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Short Communication

Variability in quince (*Cydonia oblonga* Mill.) population from Baramulla district of Kashmir valley

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The quince (*Cydonia oblonga* Mill) has a long history of cultivation in the Middle East where it is native and throughout the Mediterranean region. Commercial production seems to be mostly in eastern Europe and Asia minor [1]. Now a days, it is extended to all over the world, above all in Iraq, Iran, Afghanistan, Syria, Algeria, Tunis, Countries of southern Europe, France and Portugal [2]. In India, quince is mostly grown in Jammu and Kashmir and some parts of Himachal Pradesh most frequently in backyards and fence corners. Traditionally, quince after harvest is locally marketed and is used for culinary purposes in the form of cooked delicacy dish in "Kashmiri Wazwan". It is utilized for making preserve (murabba), which is known to possess beneficial medicinal properties in Unani medicine. In the Greece, a tea prepared by boiling dry seeds of quince in water is given in cholecystitis in humans [3]. The kernel oil is used for massage [4]. In Jammu and Kashmir, the existing variability in quince germplasm has not been exploited so far, as a result not a single known variety is available for commercial cultivation. Fruit characteristics like fruit weight, TSS, acidity, ascorbic acid and pectin are most important parameters in addition to yield for recommending a cultivar for commercial cultivation. In order to select superior genotypes for future breeding programme of quince, the extent of variability with respect to yield and fruit quality is indispensable. Hence, intensive survey of Baramulla district were surveyed for selecting better genotype having good bearing capacity with high pectin content.

Survey of quince tree was conducted in Baramulla district of Kashmir valley during September to October 2005. Twenty five bearing trees of quince were selected across the district and individual tree was assigned separate accession number named as SKAUQ-1, SKAUQ-2, SKAUQ-3, SKAUQ-4, SKAUQ-5, SKAUQ-6, SKAUQ-7, SKAUQ-8, SKAUQ-9, SKAUQ-10, SKAUQ-11, SKAUQ-12, SKAUQ-13, SKAUQ-14, SKAUQ-15, SKAUQ-16, SKAUQ-17, SKAUQ-18, SKAUQ-19, SKAUQ-20, SKAUQ-21, SKAUQ-22, SKAUQ-23, SKAUQ-24, SKAUQ-25. Every accession was evaluated for different morphological parameters of tree as per the standard procedures. Leaf shape was observed using descriptor of NBPGR, N. Delhi for other temperate fruits. Height of tree was measured from the ground level to the top of the main branch or leader with the help of measuring tape and expressed in mater whereas tree spread was measured in terms of the extent of the canopy in two direction i.e., N-S and E-W and mean of two was expressed in meters. Yield efficiency of tree was calculated as per the formula suggested by Westwood and Roberts [5]. Fruits from selected trees were randomly taken for measuring physical attributes like weight, length, girth, seed /fruit and seed/locules by following standard procedures, however, the shape of fruit was recorded as per IBPGR, Italy standard format for other temperate fruit crops. Total soluble solids were estimated in term of ^{o}Brix with the help of hand held refractometer (Atago-Japan). Brix value was corrected at 20^{o}C with the help of temperature correction chart [6]. Acidity was determined by titrating the known weight of pulp with 0.1 N NaOH, using phenolphthalein as indicator [6] and expressed in citric acidity of pulp (%). Ascorbic acid content of fruit was determined using standardized 2,6-dichlorophenol

indophenol dye and expressed as mg per 100 g of pulp. The data was analyzed in R-software as suggested by Gomez and Gomez [7].

The data pertaining to morphological characters of quince tree showed differences for leaf size, tree growth habit and other attribute of tree (Table 1). Tree growth habit of quince genotypes of Baramulla ranged from upright, , spreading to drooping type. Most of the genotypes are spreading in habit whereas eight genotypes *viz*., SKAUQ-002, SKAUQ-004, SKAUQ-005, SKAUQ-009, SKAUQ-010, SKAUQ-013, SKAUQ-016 and SKAUQ-021 had upright growth habit and two genotypes namely SKAUQ-015 and SKAUQ-022 exhibited drooping tree habit. Leaf shape of all the genotypes of quince was observed to be ovate oblong type except SKAUQ-23 which had obviate type of leaf shape. The range of tree height was recorded from 2.13 to 6.55 m with the mean of 3.82 m and coefficient of variation of 26.06. The genotype SKAUQ-005 was found to be tallest (6.55 m) whereas SKAUQ-004 and SKAUQ-010 were the smallest (2.13m) in respect of tree height.

Table 1. Descriptive statistics for growth characters and yield in quince germplasm of Baramulla district in Kashmir valley

Accession No.	Tree habit	Leaf shape	Tree height (m)	Tree spread (m)	Yield (kg tree^{-1})	Yield efficiency (kg cm^{-2})
SKAUQ001	Spreading	Ovate oblong	3.96	1.96	20	0.62
SKAUQ002	Upright	Ovate oblong	2.74	1.06	05	0.19
SKAUQ003	Spreading	Ovate oblong	5.02	4.72	80	0.45
SKAUQ004	Upright	Ovate oblong	2.13	1.06	03	0.30
SKAUQ005	Upright	Ovate oblong	6.55	3.81	160	0.80
SKAUQ006	Spreading	Ovate oblong	3.65	2.59	160	0.22
SKAUQ007	Spreading	Ovate oblong	5.79	4.19	60	0.11
SKAUQ008	Spreading	Ovate oblong	3.50	2.13	06	0.33
SKAUQ009	Upright	Ovate oblong	3.96	1.96	10	0.28
SKAUQ010	Upright	Ovate oblong	2.13	0.83	05	0.37
SKAUQ011	Spreading	Ovate oblong	3.50	1.82	30	0.36
SKAUQ012	Spreading	Ovate oblong	3.81	3.04	10	0.019
SKAUQ013	Upright	Ovate oblong	3.50	1.21	20	0.40
SKAUQ014	Spreading	Ovate oblong	2.89	1.21	06	0.24
SKAUQ015	Drooping	Ovate oblong	3.50	2.59	15	0.08
SKAUQ016	Upright	Ovate oblong	4.00	0.60	25	0.32
SKAUQ017	Spreading	Ovate oblong	4.41	3.50	20	0.27
SKAUQ018	Spreading	Ovate oblong	4.87	4.11	60	0.25
SKAUQ019	Spreading	Ovate oblong	3.65	3.04	16	0.13
SKAUQ020	Spreading	Ovate oblong	4.11	3.20	40	0.06
SKAUQ021	Upright	Ovate oblong	3.35	2.59	80	1.30
SKAUQ022	Drooping	Ovate oblong	3.35	2.89	150	2.50
SKAUQ023	Spreading	Obovate	3.04	1.76	04	0.14
SKAUQ024	Spreading	Ovate oblong	3.96	2.28	36	0.41
SKAUQ025	Spreading	Ovate oblong	4.26	2.89	10	0.09
Mean	-	-	3.82	2.40	34.44	0.41
+S.E	±0.19	±0.23	±8.54	±0.10		
Range	-	-	2.13-6.55	0.60-4.72	3.0-16	0.01-2.5
C.V. (%)	-	-	26.6	48.36	124.11	124.64

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Table 2. Physico-chemical composition of quince genotype in Baramulla district of Kashmir Valley

Accession No.	Fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Fruit shape	Fruit skin colour	Seeds /locule	TSS (%)	Acidity (%)	TSS/ acidity	Ascorbic acid (mg/100g)	Pectin (%Ca. pectate)
SKAUQ001	102.5	5.80	5.70	Pyriform	Yellow	16	12.00	0.33	36.36	7.40	4.20
SKAUQ002	117.5	6.45	6.12	Pyriform	Yellow	08	14.20	0.63	22.53	6.60	7.80
SKAUQ003	157.5	6.62	6.20	Pyriform	Yellow	09	15.30	0.50	30.60	14.4	2.30
SKAUQ004	111.2	7.70	6.80	Pyriform	Yellow	15	13.20	1.02	12.94	7.50	4.00
SKAUQ005	130.0	6.67	6.00	Pyriform	Yellow	16	15.30	0.93	16.12	13.30	3.60
SKAUQ006	115.0	5.70	6.10	Pyriform	Yellow	03	15.00	0.80	18.80	8.20	9.60
SKAUQ007	155.0	6.30	6.50	Pyriform	Yellow	03	15.10	0.50	24.00	10.00	7.60
SKAUQ008	110.0	5.70	5.60	Pyriform	Yellow	18	12.00	0.46	28.26	4.80	4.60
SKAUQ009	35.00	4.20	4.10	Pyriform	Greenish yellow	05	13.00	0.60	30.00	6.80	7.20
SKAUQ010	40.00	4.20	4.10	Pyriform	Yellow	05	18.00	0.53	37.00	8.70	4.20
SKAUQ011	105.0	6.20	6.00	Pyriform	Yellow	11	20.00	0.26	53.84	4.20	5.60
SKAUQ012	107.0	5.40	6.30	Pyriform	Yellow	08	14.00	0.44	40.90	17.60	4.20
SKAUQ013	130.0	6.40	6.50	Ovate oblong	Yellow	05	18.00	0.93	17.20	3.60	9.40
SKAUQ014	160.0	6.30	6.20	Ovate oblong	Yellow	12	16.00	0.46	33.69	7.80	10.40
SKAUQ015	170.0	6.80	7.00	Ovate oblong	Yellow	11	15.50	1.00	14.80	14.70	10.40
SKAUQ016	145.0	7.50	7.30	Ovate oblong	Greenish yellow	10	14.80	1.07	12.33	11.60	3.00
SKAUQ017	135.0	6.10	6.40	Ovate oblong	Yellow	19	13.20	0.46	28.60	20.50	5.40
SKAUQ018	175.0	6.70	6.90	Ovate oblong	Yellow	16	13.50	0.57	23.68	8.20	5.00
SKAUQ019	224.5	7.50	7.90	Ovate oblong	Yellow	03	13.00	0.26	50.00	6.50	9.00
SKAUQ020	195.0	7.30	7.40	Ovate oblong	Greenish yellow	11	11.00	0.22	50.00	15.00	7.60
SKAUQ021	147.0	6.90	6.90	Ovate oblong	Yellow	15	15.00	0.67	22.38	14.70	4.40
SKAUQ022	105.0	5.70	5.90	Ovate oblong	Yellow	06	06.00	0.87	6.89	17.60	2.80
SKAUQ023	137.5	6.30	6.90	Ovate oblong	Yellow	06	06.00	0.33	18.18	4.00	3.80
SKAUQ024	120.0	6.20	6.40	Ovate oblong	Yellow	08	08.00	0.93 ,	8.6	4.20	8.00
SKAUQ025	90.00	5.40	5.20	Ovate oblong	Yellow	08	08.00	0.20	40.00	4.90	5.40
Mean	128.95	6.21	6.25	-	-	-	13.32	0.60	27.1	9.73	5.98
±S.E	±8.43	±0.16	±0.19	±0.69	±0.05	±2.61	±0.98	±0.46			
Range	35-227.5	4.20-7.5	4.1-7.9	-	-	-	6-20	0.20-1.07	6.89-53.84	3.6-20.58	2.3-10.4
C.V.	32.7	13.60	14.15	-	-	-	26.07	45.31	48.35	5.57	41.76

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Tree spread ranged from 0.6 m (SKAU-016) to 4.72 M (SKAUQ-003) with a mean of 2.40 and coefficient of variation of 48.36. Similar type of variation in plant height and spread has been reported in quince by Ahmad *et al.* [3] SKAUQ-003 recorded maximum spread of 4.72 m followed by SKAUQ-007 and lowest tree spread was observed in SKAUQ-016 (0.6). The variation in the tree height and spread may be due to genetic variation, age of tree, soil fertility status and environmental conditions. Standard deviation in plant height and spread was observed to be 0.99 and 1.16m, respectively. Tree girth was in the range of 11.2 to 82.7 cm with the mean of 34.41 cm. The average fruit yield per tree varied from 3 to 160 kg being minimum in the selection SKAUQ-004 and maximum in the selectionSKAUQ-005. However, yield efficiency ranged from 0.09 in SKAUQ-025 to 1.3 kg cm^{-2} in SKAUQ-021. The wide variation in the yield efficiency may be due to the variation in age of the selected plants. It is evident from the tables that considerable variation exists among different accessions for different fruit traits such as fruit weight, fruit length, fruit diameter and number of seeds per locule. Fruit size and shape is most important characters for appealing the consumer. Average fruit weight ranged from 35 to

224.5g. Highest fruit weight was observed with selection SKAUQ-019 (224.5 g) followed by SKAUQ-020 (195.0 g) and SKAUQ-018 (175.0g) while SKAUQ-009 (35 g) gave lowest fruit weight. However, maximum fruit length (7.5 cm) was observed in accession SKAUQ-016 and SKAUQ-019 and minimum in SKAUQ-009 and SKAUQ-10 (4.20cm) while the fruit diameter ranged from 4.8 to 7.9 cm being minimum in SKAUQ-009 and SKAUQ-10 and highest in SKAUQ-019 with the average of 6.25cm. Fruit length : diameter ratio is a measure of fruit shape. Accession no SKAUQ-001 to SKAUQ-12 exhibited Pyriform type of fruit shape and rest of accessions were observed to be ovate oblong type of fruit shape. Almost all accessions showed yellow colour of fruit skin except SKAUQ-009, SKAUQ-015 and SKAUQ-020, which had greenish yellow colour. The locules/fruit were found five while the seed/locule varied from 3 to 19 with mean of 9.99/fruit which showed wide variability as the coefficient of variation is 49.78%.

The data presented in Table 2 reveal wide variation in chemical composition of the fruit of all the 25 accessions. TSS content varied from 6% in accession SKAUQ-023 to 20% in SKAUQ-011. Similar results were also reported by Ahmad *et al.* [3]. Titrable acidity was found to be minimum in SKAUQ-025 (0.20%) and maximum in SKAUQ-016 (1.07%) with mean value of 0.60%. TSS:acid ratio ranged from 6.89 to 53.84 with mean of 27.10 in the selected genotypes. The maximum TSS: acid ration was found in accession no. SKAUQ-011 followed by SKAUQ-020 and SKAUQ-021 and minimum in SKAUQ-022. Ascorbic acid content was estimated to be the highest in SKAUQ-017 (20.50 mg/100g pulp) followed by SKAUQ-012 (17.60 mg/100g pulp) and lowest was recorded in SKAUQ-013.

Quince is mostly used for preparation of processed food product preferably jam, Jelly, Murabba and Tutti fruiti in which pectin content is paramount for the purposes. The observation on pectin content (Percent Ca pectate) reveled that it varied from 2.3 to 10.4%. Highest pectin content was observed in accession no. SKAUQ-14, SKAUQ-15 followed by SKAUQ-006 and SKAUQ-013 and being lowest in SKAUQ-003 (2.3%). These genotypes should be utilized for improving qualitative attributes in high yielding quince varieties.

As far as variation in the genotypes studied is concerned, the highest variation was recorded for yield and yield efficiency 124.11 and 124.64%, respectively because of variation in the age of tree. However, the variation in the tree height and spread was recorded to be 26.6 and 48.36%, respectively. The variation in the canopy is less as compare to variation in the yield and yield efficiency which indicates that yield is much more influenced by the inherent bearing capacity of the tree than that of canopy of the tree. The variation in other attributes like TSS acidity, TSS: acid ratio, ascorbic acid and pectin was 26.07, 45.31, 48.35, 5.57 and 41.76%, respectively. No information is presently available concerning the extent of genetic diversity of quince in Kashmir valley. The variability observed in the present study may be attributed to the growing quince through seed, which create variability.

From the foregoing discussion it was concluded that accession no SKAUQ-022, SKAUQ-021 & SKAUQ-005 and SKAUQ-006, SKAUQ-013, SKAUQ-014 and SKAUQ-015 have been earmarked for utilization in future breeding programme for development of quince varieties having higher yielding capacity and better quality in terms of pectin and ascorbic acid content and as a short term measure these accessions can be used as mother plant for mass clonal multiplication of plant with better yield efficiency and quality.

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