Biological Forum – An International Journal **13(2): 666-669(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Evaluation of Diversity Among Tree and Leaf characteristics of Ambri apple (*Malus* × *domestica* Borkh.) in Jammu region

Koushalya Devi[1], Kiran Kour[1], Parshant Bakshi[1], B.C. Sharma[2], Manmohan Sharma[3] and B.K. Sinha[4]

[1]Division of Fruit Science,
Sher-e- Kashmir University of Agricultural Sciences and Technology of Jammu- 180009, India.
[2]Division of Agronomy,
Sher-e- Kashmir University of Agricultural Sciences and Technology of Jammu- 180009 India.
[3]School of Biotechnology,
Sher-e- Kashmir University of Agricultural Sciences and Technology of Jammu- 180009 India.
[4]Division of Plant Physiology,
Sher-e- Kashmir University of Agricultural Sciences and Technology of Jammu- 180009 India.

(Corresponding author: Koushalya Devi)*
(Received 19 April 2021, Accepted 15 June, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present study was done to evaluated the diversity of Ambri apple germplasm in Jammu region and to select elite Ambri apple genotypes possessing superior attributes. Fifty Ambri apple genotypes were collected from different locations in Jammu and their various morphological characters were studied. The genotypes showed wide variability with respect to tree and leaf characteristics. Studies on tree habit revealed substantial variability among the seedling raised Ambri apple genotypes. In the present investigation it was found that out of 50 Ambri apple genotypes (44 %) had upright tree habit while (46 %) had spreading and rest (10 %) genotypes had drooping tree habit. In case of tree vigour among the 50 selected Ambri apple genotypes none of the genotypes had extremely weak vigour, while (8 %) had weak tree vigour, (50 %) had intermediate, (38 %), had vigorous and rest (4 %) had very vigorous tree vigour. In case of leaf shape among the selected 50 Ambri apple genotypes (8 %) exhibited small leaf size, (44 %) had medium leaf size and rest (48 %) had large leaf size. Among the selected 50 Ambri apple genotypes (40 %) had oval leaf shape and (60 %) exhibited broad elliptic shape.

Keywords: Ambri apple, variability, tree vigour, leaf shape.

INTRODUCTION

Apple (*Malus* × *domestica* Borkh.) is the most important fruit of the temperate zones in the world, presenting a high diversity of commercial cultivars. Apples are members of the genus *Malus* belongs to the subfamily Pomoideae and family Rosaceae with a basic chromosome number of x = 17. Across the globe more than 10,000 apple cultivars are known today, of which only 20 are known for their commercial demand (Janick *et al.*, 1974). The centre of origin of apple is in the southwestern Asia, in the Caucasus area near Gilan in Turkistan (Vavilon, 1951). Since then, it has been spread by man into almost all parts of the world. This has been possible because of the great amount of genetic variability found in the apple which has allowed adapted types for different environments (Juniper *et al.*, 2001). Commercial cultivation of apple in India is confined to J&K, H.P., Uttaranchal and in small scale in the North-Eastern states. In India about 33 apple varieties are commercially grown over an area of 314 thousand hectares with the production of 2503 thousand metric tonnes annually (Anonymous, 2019). In the union territory of Jammu & Kashmir total area under apple is 164742 hectares with production of about 1882319 MT and productivity of 11.42 metric tonnes /hectare whereas in Jammu region, the area under apple is around 18415 hectares with the production of about 30595 MT (Anonymous 2019). Ambri apple is said to be indigenous to Kashmir (Lawrence, 1895). The scattered plantations of Ambri apple can be found in Doda and Kishtwar districts of Jammu province. The survey was conducted to explore the diversity of the Ambri apple genotypes. Due to the seedling origin and its highly cross pollinated nature, it has contributed towards the tremendous variability in size, shape and colour development which provide a platform for exploitation of vast gene pool of Ambri apple. The accessibility of Indian apple in markets is only confined between July to November, because of poor shelf life. Ambri apple continues its excellence due to crisp texture, sweet flesh, excellent aroma and prolonged storability. With the introduction of early maturing cultivars have eliminated the many locally adapted apple varieties.

Special attention on saving genetically important Ambri types from extinction is therefore to be given priority basis; this can prove useful in bringing genetic improvement in yield and quality of commercially grown apple varieties. The rich core set developed will

be a valuable resource for future genetic studies and crop improvement strategies.

MATERIAL AND METHOD

The present exploration was carried out during the year 2017 and 2018 at different selected Ambri apple growing areas of Doda and Kishtwar of Jammu province. During the survey department of Horticulture and local inhabitants were consulted to identify the hotspots of Ambri apple. Initially a total of 150 naturally growing seedling trees were marked. The sample of 100 trees were rejected and finally sample of 50 superior trees were selected. The genotypes were selected with respect to the availability of diversity in seedling Ambri apple. On the basis of preliminary field observations the trees which were bearing extremely small sized, poor quality and low yielding were not included. Codes were allotted to each genotype on the basis of their spot. A short description of all Ambri apple accessions was recorded in the form of passport data for different morpho-physiological characters with the help of Apple descriptor (NBPGR 2002). Tree habit was observed during active growth period and rated as Upright (3), Spreading (5) and (Drooping (7). Tree vigour was observed as the overall abundance of branches during the active growth period and rated as Extremely weak (1), Weak (3), Intermediate (5), Vigorous (7) and Very vigorous (9).

The leaf size of the selected genotypes was observed on mature leaf as Small (3)**,** Medium (5) and Large (7), the leaf shape was observed on mature leaf as Oval (1), Ovate (2) and Broad elliptic (3).

RESULTS AND DISCUSSION

The results of tree and leaf characteristics are given in Table 1. Tree attributes are salient as far as diversity is concerned. In this study seedling Ambri apple surveyed from locations showed diversity in tree characteristics. On the basis of tree habit the selected genotypes were divided into three categories i.e., upright, spreading and drooping. Out of 50 Ambri apple genotypes, 22 genotypes (44 %) had upright and 23 genotypes (46 %) had spreading growth habit and rest 5 genotypes (10 %) had dropping tree growth habit. The results are in accordance with the line of Hassan *et al.*, (2017), where they found upright tree habit (36.36 per cent) and spreading tree habit (63.63 per cent) among selected apple accessions. On the basis of tree vigour the selected genotypes were split up into three categories i.e., extremely weak, weak, intermediate, vigorous and very vigorous. Tree vigour among the 50 selected Ambri apple genotypes none of the genotypes had extremely weak vigour, while 4 genotypes (8 %) had weak tree vigour, 25 genotypes (50 %) had intermediate, 19 genotypes (38 %), had vigorous and rest 2 genotypes (4 %) had very vigorous tree vigour. Tree characteristics are an important factor for characterizing Ambri apple genotypes. Similar variations in tree characters were also observed by Ahmed (2008) who reported that pear genotypes showed variability in their tree behaviour and tree size. He further reported that most of genotypes were pyramidal in shape with medium to large tree size, some were larger in size with broadly spreading branches while, limited number of genotypes were found in upright in growth with small tree size. Shyamali (2006) also reported huge variation in tree characters of different pear genotypes and these variations might be due to attributed genetic makeup of the pear cultivar/rootstock. Variation in tree habits among Asian pear genotypes was observed as spreading and upright (Bhat, 2012; Griggs and Iwakiri 1977). However tree characteristics *viz.*, tree vigour, and tree habit is greatly affected by location, soil and different cultural practices like training and pruning. It was recorded that those trees which were growing under direct sunlight had vigorous growth possibly due to more sunlight available for dry matter production and produced good quality fruits as compared to those having dense canopies. From the above discussion a great genetic variability subsist as far as tree vigour is perturbed in the germplasm of Ambri apple. Kumar *et al.,* (2018) also reported that on the basis of plant growth and yield *cv.* Lal Ambri exhibited maximum plant height (480 cm), annual extension growth (60 cm), plant spread (N-S= 122.33 cm and E-W= 115.00 cm) and plant volume (23.70M^3) during investigations. Sandhu *et al.,* (2001) also reported vigorous, medium and dwarf soft pear strains on the basis of tree height, spread and trunk girth.

Table 1: Tree and leaf characteristics of Ambri apple (*Malus* × *domestica* Borkh.) genotypes.

Sr. No.	Genotype number	Tree habit	Tree vigour	Leaf size	Leaf shape
1.	SKJAB -01	5	7	5	3
2.	SKJAB -02	5	7	5	3
3.	SKJAB -03	3	7	7	3
4.	SKJAB -04	3	5	7	1
5.	SKJAB -05	5	7	7	3
6.	SKJAT -06	5	5	3	3
7.	SKJAT -07	3	5	3	3
8.	SKJAT -08	5	5	5	3
9.	SKJAT -09	7	5	5	3
10.	SKJAG -10	3	5	5	3
11.	SKJAG -11	3	5	7	3
12.	SKJAG -12	7	7	5	3
13.	SKJAG -13	5	7	5	3
14.	SKJAG -14	7	9	5	3
15.	SKJAG -15	5	9	7	1

16.	SKJAG -16	7	5	5	1
17.	SKJAG -17	3	7	5	3
18.	SKJABh -18	3	5	3	3
19.	SKJABh -19	3	5	3	3
20.	SKJABh -20	3	5	5	3
21.	SKJAK -21	5	5	7	1
22.	SKJAK -22	3	5	7	3
23.	SKJAK -23	5	5	7	1
24.	SKJAK -24	3	5	5	1
25.	SKJAK -25	3	5	5	1
26.	SKJAK -26	5	5	7	1
27.	SKJAK -27	3	5	7	1
28.	SKJAD -28	3	5	7	1
29.	SKJAD -29	3	7	7	3
30.	SKJAD -30	5	7	7	3
31.	SKJAD -31	5	7	5	1
32.	SKJAD -32	5	7	7	1
33.	SKJAD -33	5	5	5	1
34.	SKJAD -34	5	5	7	3
35.	SKJAD -35	3	7	5	1
36.	SKJAD -36	3	7	7	1
37.	SKJAN -37	5	7	7	1
38.	SKJAN -38	5	7	7	3
39.	SKJAN -39	5	7	7	3
40.	SKJAN -40	3	7	7	3
41.	SKJAN -41	3	7	5	3
42.	SKJAN -42	7	7	7	1
43.	SKJAM-43	3	5	5	1
44.	SKJAM-44	5	5	7	3
45.	SKAM-45	3	5	5	3
46.	SKJAM -46	5	5	5	1
47.	SKJAM -47	5	3	7	1
48.	SKJAC -48	5	3	5	3
49.	SKJAC -49	5	3	7	3
50.	SKJAC -50	3	3	5	3

Legend

Tree habit	Note	Tree vigour	Note	Leaf size	Note
Upright	3	Extremely weak	1	Small	3
Spreading	5	Weak	3	Medium	5
Drooping	7	Intermediate	5	Large	7
		Vigrous	7		
		Very vigorous	9		

Leaves play an important role in growth and development of plants as they serve as a source of food to plant. Variation in foliage characters such leaf size and leaf shape is considered to be important for the identification and characterization of any fruit crop germplasm. Various types of leaf characters were studied in the present study i.e., leaf size and leaf shape. In present study a wide variations has been observed in various leaf characteristics of Ambri apple.

On the basis of leaf size, Ambri apple genotypes were divided into three categories i.e., small, medium and large. Out of 50 Ambri apple selected genotypes 4 genotypes (8 %) had small size, while 22 genotypes (44 %) had medium in size and 24 genotypes (44 %) had large in size. The diversity with respect to leaf size among different Ambri apple genotypes might be due to genomic sequence and interlinkage with environment. A study was carried by Hassan *et al.*, (2017), who reported significant range in leaf size of an apple i.e., leaf blade length (6.26 to 12.06 cm) and leaf blade width (2.73 to 7.23 cm).

Bist *et al.*, (2003) also reported that Gola cultivar of pear had higher leaf length as compared to Patharnakh cultivar. He also observed that the cultivar Tumariya showed higher leaf breath as compared to Gola and Patharnakh cultivars of pear.

Leaf shape was categorized into oval, ovate and broad elliptic. Out of 50 Ambri apple 20 genotypes (40 %) had oval shape, 30 genotypes (60 %) had broad elliptic leaf shape. Variability among genotypes on the basis of leaf characteristics are supported by the results of Hassan *et al.*, (2017) who observed wide variability with respect to tree, leaf and fruit characteristics. Our results are also in close conformity with the results of Kumar *et al.*, (2018) who reported that the frequency of ovate leaf shape was observed maximum in selected apple genotypes. Similar results were observed by Elshihy *et al.*, (2004) they reported that leaves were serrated and the leaf index (leaf width/leaf length) ranged from 0.35 to 0.78 in Syrian pear genotypes. Variation in leaf shape and size were also observed by Raina *et al.* (2011).

Rana *et al.*, (2015) also observed wide variability among the genotypes on the basis of leaf characteristics in pome fruit trees. Variability with respect to leaf characters might be due to their genetic makeup and interaction with the environmental conditions. Ambri apple genotypes exhibited quantitative diversity in foliar dimensions.

Table 2: Summary of frequency of tree and leaf characteristics of Ambri apple (*Malus* × *domestica* Borkh.).

Trait	Category	No. of Genotypes	Percentage
Tree habit	Upright - 3	22	44
	Spreading- 5	23	46
	Drooping -7	5	10
Tree vigour	Extremely weak-1	—	—
	Weak - 3	4	8
	Intermediate - 5	25	50
	Vigrous - 7	19	38
	Very vigorous - 9	2	4
Leaf size	Small - 3	4	8
	Medium - 5	22	44
	Large – 7	24	48
Leaf shape	Oval - 1	20	40
	Broad elliptic - 3	30	60
	Others – 99	—	—

CONCLUSION

The purpose of our study was to obtain diversity in Ambri apple and present study confirmed that there is huge diversity of Ambri apple in North western Himalayan region. Thus it become necessary to preserve these unique genetic resources for improvement of fruit quality parameters. And for continuing its study to ensure its conservation, exchange and utilization in future breeding programmes for future development of innovative, market-driven cultivars through adoption of effective genetic approach.

REFERENCES

Ahmed, M. (2008). Biodiversity in pears (*Pyrus* sp.): Characterization and conservation of germplasm from Azad Jammu and Kashmir. Ph. D. thesis submitted to department of Horticulture University College of Agriculture Bahauddin Zakariya University Multan.

Anonymous (2019). Statement of J&K, Department of Horticulture, Jammu.

Anonymous (2019). Indian Horticulture Database. National Horticulture Board, Gurgoan.

Bhat, Z. A. (2012). Molecular characterization and hybridization studies I pear. Ph.D Thesis, division of Pomology, Punjab Agriculture University, Ludhiana.

Bist, L.D., Yadav, A., & Prakash, C. (2003). Performance of low chill pear cultivars under submountainous tarai region. *Progressive Horticulture*, *35*(1): 20-24.

Elshihy, O. M., Sharaf, A. N., & Muzher, B.M. (2004). Morphological, anatomical and biochemical characterization of Syrian pear (*Pyrus syriaca* Boiss) genotypes. *Arabian Journal of Biotechnology*, *7*(2): 209- 218.

Griggs, W. H., & Iwakiri, B. T. (1977). Asian pears in California. *California Agriculture*, *3*(1): 4-8.

Hassan, S., Bhat, K. M., & Rehman, H. U. (2017). Assessment of Genetic Variability of Wild Apple (*Malus spps*) Genotypes in Kashmir Valley. *International Journal of Plant and Soil Science, 14*(5): 1-12.

Janick, J. (1974). The apple in Java. *Hort. Science*, *9*: 13-15.

Juniper, B. E., Robimson, J., Harris, S. A., & Watkins, R. (2001). Origin of the apple *(Malus domestica* Borkh). In: *Encyclopedia of Genetics*, (ed. E.C.R.Reeve), London:Fitzroy Daerborn, 674-677.

Kumar, D., Srivastava, K .K., & Singh, S. R. (2018). Morphological and horticultural diversity of plum varieties evaluated under Kashmir conditions. *Tropical Plant Research*, *5*(1): 77-82.

Kumar, R., Bakshi, P., Jasrotia, A., Jamwal, M., & Kumar, V. (2018). Performance of apple cultivars in Bhaderwah climatic condition, Jammu and Kashmir. *International Journal of Chemical Studies*, *6*(3): 3519-3521.

NBPGR, (2002). National Bureau of Plant Genetic Resource. Apple (*Malus* × *domestica* Borkh.) pp. 201-206.

Raina, B., Dhillon, W. S., & Singh, K. (2011). Analysis of genetic diversity in pear germplasm using morphological traits and DNA markers. *Indian Journal of Horticulture*, *68*(3): 293-302.

Rana, J. C., Chahota, R. K., Sharma, V., Rana, M., Verma, N., Verma B., & Sharma, T. R. (2015). Genetic diversity and structure of *Pyrus* Selections of Indian Himalayan region based on morphological and SSR markers. *Tree Genetics and Genomes*, *11*: 821.

Sandhu, A. S., Singh, T., Singh, R., Dhillon, W. S., & Sharma, K. K. (2001). Evaluation of sub- tropical germplasm. *Indian Journal of Plant genetic Resources*, *14*: 209-11

Shyamali, G. G. V. (2006). Fruit development studies in some Asian soft pear varieties. M.Sc. Thesis submitted to Punjab Agricultural University, Ludhiana.

How to cite this article: Devi, K., Kour[2] K., Bakshi, P., Sharma, B.C., Sharma, M. and Sinha, B.K. (2021). Evaluation of Diversity Among Tree and Leaf characteristics of Ambri apple (*Malus* × *domestica* Borkh.) in Jammu region. *Biological Forum – An International Journal*, *13*(2): 666-669.