

Botanical Analysis of the Vegetable Market in Meerut (U. P.) and Their Role in Food Security

Shyam Singh¹, Uday Bhan Prajapati^{2,*}

¹Department of Botany, Meerut College, Meerut, U.P. 25001, India.

²Patanjali Herbal Research Department, Patanjali Research Institute, Haridwar, Uttarakhand, India.

How to cite this paper: Shyam Singh, Uday Bhan Prajapati. (2022) Botanical Analysis of the Vegetable Market in Meerut (U. P.) and Their Role in Food Security. *International Journal of Food Science and Agriculture*, 6(4), 416-421. DOI: 10.26855/ijfsa.2022.12.009

Received: October 30, 2022
Accepted: November 28, 2022
Published: December 30, 2022

*Corresponding author: Uday Bhan Prajapati, Patanjali Herbal Research Department, Patanjali Research Institute, Haridwar, Uttarakhand, India.
Email: swapanuday9@gmail.com

Abstract

Plants are very valuable for the human being in various ways which play an important role in human diet and nutrition. Vegetables are a big source of food for the human community. In the present investigation, the emphasis is given to the plants which are used as a vegetable by human beings. The plant parts such as roots, rhizomes, tubers, bulbs, stems, leaves, flowers, and fruits are used as vegetables. They have eaten with a meal either the salted spiced cooked recipe or as a salad. It provides vitamins, minerals, proteins, carbohydrates, fats, and oils that are necessary for the body. The authors reported 86 plants from 32 families after a detailed investigation of the vegetable market in the study area during 2021 which was used as vegetables for food. Taxonomically Cucurbitaceae, Fabaceae, and Brassicaceae were the most valuable plant families for supporting vegetable production in a selected area. It also indicates the food habit of the population in this area due to their high demand and supply.

Keywords

Vegetables, Farmer, Meerut, Horticulture, Agriculture

1. Introduction

Food is the first necessity of human beings since ancient times. The prehistoric human takes their food from wild animals but with the advancement of civilization, man started to fulfill their food requirement from the plant. He started the cultivation of crop plants for food and nutrition. Vegetables belong to horticultural crops, it may be annual or perennial and derived from some plant parts that are fruits, flowers, nuts, leaves and stems. Although the food value of vegetables is comparatively low against the cereals, millets and pulses but they have vitamins, minerals, protein, carbohydrates, fats and oils in large quantity which is an important constituent of food for nutrition and good health. Nowadays, a wide range of fresh and processed vegetables are available in the vegetable market. Thus vegetable production marketing plays an important role in the economy, livelihood of farmers and local people [1]. Small land-holding farmers in vegetable markets are more beneficial than large farmers due to their family labor, bullock power, and organic manure [2]. A report depicts the world's top ten fresh vegetable growers in 2019, China was the biggest producer in that year, with roughly 588.26 million metric tonnes of fresh vegetables produced, followed by India with approximately 132 million metric tonnes [3]. Tomatoes were the most popular veggies in that year, based on global production volume. In this way India is the world's second-largest producer of fruits and vegetables. India's proportion of global fruit and vegetable production is 11.38 percent and 11.78 percent, respectively [4]. Farm revenue enhancement, poverty alleviation, food security, and sustainable agriculture all benefit from the vegetable sector [5]. Our country has a wide range of agro-climatic situations for the production of vegetable crop throughout the year which makes the continuous supply of fresh vegetables [6]. The World Health Organization suggests that a daily intake of 400-600 gm of fruit and vegetables reduces the risk of micronutrient deficiency, cardiovascular disease, cancer, and other nutritional health risks [7].

2. Material and Method:

Study Area:

The Meerut district lies between 28.9845° N and 77.7064° E latitude in the Indo-Gangetic plains of India. It is bound to the north by Muzaffarnagar district, in the south by Hapur and Bulandshahr, while Gaziabad and Bagpat district from the southern and western limits. In area, Meerut district covers 2522 km² (974 sq m) which is larger than Delhi. As per Census 2011, the population of Meerut district is 3442689 with Thra tehsils, Meerut sadar, Mawana and Saradhana [8]. Meteorological data indicate that Meerut belongs to a warm and temperate region. Temperatures rise again in October and the city then has a mild, dry winter season from late October to the middle of March. Lowest temperature recorded is 0.5°C. Rainfall is about 80 cm to 100 cm per annum, which is suitable for growing crops. Most of the rainfall is received during the monsoon. Humidity varies in a range from 30% to 100%. The river Ganges forms the eastern boundary and separates the district from Moradabad and river Hindon forms the western boundary and separates the district from Bagpat [9].

Data collection:

This research examines in the vegetable markets like Sadar, Khakhoda, Khautil, Kathor and Meerut new Mandi, District Meerut, Uttar Pradesh, India. The data for this research was collected through personal interviews of farmers and vegetable sellers using farmer survey instruments between January 2021 to December 2021. First of all, a list of taxa of the vegetables was prepared by referring to all available literature and specimens deposited in various herbaria. After that, field visits of 1-3 days during winter, summer, monsoon, and autumn duration were undertaken to nooks and corners of the Meerut vegetable market for vegetable collection. During the field visits, three specimens were collected of each species and prepared voucher specimens following standard herbarium techniques [10]. The specimens are deposited in the herbarium of Meerut College, Meerut, Uttar Pradesh. Identification of taxa was confirmed with the help of available literature such as Cooke (1958) [11], Babu et al. (1987) [12], Sanjappa (1995) [13], and online sources *i.e.* Pl@ntNet [14], Plant.id [15], Whatistheplant [16] and PlantSnap [17]. Doubtful and interesting identifications were confirmed by their direct comparison with authentically identified specimens deposited in various herbaria such as the Herbarium of Botanical Survey of India, Dehradun (BSI) and Patanjali Research Foundation Herbarium, Haridwar. The botanical name of the taxa has been verified with International Plant Name Index (IPNI). The genera, species and infraspecific taxa are alphabetically arranged in the present paper.

Vegetables:

The term vegetable was used as an adjective in English to mean capable of growth, and is recorded in 1767 as a noun meaning "plant cultivated for food, edible herb or root" [18]. On the basis of extensive survey and analysis, here all vegetables are classified into two groups. The first one is on the basis of their plant taxonomy and another is on the basis of their edible part.

1) On the basis of Taxonomy

- a) Monocot vegetables *i.e.* Garlic, onion, maize, ginger etc.
- b) Dicot vegetables *i.e.* Potato, tomato, cauliflower, cabbage, ladyfinger, pumpkin etc.
- c) Fungi *i.e.* Mushroom

2) On the basis of Edible parts:

- a) Root vegetables
- b) Stem vegetables
- c) Leafy vegetables
- d) Fruit vegetables
- e) Miscellaneous vegetables

3. Result and discussion

After a complete survey of the vegetable market, eighty-six (86) vegetable plant was reported which belong to 31 family of Angiosperm and 01 family of Fungi. All angiosperm vegetable plant divides into monocot and dicot. Monocot vegetables have nine (09) plant while Dicot vegetable have seventy-six plants (76). *Dioscorea alata* L., *Colocasia esculenta* (L.) Schott, *Allium cepa* L., *Allium sativum* L, *Asparagus officinalis* L., *Musa × paradisiaca* L., *Zea mays* L. and *Zingiber officinale* Roscoe belong to Monocotyledons Group which are used either in the form of leaf, shoot, fruit, bulb, and rhizome. Family Cucurbitaceae, Fabaceae, and Brassicaceae provide most vegetables in this region respectively (Figure 2). Due to the warm and temperate climate of the study area, these family plants grow easily. Easy cultivation practices make these families more suitable crops in the region. Cucurbits are herbaceous, tendril-bearing vines, short-vegetative cycle, that are adapted to warm climates. Leguminosae (Fabaceae) is generally characterized by typical legume fruit and the ability to symbiotically fix nitrogen. Brassicaceae, often called Cruciferae or the mustard family, comprise many economically important species that are grown worldwide. They have been traditionally consumed in the human diet as fresh and preserved vegetables, vegetable oils, and condiments, from ancient times to the present time. On the basis of Edible parts all vegetables are categories into five categories *i.e.* Six Root vegetables (06), Five Stem vegetables (05), Sixteen Leafy vegetables (16), Fifty-five Fruit vegetables (55), and Four Miscellaneous vegetables (04)

(Table 1). Plant part plays an important role for their utilization as a vegetable. In this study, the author found that the most commonly used part of the plant was Leaves and Fruit (Figure 1). Some plant utilizes their leaves, fruit and, seed while some leaves with flower, leaves with tuber, leaves with root or Leaves with stem (Table and Figure 1).

Table 1. The list of the plants and their edible parts with preparation is as follows

Botanical Name	Angiosperm	Family	Common name	Preparation (Recipes)	Edible Part
Root vegetables					
<i>Ipomoea batatas</i> (L.) Lam.	Dicot	Convolvulaceae	Sakarkand/ Sweet Potato	Sag/vegetable/KandKawab	Leaves and Tuber
<i>Manihot esculenta</i> Crantz.	Dicot	Euphorbiaceae	Kandmool/Tapioca	Cooked boiled vegetables	Root and leaves
<i>Daucus carota</i> L.	Dicot	Apiaceae	Gajar/Carrot	Vegetable/Salad	Root
<i>Beta vulgaris</i> L.	Dicot	Amaranthaceae	Chukandar/ Beat	Cooked as vegetable / Salad	Root
<i>Raphanus sativus</i> L. Syn. <i>Raphanus raphanistrum</i> subsp. <i>sativus</i> (L.) Domin	Dicot	Brassicaceae	Muli/ Radish	Cooked as vegetable / Salad	Root and leaves
<i>Brassica rapa</i> L.	Dicot	Brassicaceae	Shaljam/Turnip	Cooked as vegetable / Salad	Root and leaves
Stem vegetables					
<i>Solanum tuberosum</i> L.	Dicot	Solanaceae	Aloo/ Potato	Roasted /Fried/Cooked as vegetables/chips	Tubers
<i>Dioscorea alata</i> L.	Monocot	Dioscoreaceae	Ratalu/ Yam	Cooked as vegetable	Tubers
<i>Colocasia esculenta</i> (L.) Schott	Monocot	Araceae	Arvi/taro	Roasted fried vegetable	Tubers
<i>Allium cepa</i> L.	Monocot	Amaryllidaceae	Piyaz/Onion	Mature bulb/ raw salad/ Cooked as vegetables	Leaves and Stem
<i>Allium sativum</i> L.	Monocot	Amaryllidaceae	Lehsun/ Garlic	Flavored sauce /Pickles/Salad	Leaves and Stem
Leafy vegetables					
<i>Spinacia oleracea</i> L.	Dicot	Amaranthaceae	Palk/Spinach	Cooked as vegetable / Salad/Sag/Soup	Leaves
<i>Apium graveolens</i> L.	Dicot	Apiaceae	Ajmur/ Celery	Leaves used in salad and soup	Leaves
<i>Trigonella foenum-graecum</i> L.	Dicot	Fabaceae	Methi/ Fenugreek	Cooked as vegetable	Leaves
<i>Brassica oleracea</i> var. <i>botrytis</i> L.	Dicot	Brassicaceae	Phool-gobhi/Cauliflower	Cooked as vegetable / Soup/Pickles	Leaves and Flower
<i>Brassica oleracea</i> var. <i>capitata</i> L.	Dicot	Brassicaceae	Band-gobhi/ Cabbage	Cooked as vegetable / Salad	Leaves
<i>Brassica oleracea</i> var. <i>gongylodes</i> L.	Dicot	Brassicaceae	Ganth-gobhi/ KnolKhol	Cooked as vegetable / Soup	Leaves
<i>Brassica oleracea</i> var. <i>gemmifera</i> Zenker.	Dicot	Brassicaceae	Button Gobhi/ Brussels	Cooked as vegetable / Salad	Leaves
<i>Brassica oleracea</i> var. <i>italica</i> Plenck	Dicot	Brassicaceae	Karam sag/ Broccoli	Cooked as vegetable /Soup	Leaves
<i>Amaranthus spinosus</i> L.	Dicot	Amaranthaceae	KatiliChaulai/Amaranthus	Cooked as vegetable / Paratha Sag	Leaves
<i>Amaranthus viridis</i> L. Syn. <i>Amaranthus blitum</i> L.	Dicot	Amaranthaceae	JangliChaulai/Wild Amaranthus	Cooked as vegetable / Sag/Paratha	Leaves
<i>Asparagus officinalis</i> L.	Monocot	Asparagaceae	Seetamuli/Asparagus	Vegetable / Salad/Sauce	Leaves
<i>Chenopodium album</i> L.	Dicot	Amaranthaceae	Bathua/Pigweed	Cooked as vegetable / /Sag/Soup/Rayta/Paratha	Leaves
<i>Brassica juncea</i> (L.) Czern.	Dicot	Brassicaceae	Sarson/Yellow sarson	Vegetable / Salad/Sag	Leaves
<i>Brassica juncea</i> (L.) Czern.	Dicot	Brassicaceae	Sarson/Leaf mustard	Vegetable / Salad/Sag	Leaves
<i>Brassica hirta</i> Moench	Dicot	Brassicaceae	Sarson/White mustard	Vegetable / Salad/Sag	Leaves
<i>Portulaca oleracea</i> L.	Dicot	Portulacaceae	Kulfa/ Purslane	Cooked as vegetable	Leaves
Fruit vegetables					
<i>Cucurbita maxima</i> Duchesne	Dicot	Cucurbitaceae	Kaddu/Squash Gourd	Cooked as vegetable	Fruit and Flower
<i>Benincasa hispida</i> (Thunb.) Cogn.	Dicot	Cucurbitaceae	Petha/Ash gourd	Cooked as vegetable / Sweeter petha	Fruit
<i>Lagenaria siceraria</i> (Molina) Standl.	Dicot	Cucurbitaceae	Lauki/Bottal gourd	Cooked as vegetable / Rayta	Fruit
<i>Luffa acutangula</i> (L.) Roxb.	Dicot	Cucurbitaceae	Kali Tori/Ribbeg gourd	Cooked as vegetable /Soup	Fruit
<i>Luffa cylindrica</i> (L.) M.Roem.	Dicot	Cucurbitaceae	Ghiya tori/Smooth spring	Cooked as vegetable /Soup	Fruit
<i>Momordica charantia</i> L.	Dicot	Cucurbitaceae	Karela/Bitter gourd	Fried Vegetable /Roasted/Soup	Fruit
<i>Citrullus vulgaris</i> var. <i>fistulosus</i> (Stocks) J.L.Stewart Syn. <i>Benincasa fistulosa</i> (Stocks) H. Schaef. & S.S. Renner	Dicot	Cucurbitaceae	Golelauki/Round gourd	Cooked as vegetable	Fruit
<i>Trichosanthes dioica</i> Roxb.	Dicot	Cucurbitaceae	Pointed gourd/Parwal	Cooked as vegetable / Sweetner	Fruit
<i>Trichosanthes anguina</i> L. Syn. <i>Trichosanthes cucumerina</i> L.	Dicot	Cucurbitaceae	Chichinda/Snake gourd	Cooked as vegetable	Fruit
<i>Coccinia grandis</i> (L.) Voigt	Dicot	Cucurbitaceae	Kundru/Ivy gourd	Roasted/Cooked as vegetable	Fruit
<i>Cucumis melo</i> var. <i>momordica</i> (Roxb.)	Dicot	Cucurbitaceae	Phoot/Kachra/Cucumber	Eaten raw/Cooked as Vegetable	Fruit

Duthie & J.B. Fuller						
<i>Cucumis utilissimus</i> Roxb. Syn. <i>Cucumis melo</i> L.	Dicot	Cucurbitaceae	Long melon	Cooked as vegetable	Fruit	
<i>Cucumis sativus</i> L.	Dicot	Cucurbitaceae	Kakri/Khira/ Cucumber	Raw/Salad/ Vegetable	Fruit	
<i>Lycopersicon esculentum</i> Mill. Syn. <i>Solanum lycopersicum</i> L.	Dicot	Solanaceae	Tamater/Tomato	Cooked as vegetable / Salad/Raw	Fruit	
<i>Solanum melongena</i> L.	Dicot	Solanaceae	Baigan/Brinjal	Cooked as vegetable / Roasted/Boiled	Fruit	
<i>Capsicum annum</i> L.	Dicot	Solanaceae	Mirch/Bell pepper	Vegetable / Salad/Raw	Fruit	
<i>Abelmoschus esculentus</i> (L.)	Dicot	Malvaceae	Okra/Bhindi/Lady finger	Cooked as vegetable	Fruit	
<i>Artocarpus heterophyllus</i> Lam.	Dicot	Moraceae	Kathal/Jackfruit	Cooked as vegetable / Pickles	Fruit	
<i>Vigna unguiculata</i> (L.) Walp.	Dicot	Fabaceae	Lobia/Cow pea	Cooked as vegetable	Fruit	
<i>Vigna aconitifolia</i> (Jacq.) Maréchal	Dicot	Fabaceae	Aconite/Moth	Cooked as vegetable	Fruit	
<i>Phaseolus vulgaris</i> L.	Dicot	Fabaceae	Rajma/French been	Cooked as vegetable	Fruit	
<i>Dolichos lablab</i> L. Syn. <i>Lablab purpureus</i> (L.) Sweet	Dicot	Fabaceae	Sem/Hyacinth Bean	Cooked as vegetable	Fruit	
<i>Vicia faba</i> L.	Dicot	Fabaceae	Bakla/Sobchana/Broad bean	Cooked as vegetable	Fruit	
<i>Cyamopsis tetragonoloba</i> (L.) Taub.	Dicot	Fabaceae	Gaur fali/Cluster bean	Cooked as vegetable	Fruit	
<i>Coriandrum sativum</i> L.	Dicot	Apiaceae	Dhania/Coriander	Cooked as vegetable/ Salad/Stuffing	Fruit	
<i>Mentha arvensis</i> L.	Dicot	Lamiaceae	Pudina/Mint	Cooked as vegetable / Salad/Chatni	Fruit	
<i>Murraya koenigii</i> (L.) Spreng.	Dicot	Rutaceae	Kari Patta/Karri leaves	Cooked as vegetable / Salad	Fruit	
<i>Anethum graveolens</i> L.	Dicot	Apiaceae	Sowa/Dill	Cooked as vegetable / Salad/Chatni	Fruit	
<i>Mangifera indica</i> L.	Dicot	Anacardiaceae	Aam/Mango	Cooked as vegetable / Chatni/Pickles	Fruit	
<i>Citrus × limon</i> (L.) Osbeck	Dicot	Rutaceae	Neemboo/Lemon	Raw/ Salad/Pickle/Jam	Fruit	
<i>Musa × paradisiaca</i> L.	Monocot	Musaceae	Kela/Banana	Cooked as vegetable	Fruit	
<i>Pisum sativum</i> L. Syn. <i>Lathyrus oleraceus</i> Lam.	Dicot	Fabaceae	Mater/Pea	Cooked as vegetable	Fruit and Seed	
<i>Capsicum frutescens</i> L.	Dicot	Solanaceae	Mirch/Green Chilli	Cooked as vegetable / Salad	Fruit	
<i>Momordica dioica</i> Roxb. ex Willd.	Dicot	Cucurbitaceae	Kakara/ Spine Gourd	Cooked as vegetable / Pickle/Chatni	Fruit	
<i>Moringa oleifera</i> Lam.	Dicot	Moringaceae	Sahajan/Drum sticks	Cooked as vegetable	Fruit	
<i>Nelumbo nucifera</i> Gaertn.	Dicot	Nelumbonaceae	Kamal/Bhish/Lotus	Cooked as vegetable	Fruit	
<i>Bombax ceiba</i> L.	Dicot	Malvaceae	Semal/Silk cotton	Cooked as vegetable	Fruit	
<i>Emblica officinalis</i> Gaertn. Syn. <i>Phyllanthus emblica</i> L.	Dicot	Phyllanthaceae	Amla/Indian gooseberry	Pickle/ Murabba/Jam	Fruit	
<i>Trapa natans</i> L.	Dicot	Lythraceae	Singhada/Water chestnut	Cooked as vegetable / Boiled/Raw	Fruit	
<i>Carissa macrocarpa</i> (Eckl.) A.DC.	Dicot	Apocynaceae	Karonda/Natal plum	Cooked as vegetable / Pickles	Fruit	
<i>Cynara scolymus</i> L. Syn. <i>Cynara cardunculus</i> L.	Dicot	Asteraceae	Hathichak/Artichoke	Cooked as vegetable / Boiled	Fruit	
<i>Cyclanthera pedata</i> (L.) Schrad.	Dicot	Cucurbitaceae	PahadiKarela	Cooked as vegetable	Fruit	
<i>Spondias mombin</i> L.	Dicot	Anacardiaceae	Amla/hogpalm	Cooked as vegetable / Raw	Fruit	
<i>Cicer arietinum</i> L.	Dicot	Fabaceae	Chana/Gram	Cooked as vegetable / Sag	Fruit	
<i>Sechium edule</i> (Jacq.) Sw. Syn. <i>Sicyos edulis</i> Jacq.	Dicot	Cucurbitaceae	Chow Chow /Chayote	Cooked as vegetable / Salad/Sag/Soup	Fruit	
<i>Carica papaya</i> L.	Dicot	Caricaceae	Papita/Papaya	Cooked as vegetable / Salad/Sag/Soup	Fruit	
<i>Corchorus capsularis</i> L.	Dicot	Malvaceae	Sanai/Jute	Cooked as vegetable	Fruit	
<i>Melothria scabra</i> Naudin	Dicot	Cucurbitaceae	Kachari/Mouse melon	Cooked as vegetable / Pickle	Fruit	
<i>Cordia dichotoma</i> G.Forst.	Dicot	Boraginaceae	Lasoda/Glue berry	Cooked as vegetable / Raw	Fruit	
<i>Sesbania grandiflora</i> (L.) Poir.	Dicot	Fabaceae	Agast/Agathi	Cooked as vegetable	Leaves and Flower	
<i>Ficus racemosa</i> L. Syn. <i>Ficus virens</i> Aiton	Dicot	Moraceae	Gullar/Ficus	Cooked as vegetable / Raw	Fruit	
<i>Ipomoea aquatic</i> Forssk.	Dicot	Convolvulaceae	Panipalak/Water spinach	Cooked as vegetable	leaves and Shoot	
<i>Zea mays</i> L.	Monocot	Poaceae	Makka/maize	Cooked as vegetable / Roasted	Fruit	
<i>Glycine max</i> (L.) Merr.	Dicot	Fabaceae	Bhat/Soyabean	Cooked as vegetable	Fruit	
<i>Zingiber officinale</i> Roscoe	Monocot	Zingiberaceae	Adarak/Zinziber	Chatni / Sauce/pickles	Fruit	
Miscellaneous vegetables						
<i>Papaver somniferum</i> L.	Dicot	Papaveraceae	Posta/Opium	Cooked as vegetable	Seed	

Agaricus bisporus (J. Lange) Imbach	Fungi	Agaricaceae	Kukurmutta/Mashroom	Cooked as vegetable	Fruiting body
Madhuca longifolia (J. Koenig ex L.)	Dicot	Sapotaceae	Mahua/Madhuca	Cooked as vegetable / Salad/Sag/Soup	Flower
Bambusa vulgaris Nees	Monocot	Poaceae	Bans/Bamboo	Cooked as vegetable	Shoots

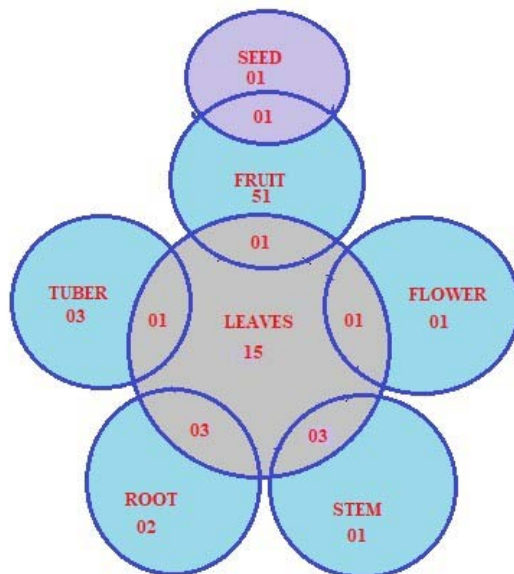


Figure 1. Vegetables classified on the basis of edibal part.

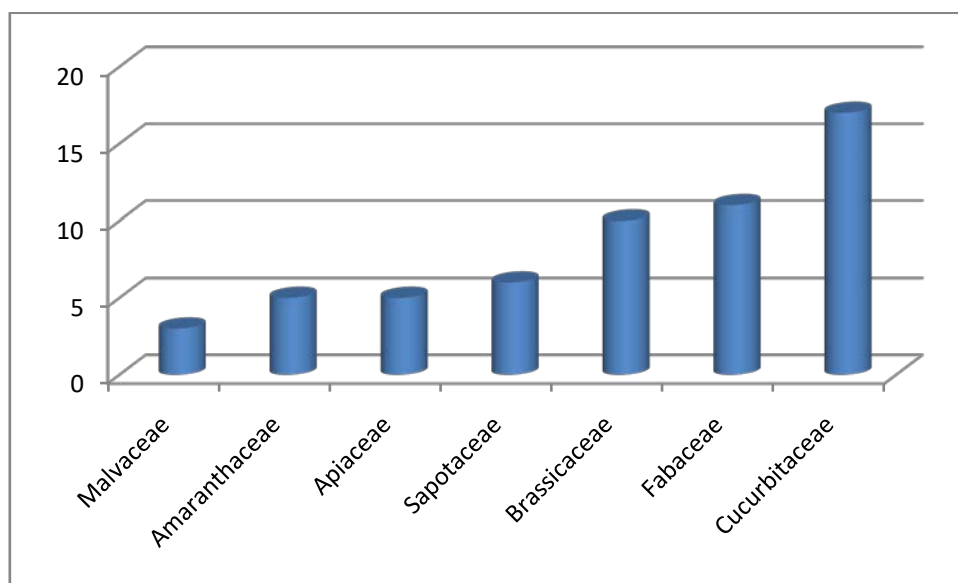


Figure 2. Plant Family of vegetables.

4. Conclusion

Meerut has a large contribution to vegetable production, situated near NCR Delhi. All the plants are consumed as vegetables for food Safety & nutritional value. These plants are consumed in either raw or cooked. By cultivation and marketing of vegetable crops, the related person like farmers, vendors, sellers, etc. benefit directly or indirectly as per economic point of view which enhances their livelihood. In this study, we concluded that leaves and fruit were the most consumed parts of the plant. Taxonomically Cucurbitaceae, Fabaceae and, Brassicaceae were the most valuable plant families for support vegetable production in the selected area. It also indicates the food habit of the population in this area due to their high demand and supply.

Authors' contributions

SS designed the study. UBP carried out the experiment and interpreted the results and drafted the manuscript. SS and

UBP reviewed the manuscript. The authors read and approved the final manuscript.

References

- [1] Singh, S. and Prajapati, U.B. (2013). Periurban Agriculture in Gorakhpur Region. *Ad. Plant sci*, 26 (I), 243-247. ISSN 0970-3586.
- [2] Joshi, P.K., Joshi, L., & BIRTHAL, P.S. (2006). Diversification and Its Impact on Smallholders: Evidence from a Study on Vegetable Production. *Agricultural Economics Research Review*, 19(347-2016-16776), 219-236.
- [3] Shahbandeh, M. (2021). Leading Global Producers of Fresh Vegetables 2019. <https://www.statista.com/statistics/264662/top-producers-of-fresh-vegetables-worldwide/> [Accessed October 12, 2020].
- [4] Malhotra, S.K. (2021). Mainstreaming Indigenous Fruits & Vegetables for Food & Nutrition Secure Future (Perspectives: India). Webinar for International Year for Fruits & Vegetables, Organized by: Govt. of India & FAO Regional office in India 29 December, 2021. <http://www.nhb.gov.in/KnowledgeCenter/Mainstreaming-Indigenous-Fruits-and-Vegetables.pdf> [Accessed September 05, 2020].
- [5] Prajapati, U.B. and Srivastava, C. (2013). Increasing Shelf Life and Organoleptic Values of Leafy Vegetables by Ecofriendly Alternatives to Enhance the Livelihood of Small Marginal Farmers. *International journal of agriculture*, 124, 260-265. ISJN-7758-2463.
- [6] Shankar, T., & Singh, K. M. (2016). An Analysis on Problems of Vegetables Marketing in Farmers' Market of Jharkhand-A Case Study in Ranchi District. MPRA Paper No. 78721. https://mpra.ub.uni-muenchen.de/78721/1/MPRA_paper_78721.pdf.
- [7] WHO (World Health Organization) [Internet]. (2018). http://www.who.int/elena/titles/fruit_vegetables_ncds/en/ [Accessed February 10, 2020].
- [8] Census 2011. (2022). Meerut District: Population 2011-2022 data. <https://www.census2011.co.in/census/district/509-meerut.html> [Accessed December 02, 2020]
- [9] UPPCB. (2020). Meerut City Clean Air Action Plan. <https://cpcb.nic.in/Actionplan/Meerut.pdf> [Accessed December 02, 2020]
- [10] Rao, R.R., Sharma, B.D. (1990). A Manual for Herbarium Collections. Botanical Survey of India, Calcutta, 1, 1–184.
- [11] Cooke, T. (1958). The Flora of the Presidency of Bombay (Repr. ed.). Botanical Survey of India, Calcutta, 1, 305–436.
- [12] Babu, C.R., Sharma, S.K., Johri, B.M. (1987). Leguminosae- Papilionoideae: Tribe- Phaseoleae. *Bulletin Botanical Survey of India*, 27, 1–28.
- [13] Sanjappa, M. (1995). Leguminosae - Papilionoideae: Tribe- Indigofereae. In: Hajra, P.K., Sashtry, A.R.K., Sanjappa, M., editors. *Fascicles of Flora of India - 21*. Botanical Survey of India, Calcutta, 1-167.
- [14] plantnet.org. (2022). <https://identify.plantnet.org/> [Accessed March 10, 2022]
- [15] Plant.id. (n.d.). <https://plant.id/> [Accessed February 10, 2022]
- [16] Whatistheplant. (2021). <https://whatistheplant.com/> [Accessed April 10, 2022]
- [17] PlantSnap. (2022) <https://www.plantsnap.com> [Accessed September 10, 2022]
- [18] Online Etymology Dictionary. (2022). vegetable. <https://www.etymonline.com/word/vegetable> [Accessed July 10, 2022]