



Plant Archives

Journal homepage: <http://www.plantarchives.org>

DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.1.315>

EXPLORING THE POTENTIAL OF LOCAL AND WILD FRUITS FOR SUSTAINABLE RURAL DEVELOPMENT: A CASE STUDY OF KHIRSU BLOCK, PAURI GARHWAL, UTTARAKHAND INDIA

Ankit Sati, R.S. Negi, Santosh Singh*, Eshwar Singh and Nabdeep Singh

Department of Rural Technology, HNB Garhwal University, Srinagar Garhwal, Uttarakhand, India

*Corresponding author E-mail: Singhrawat.santosh@gmail.com

(Date of Receiving : 02-02-2025; Date of Acceptance : 05-04-2025)

ABSTRACT

The present study was conducted in Khirsu block of Pauri Garhwal Uttarakhand, to obtain information on the Local and wild Fruits plants used by the rural community. Survey questions, in-person field trips, and participant observations were employed to gather data regarding the community's use of various wild and local fruit plants. It was observed that all 18 species were used by rural communities in the study area. 12 are wild fruits and 6 are local species that were found to be used as livelihood sources. The result indicates that value addition through processing fruits into products like pickles, jams, squashes, and jellies can significantly enhance profitability. Fruit loss is one of the major problems in the study area, 55-60 % of the fruit is damaged or spoiled due to interruption of wild animals especially monkeys, due to a lack of storage facilities farmers cannot store their raw fruits for a long time they are compulsion to sell their fruits in local market in very less margins, which effect on their income. The current study is a step toward increasing public awareness about the significance of these local and wild edible fruit plants and the need for further conservation.

Keywords : Wild Fruits, Underutilized, Sustainable rural development, Entrepreneurship development

Introduction

Wild plants have been an essential component of human diets since the majority of prehistoric societies. Eating wild edibles is ingrained in many communities' eating customs and is closely related to almost every element of a person's sociocultural, spiritual, and physical well-being (Satyarthi *et al.* 2018; Thakur and Puri 2016). For a variety of reasons, including food, medicine, fuel, fodder, agricultural implements, furniture, construction materials, and other necessities for daily living, our ancestors prioritized some wild species above others based on their distinct characteristics. Rich in biological richness is the hilly state of Uttarakhand, located in the North Western Himalayas. Most rural people are dependent on the forests and their products to meet their daily requirements (Maikhuri *et al.*, 2004). Fruit gathering from forests is a long-standing custom in the State that is still prevalent in daily life and folklore (Sharma *et al.*, 2020; Kala, 2007).

The wild fruits are eaten in their raw or cooked forms, as well as in processed foods including jams, pickles, juices, and chutney. Food processing industries are in 1st position in terms to generate employment, with approx. 15 lakh's people engaged in food processing field. Due to vast in population rate day by day, it became a challenge to generate employment for Indian youth. In government sectors job opportunity are shrinking and private companies are not comfortable with freshers. For rural youth, it became a challenge to get a moderated job in their local area., and which result's, jobless youth are migrating towards towns and cities day by day to do any sort or less than expectations work (Negi and Anand, 2015; Joshi *et al.*, 2018). Postharvest management of horticultural crops is one such field which have great chances for generating employment. Beneficiaries may find work throughout harvest season in a variety of post-harvest activities, including packaging, pre-treatments, harvesting, and delivering fresh fruit to cities and towns. Fruit post-harvest losses are particularly severe

in developing nations like India, where the entire loss from harvest to consumer point can reach 30–40%, amounting to millions of crores of rupees. There are many different kinds of fruits in Indian jungles. Currently, India is the world's second-largest producer of fruits (Patil *et al.*, 2013).

The role of wild fruits in promoting sustainable rural development: In order to persuade the populace to embrace Himalaya, the enterprise was shown to them in the guise of a little cottage industry at the village level. Food preparation for their entrepreneurial units to operate well, entrepreneurs face a variety of challenges related to finance, marketing, technology, and export (Saraswati, 2014). The core of the horticulture sector is fruit and vegetable processing and post-harvest management (Goyal, 2006). There are urgent need to provide the facilities.

Boosting Entrepreneurship with Effective Post-Harvest Management

Entrepreneurship can be promoted using wild fruits in Uttarakhand in several ways:

Developing Value-added products: Wild fruits like Kilmoru, Kafal, Hisalu, Plum and Khumari have great nutritional value and quality. Local entrepreneurs can develop various processed from these fruits such as jams, RTS beverages, fruits-based drinks, chutneys, candied fruit, preserves, pickles, squashes, concentrates and nectars (Butola, 2022).

Establishing research and development: For these wild fruits, high-yielding cultivars, value-added goods, protective methods, and post-harvest handling techniques are required. This can be accomplished by setting up centers for research and development that will aid in the spread of these fruit crops (Butola, 2022).

Promoting entrepreneurship through government initiatives: In terms of business and investment, Uttarakhand has always been rated as one of India's best states. To encourage entrepreneurship, the state government established a "Startup Council" with members from both the public and private sectors. The strategy provides start-ups with benefits and incentives in a number of intervention areas, such as monthly allowances and marketing support (Butola, 2022).

Utilizing undirtied and neglected local fruits: Locals in Uttarakhand employ a wide variety of wild, edible fruits that have nutritional and therapeutic qualities.

Promoting the utilization of these underutilized fruits can serve as a potential entrepreneurial venture for local people.

Providing training and skill development: The "Uttarakhand Skill Development Mission" trains students for employment in the Food Processing Sector. Providing training and skill development programs focused on wild fruit processing and value addition can encourage entrepreneurship among rural communities (Butola, 2022).

By leveraging the availability of diverse wild fruits, developing value-added products, providing government support, and promoting skill development, entrepreneurship can be successfully promoted using wild fruits in Uttarakhand. The present paper tries to focus on the availability and utilization aspect of various wild and local fruit plants towards value added products and processing in Khirsu Block, Pauri Garhwal, Uttarakhand.

Materials and Methods

The present research study was conduct in Khirsu Block, Pauri Garhwal District of Uttarakhand during 2021-2022. In the present study, the primary data was collected to carry out mainly through questionnaire interview and focus group discussion with the local people to document the indigenous knowledge of wild and local fruit plants. The discussions were conducted in their local dialect (Garhwali) as well as in Hindi language. The total sample size of the study is 80 respondents. The percent change calculates the difference in value and the change from the original value to the new value over time.

$$\%Change = \frac{X_2 - X_1}{X_1}$$

Result and Discussion

Wild fruits availability

The present paper is an attempt to analyse the use of wild fruits availability with respect to their use by the local inhabitants of rural community of the study area. The results of the study reported that 12 wild fruit plant species were used by the communities for various utilization aspects. These plant species were distributed among 6 families. Out of 6 wild fruits plant species reported (Table 1 and Figure 1).

Table 1 : Availability of Wild fruits in the study area.

S. No	Local Name	Botanical Name	Family	Uses & Mediational Properties	References
1	Kafal	<i>Myrica esculenta</i>	Myricaceae	✓ The fruit serves as a natural antioxidant. ✓ A decoction made from the leaves and bark is highly effective for treating asthma bronchial, sinusitis, and cough. ✓ The bark possesses unique medicinal properties, useful in treating conditions like cardiac debility, gonorrhea, hemoptysis, dysentery, epilepsy, typhoid, edema, and hypothermia. ✓ In Ayurveda, this plant is renowned as a detoxifier, pain reliever, and healing herb. ✓ The oil extracted from the seeds is beneficial for body massage, particularly for relieving body aches, and is also used to treat ear discharge. ✓ An Ayurvedic formulation, Kaas-Har Churna, made from this plant, is commonly used to treat cold and cough.	Saklani <i>et al.</i> , 2021; Bhatt <i>et al.</i> , 2017; Saklani <i>et al.</i> , 2012; Mahato 2014; Seal 2011; Satyarthi <i>et al.</i> , 2018
2	Amla	<i>Emblica officinalis</i>	Euphorbiaceae	✓ In Ayurveda, amla is regarded as a powerful rejuvenator and immune modulator, known to slow aging, promote longevity, improve digestion, reduce cough and fever, treat constipation, strengthen the heart, alleviate asthma, benefit the eyes, promote hair growth, energize the body, enhance intellect, and inhibit cancer cell growth. ✓ In Indian medicine, amla fruit is frequently used to cure fever and common colds as well as various other conditions. It can be used alone or in combination with other plants as a anti-pyretic, laxative, diuretic, refrigerant, liver tonic, stomachic, hair tonic, restorative, , and to prevent ulcers and indigestion. ✓ Amla is also known for its protective effects on the liver, heart, kidneys, and nervous system, along with its antioxidant, anti-inflammatory, analgesic, antipyretic, and restorative properties.	Bhatt <i>et al.</i> , 2017; Lanka 218; Priya and Islam 2019; Mirunalini and Krishnaveni 2010; Satyarthi <i>et al.</i> , 2018; Sharma <i>et al.</i> , 2017
3	Bedu	<i>Ficus palmata</i>	Moraceae	✓ Ripe fruits are eaten raw and contain around 45% juice. ✓ The fruits primarily contain sugars and mucilage, acting as laxative, demulcent, and, emollient, ✓ Fruit is used for treating various conditions, including gastrointestinal issues, diabetes, tumors, ulcers, and has hypoglycemic, lipid-lowering, and antifungal properties.	Bhatt <i>et al.</i> , 2017; Alqasoumi <i>et al.</i> , 2014; Saklani and Chandra 2011; Satyarthi <i>et al.</i> , 2018; Chandra & Saklani, (2016); Sharma <i>et al.</i> , 2017
4	Timla	<i>Ficus auriculata</i>	Moraceae	✓ The, stem bark, fruit and leaves have antioxidant properties that help prevent cardiovascular, neurodegenerative diseases, and cancer. ✓ Phenolic compounds in the plant offer	Bhatt <i>et al.</i> , 2017; Saklani and Chandra 2012; Khatun <i>et al.</i> , 2016; Mehra

				anthelmintic, antifungal and antimicrobial effects against <i>Pseudomonas aeruginosa</i>, <i>Bacillus subtilis</i>, <i>Escherichia coli</i>. And <i>Staphylococcus aureus</i>. ✓ Consuming the fruit may improve overall health and lower the risk of chronic diseases.	& Tandon 2021; Satyarthi <i>et al.</i> , 2018; Sharma <i>et al.</i> , 2017
5	Mango	<i>Mangifera indica</i>	Anacardiaceae	✓ Vit-A, Lowers blood pressure	Batool <i>et al.</i> , 2018; Parvez 2016; Bisht (2017); Bhatt <i>et al.</i> , 2017; Satyarthi <i>et al.</i> , 2018; Sharma <i>et al.</i> , 2017
6	Kingodu	<i>Berberis aristata</i>	Berberidaceae	✓ The fruits are edible and typically consumed when ripe. ✓ Flower buds are added to sauces. ✓ <i>Berberis aristata</i> is commonly used to make rasont (an extract from the root or stem bark). ✓ It is used for treating conjunctivitis, bleeding piles, wound healing, ulcers, jaundice, enlarged liver, and as a gargle for mouth ulcers.	Saied <i>et al.</i> , 2007; Bisht (2017); Bhatt <i>et al.</i> , 2017; Mazumder <i>et al.</i> , 2011; Chander <i>et al.</i> , 2017; Satyarthi <i>et al.</i> , 2018; Sharma <i>et al.</i> , 2017
7	Karondhu	<i>Carissa spinarum</i> L.	Apocynaceae	✓ Ground garna plant roots are applied to cattle wounds to kill worms. ✓ The fruit acts as a potent purgative and is used in various purgative formulations.	Bhatt <i>et al.</i> , 2017; Bisht (2017); Ansari & Patil 2018; Chauhan <i>et al.</i> , 2015; Satyarthi <i>et al.</i> , 2018
8	Shehtoot, Chimu	<i>Morus alba</i>	Moraceae	✓ Leaves are used to treat fever, inflamed eyes, sore throats, headaches, dizziness, vertigo, elephantiasis, and possess antibacterial, diaphoretic, and hypoglycemic properties. ✓ Fruit juice serves as a tonic for kidney health, neurasthenia, hypertension, and diabetes. ✓ The fruit helps prevent premature greying of hair, treats blurred vision and insomnia, and is a good source of vitamins and minerals.	Bhatt <i>et al.</i> , 2017; Bisht (2017); Zhang <i>et al.</i> , 2018; Yuan and Zhao 2017; Kadam <i>et al.</i> , 2019; Satyarthi <i>et al.</i> , 2018; Sharma <i>et al.</i> , 2017
9	Melu, Mehal	<i>Pyrus pashia</i>	Rosaceae	✓ Fresh leaves have astringent, febrifuge, laxative, and sedative properties, and crushed leaves are used cosmetically to stain palms, feet, and nails. ✓ The fruit juice is astringent and diuretic, used for treating dysentery, leishmaniasis, eye issues, digestive disorders, sore throat, irritability, abdominal pain, and anemia. ✓ Fruits exhibit antimicrobial, antioxidant, stomachic, and hypoglycemic properties. ✓ The bark is astringent, laxative,	Bhatt <i>et al.</i> , 2017; Bisht (2017); Tsering <i>et al.</i> , 2012; Saklani and Chandra 2012; Satyarthi <i>et al.</i> , 2018; Sharma <i>et al.</i> , 2017

				anthelmintic, and febrifuge, traditionally used for digestive disorders, sore throat, fever, ulcers, and typhoid.	
10	Hisra, Hisalu, Yellow, Himalayan Raspberry	<i>Rubus ellipticus</i>	Rosaceae	✓ The plant has astringent and febrifuge properties. ✓ The fruit is a potential source for anti-fertility drugs. ✓ The fruit counteracts toxins, reduces inflammation, relieves pain, and stops hemorrhage. ✓ Fruits are rich in malic, citric, and tartaric acids. ✓ Roots and young shoots are used to treat colic pain.	Bhatt <i>et al.</i> , 2017; Bisht (2017); Pandey & Bhatt 2016; Sharma and Kumar 2011; Lalit <i>et al.</i> , 2021; Satyarthi <i>et al.</i> , 2018; Sharma <i>et al.</i> , 2017
11	Dlimya, Wild pomegranate	<i>Punica granatum</i>	Punicaceae	✓ Wild pomegranate is primarily used to make anardana (dried arils), commonly used in chutneys and as a souring agent. ✓ Juice from fresh leaves and young fruits is used to treat dysentery. ✓ Powdered bark is given to expel roundworms. ✓ Ripe fruits act as a tonic, laxative, and blood enhancer, and are beneficial for sore throat, eye issues, brain diseases, and chest ailments. ✓ The bark is used to expel tapeworms. ✓ Flower buds are used to treat bronchitis.	Bhatt <i>et al.</i> , 2017; Bisht (2017); Ge, Shasha, <i>et al.</i> , 2021; Bhowmik <i>et al.</i> , 2013; Jurenka 2008; Satyarthi <i>et al.</i> , 2018
12	Harad	<i>Terminalia chebula</i> Retz.	Combretaceae	✓ Can be eaten raw or consumed in powdered form. ✓ Aids digestion, balances “Tridosha,” boosts immunity, and is a component of “Triphala.”	Bhatt <i>et al.</i> , 2017; Bisht (2017); Nigam <i>et al.</i> , 2020; Meher <i>et al.</i> , 2018; Satyarthi <i>et al.</i> , 2018; Sharma <i>et al.</i> , 2017

Source: Field data

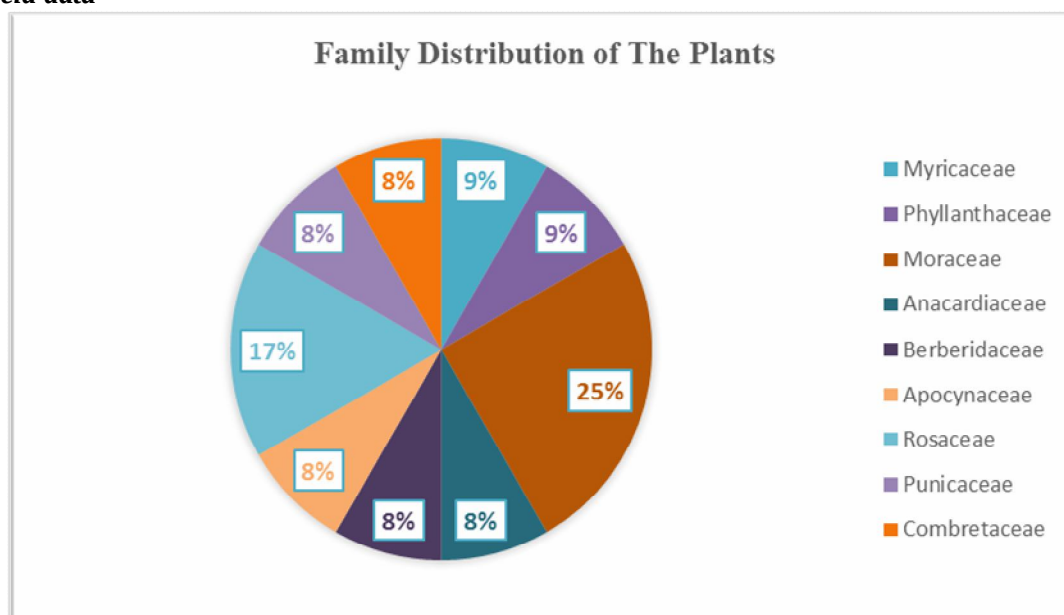


Fig. 1: Family Distribution of the Plants

Availability of Local Fruit

Selected villages in the khirsu block of the study area have a strong potential to produce local fruits. Citrus varieties in particular (such as Malta, Santra, and Nimbu) are widely available. The results of the

study reported that 6 local fruit plant species were mostly cultivated used by the communities for various utilization aspects. These plant species were distributed among 2 families Rutaceae and Rosaceae (Table 2).

Table 2 : Availability of Local fruits in the study area

S. No.	Common name	Botanical Name	Family	Uses	References
1	Malta	<i>Citrus sinensis</i>	Rutaceae	Boosts mood, contains antioxidants and vitamin B, improves bone health, and is a good source of essential amino acids.	Yerou <i>et al.</i> , 2017; Goswami 2020; Bisht and Sharma 2014; Satyarthi <i>et al.</i> , 2018
2	Santra, Nargngi	<i>Citrus reticulata</i>	Rutaceae	Rich in vitamin C, it boosts the immune system, helps maintain blood pressure, and balances sugar levels.	Goswami 2020; Singh and Shivankar 2010; Singh <i>et al</i> 2017; Satyarthi <i>et al.</i> 2018
3	Nimbu	<i>Citrus limon</i>	Rutaceae	Promotes digestion, acts as a natural laxative, prevents constipation, regulates bowel movements, and detoxifies the body.	Paw <i>et al</i> 2020; Singh <i>et al</i> 2020
4	Peach	<i>Prunus persica</i>	Rosaceae	Rich in nutrients and antioxidants, packed with vitamins and minerals. Aids digestion, protects skin, and reduces allergy symptoms.	Tomas Barberan <i>et al</i> 2013; Kant, <i>et al</i> 2018; Hussain <i>et al</i> 2021; Satyarthi <i>et al.</i> 2018
5	Chulu	<i>Prunus armeniaca</i>	Rosaceae	The seeds (kernels) have antioxidant, anti-asthmatic, antitussive, and antispasmodic properties. They are used as an antidote, expectorant, tonic, and anthelmintic. The oil supports the immune system and enhances the body's ability to combat infections like colds.	Tomas Barberan <i>et al</i> 2013; Rai 2016; Satyarthi <i>et al.</i> 2018
6	Nashpati	<i>Pyrus communis</i> L.	Rosaceae	The seeds (kernels) have antioxidant, anti-asthmatic, antitussive, and antispasmodic properties. They are used as an antidote, expectorant, tonic, and anthelmintic. The oil supports the immune system and enhances the body's ability to combat infections like colds.	Kolniak <i>et al</i> 2020; Kaur and Arya 2012; Satyarthi <i>et al.</i> 2018

Source: Field data

Table 3: Utilization aspect of the wild fruit plants

Particulars	Frequency		Percentage		Total
	Yes	No	Yes	No	80
Medicinal Purpose	24	56	30	70	80
Value Addition/Processing	20	60	25	75	80
Direct Consumption	67	13	83.75	16.25	80
Specially Income	29	51	36.25	63.75	80

Source: Field data

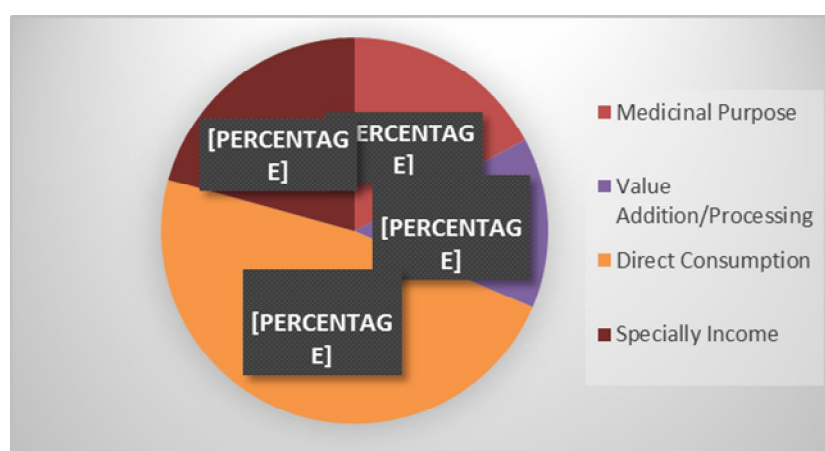


Fig. 2: Utilization aspect of the wild fruit plants

Table 4: Income Generation through fruits and their value-added products

Name of Fruit	Average price of fresh Fruit	Name of Product	Average Selling Price	Average Other Expenditure in Value addition of Products	Price difference
Mango	15	Pickle	85	20	50
		Squash	80	15	50
Amla	13.33	RTS	95	16	65.67
		Pickle	120	22	84.67
		Squash	80	16	50.67
		Jam	150	45	91.67
		Chutney	150	46	90.67
Kafal	45.33	Squash	180	20	114.67
Malta	12.33	Squash	80	17	50.67
		RTS	100	16	71.67
Santra	12.33	Squash	80	17	50.67
		RTS	100	16	71.67
Nimbu	13	Squash	80	17	50
		RTS	90	16	61
		Pickle	140	22	105
Apple	31.66	Jam	170	45	93.34
		Chutney	170	45	93.34
		Jelly	250	50	168.34
Nashpati	31.33	Jam	200	50	118.67
		Chutney	200	50	118.67
Peach	13.33	Jam	150	50	86.67

The table 4 provides an insightful comparison between the average prices of fresh fruits and the corresponding prices of various value-added products derived from them. It also includes the average additional expenditures involved in value addition and the price differences, highlighting the profitability and value enhancement through processing.

The data indicates that value addition through processing fruits into products like pickles, jams,

squashes, and jellies can significantly enhance profitability. Products like apple jelly, nimbu pickle, and various amla products show particularly high price differences, suggesting these are especially lucrative avenues for value addition. This table provides a useful reference for producers and entrepreneurs considering investment in fruit processing industries (Dhiman and Rani 2011).

Additional Income form Value Addition

The survey result shows that most of the farmers, about 65.0 percent farmers get below Rs 5000 annually by direct selling their fruit products while after the

value additional/processing changing percentage became -55.76 percent. After the processing of fruits group of above Rs 20000 respondent significantly increase 66.67 percent.

Table 5 : Income of Respondents from wild and local fruits

Income (Rs)	Compression				% Change
	Income from direct Selling		Income after Value Addition		
< 5000	52	65.0	23	28.75	-55.76
5001-10000	22	27.5	30	37.50	36.36
10000-20000	4	5.0	15	18.75	17.67
Above 20000	2	2.5	12	15.00	66.67
TOTAL	80	100	80	100	

Source: Primary data

Fruit loss & Reason behind Fruit loss after post harvesting

Fruit loss is one of the most problem in the study area 55-60 % of fruit is damaged or spoiled due to interruption of wild animals specially monkey. Due to lack of storage facility farmers cannot stored their raw fruits for long time they are compulsion to sell their fruits in local market in very less margins, which totally effect on their income. The basic reasons for fruit loss in the study area according to respondent's farmers are as following:

- ❖ Due to vast interruption of wild animals (monkey & Boar).
- ❖ Due to poor post-harvest management.
- ❖ Improper storage condition
- ❖ Inadequate handling during transportation.
- ❖ Poor facilities for processing.
- ❖ Lack of awareness of govt. Policies & technical skills.
- ❖ Transportation facilities.
- ❖ Unskilled farmer

Conclusion

The present study emphasizes on the production status of various indigenous fruit plants and awareness percentage towards value added products and processing in khirsu block, pauri Garhwal, Uttarakhand. According to the survey result, in the study area of khirsu, the availability percent of Burans (*Rhododendron arboretum*) or kafal (*Myrica esculenta*) is very high about 86.3 percent fruits plant are available. The availability of local fruit especially citrus variety (malta, santra, nimbu) are available in

high amount. An average of 353.62 kg/ farmer has malta production out of total respondents. Low awareness about the value-added products of fruit processing and training related to processing are the main reasons of fruit loss in the study region.

Suggestions

- ✓ Farmers of the area are gaining maximum profit who is working on fruit processing or post-harvest management practices.
- ✓ Fruit loss in the area is more than 60% if training is given to that rural community or working on new fruit processing unit, with the coordination with Govt. & Govt. policies it can give more profit to local farmers and generate new employment to them.
- ✓ If a better framework or training is given to rural community for fruit preservation & processing it contributes a vast in their income generation and make them economically and socially strong and also contributes in agro related self-employment generation any pandemic situation.
- ✓ Post Harvest management practices training should be given to local farmers through which they can boost up themselves economically as well as socially. Even low-cost storage chambers should be provided or formed for those marginal farmers, through which they can stored their fruits for long time and increase the self- life of those raw products.
- ✓ Pulper machine can also help those farmers to store their fruits by extracting fruit pulp for storing these pulps for future processing work.
- ✓ By employment generation through fruit processing, it also promotes for checking migration.



Plate 1: Different types of Wild Edible Fruits in the Study Area



Plate 2. Processing Unit
(Himshikhar, Fedikhal) in Khirsu



Plate 3. Juice Extraction (Manually) in
processing unit, khirsu



Plate 4 : Women's participation in Processing Training



Plate 5. Training given to Rural Community about Processing and Value Addition

References

- Alqasoumi, S. I., Basudan, O. A., Al-Rehaily, A. J., & Abdel-Kader, M. S. (2014). Phytochemical and pharmacological study of *Ficus palmata* growing in Saudi Arabia. *Saudi Pharmaceutical Journal*, 22(5), 460-471.
- Ansari, I. M. T. I. Y. A. Z., & Patil, D. T. (2018). A brief review on phytochemical and pharmacological profile of *Carissa spinarum* L. *Asian J. Pharm. Clin. Res*, 11(9), 12-18.
- Batool, N., Ilyas, N., Shabir, S., Saeed, M., Mazhar, R., & Amjid, M. W. (2018). A mini-review of therapeutic potential of *Mangifera indica* L. *Pakistan Journal of Pharmaceutical Sciences*, 31(4).
- Bhatt, I. D., Rawat, S., Badhani, A., & Rawal, R. S. (2017). Nutraceutical potential of selected wild edible fruits of the Indian Himalayan region. *Food chemistry*, 215, 84-91.
- Bhowmik, D., Gopinath, H., Kumar, B. P., & Kumar, K. S. (2013). Medicinal uses of *Punica granatum* and its health benefits. *Journal of Pharmacognosy and Phytochemistry*, 1(5), 28-35.
- Bisht A.S. (2017). Future prospective of wild edible fruits from Bharsar and Adjoining area in Pauri Garhwal Uttarakhand, India. *Brazilian Journal of Biological Sciences*, 4(7): 81-88.
- Bisht, A. S., & D Sharma, K. (2014). Plants utilization by the communities of Bharsar and adjoining area of Pauri Garhwal District, Uttarakhand, India. *Biodiversitas Journal of Biological Diversity*, 15(1).
- Butola JS (2022) Value Addition and Product Development of Fruits through Intervention of Vacuum Freezedrying Technology: An Industrial Prospect for Wild Edibles in Uttarakhand. *Medicon Agriculture & Environmental Sciences* 3(2) DOI: 10.55162/MCAES.03.053
- Chandra, S., & Saklani, S. (2016). Evaluation of the Anti-Inflammatory Activity of the Methanolic Extract of the Fruits of *Ficus palmata*. *British Journal of Pharmaceutical Research*, 12(4), 1-5.
- Chander V, Aswal JS, Dobhal R, Uniyal DP (2017) A review on Pharmacological potential of Berberine; an active component of Himalayan *Berberis aristata*. *Journal of Phytopharmacology*, 6(1):53-58.
- Chauhan, A. M. B. I. K. A., Tanwar, B. E. E. N. U., & Arneja, I. N. T. E. L. L. I. (2015). Influence of processing on physiochemical, nutritional and phytochemical composition of *Carissa spinarum* (karonda) fruit. *Asian J Pharm Clin Res*, 8(6), 254-9.
- Dhiman P. K & Rani A (2011), Problems and Prospects Of Small Scale Agro Based Industries: An Analysis Of Patiala District – ZENITH *International Journal of Multidisciplinary Research* 1(4)
- Ge, S., Duo, L., Wang, J., Yang, J., Li, Z., & Tu, Y. (2021). A unique understanding of traditional medicine of pomegranate, *Punica granatum* L. and its current research status. *Journal of ethnopharmacology*, 271, 113877.
- Goyal, S. K. (2006). Potential in Agribusiness – Fruit and Vegetable Processing Industry in India - *Journal of International Farm Management*, 3(2).
- Goswami, S. (2020). Floristic Diversity, Productivity and Economics of Malta [*Citrus Sinensis* (L.) Osbeck] Based Traditional Homegarden: A Study of Tehri Garhwal, Uttarakhand.
- Hussain, S. Z., Naseer, B., Qadri, T., Fatima, T., & Bhat, T. A. (2021). Peach (*Prunus persica*) Morphology, taxonomy, composition and health benefits. In *Fruits Grown in Highland Regions of the Himalayas: Nutritional and Health Benefits* (pp. 207-217).
- Joshi SK, Ballabh B, Negi PS, Dwivedi SK (2018). Diversity, Distribution, use pattern and evaluation of wild edible plants of Uttarakhand, India, *Defence Life Science Journal* 3(2):126-135.
- Jurenka, J. (2008). Therapeutic applications of pomegranate (*Punica granatum* L.): a review. *Alternative medicine review*, 13(2).
- Kala, C. P. (2007). Prioritization of cultivated and wild edibles by local people in the Uttaranchal Hills of Indian Himalaya. *Indian Journal of Traditional Knowledge*, 6(1): 239-244.
- Kaur, R., & Arya, V. (2012). Ethnomedicinal and Phytochemical Perspectives of *Pyrus communis* Linn. *Journal of Pharmacognosy and Phytochemistry*, 1(2), 14-19.

- Kolniak-Ostek, J., Kłopotowska, D., Rutkowski, K. P., Skorupińska, A., & Kruczyńska, D. E. (2020). Bioactive compounds and health-promoting properties of pear (*Pyrus communis* L.) fruits. *Molecules*, **25**(19), 4444.
- Kadam, R. A., Dhupal, N. D., & Khyade, V. B. (2019). The Mulberry, *Morus alba* (L.): The medicinal herbal source for human health. *Int. J. Curr. Microbiol. Appl. Sci*, **8**(4), 2941-2964.
- Khatun, M. J. M., Rahman, M. M., Rahim, M. A., Jakariya, M., & Mirdah, M. H. (2016). Study on the ethnobotany and nutritional status of three edible *Ficus* species in hill district of Bangladesh.
- Kant, R., Shukla, R. K., & Shukla, A. (2018). A review on peach (*Prunus persica*): an asset of medicinal phytochemicals. *Int J Res Appl Sci Eng Technol*, **6**(1), 2186-200.
- Lalit, K., Avijit, M., Sanjita, D., & Suniti, C. (2021). Rubus ellipticus: A Phyto-nutraceutical with medicinal importance. *International Journal of Pharmaceutical Research (09752366)*, **13**(2).
- Lanka, S. (2018). A review on pharmacological, medicinal and ethnobotanical important plant: *Phyllanthus emblica* linn. (syn. *Emblica officinalis*). *World Journal Of Pharmaceutical Research*, **7**(4), 380-396.
- Maikhuri, R. K.; Rao, K. S.; Saxena, K. G. (2004). Bioprospecting of Wild Edibles for Rural Development in the Central Himalayan Mountains of India. *Mountain Research and Development*, **24**(2): 110-113
- Mirunalini, S., & Krishnaveni, M. (2010). Therapeutic potential of *Phyllanthus emblica* (amla): the ayurvedic wonder. *Journal of basic and clinical physiology and pharmacology*, **21**(1), 93-105.
- Mahato, R. B. (2014). Wild edible fruits of Palpa district, West Nepal. *Journal of Natural History Museum*, **28**, 127-136.
- Mazumder, P. M., Das, S., & Das, M. K. (2011). Phytopharmacology of *Berberis aristata* DC: a review. *Journal of Drug Delivery and Therapeutics*, **1**(2).
- Mehra, N., & Tandon, S. (2021). Traditional uses, phytochemical and pharmacological properties of *Ficus auriculata*: A review. *Journal of Drug Delivery and Therapeutics*, **11**(3), 163-169.
- Negi, S., & Anand, N. (2015). Issues and challenges in the supply chain of fruits & vegetables sector in India: a review. *International Journal of Managing Value and Supply Chains*, **6**(2), 47-62.
- Nigam, M., Mishra, A. P., Adhikari Devkota, A., Dirar, A. I., Hassan, M. M., Adhikari, A., & Devkota, H. P. (2020). Fruits of *Terminalia chebula* Retz.: A review on traditional uses, bioactive chemical constituents and pharmacological activities. *Phytotherapy Research*, **34**(10), 2518-2533.
- Pandey, Y., & Bhatt, S. S. (2016). Overview of Himalayan yellow raspberry (*Rubus ellipticus* Smith.): A nutraceutical plant. *Journal of Applied and Natural Science*, **8**(1), 494-499.
- Patil, M. M., Kalse, S.B. and Sawant, A. A. (2013) Preparation of guava jam blended with sapota, *Agric Eng. Int. CIGR Journal*, **15**(1):167-172.
- Parvez, G. M. (2016). Pharmacological activities of mango (*Mangifera indica*): A review. *Journal of Pharmacognosy and phytochemistry*, **5**(3), 01-07.
- Paw, M., Begum, T., Gogoi, R., Pandey, S. K., & Lal, M. (2020). Chemical composition of Citrus limon L. Burmf peel essential oil from North East India. *Journal of Essential Oil-Bearing Plants*, **23** (2), 337-344
- Priya, F. F., & Islam, M. S. (2019). *Phyllanthus emblica* Linn. (Amla) a natural gift to humans: an overview. *J. Dis. Med. Plants*, **5**, 1-9.
- Rai, I., Bachheti, R. K., Saini, C. K., Joshi, A., & Satyan, R. S. (2016). A review on phytochemical, biological screening and importance of Wild Apricot (*Prunus armeniaca* L.). *Oriental Pharmacy and Experimental Medicine*, **16**, 1-15.
- Saied, S.; Batool, S.; Naz, S. (2007). Phytochemical studies of *Berberis aristata*. *J. of Basic and Applied Sciences*, **3**(1), 1-4.
- Saklani, S.A.R.L.A., Chandra, S.U.B.H.A.S.H., Mishra, A. P., & Badoni, P. P. (2021). Nutritional evaluation, antimicrobial activity and phytochemical screening of wild edible fruit of *Myrica nagi* pulp. *International journal of pharmacy and pharmaceutical sciences*, **4**(3), 407-411.
- Saklani, S., & Chandra, S. (2012). In vitro antimicrobial activity nutritional profile of medicinal plant of Garhwal, Himalaya. *Int J Pharm Sci Res*, **3**, 268-272.
- Saklani, S., & Chandra, S. (2012). In vitro antimicrobial activity, nutritional profile and phytochemical screening of wild edible fruit of Garhwal Himalaya (*Ficus auriculata*). *Int J Pharm Sci Rev Res*, **12**(2), 61-64.
- Saklani, S., & Chandra, S. (2011). Antimicrobial activity, nutritional profile and quantitative study of different fractions of *Ficus palmata*. *International Research Journal of Plant Science*, **2**(11), 332-337
- Saraswati (2014). Employment Potential of Food Processing Industries in India, *International Refereed Journal of Reviews and Research*, **2**(1): 2348 – 2001
- Satyarthi, K., Sharma, Y.P., Sharma, P., Vaidya, P., Randhawa S.S. (2018). Wild Edible Fruits of Himachal Pradesh. *Himachal Pradesh State Biodiversity Board*. (Website: <http://www.hp biodiversity.gov.in> ; <http://www.hpccc.gov.in>)
- Singh, N., Jaiswal, J., Tiwari, P., & Sharma, B. (2020). Phytochemicals from citrus limon juice as potential antibacterial agents. *The Open Bioactive Compounds Journal*, **8**(1).
- Sharma, I. P., Kanta, C., Semwal, S. C., & Goswami, N. (2017). Wild fruits of Uttarakhand (India): ethnobotanical and medicinal uses. *International Journal of Complementary & Alternative Medicine*, **8**(3), 1-8.
- Singh, I. P., & Shivankar, V. J. (2010) Variability in citrus for livelihood and nutritional security. *Indian Horticulture*, **55**(3).
- Singh, A. K., Meetei, N. T., Singh, B. K., & Mandal, N. (2017). High incidence of citrus tristeza virus in mandarin (*Citrus reticulata*) in North-East states of India. *Virus Disease*, **28**, 401-407.
- Sharma, U. S., & Kumar, A. (2011). Anti-diabetic effect of *Rubus ellipticus* fruit extracts in alloxan induced diabetic rats. *Journal of Diabetology*, **2**(2), 4.
- Seal, T. (2011). Nutritional composition of wild edible fruits in Meghalaya state of India and their ethno-botanical importance. *Research journal of Botany*, **6**(2), 58-67.
- Sharma Ritu1, Goraya G.S. and Seth M.K (2020) Diversity and Traditional Knowledge of Some Wild Edible Fruits Used

- by Rural Communities of District Mandi, Himachal Pradesh. *Int. J. Adv. Res.* **8**(07), 132-139
- Thakur K, and Puri S (2016). Ethnobotanical plants of bandli wildlife sanctuary, mandi, himachalpradesh. *International Journal of Advanced Research*, **4**(6):106-108.
- Tsering, J., Gogoi, B. J., & Tag, H. (2012). Ethnobotany and phytochemical analysis of *Pyrus pashia* leaves. *International Journal of Pharmaceutical Sciences and Research*, **3**(8), 2721.
- Tomás Barberán, F. A., Ruiz, D., Valero, D., Rivera, D., Obón, C., Sánchez-Roca, C., & Gil, M. I. (2013). Health benefits from pomegranates and stone fruit, including plums, peaches, apricots and cherries. *Bioactives in fruit: Health benefits and functional foods*, 125-167.
- Yuan, Q., & Zhao, L. (2017). The Mulberry (*Morus alba* L.) Fruit: A Review of Characteristic Components and Health Benefits. *Journal of Agricultural and Food Chemistry*, **65**(48), 10383-10394.
- Yerou, K. O., Ibri, K., Bouhadi, D., Hariri, A., Meddah, B., & Touil, A. T. (2017). The use of orange (*Citrus sinensis*) peel as antimicrobial and anti-oxidant agents. *Journal of Fundamental and Applied Sciences*, **9**(3), 1351-1357.
- Zhang, H., Ma, Z. F., Luo, X., & Li, X. (2018). Effects of mulberry fruit (*Morus alba* L.) consumption on health outcomes: A mini-review. *Antioxidants*, **7**(5), 69.