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Physico-chemical variation in fruits of *Pyrus pashia* genotypes

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ABSTRACT

Pyrus pashia is considered as potential underutilized fruit crop for its taste, nutritive and market value. The study was conducted to find out variation among local genotypes of P. pashia in Khasi and Jaiòtia Hills of Meghalaya. Significant variation of physico-chemical characters of fruits was found among fruits of different genotypes (p d" 0.05). Fruit length ranged from 19.81 mm to 45.02 mm, fruit diameter (22.19-52.89 mm), fruit weight (5.69-71.21 g), pulp weight (3.80-42.96 g) and fruit volume (3.40-66.40 cc). While, irrespective of genotypes, fruit possessed eye basin and gritty pulp texture. Similarly, total soluble solids varies from 6.02 to 11.82%, titratable acidity (0.27-0.40%) and TSS:Titratable acidity (14.94-41.62). Peel a value ranged from 9.74 to 17.54 in shoulder, 10.24-18.27 in middle and 9.53-17.28 in bottom portion of the fruit and seed weight ranging from 0.34 to 0.57 g. Genotype 3 showed promising for fruit dimension, fruit weight, pulp weight and fruit volume over other genotypes. Genotype–1 was found highest for TSS and minimum titratable acidity. Similarly, Genotype – 3 had appealing appearance as indicating by a* value. Therefore, variation observed might be useful for selection of promising genotypes and for inclusion as parental line in breeding programme.*

Keywords: Fruits, genotypes, *Pyrus pashia* and variation

INTRODUCTION

Pyrus pashia is locally known as Sohjhur (Khasi) and Sohaitsyiar (Pnar). It belongs to the Rosaceae family and is believed to have originated in Himalayas including north east India. Among various minor fruits found in Arunachal Pradesh (Hazarika and Lalruatsangi, 2016) and Meghalaya, it is one of the most popular underutilized fruits of the tribal population in North –eastern states. In Meghalaya, this fruit tree is commonly available in different parts of the state and found to be very popular and preferred for its sweetness and grittiness (Rymbai *et al*., 2014). P. pashia is distributed in Himalayan region and its hill track comprising of north eastern region of India extending from Pakistan to Vietnam and from southern province of China to the northern region of India (Krause *et al*., 2007). In Bhutan, it is exclusively found in home gardens of smallholder farmers. The province Nuristan of Afghanistan is the most western range of its occurrence. Sohjhur is a luscious fruit varies in taste from strong stringency type to sweet and gritty type with pleasant aroma and edible peel (Rymbai *et al.,* 2016). P. pashia is used as rootstocks for pear, leaf extract as a tonic for hair loss, treatment of digestion related ailments and possesses antimicrobial activity. In addition, warm leaves extract are also consumed as beverages (Gulia, 2005). Considering the demand and price of the mature fruits in the local market (Rs. 15- 40 kg^{-1}) in Shillong, it can be regarded as potential underutilized fruit crop. In addition, this fruit contributes valuable nutrition particularly in terms of protein, total solids and sugar to human (Parmar and Kaushal, 1982).

Therefore, *sohjhur* may offer good source of income and nutrition for population inhabitant in the Himalayan hill tracts due to its richness in nutrients and good aroma for consumption as dessert fruit. In view of these, a study was conducted on variation among fruits of *P. pashia* to generate information for its potential uses in crop improvement programmes.

MATERIAL AND METHODS

Fully ripened fruits of *Pyrus pashia* were collected from five different locations of Jaiòtia Hills, Khasi Hills and Ri-Bhoi districts during June to August, 2014-16. Analysis was carried out in the Division of Horticulture, ICAR Research Complex for NEH Region, Umiam, Meghalaya. The fruit description, *viz*., fruit length, fruit width, fruit circumference, fruit weight, fruit volume, fruit stalk thickness, depth of stalk cavity, depth of fruit eye

Table 1: Morphological characteristics of fruits

Genotypes	Fruit length (mm)	Fruit diameter (mm)	Fruit weight (g)	Pulp weight (g)	Fruit stalk length (cm)	Fruit stalk thickness (mm)	Depth of stalk cavity (mm)	Depth of fruit eye basin (mm)	Fruit volume (cc)	Specific gravity	Fruit eye basin	Pulp texture
Genotype 1	35.22	36.55	29.54	14.61	3.25	2.11	2.16	4.42	18.60	0.99	Present	Gritty
Genotype 2	19.81	22.19	5.69	3.80	2.95	2.42	1.18	1.29	3.40	0.97	Present	Gritty
Genotype 3	45.02	52.89	71.21	42.96	4.91	2.76	3.34	4.97	66.40	1.01	Present	Gritty
Genotype 4	42.58	41.87	41.12	21.81	2.10	2.38	1.78	3.53	35.60	1.01	Present	Gritty
Genotype 5	40.37	41.97	42.07	22.03	2.60	2.78	1.49	2.99	39.20	1.00	Present	Gritty
S E(±m)	0.52	0.60	1.53	0.89	0.27	0.26	0.23	0.37	2.55	-	-	-
CD (p=0.05)	1.57	1.83	4.6	2.69	1.21	0.81	0.69	1.14	7.74	ns	-	-

ns, non-significant

basin and pulp texture were recorded at fruit maturity stage based on standard methods and DUS guidelines (Anon., 2012). The fruit pulp percentage was calculated as stated by Peter *et al.* (2007). The total soluble solids (TSS) was determined with the help of digital hand refractometer (Model - *HI 96801*) from three different points on fruit, *i.e.* shoulder, middle and distal end portion of the fruit after mixing thoroughly. The values were expressed in percentage (Ranganna, 1986). Titratable acidity was also estimated as per methods described by Ranganna (1986). The peel colour was measured with the help of Hunter's colorimeter (Model – *Hunter Lab Color Quest XE*) at three points on fruit surface, *viz*., shoulder, middle and base. The colorimeter was calibrated with standard black and white calibration tiles. The nose cone was kept in complete contact with fruit surface to prevent leakage of light emitted by the colorimeter. The measurement was expressed in terms of chromaticity coordinates $L*$, $a*$ and $b*$. Where $L*$ indicates dark (a low number, 0-50) and light (a high number, 51-100), a* measures redness when positive, greyness when zero and greenness when negative, and b* measures yellowness when positive, greyness when zero and blueness when negative.

The experiment was laid out in Randomised Block Design (RBD) with three replications collected from all direction of the canopy. The data on different parameters were analysed using analysis of variance (ANOVA) by employing Statistical Package for Agricultural Workers (STAT OP Sheoran). Valid conclusions were drawn only on significant differences between the genotype mean at 0.05 level of probability.

RESULT AND DISCUSSION

Physical characteristics

Result revealed a significant variation among physical characteristics of fruits (Table 1). Genotype 3 showed significantly maximum fruit length (45.02 mm), fruit diameter (52.89 mm), fruit weight (71.21 g), pulp weight (42.96 g), fruit stalk length (4.91 cm), fruit stalk thickness (2.76 mm), depth of stalk cavity (3.34 mm), depth of fruit eye basin (4.97 mm) and fruit volume (66.40 cc) over other genotypes. Fruit of all genotypes possessed eye

Table 2 : Colour coordination of fruits

Genotypes	Shoulder			Middle			Bottom		
	*L**	*a**	*b**	*L**	*a**	*b**	*L**	*a**	*b**
Genotype 1	47.33	15.86	18.22	47.49	15.61	18.36	49.09	15.46	19.46
Genotype 2	56.27	9.74	15.36	57.22	10.24	17.26	51.47	9.53	16.26
Genotype 3	52.38	17.54	19.69	55.58	18.27	20.73	54.63	17.28	21.63
Genotype 4	50.86	16.65	19.27	51.25	16.82	19.86	50.26	16.04	20.58
Genotype 5	48.28	13.57	17.62	49.35	14.27	17.69	48.52	13.33	17.29
Se(±m)	3.46	1.03	0.78	2.75	1.25	0.68	2.26	1.18	0.85
CD (*p*=0.05)	7.257	2.863	1.926	7.714	3.371	1.725	4.782	3.0682	2.671

Table 3: Seed characteristics of fruits.

Genotypes	Seed length (mm)	Seed width (mm)	Seed thickness (mm)	Seed weight (g)	Seed shape
Genotype 1	7.93	4.16	2.18	0.40	ovate
Genotype 2	6.48	4.57	2.65	0.34	ovate
Genotype 3	10.22	5.93	2.91	0.57	ovate
Genotype 4	8.20	5.22	2.78	0.53	ovate
Genotype 5	7.72	4.37	2.46	0.46	ovate
Se(±m)	0.209	0.184	0.092	0.02	-
CD (*p*=0.05)	0.633	0.557	0.28	0.65	-

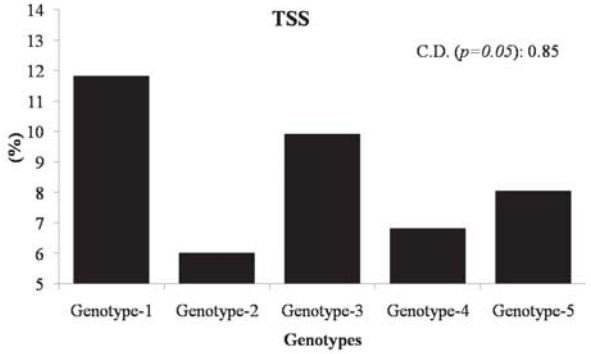

Fig.1: Total soluble solids of fruits

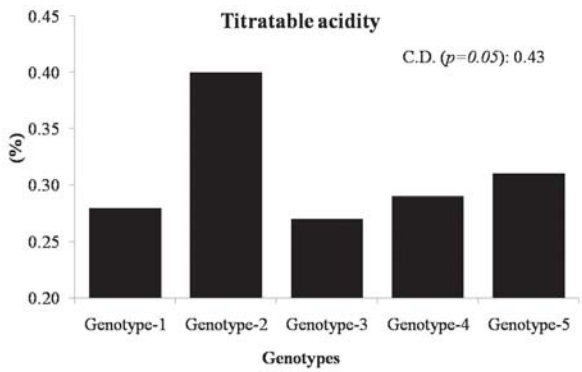

Fig. 2: Titratable acidity of fruits

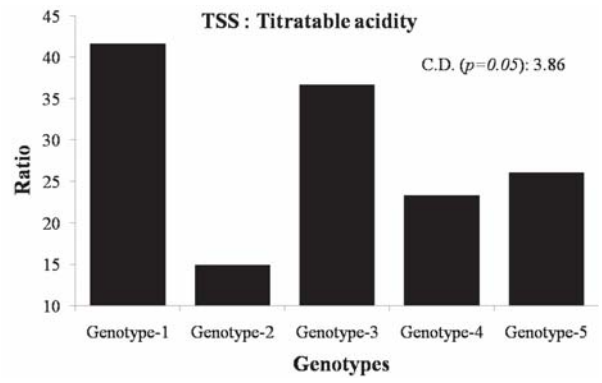

Fig. 3. TSS: Titratable acidity of fruits

basin and gritty pulp texture. The variation in physical characteristics of fruits might be due to distinct genetic features of the genotypes.

Biochemical characteristics

Fruit quality of different genotypes showed significant variation as indicated in figures (1-3). It was observed that total soluble solids was recorded highest in Genotype – 1 (11.82%), followed by Genotype – 3 (9.92%), while minimum was

recorded in Genotype – 2 (6.02%) (Fig. 1). Titratable acidity showed maximum in Genotype 2 (0.40%) and minimum in Genotype 3 (0.27%) which was *at par* with Genotype – 1 (0.28%) (Fig 2). TSS:Titratable acidity divulged highest value in Genotype 1 (41.62) and lowest in Genotype 2 (14.94) (Fig 3). This variation might be due to genetical make up of the genotypes.

Pigmentation of fruits

Genotypes showed significant variation in peel colour content (Table 2). It is evident that *L** value ranged from 47.33 (Genotype 1) to 56.27 (Genotype 2) in shoulder, 47.49 (Genotype 1) to 57.22 (Genotype – 2) in middle and 48.52 (Genotype 5) to 54.63 (Genotype – 3) in bottom portion of the fruit. Genotype – 3 recorded maximum a* value in shoulder (17.54), middle (18.27) and bottom (17.28) portions. Similarly, maximum *b** in shoulder (19.69), middle (20.73) and bottom (21.63) was recorded in Genotype – 3. Furthermore, it was revealed that a* value was higher in shoulder portion and b* value in bottom portion irrespective of genotypes. The variation observed in fruit pigmentation might be due to genetical factor.

Seed characteristics

Seed characteristics of different genotypes had significant variation (Table 3). Result showed that Genotype – 3 recorded highest value for seed length (10.22 mm), seed width (5.93 mm), seed thickness (2.91 mm) and seed weight (0.57 g). While, minimum seed length, seed width and seed thickness was recorded in Genotype – 1. Seed shape of all genotypes was noted as ovate. The variability in seed characteristics might also be attributed to genotypic features.

CONCLUSION

Results divulged a significant variation among different genotypes of *P. pashia* for fruit and seed characteristics. It is inferred that Genotype – 3 and Genotype – 1 had good physical and quality characteristics of fruit. Hence these two genotypes may be utilized for cultivation and included in crop improvement programmes.

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