IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 18, Issue 4 Ser. 1 (April 2024), PP 01-06
www.iosrjournals.org

Population Structure Of Pyrus Pashia Buch.-Ham. Ex D.Donin- An Underutilized Wild Edible Fruiting Species From Morni Hills, Panchkula, Haryana, India

Mala Rathore[1], Manisha Gusain[1], P.K. Verma[2]And Surender Singh[1]
[1]*Non Timber Forest Products Discipline, Silviculture & Forest Management Division, Icfre-Forest Research Institute, Dehradun, Uttarakhand,India.*
[2]*Forest Botany Division, Icfre-Forest Research Institute, Dehradun, Uttarakhand, India.*

Abstract
The longstanding practice of consuming wild edible fruits for their nutritional and medicinal benefits is well-documented. These naturally occurring fruit plants exhibit robust resilience under adverse climatic conditions, fostering local harvesting and marketing practices. Pyrus pashia (P. pashia; Buch. Ham. ex D. Don; family, Rosaceae), commonly referred to as the 'Himalayan pear,' stands out as one of these underutilized trees. With widespread distribution in temperate regions up to an altitude of 2,500 m in the Western Himalaya, P. pashia holds significant potential in traditional medicine. A field study was carried out in the forests of Morni Hills, Panchkula, situated within the lower Shivalik range in North-east Haryana to study its population structure. The vegetational data was analysed for altitudinal ranges i.e. 820 m AMSL and parameters observed like floristic composition, phytosociology and diversity indices. The data was collected in the month of February, 2023. For sampling of vegetation, 10 plots were selected at random places. A total of 44 plant species (16 trees, 10 shrubs and 18 herbs) were recorded. Study showed that the forest is moderately distributed with no threat to the selected species.

Key words: *Floristic Composition, IVI (Important Value Index), Speciesdiversityindices,*

Date of Submission: 22-03-2024 Date of Acceptance: 02-04-2024

I. Introduction

Wild edible fruits (WEFs) refer to edible fruit species which are not cultivated but are collected from their natural habitat (Ranogajec, 2011). WEFs are mainly consumed during off-season periods of cultivated fruits and vegetables, predominated by food shortage(Rasingam, 2011; Deshmukh and Waghmode, 2012).Even though agricultural communities rely mostly on improved cultivated varieties due to their nutritional value, health benefits, and higher productivity, the habit of consuming wild foods has not been entirely abandoned (Lockett, 2000).Throughout history, wild edible plants have sustained human populations in each of the inhabited continents. Human consumption of wild plants has been documented from antiquity into the recentEra.Dietary use of wild fruits, nuts, seeds, and leaves appear in numerous historical records (Darby *et al*. 1977; Sundriyal & Sundriyal, 2001; Mahapatra & Panda, 2009; Ojelel & Kakudidi, 2015). Today, most human plant foods are based on a rather limited number of crops. However, it is clear that in many parts of the world, the use of wild plants is not negligible. In India, the indigenous fruits collected from the wild play a significant role in the food and nutrient security of rural poor and the tribals. Some wild fruits have been identified to have better nutritional value than cultivated fruits (Sundriyal & Sundriyal, 2001; Mahapatra & Panda, 2009).

Pyrus pashia Buch.-Ham ex D. Don, is a small to medium-sized fruiting tree and a member of the *Rosaceae* family. It is generally known as `Kainth' and goes by several other names such as `Batangi', `Molu', `Tangai', `Sohjhur' and `Mehal'(Matin*et al*, 2001 ; Ahmad, 2007).In India, the plant is mainly found in the Himalayan region and parts of the northern states such as Uttarakhand, Himachal Pradesh and Punjab. This fruit requires a period from May to December to mature, becomes soft and edible on ripening (Parmar and Kaushal, 1982).The leaf extract is used as a tonic for hair loss and woods are used as a major fuel source in the central Himalayan region and consumed as tea beverages by monpa community of twang, Arunachal Pradesh (Tsering*et al*, 2012). Twigs of the tree are used in tooth ache problems by the indigenous people of Jammu Kashmir (Sharma*et al*, 2016).Fruitsare used for the treatment of dehydration, GI disorder, fever, headache, hysteria and epilepsy (Rasineni*et al*, 2008). The decoction of dried fruits with other plant parts of *P. pashia* effectively improves spleen and stomach function. The fruits are also used as fodder for milk-producing animals to enhance their milk production (Jiangsu, 1986).Edible flowers are used in cardiovascular disease and certain cancers, these properties are attributed by the presence of phenolic compounds (Janbaz*et al*, 2015). Paste of

young twigs and fresh leaves is used for fungal infection of toe (Siddiqui*et al*, 2015). Bark possesses astringent and tonic properties and is used in the management of sore throat, typhoid fever, peptic and gastric ulcers (Janbaz, *et al*., 2015).In addition to this *Pyrus pashia* fruit has good nutritional value (Parmar &Kaushal , 1982). Therefore, *Pyrus pashia* may offer good source of income and nutrition for population inhabitant in the Himalayan hill tracts.

Botanical description

The average tree is 6 to 10 metres tall.Young trees can be recognized by wooly or fuzzy leaves on young branchlets which become smoother as the tree ages (Ghora and Panigrahi, 1985).Theleaves of a mature tree are characterized with an ovate to ovate-lanceolate shape, the length of which ranges from 5 to 10 centimetres. Mature trees can have spiny branches with bark that is rough and quite dark, almost black in some cases. The early fruit is mostly of light green colour but at maturity, its colour turns blackish brown with numerous yellow and white dots on its skin surface. The shape of fruit is often described as oblate, ovoid, obovoid, oval or quince. On average the fruit diameter ranges from16 mm to 24 mmand the height ranges from 13mm to 18 mm (Kanjilal, 2004).

Figure 1: *Pyrus pashia*: a) Whole plant b) Leaves c) Flowers d) Fruits

II. Material And Methods

Study site

The study site was selected at 820m above mean sea level at 30′42″N and 77’04″E in Morni hills in the North-eastern region of Haryana, India. Morni hills represent tertiary formations of Siwalik Hills. Siwalik Hills form the outermost hills of Himalayas and are composed of alluvial detritus derived from the Sub-aerial waste of mountains (Wadia, 1961). The soil of the region is clay loam and underlying rocks are

stoneandconglomerates.

Determination of morphological parameters

The tree height and girth was recorded using altimeter and measuring tape. The fruits were collected and fruit length, width was determined using Digital Vernier Callipers (Mitutoyo Make). The pulp was weighed after removing the seeds and the seed: pulp ratio was determined.

Population structure study

For the study, 10 plots (each of 100 m^2) were selected randomly at820mabovemeansealevel (AMSL). For the phytosociological analysis, the quadratmethod was used. Trees were sampled in 10 × 10 m quadrats,Shrubs/saplings in 5 × 5 m quadrats, and Herbs/seedlings in 1 × 1 m quadrats within each plot (Curtis and McIntosh, 1950; Phil-lips, 1959). The circumference of trees was also measured at 1.37m height above fromthe ground.The quantitative analysis of the vegetation for frequency, density and dominance was done following Misra (1968). Various species diversity indices were also calculated, viz. index of species diversity using Shannon and Weiner(1963) and species evenness or equitability by Pielou (1966).

Regeneration status

The regeneration status of tree species was determined on the basis of population size of seedlings, saplings and mature trees. Good regeneration, i.e., if particular species is present in seedlings > saplings > trees; fair regeneration, i.e., if species presents in seedlings > saplings ≤ trees; poor regeneration, i.e., if a species survives only in sapling stage, but not as seedling; if a species is presents only in adult form it is considered as not regenerating (Khan & Tripathi, 1986; Shankar, 2001).

III. Results And Discussion

The morphological parameters of the fruits collected from Morni-Pinjore revealed a significant variation among them. The average fruit length (17.40 mm), fruit diameter (19.38 mm), fruit weight (4.40 g), pulp weight (4.99 g) and seed: pulp ratio (1 : 35.2)were recorded of the *P. pashia* fruits . Fruit sizes are medium to small and fruit is dark brown in color. *Pyrus pashia* is found mainly in the village fringes and in the hotter aspect where direct sunlight was received. Tree height ranges 8- 11m, girth 11-30 cm with maximum trees between girth class 11-20 cm(Graph 1). Fruit ripening was seen in November –December month. Population of *Pyrus pashia* was moderate and its common associate species are *Pinus roxburghi, Rhododendron arboreum*and *Quercus leucotrichophora.*

Studies on population distribution of various wild edible plant species have been carried out by a number of researchers (Chauhan *et al*, 2017; Paul *et al*, 2019; Pai & Satish, 2020; Phuyal *et al*, 2022). Using similar methodology regeneration status and population structure of *Pyrus pashia*in Morni hills, Haryana, was determined (Table 1). Seedlings were 10,000 $ha^{-1,}$ saplings 11 $ha^{-1}$and in trees for 11-20 cm diameter classes it was 30 trees and for 21-30 cm diameter classes it was 10 trees. The tree layer of *Pyrus pashia* shows second highest IVI (38.82) after *Toona ciliata*(39.94). IVI index for *Pyrus pashia*determined by Dhiman *et al*(2020) was 9.3253 which is very less as compared to our data. This may be due to some construction activities undergoing then at the selected site as reported by the author.

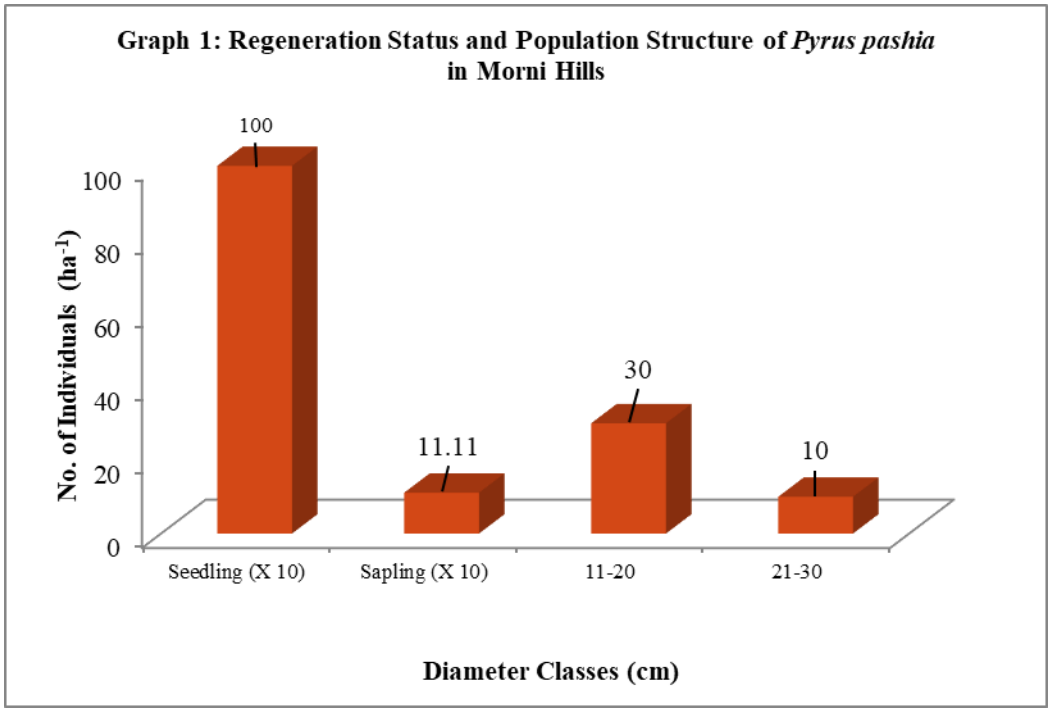
The shrub layer showed maximum IVI of Invasive species, *Lantana camara* (52.57) and *Parthenium hysterophorus*(57.62). *Pyrus pashia*showed IVI (20.96) in shrubs/sapling layer. The IVI is maximum for *Eupatorium adenophorum* (31.89) followed by *Cyanadondactylon*(28.96) and for *Pyrus pashia*(15.93) in herbs/seedlings. Shannon Wiener Index/ Species Diversity Index ranges from 1-5. Dhiman *et al*,(2020) have determined Diversity Index as 3.11and evenness index as 0.94. Our results showed Diversity Index for trees as 2.63 and Eveness Index as 3.5. Thus our results indicate that the forest is moderately diverse and even.

Table1. Vegetationanalysisand diversityindicesof Trees, Shrubs and herbs of Morni hills

SI. No.	Name of the plant	Family	Density (Tree ha-1)	Basal area(cm^2/ha)	IVI	H'
		A. Trees				
1.	*Acacia catechu*	Fabaceae	40	383.7579618	33.75282	-0.26
2.	*Aegle marmelos*	Rutaceae	10	161.2261146	9.643732	-0.11
3.	*Bombax ceiba*	Bombacaceae	10	127.388535	9.018916	-0.11
4.	*Cassia fistula*	Fabaceae	20	49.7611465	7.585514	-0.11
5.	*Emblica officinalis*	Euphorbiaceae	20	266.0031847	18.24512	-0.18
6.	*Ficus auriculata*	Moraceae	10	97.53184713	8.467608	-0.11
7.	*Ficus palmata*	Moraceae	10	183.4394904	10.05391	-0.11
8.	*Ficus racemosa*	Moraceae	20	509.5541401	16.07566	-0.11
9.	*Grewia optiva*	Tiliaceae	30	410.0318471	27.5713	-0.23
10.	*Grevillea robusta*	Proteaceae	10	127.388535	9.018916	-0.11

11.	*Hesperethusacrenulata*	Rutaceae	20	168.2324841	16.43977	-0.18
12.	*Mangifera indica*	Anacardiaceae	30	296.5764331	25.47633	-0.23
13.	*Pyrus pashia*	Rosaceae	40	658.2006369	38.82044	-0.27
14.	*Syziumcumini*	Myrtaceae	10	336.3853503	12.87808	-0.11
15.	*Terminalia arjuna*	Combretaceae	30	199.044586	17.00872	-0.18
16.	*Toona ciliata*	Meliaceae	20	1441.082803	39.94315	-0.18
	Total			**5415.605096**	**300**	**-2.62**
	Shannon Weiner Index					**2.62**
	EvenessIndex					**3.45**
		B.	**Shrubs/Saplings**			
1.	*Berberis asiatica*	Berberidaceae	4	11.6961	17.10	-0.094
2.	*Lantana camara*	Verbenaceae	32	9.2082	52.57	-0.325
3.	*Murrayakoengii*(Sapling)	Rutaceae	20	22.9899	50.07	-0.263
4.	*Parthenium hysterophurus*	Asteracaeae	48	4	57.62	-0.363
5.	*Pyrus pashia*(Sapling)	Rosaceae	8	10.1284	20.96	-0.152
6.	*Rubus ellipticus*	Rosaceae	16	0.6656	22.35	-0.234
7. 0	*Sida cordifolia*	Malvaceae	4	20.9010	26.30	-0.094
8.	*Solanum incanum*	Solanaceae	8	0.1452	10.99	-0.152
9.	*Toxicodendeon parviflorum*	Anacardiaceae	8	0.2603	11.10	-0.152
10.	*Woodfordiafruticosa*	Lythraceae	8	20.133	30.95	-0.152
	TOTAL			**100.0280**	**300**	**-1.982**
	Shannon Weiner Index					**1.982**
	Eveness Index					**0.81**
		C.	**Herbs/Seedlings**			
1.	*Acyranthes aspera*	Amaranthaceae	400	0.078029	11.79	-0.1497
2.	*Adhatodavasica*(seedling)	Acanthaceae	700	0.3443795	25.38	-0.2131
3.	*Alpudamutica*	Poaceae	800	0.017777	5.41	-0.0922
4.	*Andrographis paniculata*	Acanthaceae	600	0.4374805	25.01	-0.1942
5. 8	*Arenaria serpyllifolia*	Caryophyllaceae	100	0.009498	2.72	-0.0547
6.	*Bidens pilosa*	Asteraceae	700	0.166106	6.30	-0.0547
7. 6	*Cheilanthesbicolor*	Polypodiaceae	400	0.221291	12.57	-0.1231
8.	*Cyanadondactylon*	Poaceae	400	0.391558	28.96	-0.2131
9.	*Dendrocalamusstrictus*	Poaceae	300	0.079599	16.82	-0.1942
10.	*Desmodiumpulchellum*	Fabaceae	100	0.082739	9.39	-0.1231
11. 0	*Dichanthiumannulatum*	Poaceae	700	0.574227	23.14	-0.0922
12.	*Eupatorium adenophorum (Seedling)*	Asteraceae	200	0.628785	31.89	-0.2131
13. 4	*Geranium spp.*	Geraniaceae	500	0.08007	16.83	-0.1497
14. 3	*Pyrus pashia (seedling)*	Rosaceae	600	0.477594	15.93	-0.2131
15. 7	*Rumex hastatus*	Musaceae	100	0.166027	13.80	-0.1497
16. 1	*Solanum nigrum*	Solanaceae	400	0.320986	24.85	-0.2302
17. 2	*Strobilanthes sp.*	Acanthaceae	200	0.173249	13.97	-0.1497
18. 5	*Viola canescens*	Violaceae	300	0.119241	15.23	-0.1732
	Total			**4.368638**	**300.00**	**-2.4371**
	Shannon Weiner Index					**2.4371**
	EvenessIndex					**0.6729**

D= Density (individuals/hectare). B.A= Basal Area(cm^2/hectare). IVI= Important value index. H'= Shannon Weiner Index. E= Pielou Index.



On data analysis for *P.pashia* it was found that seedlings> Sapling < Adults (Graph 1). This shows fair regeneration status of *Pyrus pashia* **in** the studied area. Regeneration status of *Pyrus pashia* along the disturbance gradient was Good in moderately disturbed areas and poor in least disturbed areas in Kedarnath wildlife sanctuary and adjoining areas , Uttarakhand (Singh& Malik. (2018). Pala *et al* (2013) have found the regeneration status of *Pyrus pashia* in sacred **and** protected landscapes of Garhwal Himalayas from generally fair to good. In a study in Jammu & Kashmir regeneration status of *P. pashia*showed a better density of seedlings and saplings and this indicated their good regeneration potential (Jazib &Manzroor,2021) . A study by Tewari *et al* (2018) suggests that *Pyrus pashia*, and some other speciesexist in the good regeneration category across various forest types in ridge forests of western Himalayas. Thus our results are in line with the reported literature.

IV. Conclusion

*Pyrus pashia*occurring insubtropical deciduous forest of Shivalik hills,inMorniPinjore Haryana, is important for its ethno-botanical uses. It is a species with nutritious fruit havingmany medicinal uses and has potential for livelihood generation in rural areas. Results show that regeneration of this species is fair in MorniPinjore as there are sufficient seedlings and saplingspresent in the forest. Thus there is no threat observed to this species in the studied area.

Acknowledgement

We would like to thank ICFRE, Dehradun and CAMPA, MoEFandCC, New Delhi, for financial and logistic support.

References

[1] Ahmad Z .2007 . Country Report On Plant Genetic Resources For Food And Agriculture-Pakistan. National Agricultural Research Centre, Islamabad, Pakistan, Pp79.
[2] Ashish Paul, Mohamed Latif Khan & Ashesh Kumar Das .2019. Population Structure And Regeneration Status Of Rhododendrons In Temperate
[3] Mixed Broad-Leaved Forests Of Western Arunachal Pradesh, India, Geology, Ecology, And Landscapes, 3:3, 168-186.
[4] Beluhan S, Ranogajec A. 2011. Chemical Composition And Non-Volatile Components Of Croatian Wild Edible Mushrooms. Food Chem. 124(3):1076–82.
[5] Chauhan Ds, Lal P, Singh D .2017. Composition, Population Structure And Regeneration Of Rhododendron Arboreum Sm. Temperate Broad-Leaved Evergreen Forest In Garhwal Himalaya, Uttarakhand, India. J Earth Sci Clim Change 8: 430.
[6] Curtis, Jt, Mcintosh, Rp. 1950. The Interrelation Of Certain Analytic And Synthetic Phytosociological Characteristics, Ecology. 31:434-455.
[7] Darby Wj, Ghalioungui P., Grivetti Le. 1977. Food: The Gift Of Osiris, Academic Press, London.
[8] Deshmukh Bs, Waghmode A. 2011. Role Of Wild Edible Fruits As A Food Resource: Traditional Knowledge. Int J Pharm Life Sci. 2(7) : 919–24.

[9] Ghora C , Panigrahi G . 1995. The Family Rosaceae In India. In: Revisionary Studies On Six Genera (Prunus, Prinsepia, Maddenia, Rosa, Malus, And Pyrus). Vol 2. Bishen Singh Mahendra Pal Singh, Dehradun, Pp. 481.
[10] Janbaz Kh, Saqib F, Hawaz J. 2015. Scientific Basis For Used Of Pyrus Pashia Buch-Ham Ex D.Don Fruit In Gi, Respiratory And Cardiovascular Ailments. Plos One. 10(3): E0118605.
[11] Janbaz Kh, Zaeem Am, Saqib F, Imran I, Zia-Ul-Haq M, Abid Rm, Jaafar Hz , Moga M. 2015. Scientific Basis For Use Of Pyrus Pashia Buch.-Ham. Ex D. Don Fruit InGastroin-Testinal, Respiratory, And Cardiovascular Ailments. Plos One 10: E0118605.
[12] Jazib. J And Manzoor. J .2021. Population Structure Of Forests In Jammu And Kashmir, India. J Biores Manag., 8(4): 167- 176.
[13] Jiangsu New Medical College. 1986. 'Dictionary Of Chinese Traditional Medicine'. Shanghai People's Press, 1986.
[14] Kanjilal Un. 2004, Forest Flora, Natraj Publishers, Dehradun.
[15] Khan Ml, Rai Jpn, Tripathi Rs. 1987. Population Structure Of Some Tree Species In Disturbed And Protected Subtropical Forests Of North-East India. Acta OecolOecol Appl. 8(3):247-55.
[16] Lockett Ct, Calvert Cc, Grivetti Le. 2000. Energy And Micronutrient Composition Of Dietary And Medicinal Wild Plants Consumed During Drought. Study Of Rural Fulani, Northeastern Nigeria. Int J Food Sci Nutr. 51(3):195–208.
[17] Mahapatra Ak, Panda Pc .2009. Wild Edible Fruit Plants Of Eastern India. Bhubaneswar: Regional Plant Resource Centre, Orissa.
[18] Matin A, Khan Ma, Ashraf M And Qureshi Ra . 2001. Traditional Use Of Herbs, Shrubs, And Trees Of Shogran Valley, Mansehra. Pak J Bio Sci 4: 1101-1107.
[19] Misra R. 1968. Ecology Work Book, Oxford And Ibh Publications Co., New Delhi.
[20] Ojelel S, Kakudidi E. 2015. Wild Edible Plant Species Utilized By A Subsistence Farming Community In Obalanga Sub-County, Amuria District, Uganda. J EthnobiolEthnomed. 11:7
[21] Pai Vv, Satish Bn. 2020. Population Structure, Regeneration Status And Ethnobotanical Survey Of Wild Edible Fruits In Sacred Groves Of Kodagu. International Journal Of Ecology And Environmental Sciences, 2(4), 494-498.
[22] Parmar C. Kaushal Mk. 1982. Pyrus Pashia. In: Wild Fruits. Kalyani Publishers, New Delhi, India. Pp. 78–80.
[23] Phillips E.A. 1959. Methods Of Vegetation Study. Holt, Rinehart And Winston, New York, Pp. 107.
[24] Phuyal N, Jha Pk, Raturi Pp,Rajbhandary S. 2022.Population Structure And Regeneration Of Zanthoxylum Armatum Dc. In Salyan, Nepal Journal Of Ecology And Environment . 46:11.
[25] Pielou Ec. 1966. The Measurement Of Diversity In Different Types Of Biological Collections. Journal Of Theoreti-Calbiology,13:131-144.
[26] RasineniGk, Siddavattam D, Reddy Ar. 2008. Journal Of Medicinal Plants Research. 2008; 2(10):285 -291.
[27] Rasingam L. 2012. Ethnobotanical Studies On The Wild Edible Plants Of Irula Tribes Of Pillur Valley, Coimbatore District, Tamil Nadu, India. Asian Pac J Trop Biomed. 2(3): S1493-S1497.