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Morphological characterization of wild apple genotypes in Kashmir valley

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Abstract

Diversity is the condition by which differences occur among individuals of the same plant species. Some characteristics change very little, while others, especially quantitative ones, change rather quickly and readily, even when environmental conditions change slightly. This fact has prompted a study on this diversity. In the present study diversity of wild apple accessions was studied in selected regions of Kashmir Valley. Forty wild apple accessions were collected from central and south Kashmir and their various morphological characters were studied. The genotypes studied showed variation with respect to leaf and fruit in Quantitative and qualitative characters. The results showed a significant range in leaf blade length (6.64-9.72 cm) and leaf blade width (3.24-5.43 cm). Regarding chemical analysis of fruit, the TSS varied from 6.650-13.116 o Brix and acidity varied from 0.043-0.920%. It is thus concluded that wide variation existed in the studied genotypes which can be utilized in future improvement program.

Keywords: Apple, variability, Kashmir, characters

Introduction

Apple is the most pervasive and well-adapted species of temperate fruit crops. It was known to the Greeks and Romans and mentioned by Theophrastus in the third century B.C. Since then the apple has been distributed into almost all parts of the world. It is grown in high latitude regions of the world where temperatures may reach 40 °C at high elevations (Janick, 1974) [2]. The apple belongs to the Rosaceae or rose family and has been classified into the subfamily Pomoideae and genus *Malus*. *Malus* species are widely distributed throughout North America, Europe, Asia Minor, and Asia and serve as potential genetic resources for the development of new apple cultivars and/or rootstocks adapted to diverse environmental conditions (Hokanson *et al.*, 2001) [1]. The genus *Malus* consists of about 27 species. Among wild *Malus* species, *Malus sieversii* Lebed. Native to Central Asia, has been recognized as a major progenitor of the domesticated apple *Malus × domestica* Borkh (Forsline *et al.*, 2003) [3]. Himalayas provide suitable ecological niches for the prevalence of large number of temperate fruit. Germplasm (Sharma and Pramanick, 2012) [4]. The indigenous crab apples distributed throughout Himalayan region constitutes different *Malus* species. The genus *Malus* is characterized by a large diversity resulted from the accumulation of somatic mutations and fostered by the human activities during the long history of the cultivation, artificial crossing and transportation to distant habitats (Muzher *et al.*, 2007) [5]. Genetic diversity in crop species can be determined using morphological and agronomic characteristics, as well as biochemical and DNA marker analysis (Liu, 1997) [6]. Indian Himalayan region is very rich in temperate fruit genetic diversity and stretches from Jammu and Kashmir to the Northeastern hills and harbour vast genetic diversity of temperate fruits like apple, pear, peach, apricot, walnut, almond and other fruits and their wild relatives. Kashmir being a hot spot for apple diversity, the survey was conducted to explore the diversity of these apple genotypes. The rich core set developed will be a valuable resource for future genetic studies and crop improvement strategies.

Materials and Methods

Forty wild apple accessions from Kashmir valley were analyzed in this study using apple descriptor DUS, (2005). Individual trees of wild apple genotypes from central and south Kashmir valley were selected and various characters were studied, which comprised of both qualitative and quantitative traits.

All the accessions were examined for leaf characters *viz.*, leaf blade length and leaf blade width. TSS was calculated by using refractometer and titratable acidity (TA) was determined by neutralization to pH 7.0 with 0.1 N NaOH.

Results and Discussion

The results of quantitative leaf characters are given in tables 1. The maximum leaf blade length of 12.06 cm was recorded in Sel-29 while as minimum leaf blade length of 6.26 cm was recorded in Sel-9. Leaf blade width of crab apple genotypes ranged from 3.24-5.43 cm with maximum (5.43 cm) recorded in Sel-23 followed by Sel-21 (5.343 cm) and minimum (3.24 cm) recorded in Sel-40. (1.016 cm) recorded in Sel-12. The

results were in close confirmation with Kumar *et al.* (2018) [7] who reported that the leaf blade length and leaf blade width, were effective parameters for explaining the natural variability among the studied *Malus* species TSS and acidity was highest in Sel-21 and highest value of acidity was observed in Sel-24. These results are in close conformity with Kaya *et al.*, (2015) [8] who reported that the range for soluble solids content was 9.0-14.4% and 0.15-1.75% for titratable acidity. Kaya *et al.* (2015) [8] in their studies on fruit quality characters and genetic variability of apple germplasm in Turkey reported that the range for soluble solids content was 9.0%-14.4% and 0.15%– 1.75% for titratable acidity.

Table 1: Mean values of different traits of various crab apple genotypes

S. No	Selection	Leaf blade length (cm)	Leaf blade width (cm)	TSS (^o Brix)	Acidity (%)
1	Sel-1	8.22	4.216	10.113	0.560
2	Sel-2	8.426	4.416	11.216	0.523
3	Sel-3	8.540	4.216	10.916	0.416
4	Sel-4	8.91	4.820	9.533	0.716
5	Sel-5	8.31	4.016	8.916	0.416
6	Sel-6	8.833	4.526	10.116	0.446
7	Sel-7	6.650	3.333	7.916	0.183
8	Sel-8	7.323	3.726	7.420	0.316
9	Sel-9	7.913	3.926	7.020	0.216
10	Sel-10	7.740	3.853	11.023	0.716
11	Sel-11	7.7167	3.046	7.343	0.246
12	Sel-12	6.640	3.523	9.223	0.320
13	Sel-13	7.026	3.726	8.316	0.416
14	Sel-14	7.333	3.836	9.023	0.423
15	Sel-15	7.813	3.833	8.216	0.363
16	Sel-16	7.510	3.246	7.923	0.416
17	Sel-17	8.243	4.036	8.216	0.086
18	Sel-18	8.110	4.043	8.116	0.423
19	Sel-19	8.226	4.443	8.026	0.516
20	Sel-20	8.336	4.236	7.916	0.043
21	Sel-21	9.653	5.343	13.116	0.476
22	Sel-22	9.020	5.036	12.120	0.160
23	Sel-23	9.146	5.430	9.120	0.086
24	Sel-24	9.723	5.323	9.323	0.920
25	Sel-25	7.116	5.340	8.920	0.076
26	Sel-26	7.216	5.343	8.233	0.223
27	Sel-27	7.616	3.233	8.510	0.526
28	Sel-28	8.816	4.046	7.216	0.173
29	Sel-29	8.526	4.966	6.720	0.316
30	Sel-30	8.713	4.343	6.650	0.613
31	Sel-31	8.523	4.033	7.216	0.413
32	Sel-32	8.616	4.043	7.053	0.416
33	Sel-33	7.313	3.440	7.153	0.323
34	Sel-34	7.543	3.543	8.183	0.316
35	Sel-35	8.533	3.336	10.286	0.413
36	Sel-36	7.913	4.413	10.753	0.416
37	Sel-37	8.026	4.750	11.320	0.526
38	Sel-38	6.983	4.236	11.953	0.516
39	Sel-39	7.243	4.046	11.553	0.483
40	Sel-40	7.956	3.230	10.626	0.540
Mean		8.051	4.162	9.063	0.392
C.D at 5%		0.112	0.035	0.536	0.018

Conclusion

The present study confirmed that there is huge diversity of apple in Kashmir, thus it becomes necessary for preserving these unique genetic resources and continuing its study to ensure its conservation, exchange and utilization in future breeding programmes for future development of innovative, market-driven cultivars.

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