric ulcers.

The product is designed to provide high-quality protein, minerals, vitamins, fibre, and other plant bioactive substances such as antioxidants, all of which are beneficial to human health and well-being.

The goal of this research is to create a ready-to-cook food using technology from an existing product. The product was created with the essence or flavour and taste of Indian culture in mind, as well as the current health and nutritional needs of the consumer. Vegetable chunks, the formed product, is a traditional Indian societal food called "wadi." The product is similar to wadi, which is a type of wadi created from pulses (Jain, R. and Goomer, S., 2016).

The vegetable chunks are high in vitamins, minerals, protein, fat, and other nutrients due to the main ingredient, which is known as "raw fig," "Gular," and "Ficus carica (scientific name)" and has numerous medicinal properties such as antioxidant properties, anti-inflammatory effect, anti-cancer activity, anti-diabetic activity, hepatoprotective effect, and immunomodulatory effect. Ficus belongs to the Moraceae family, which includes about 800 species of trees, shrubs, hemiepiphytes, climbers, and creepers in the tropics and subtropics Frodin, D. G. (2004). Turkey, Egypt, Morocco, Spain, Greece, California, Italy, and Brazil are the leading producers, with production also taking place in nations with hot, dry summers and warm winters. Fruits contain cyaniding-3-O-glucoside, cyanidin-3-Orhamnoglucoside, saturated fat, cholesterol, and salt, as well as insoluble sugars., Protein, vitamin A, vitamin C, calcium, and iron are all important nutrients. The nicest thing about raw fig is that it can

be utilised in a variety of delicious and healthy meals (Rahmani, A.H. and Aldebasi, Y.H., 2017).

Carrot, capsicum, ash gourd, and green pea are some of the other vegetables used in the preparation of vegetable chunks. All of these vegetables have a variety of health benefits, including helping to maintain eye health, lowering the risk of cancer, boosting the immune system, controlling diabetes, reducing inflammation, acting as a natural exfoliator, and promoting hair growth. Other ingredients in vegetable chunks include soya bean seed and chickpea flour, both of which are high in protein, fat, carbohydrate, calcium, and fibre.

The first type of vegetable chunks is "vegetable chunks," whereas the second type is "vegetable chunks with chickpea flour." On the basis of nutritional content, both products are nearly identical, with the exception of a minor difference in the nutritional value of vegetable pieces with chickpea flour. Both items are quite different in terms of taste, flavour, colour, and texture, as well as in terms of weight.

1. Materials and Methods

The present study “vegetable chunks as a potential source of nutrients” was conducted inLucknow are as follows. The reason for selecting Lucknow district (because one of the major city, capital and university located in Uttar Pradesh).

Over all work was done in the lab of school of Home Science under the course of Food Science & Technology.

1.1 Materials Required

Two type of samples are developed according to need and for checking nutrient content.

In pure Raw fig, carrot, capsicum, green pea, ash gourd, and soya bean seeds in dry form are utilised as vegetable pieces raw material. The raw components in vegetable chunks with chickpea flour were the same as in regular vegetable chunks; however, chickpea flour was added to improve the nutritional quality and boost the product's stability when compared to regular vegetable chunks. Spices are added to the chunks during the manufacturing process to improve the product's taste and flavour. Cumin seed powder, turmeric powder, coriander powder, red chilli powder, salt, baking soda, water, and garam masala were among the other ingredients used. All of the basic supplies were obtained in Lucknow's local market.Soya bean seed was grinded properly and packed in pouches. Protein, fat, and dietary fibre are all found in soya bean seeds powder. Soya bean seeds have been shown to treat sleep

difficulties, assist with diabetic management, enhance blood circulation, and improve heart health. Spices with antioxidants, anti-inflammatory qualities, and glucose and cholesterol-lowering properties, as well as properties that alter cognition and mood, are included.

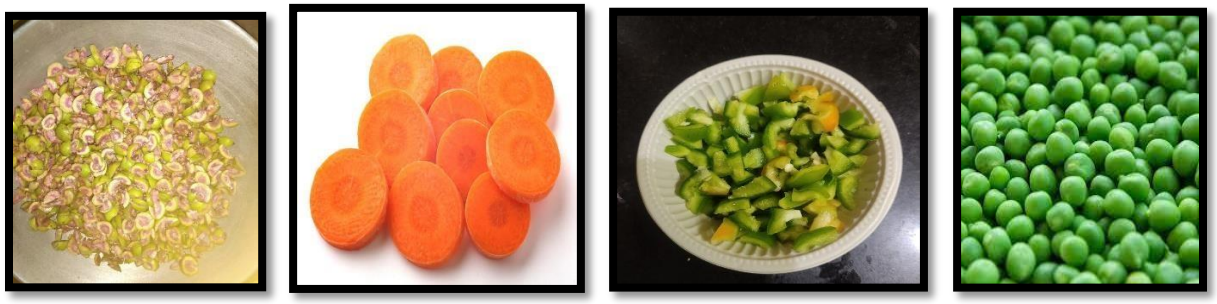
Methodology

1.1.1 Product Preparation

In a grinder, all of the sun-dried vegetables are powdered. All of the vegetables are washed, cleaned, sliced, and blanched before being dried in the sun. Patras, A., Tiwari, B. K., and Brunton, N. P. blanched prepared vegetables in boiling water at a temperature of 970°C (Patras, A., Tiwari, B. K., & Brunton, N. P. (2011). The ratio of powdered vegetables was blended in varied ratios for the creation of 1 kilogramme vegetable pieces. Raw fig powder (200g), green pea powder (200g), soy bean powder (200g), carrot (100g), capsicum (100g), and Ash Gourd powder (200g). All of the veggies were blanched in boiling water at 970°C according to the researcher's procedure (Patras, A., Tiwari, B. K., & Brunton, N. P.) (2011). All of the items were weighed in varied proportions before being combined in a bowl. Salt, chiles, turmeric powder, garam masala, amchoor powder, and baking soda were all added. The flour was added for making chunks in vegetable chunks with chickpea flour, the amount of chickpea flour was 100(gm), and the ration of soyabean seed was added (100 g). After the chunks were made, they were placed in a sun dryer for two days to dry. Vegetable chunks were stored in dry conditions in airtight plastic bags or containers. Solar drying has a wide range of applications in the food industry, including the drying of vegetables, fruits, spices, medicinal plants, grains, and other biological materials (Panwar, N. L., Kaushik, S. C., & Kothari, 2003).

Diagrams related to product preparation-

Cutting of Vegetables-



Dried Vegetables-

Processing of Chunks

Prepared Product-

Vegetable Chunks

Vegetable Chunks with Chickpea flour

1.2.2 Determination of Antioxidants

In a conical flask, 0.2 g of powdered food sample was placed, then 5 ml of 99 percent methanol was added, and the flask was covered with aluminium foil. Place the sample in a water bath that is shaking at (100 rpm temperature 2.5 hr.). In 50 ml of methanol, 2 mg of DPPH was added, then the solution was covered with aluminium foil and kept refrigerated. The sample was placed in a centrifuge tube and centrifuged for 15 minutes after 2.5 hours of shaking (6000-8000 rpm). Then, using a flask and funnel, a filter paper was placed in the funnel and the solution was filtered. 1 ml of extracted solution was pipetted into flasks in the ratios of 1 ml, 2 ml, 3 ml, 4 ml, and 5 ml, with 99 percent methanol added to make up 10 ml. After that, 1 mL of the sample was taken and poured into a conical flask in a beaker. In each ratio, 3 mL of DPPH solution was added, followed by 10 mL of 99 percent methanol. The solution was then kept in a dark

environment for 30 minutes. After that, do a spectrophotometric assay and take sample readings (Tailor Chandra Shekhar*1 and Goyal Anju2) (2014).

Formula-

$$DPPH = \frac{\text{Abs of control} - \text{Abs of sample}}{\text{Abs of control}} \times 100$$

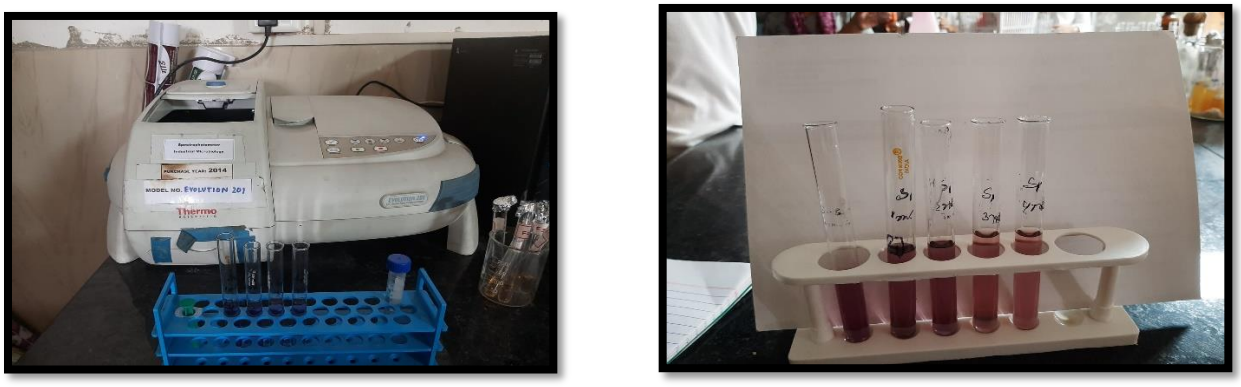


Figure 3.4.4.3.7 Antioxidant estimation

1.2.3 Determination of morphological structure by SEM /EDS

Scanning electron microscopy (SEM) and energy dispersive x-ray spectroscopy (EDS) are two surface examination techniques that have long been considered "advanced" by materials scientists. Several substantial technological breakthroughs have been made since commercial development in the 1950s, but the underlying physics of these technologies have remained the same.

The imaging element of the technology is known as SEM. A scanning electron microscope, unlike a "normal" optical microscope, employs electrons to image—essentially translating electron interactions into an optical signal. While optical microscopy offers advantages in some applications, it can also have resolution limitations, which are ultimately determined by light wavelength and focal depth. Magnification and resolution in SEM, on the other hand, are ultimately determined by electron optics and sample contact, allowing for a greater depth of focus.

1.2.4 Antimicrobial Analysis

Agar plates:

Based on the type of bacteria to be counted or selected, selected and produced an agar media. To reduce the quantity of condensation that occurs after autoclaving, cool the agar to between 45°C and 50°C before pouring the plates. The agar should have a thickness of around 0.3 cm, which can be obtained by pouring 15 to 20 ml of media per 100 x 15 mm plate. Because the inoculum takes longer to absorb into the agar, freshly produced plates do not operate as well as dry plates. Plates can be dried by allowing them to sit at room temperature for 24 hours. Plates dry faster in a low-humidity environment, so putting them in a laminar flow hood will hasten the process.

Inoculations:

Plates with 20 to 300 (or 25 to 250) CFUs can be used to compute the number of CFUs/ml of the original sample for counting colony-forming units (CFUs). A dilution series, usually a ten-fold dilution series, is typically prepared using a suitable dilutent such as phosphate-buffered saline. Protocols for Serial Dilution In terms of spreading, absorption, and calculating, 0.1 ml is a good inoculum volume (100 microliters).

Because some bacteria attach quickly to the agar surface, the inoculum should be distributed as soon as possible. It's best to start with the most dilute suspension and work your way up to the most concentrated. It is not necessary to change pipette tips between dilutions if you proceed from most dilute to most concentrated.

Spreading:

By dipping a reusable glass or metal spreader in alcohol (such as 70% isopropyl or ethanol), shaking off the excess alcohol, then igniting the residue, a reusable glass or metal spreader can be flame sterilised. After then, the spreader is allowed to cool. The spreader is positioned in touch with the inoculum on the plate's surface, allowing the inoculum to run uniformly down the length of the spreader. As shown in Fig. 3-7 on the Atlas page, even pressure is supplied to the spreader, and the plate is spun on a turntable or by hand. The spreader can also be spun across the agar surface. It's best not to spread the inoculum all the way to the agar's edge. The idea is to spread the inoculum evenly and allow it to absorb into the agar. After the plate, or spreader, is rotated long enough, water does not pool along the spreader when the rotation is halted. After spreading, leave plates alone for 10 to 20 minutes. The amount of time it takes to dry depends on the temperature and humidity in the room.

Incubation:

After allowing 10 to 20 minutes for the inocula to soak, the spread plates can be flipped and incubated as desired. Before the colonies have had a chance to fully form, examine the plates. Colonies that are too close together may be difficult to separate afterwards. Continue the incubation process as needed. When working with slow-growing colonies, incubation in closed humidified containers will assist minimise difficulties with plates drying up. Counting and Selection: Plates are inspected after they have been incubated for the appropriate amount of time. The growth on the plates should reflect the predictable decline in CFUs/plate of a 10-fold dilution series prepared from an overnight broth culture of Escherichia coli when plating a dilution series.

Gram Staining:

Crystal violet staining reagent is flooded for 1 minute into an air-dried, heat-fixed smear of cells. Please keep in mind that the smear quality (too much or too little cell concentration) will alter the Gram Stain results.

2. Wash the slide for 2 seconds in a mild, indirect spray of tap water.

3. Flooded slide using Gram's iodine as a mordant. Please wait one minute.

4. Wash the slide for 2 seconds in a mild, indirect spray of tap water.

5. Apply a decolorizing chemical to the slide. Wait 15 seconds or add one drop at a time to the slide until the decolorizing chemical runs clean (see Comments and Tips section).

6. Use safranin to flood the slide with counterstain. Wait for 30 to 1 minute.

7. Wash the slide in a gentle, indirect stream of tap water until the effluent is colourless, then blot dry with absorbent paper.

8. Using a Brightfield microscope, examine the outcomes of the staining operation in oil immersion. Gram-negative bacteria will stain pink/red, while gram-positive bacteria will stain blue/purple at the end of the Gram Stain.

1.3 Result and Discussion

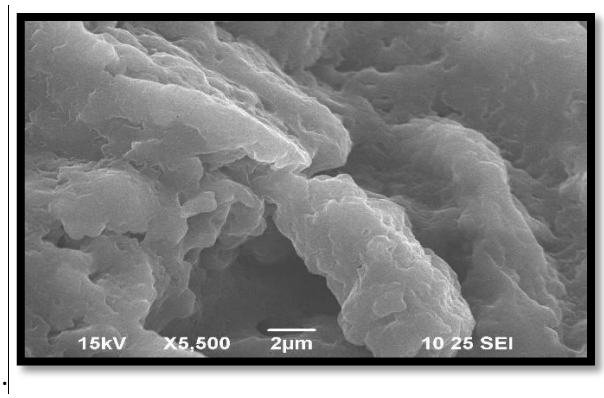
1.3.1 Antioxidant Estimation

When assessed using the DPPH scavenging assay technique, both samples (S_1 and S_2) demonstrated antioxidant potential. Both samples had antioxidant activity of 14.25 (S1) and 11.38 (S2) ug/ml, indicating that S1 (vegetable pieces) has greater antioxidant properties than S2 (vegetable chunks with chickpea flour).

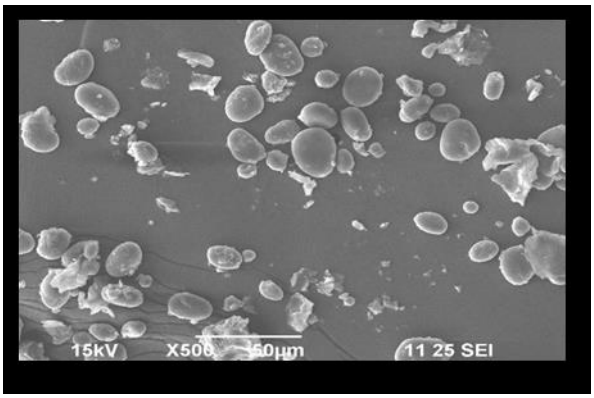
1.3.2 SEM with EDS Estimation

Both samples have an amorphous structure. The atomic structure of an amorphous structure is similar to that of a liquid, and it lacks organization (it is not a crystalline structure). Unless otherwise specified, amorphous materials mentioned in the Materials Science Engineering sector are usually amorphous solids.

The morphologies of the flour samples were determined using SEM at different level of magnifications (×5,500(S_1), ×500(S_2),).



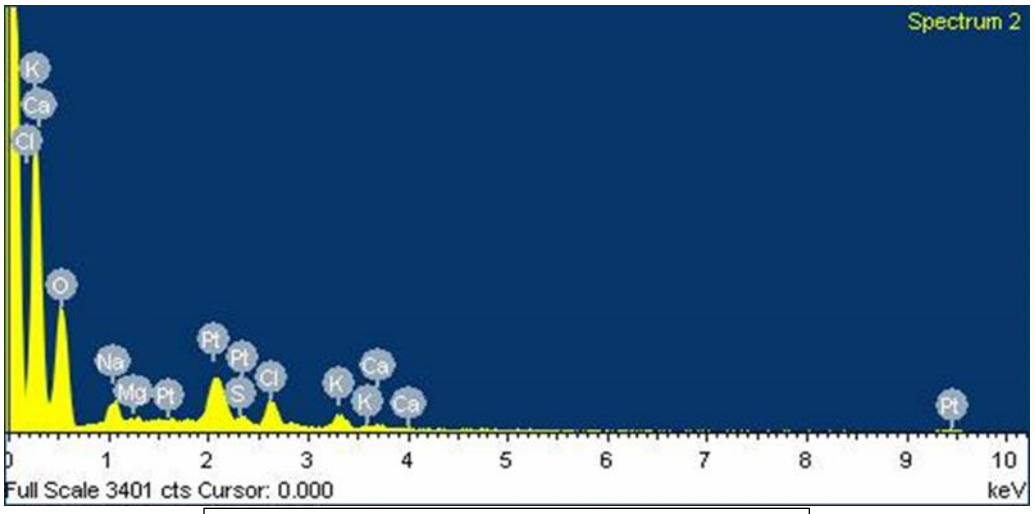
Amorphous Structure of S_1



Amorphous Structure of S_2

Element Present in Product (S_1)

Element	Weight%	Atomic%
O K	65.97	86.31
Na K	5.59	5.09
Mg K	0.88	0.76
S K	1.71	1.12
Cl K	4.98	2.94
K K	3.07	1.64
Ca K	0.57	0.30
Pt M	17.24	1.85
Totals	100.00	



Elements estimation graph

Element Present in Product (S_2)

Element	Weight%	Atomic%
C K	47.82	59.13
O K	37.40	34.72
Na K	5.28	3.41
Mg K	0.04	0.03
S K	0.61	0.28
Cl K	4.29	1.80
K K	0.73	0.28
Ca K	0.22	0.08
Pt M	3.61	0.27
Totals	100.00	

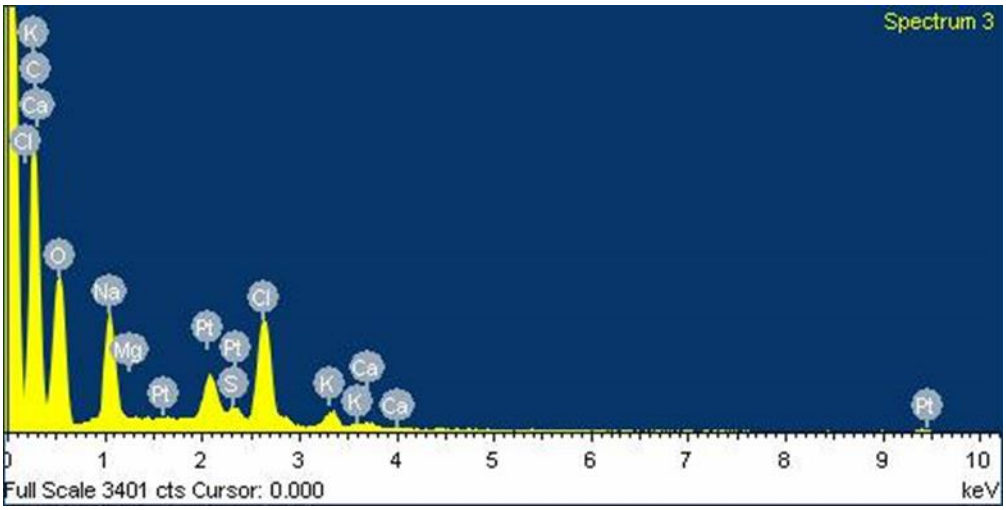
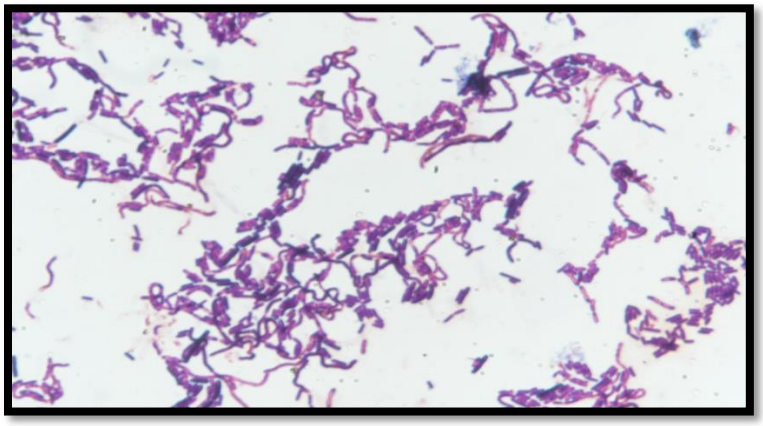


Figure 4.10 Mineral estimation

1.3.3 Anti-Microbial Analysis

Bacteria obtained in sample are can be saw by this image



Bacteria are depicted as rods, suggesting the presence of Bacili, Streptobacilli, and Cocobacilli.

According to the findings, both goods have a long shelf life.

4. Conclusion

The nutritional composition of both formulated products was good, with very little variance in the amount of nutrients. The nutritional value of certain veggies increases the product's worth. Lower moisture content extended the shelf life of prepared items while reducing microbial activity. Micronutrient supplementation increased as a result of the availability of designed products. The process of solar drying vegetables contributes to the reduction of post-harvest losses. The formulation showed to be an excellent source of nutrients, and it's also classified as a ready-to-cook food, which is in great demand in metropolitan areas. Products created for health purposes proved to be a good source of energy, carbohydrate, protein, fat, and calcium. The product contains antioxidants, which help to boost the immune system.

5. References

1. Jain, R., & Goomer, S. (2016, March). Development of Dehydrated Protein and Fibrerich Vegetable Chunks. *In National Conference on Advances in Food Science and Technology (Vol. 16, p. 117).*
2. Dhandevi, P. E. M., & Jeewon, R. (2015). Fruit and vegetable intake: Benefits and progress of nutrition education interventions-narrative review article. *Iranian journal of public health, 44(10), 1309.*
3. Rahmani, A. H., & Aldebasi, Y. H. (2017). Ficus carica and its constituents role in management of diseases. *Asian J Pharm Clin Res, 10(6), 49-53*.
4. Panwar, N. L., Kaushik, S. C., & Kothari, S. (2012). State of the art on solar drying technology: a review. *International Journal of Renewable Energy Technology, 3(2), 107- 141*.
5. Nielsen, S. S. (2017). *Food analysis laboratory manual. Springer.*
6. Patras, A., Tiwari, B. K., & Brunton, N. P. (2011). Influence of blanching and low temperature preservation strategies on antioxidant activity and phytochemical content of carrots, green beans and broccoli. *LWT-Food Science and Technology, 44(1), 299-306.*
7. Pomeranz, Y., & Meloan, C. E. (1994). Ash and minerals. *In Food analysis (pp. 602- 624). Springer, Boston, MA.*
8. (Chandel, S. S., Ibrahim, M., & Bharose, R. (2021). Physiological Analysis and Evaluation of Heavy Metal Contents in Leafy Vegetables and fruits collected from the local Market of Prayagraj. *International Journal of Environmental Science, 6*
9. Patras, A., Tiwari, B. K., & Brunton, N. P. (2011). Influence of blanching and low temperature preservation strategies on antioxidant activity and phytochemical content of carrots, green beans and broccoli. *LWT-Food Science and Technology, 44(1), 299-306.*
10. Frodin, D. G. (2004). History and concepts of big plant genera. Taxon, 53(3), 753-776.
11. Tyagi, N. K., & Mishra, S. (2019). Development of premixes for preparation ofnutrigenomic food and its impact on life style related diseases.
12. Sravani, T., & Paarakh, P. M. (2012). Antioxidant activity of Hedychium spicatumBuch.-Ham. rhizomes.
13. Leaves, L., & Leaves, L. (2014). Antioxidant activity by DPPH radical scavengingmethod of ageratum conyzoides. *American Journal of Ethnomedicine*, *1*(4), 244-249.