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Exploring the consumption trends of ethnomedicinal plants as dietary supplements in the Kumaun Himalaya

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Abstract: *The primary objective of this study is to meticulously identify, comprehensively document, and actively contribute to the conservation efforts of ethnomedicinal plants utilized by the indigenous villagers of the Kumaun Himalayas. These plants, deeply entrenched within local tradition, serve as vital resources for treating a diverse array of diseases and ailments, underscoring their significance in indigenous healthcare practices. The present investigation was conducted across three key blocks within the districts of Nainital, Almora, and Bageshwar, situated in the Kumaun division of Uttarakhand. Throughout this study, an exhaustive survey identified a total of 60 distinct species of medicinal plants, all of which are utilized as ethnomedicinal resources within the region's indigenous communities. The findings revealed that the highest number of species, comprising 25 species, were employed as vegetables, with fruits following closely behind at 18 species, and 17 species utilized specifically for tea and decoction purposes. This study also emphasized the indigenous knowledge surrounding medicinal plants, focusing particularly on those utilized during the COVID-19 pandemic within the area. Through this documentation, we aim to preserve and disseminate valuable traditional knowledge for the benefit of future generations and potential integrations into contemporary healthcare practices.*

Key Words: *COVID-19, medicinal plants (immunity boosters), various diseases, Kumaun Himalaya.*

1. INTRODUCTION :

Ethnomedicinal plants are those that have been traditionally used by various indigenous communities and cultures for medicinal purposes. These plants often form a significant part of traditional healing systems and have been passed down through generations via oral tradition. Ethnomedicinal knowledge is typically deeply rooted in the cultural and ecological context of the communities that use them. These plants are valued for their therapeutic properties and are utilized to treat a wide range of ailments and health conditions, including but not limited to fevers, infections, digestive issues, skin disorders, and respiratory problems. The use of ethnomedicinal plants is often based on empirical observations and experiences accumulated over centuries of use. Ethnomedicinal plants are not only a source of healthcare for many communities but also hold cultural and economic importance. They may play a vital role in rituals, ceremonies, and cultural practices, as well as contribute to livelihoods through trade and commerce. In recent years, there has been growing interest in ethnomedicinal plants from researchers, pharmaceutical companies, and conservationists alike. Scientists study these plants to validate their medicinal properties through scientific research and to identify potential new drugs or treatments. Conservation efforts are also underway to protect these valuable resources from overexploitation and habitat destruction. Overall, ethnomedicinal plants represent a rich repository of traditional knowledge and biodiversity, offering valuable insights into the relationship between humans and their natural environment, as well as holding promise for addressing contemporary healthcare challenges.

In the current study, we meticulously examined the utilization of ethno-medicinal plants within the Kumaun region, with a specific focus on their usage patterns during the covid-19 pandemic, aimed at understanding their efficacy in combating the coronavirus. During the covid-19 pandemic, it is crucial for individuals to prioritize the enhancement of their immune system through the consumption of nutritional supplements, as emphasized by Mishra and Patel (2020). Adopting proper hygiene practices and incorporating a diet rich in fruits, which serve as a significant source of vitamin c, as well as vegetables, play pivotal roles in combating the disease, as corroborated by findings from studies conducted by Farheen *et al*., (2022) and Sabri *et al*., (2021). Moreover, insights provided by Nejat *et al*., (2021) underscore the

potential benefits of traditional and folk medicine in preventing covid-19, further highlighting the importance of holistic approaches in disease prevention and management.

Banerjee *et al*., (2020) proposed that natural food sources, including fruits, vegetables, and spices, possess medicinal properties and are readily accessible in nature. Within our country, individuals often adhere to traditional practices, utilizing these natural remedies as a means to combat various illnesses and health challenges. This acknowledgment underscores the enduring reliance on indigenous knowledge and the abundant resources provided by the natural world in managing and addressing health concerns. According to (Kumar and Arya, 2021), *prunus armeniaca*, *Rubus ellipticus*, *Myrica esculenta*, *Withania somnifera*, *Ocimum sp.*, *Vitis vinifera*, *zingiber officinale*, *prunus persica*, *Urtica dioica*, and *Melia azedarach* are medicinal plants used as an immunity booster. Fever, cough, cold, and bronchitis are also cured by traditionally used plants and they are rich in antioxidants (Lata and Jamali, 2021). Hence, the advent of the covid-19 pandemic serves as a crucial juncture prompting introspection into the documentation of our abundant traditional wisdom, particularly regarding the utilization of medicinal plants. This global crisis accentuates the critical importance of safeguarding and advocating for these precious botanical treasures, which have long served as vital remedies for a diverse range of health conditions. Moreover, it highlights the potential for cultivating a flourishing medicinal plant industry in Uttarakhand, renowned as the herbal state, thereby enhancing livelihood opportunities for its residents.

2. MATERIALS AND METHODS :

Study area: The current study was carried out across three specifically chosen blocks within three distinct districts among a total of 13 districts in Uttarakhand. A total of nine villages were meticulously surveyed to gather comprehensive data. Each district contributed three villages for questionnaire-based information collection. Specifically, from the Ramgarh block in Nainital district, the villages of Chapar, Kaphura, and Kwarab were selected. In the Hawalbagh block of the Almora district, the villages of Chausali, Matela, and Udiyari were surveyed. Lastly, from the Kapkot block in the Bageshwar district, the villages of Bhasauri Kutir, Farsali Walli, and Nargara were chosen as Focal points for data collection.

Ramgarh block: Ramgarh, situated in the Nainital district of the Kumaun region, lies at the geographical coordinates of 29°27´0´´N latitude and 79°33´0´´E longitude, encompassing elevations ranging from 1300 to 1900 meters above sea level. Nestled amidst hilly terrain along the Kosi River, the area spans approximately 219.84 km^2. The primary occupation of the residents revolves around agriculture and harnessing forest resources. Throughout the study, the researchers extensively explored the Ramgarh block to gather questionnaire data about various aspects of medicinal and aromatic plants, which thrive both in the natural forest habitats and cultivated areas. For this purpose, three villages were randomly selected, each situated within altitudinal ranges from 1336 meters to 1693 meters. The Ramgarh valley boasts a bountiful array of botanical resources, with many households engaging in the cultivation of diverse vegetables, fruits, notably apples, and traditional crops, alongside nurturing medicinal plants. Pine and oak species dominate the region's forest cover, with moderate to steep slopes prevalent across.

Hawalbagh block: Geographically, Hawalbagh extends between 29°32´30´´N latitude and 79°43´50´´E longitude and possesses an area of 267.53 km^2. Hawalbagh block of the Almora district of Uttarakhand lies in the Lesser Himalayan terrain. It is situated along the Kosi River. This block is mainly dependent on forest, cultivation, land and agriculture. This region is dominated by pine trees and oak trees are found as co-dominant species. Three villages are selected from this block for data collection which lie in 1157 m to 1229 m altitude.

Kapkot block: Kapkot block is located at 29°93´79´´N latitude and 79°90´25´´E longitude. It lies on the Saryu River in Bageshwar district. This region is found with wild medicinal plants and with co-dominant species like oak and pine trees. The selected villages range from 1277m to 1464 m altitude. The agricultural activity is the main livelihood activity of the area. Peoples of this region also depend on their cultivation land and forest as the primary source of income.

Questionnaire survey and data collection: The following information was compiled from a questionnaire survey conducted between June and November 2022. The survey aimed to gather ethnomedicinal insights into the usage of medicinal plants among villagers of different age groups during the COVID-19 pandemic. A semi-structured questionnaire was meticulously crafted for this purpose. The respondents were selected randomly from different age groups i.e. age below 30 years (young age group), 31-60 years (middle age), and 61-90 years (old age group). Throughout the field survey, ten questionnaires were completed in each chosen village, resulting in a comprehensive dataset from 90 informants. Additionally, the involvement of local vaidyas (traditional practitioners) enriched our findings. Their willingness to share their expertise was particularly noteworthy, considering the reluctance of many contemporary vaidyas to divulge their knowledge. This cooperation addressed a prevalent challenge encountered when seeking insights from traditional healers.

Data analysis: The amassed data underwent thorough analysis utilizing Excel spreadsheets, documents, and quantitative indices, including the use value metric (Phillips and Gentry, 1993). This analytical approach ensured a comprehensive understanding of the collected information. Furthermore, the findings were cross-referenced with previously published reports to validate and augment our findings.

Use value (UV): The use value determines which plants are the most useful as immunity boosters by informers. It helps to understand how many times people use a certain plant to boost immunity.

$$UV = \Sigma UN / N$$

Where, UN= Total number of times people reported using a plant for different purposes; N= Total number of people reported (Phillips and Gentry, 1993).

3. RESULT AND DISCUSSION :

Ethno-medicinal plants for immunity boosting: A comprehensive inventory of 60 species of ethno-medicinal plants renowned for boosting immunity was documented from the study area, encompassing 28 plant families. The majority, 47 species, were identified in the Ramgarh block, closely trailed by the Kapkot block with 46 species. Conversely, the Hawalbagh block had a relatively lower count of 40 recorded plants compared to the other two blocks. These plants, deeply ingrained in local traditions, were commonly employed as household remedies to fortify immunity amidst the COVID-19 pandemic. Among the documented species, herbs comprised the highest count with 28 species, followed by 16 tree species, 10 climbers, and 6 shrubs, as detailed in (Fig.1).

Collecting traditional knowledge across age groups: Information pertaining to medicinal plants was gathered from a total of 90 informants across three age groups. Among them, the majority, comprising 57 informants, fell within the 31-60 years age (middle age), followed by 31 informants from the old age group (61-90 years). Only two informants were interviewed from the young age group (below 30 years). Based on the responses received from the informants regarding the usage of all 60 medicinal plants, their utilization was categorized into four main categories: tea, decoction, fruits, and vegetables. The villagers' patterns of utilization were also studied.

Utilization pattern: The analysis revealed that *M. domestica* and *S. tuberosum* were highly regarded plants, with utilization rates ranging from 70% to 100%, particularly valued for their role in boosting immunity through the consumption of fruits and vegetables in the region. Following closely were *Z. officinale* and *P. nigrum*, with utilization rates of 40% to 70%, commonly used for preparing tea and decoctions. *M. balbisiana* and *C. reticulata* were also significantly utilized as fruits, while *C. maxima*, *R. sativus*, and *B. campestris* were popular choices for vegetable consumption, with utilization rates falling within the same range. Additionally, various other plant species were recognized for their immune-boosting properties, though they were utilized to a lesser extent, each representing less than 10% of usage. Among the 60 plants surveyed, *M. domestica* held the highest use value (0.778), followed closely by *S. tuberosum* (0.711), *Z. officinale* (0.656), and *R. sativus* (0.644), as indicated in Table 1.

Traditional methods and recipes

Tea process: To make tea at home, first boil 1-2 glasses of water in a kettle. Then, small pieces of *Z. officinale* (ginger), along with either ½ teaspoon of *P. nigrum* (black pepper) or 1-2 pieces of *S. aromaticum* (cloves) or *E. cardamomum* (cardamom) are added to it. Apart from this, 1-3 leaves of *O. tenuiflorum* (holy basil) or 2-3 petals of *R. indica* (rose) along with 1 or ½ teaspoon of tea leaves are also added to this homemade tea. This combination creates a simple tea blend. In the case of herbal tea, the tea is made by boiling 5 to 6 leaves of *R. officinalis* (rosemary) or *T. linearis* (thyme) in one glass of boiled water. This results in a flavourful herbal infusion.

Decoction process: To prepare a decoction, begin by bringing 1-1 ½ glasses of water to a boil in a pan. Next, add 1-2 teaspoons of *T. ammi* and allow it to boil until the water reduces by half. Similarly, decoctions can be made by boiling *A. vera* in water. Additionally, boosting immunity can be achieved by boiling a combination of a few leaves from plants such as *M. koenigii* or *M. azadirachta* or *W. somnifera*, or *T. cordifolia*, in water, and consuming the resulting infusion.

Another method for preparing a decoction involves combining 1-2 leaves of *C. tamala* with finely ground pieces of *Z. officinale*, 1-2 pieces each of *P. nigrum*, *E. cardamomum*, *C. zeylanicum*, and *S. aromaticum*. Boil this mixture in 1 to 1 ½ glasses of water in a pan. Once the quantity of the boiled mixture is reduced by half, strain and consume it. This method is also known to enhance the body's immunity.

Use of fruits: Utilizing fruits to boost immunity involves consuming them with either white or black salt. Additionally, juices derived from fruits such as *M. indica*, *P. granatum*, *M. charantia*, *C. aurantiifolia* and *C. reticulata* are employed to address deficiencies in vitamins, iron, or blood-related issues.

Use of vegetables: Vegetables are primarily prepared as culinary dishes. However, certain vegetables like *S. tuberosum*, *S. lycopersicum* and *D. bulbifera* is also consumed with salt by villagers. Additionally, *A. esculentus* is eaten by some individuals who crush it on stone and season it with salt and chili before consumption.

Domestication of immunity-boosting plants: Plants are also grown by villagers in their home fields which are used for different purposes such as fruits, vegetables, tea, and decoction. They are mainly dependent on their farming because they use these plants in an emergency. They use these plants as home remedies or as supplements on a daily basis which is important for health and improves human health. The Present study also emphasizes the uses of various plants to cure many diseases in the area. Geographically, hilly areas people are residing in hilly areas due to lack of facilities and health issues. In this case, these plants can be supplied as primary health treatment or care. It can be a low-cost treatment in such remote areas. However, there is a need to make local people aware of the indigenous knowledge of these immunity-boosting plants. *Z. officinale, P. nigrum, E. cardamomum* and *S. aromaticum* are common plants that are used for tea and decoction purposes (Table 2 and Fig 2.). *Z. officinale* contains gingerols, volatile oil components- sesquiterpene hydrocarbons, zingerberene, curcumene and farnesene. Non- volatile components- gingerols, shogaols, paradols, and zingerone. Zingiban, beta-bisabolene, beta-sesquiphellandrene, luteolin and rutin (Aleem *et al*., 2020; Gupta and Sharma, 2014). Chemical compounds present in *P. nigrum* limonene, sabinene, α-pinene, β-bisabolene, α-copaene, α-cadinol, α-thujene, and α-humulene (Ashokkumar *et al*., 2021; Scott *et al*., 2008). Metabolites of *E. cardamomum* are flavonoids (catechin, myricetin, quercetin and kaempferol) and carotenoids (lutein and β-carotene) and also exhibits sabinene, nerol, α-terpinyl acetate, α-terpineol and α-pinene (Ashokkumar *et al*., 2020). Components of *S. aromaticum* are eugenol, chavibetol, β-caryophyllene, eugenol acetate, trisiloxane 1, α- selinene, cadinene, 2-pinene (Bhardawaj *et al*., 2023).

4. CONCLUSION:

In ancient times, many people relied heavily on natural resources for their essential needs such as food, fodder, and shelter. They had an intrinsic knowledge of the environment and utilized a variety of plants not only for nourishment but also for medicinal purposes. These ethnomedicinal practices have been passed down through generations, demonstrating the profound relationship between humans and nature. The COVID-19 pandemic, which has affected the world significantly over the last few years, has underscored the vulnerabilities associated with modern lifestyles. One critical lesson from the pandemic is the realization of our overdependence on market-based products and ready-made foods. This dependency often leads to compromised immunity and an increase in illnesses, as many processed foods lack the essential nutrients required to maintain good health. During the pandemic, many people sought alternatives to conventional medicine, turning instead to natural remedies. This shift was driven by the need for stronger immune systems and better overall health. Medicinal plants, known for their therapeutic properties, became a popular choice. People began to incorporate these plants into their daily routines, using them to treat common ailments such as colds and coughs. This resurgence in the use of medicinal plants marked a significant lifestyle change for many. In rural areas, the use of ethnomedicinal plants is not just a trend but a way of life. Villagers often depend entirely on these plants for their healthcare needs. This deep-rooted knowledge and practice highlight the importance of these plants in promoting health and well-being. Given the benefits of ethnomedicinal plants, it is crucial to raise awareness about their uses and advantages. Educating people about the benefits of these plants can lead to healthier communities. Additionally, incorporating small quantities of these plants into our daily diets as food supplements can be an effective way to enhance our health naturally. For instance, adding herbs like turmeric, ginger, and basil to our meals can provide anti-inflammatory, antioxidant, and immune-boosting benefits. In conclusion, the lessons learned from the COVID-19 pandemic have shown us the importance of natural resources and traditional practices in maintaining health. By embracing ethnomedicinal plants and integrating them into our daily lives, we can foster a more holistic and health-conscious society.

Table 1: List of plants used as food supplements in the study area

S. No.	Botanical name	Local name	Family name	Plant part	Use Value
1	*Abelmoschus esculentus* (L.) Moench	Bhindi	Malvaceae	Fruit	0.122
2	*Aloe vera* (L.) Burm.f.	Aloe vera	Asphodelaceae	Gel	0.011
3	*Amaranthus viridis* L.	Cholai	Amaranthaceae	Leaves	0.278
4	*Amomum subulatum* Roxb.	Badi elaichi	Zingiberaceae	Seeds	0.022

5	*Brassica campestris* L.	Sarso	Brassicaceae	Leaves	0.422
6	*Brassica nigra (*L.) W.D.J. Koch	Layi	Brassicaceae	Leaves	0.333
7	*Brassica oleracea* var. botrytis L.	Phool gobhi	Brassicaceae	Inflorescence	0.167
8	*Brassica oleracea* var. capitata L.	Patta gobhi	Brassicaceae	Bud	0.122
9	*Capsicum annuum* L.	Simla mirch	Solanaceae	Fruit	0.044
10	*Carica papaya* L.	Papita	Caricaceae	Fruit	0.111
11	*Chenopodium album* L.	Bathua	Chenopodiaceae	Leaves	0.233
12	*Cicer arietinum* L.	Chana	Fabaceae	Seeds	0.011
13	*Cinnamomum tamala* (Buch.-Ham.) T. Nees & C.H. Eberm.	Tejpatta	Lauraceae	Leaves	0.211
14	*Cinnamomum zeylanicum* Blume	Dalchini	Lauraceae	Bark	0.022
15	Citrus×aurantiifolia (Christm.) Swingle	Kangazi Nimbu	Rutaceae	Fruit	0.011
16	*Citrus limon* (L.) Burm.f.	Pahadi nimbu	Rutaceae	Fruit	0.033
17	*Citrus reticulata* Blanco	Santra	Rutaceae	Fruit	0.511
18	*Cucumis sativus* L.	Kakdi	Cucurbitaceae	Fruit	0.033
19	*Cucurbita maxima* Duchesne	Kaddu	Cucurbitaceae	Fruit	0.444
20	*Daucus carota* L.	Gajar	Apiaceae	Root	0.133
21	*Dioscorea bulbifera* L.	Gethiya/Gethi	Dioscoreaceae	Fruit	0.022
22	*Elettaria cardamomum* (L.) Maton	Elaichi	Zingiberaceae	Seeds	0.144
23	*Ficus palmata* Forssk.	Anjir	Moraceae	Fruit	0.011
24	*Lagenaria siceraria* (Molina) Standl.	Loki	Cucurbitaceae	Fruit	0.2
25	*Litchi chinensis* Sonn.	Litchi	Sapindaceae	Fruit	0.022
26	*Luffa acutangula* (L.) Roxb.	Turai	Cucurbitaceae	Fruit	0.089
27	*Malus domestica* (Suckow) Borkh.	Seb	Rosaceae	Fruit	0.778
28	*Mangifera indica* L.	Aam	Anacardiaceae	Fruit	0.122
29	*Melia azadirachta* L.	Pahadi Neem	Meliaceae	Leaves	0.011
30	*Momordica charantia* L.	Karela	Cucurbitaceae	Fruit	0.122
31	*Murraya koenigii* (L.) Spreng.	Kari patta	Rutaceae	Leaves	0.011
32	*Musa balbisiana* Colla	Kela	Musaceae	Fruit	0.489
33	*Myrica esculenta* Buch.-Ham. ex D.Don	Kafal	Myricaceae	Fruit	0.067
34	*Ocimum tenuiflorum* L.	Tulsi	Lamiaceae	Leaves	0.244
35	*Phaseolus vulgaris* L.	Beans	Fabaceae	Pods	0.056
36	*Piper nigrum* L.	Kali mirch	Piperaceae	Seeds	0.467
37	*Pisum sativum* L.	Matar	Fabaceae	Pods	0.022
38	*Prunus armeniaca* L.	Khubani	Rosaceae	Fruit	0.278
39	*Prunus domestica* L.	Plum	Rosaceae	Fruit	0.244
40	*Prunus persica* (L.) Batsch	Aadu	Rosaceae	Fruit	0.256
41	*Psidium guajava* L.	Amrod	Myrtaceae	Fruit	0.122
42	*Punica granatum* L.	Anar	Punicaceae	Fruit	0.189
43	*Raphanus sativus* L.	Pahadi mooli	Brassicaceae	Root	0.644
44	*Rosa indica* L.	Gulab	Rosaceae	Petals	0.011
45	*Rosmarinus officinalis* L.	Rose merry	Lamiaceae	Leaves	0.022
46	*Rubus ellipticus* Sm.	Hisalu	Rosaceae	Fruit	0.011
47	*Solanum lycopersicum* L.	Tamatar	Solanaceae	Fruit	0.089
48	*Solanum melongena* L.	Began	Solanaceae	Fruit	0.089
49	*Solanum tuberosum* L.	Aalu	Solanaceae	Stem	0.711
50	*Spinacia oleracea* L.	Palak	Chenopodiaceae	Leaves	0.222
51	*Syzygium aromaticum* (L.) Merr. & L.M. Perry	Laung	Myrtaceae	Seed	0.233

52	*Thymus linearis* Benth.	Thyme/Jayuni jad	Lamiaceae	Leaves	0.022
53	*Tinospora cordifolia* (Willd.) Hook.f. & Thomson	Gurj/Giloy	Menispermaceae	Stem	0.289
54	*Trachyspermum ammi* (L.) Sprague	Ajwain	Apiaceae	Seeds	0.011
55	*Trigonella foenum-graecum* L.	Methi	Fabaceae	Leaves	0.056
56	*Urtica dioica* L.	Bichu/Sisun	Urticaceae	Leaves	0.056
57	*Vitis vinifera* L.	Angur	Vitaceae	Fruit	0.3
58	*Withania somnifera* (L.) Dunal	Ashwagandha	Solanaceae	Leaves	0.011
59	*Zanthoxylum acanthopodium* DC.	Timur	Rutaceae	Fruit	0.011
60	*Zingiber officinale* Roscoe	Adarak	Zingiberaceae	Rhizome	0.656

Table 2: Utilization range (%) of different immunity-boosting plants

Immunity boosters	**Utilization range (%)**			
Supplements	Tea	Decoction	Fruit	Vegetable
	Higher (70-100)			
No. of plants used	-	-	*1= 21	*1= 36
	Middle (40-70)			
No. of plants used	*2= 1,2	*2= 1,2	*2= 29,34	*3= 46,53,57
	Lower (10-40)			
No. of plants used	*3= 3,5,8	*4= 13,3,14,5	*8= 18,19,20,22,23, 24,25,33	*10= 37,40,43,44, 48, 49,50,54,55,56
	Least (Below 10)			
No. of plants used	*3= 4,6,7	*7= 9,10,11, 12,15,16,17	*7= 26,27,28,30, 31,32,35	*11= 38,39,41,42,45, 47,51,52,58,59,60

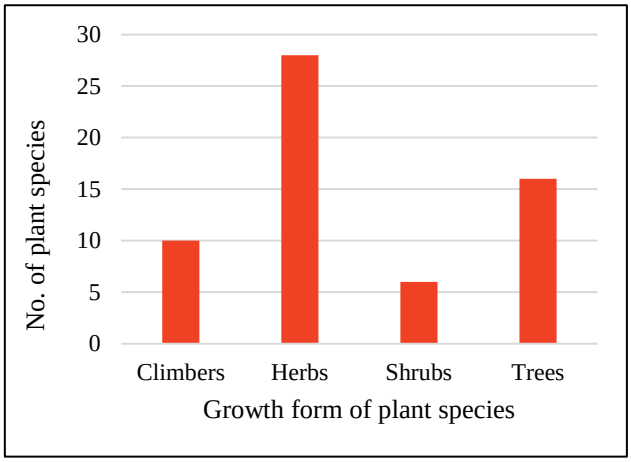

Figure 1. Different growth forms

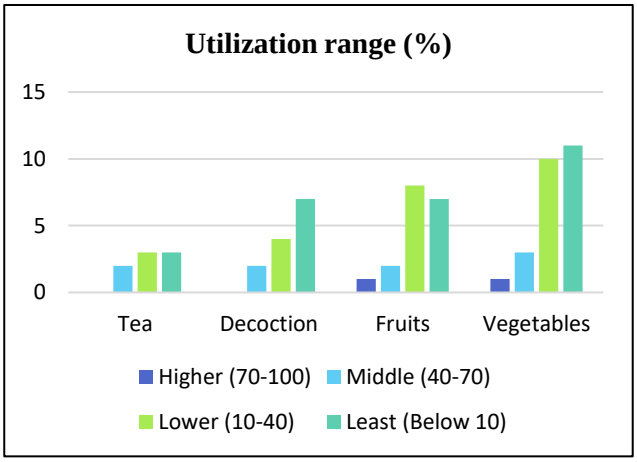

Figure 2. Utilization range (%) of plants

Abbreviation *= Total number of plants,1= *Z. officinale*, 2= *P. nigrum*, 3= *E. cardamomum*, 4= *R. indica*, 5= *S. aromaticum*, 6= *R. officinalis*, 7= *T. linearis*, 8= *O. tenuiflorum*, 9= *A. vera*, 10= *T. ammi*, 11= *W. somnifera*, 12= *A. subulatum*., 13= *C. tamala*, 14= *T. cordifolia*, 15= *M. koenigii* , 16= *M. azadirachta*, 17= *C. zeylanicum*, 18= *P. armeniaca*, 19= *P. persica*, 20= *P. domestica*, 21= *M. domestica*, 22= *M. indica*, 23= *P. guajava*, 24= *P. granatum*, 25= *V. vinifera*, 26= *F. palmata*, 27= *R. ellipticus*, 28= *M. esculenta*, 29= *M. balbisiana*., 30= *L. chinensis*, 31= *C. aurantiifolia*, 32= *C. limon*, 33= *C. papaya*, 34= *C. reticulata*, 35= *Z.. acanthopodium*, 36= *S. tuberosum*, 37= *C. album*, 38= *P. vulgaris*, 39= *S. melongena*, 40= *A. esculentus*, 41= *U. dioica*, 42= *C. arietinum*, 43= *A. viridis*, 44= *D. carota*, 45= *D. bulbifera*, 46= *C. maxima*, 47= *C. sativus*, 48= *M. charantia*, 49= *B. nigra*, 50= *L. siceraria*, 51= *P. sativum*, 52= *T. foenum-graecum*, 53= *R. sativus*, 54= *S. oleracea*, 55= *B. oleracea* v. capitata, 56= *B. oleracea* v. botrytis, 57= *B. campestris*, 58= *C. annuum*, 59= *S. lycopersicum*, 60= *L. acutangula*.

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