SUMMARY

Fruit quality, consumer perception and quality assessment for fresh apricots of Ladakh

Forty-seven apricot genotypes with white and brown fruit stone were studied by both instrumental and sensory methods. Attributes such as aroma, juiciness, sweetness, flesh colour, stone colour, fruit shape, and size were the main factors affecting overall acceptability of apricots. Fruit with white stone ranked first in terms of liking for sweetness, juiciness, aroma, stone colour, flesh colour, fruit shape, and size. It scored the highest hedonic score for overall appreciation (8.0±0.2). It also had the highest total soluble solids (TSS) (27.5±3.6°Brix), reducing sugars (17.5±1.9%) and total sugars (20.3±1.9%) values, while the moisture content (68.9±8.3%) was the lowest among the analyzed genotypes. Consumers were attracted to the unique white stone phenotype. Relationships between the instrumental data and sensory panel score were established. Overall appreciation showed positive significant relation with TSS (R^2 = 0.177), TSS/total acid (R^2 = 0.118), reducing sugar (R^2 = 0.140), total sugar (R^2 = 0.177) and fruit weight (R^2 = 0.230). A statistically significant negative relationship was observed between overall appreciation and fruit moisture content (R^2 = 0.168). The study demonstrated that white stone coat phenotype could be considered as a marker for high quality apricots in terms of aroma, sweetness, juiciness and overall appreciation.

Change in phenology and fruit quality of fresh apricot along an altitudinal gradient in trans-Himalaya

Consumer concern about the poor taste of fresh apricots is increasing and knowledge about the more suitable production requirement is essential. Genetic component influencing apricots quality is well known. However, there is limited information on the environmental effect on fruit quality. Therefore, this investigation aimed at studying the influence of elevation on phenological and fruit quality characters of apricot genotypes. Fruits from 162 trees were sampled from nine villages located at an elevation ranging from 3006 to 3346 meter asl in Ladakh. The altitude had a significant influence on the date of flowering, fruit weight, moisture, and TSS content. For every 100 meter rise in elevation, flowering and fruit ripening delayed by 3.3 and 7.1 days, respectively. An inverse relationship between fruit weight and elevation (R^2 = 0.310) was observed. The fruit weight decrease by 0.5 gm. for every 100 meter increase in elevation. Fruit moisture content decreased significantly with increase in elevation (R^2 = 0.585). The decrease in moisture content was 1.9% for every 100

meter rise in elevation. Increase in elevation had a linear relationship with fruit TSS content (R^2 = 0.726). The fruit TSS increased by 1.2ºBrix for every 100 meter rise in elevation. Knowledge from the present study on the impact of altitude on fruit quality characters suggests guidance on selection of orchard site for improving apricot fruit quality.

Altitudinal effect on sugar content and sugar profile in dried apricots

Apricot fruits from 108 genotypes were taken from six isolated villages located at an altitude ranging from 3006 to 3346 meter asl in Ladakh region. A linear relationship was observed between altitudinal elevation and total sugar content (R^2=0.877). Total fruit sugar increased by 64.8 mg.g^{-1} DW for every 100 meter rise in elevation. The most predominant individual sugar was sucrose (SUR) (57.8% of total sugar). The proportion of glucose (GLU), fructose (FRU), and sorbitol (SOR) was 19.4%, 14.3%, and 8.4% of total sugar, respectively. With altitudinal elevation, the relative proportion of SOR increased significantly in fruits with brown stone (R^2=0.849). A linear relationship was observed between the altitudinal elevation of the orchard and SUR (R^2 = 0.767). SUR content increased by 49.1 mg.g^{-1} DW for every 100 meter rise in elevation. Fruit SOR content showed a linear relationship with rising in elevation (R^2=0.899). GLU level increased with rising elevation, while FRU content showed the opposite relationship with elevation. Therefore, data indicated that apricots of high elevation contain higher sugar, SUR and SOR content. This knowledge is vital since it provides guidance for selecting site for orchard establishment for improving apricot fruit sweetness.

Effect of altitude and seed phenotypic characters on amygdalin and sugar content in apricot kernel

Apricots from 126 genotypes differing in stone colour and kernel taste were collected from seven different villages from 3008-3346 m asl spread across trans-Himalaya Ladakh region. Amygdalin and sugar content in the kernel were determined in the apricot kernel. Amygdalin level in the bitter kernel was significantly higher (44.6±9.0 mg.g^{-1}) than sweet kernel (3.1±1.8 mg.g^{-1}) with brown stone. The altitudinal gradient had no influence on kernel amygdalin level, whereas altitude had a significant impact on the kernel sugar content. A linear relationship was observed between total sugar content and rising elevation (R^2=0.103). Total sugar increased by 2.9 mg.g^{-1} DW for every 100 meter rise in elevation, Sucrose (SUC)

was the major sugar (47.9%). It was followed by glucose (GLU) (24.6%), fructose (FRU) (23.6%), inositol (INO) (3.5%) and arabitol (ARA) (3.5% of total sugar). A linear relationship was observed between SUC and increasing elevation (R^2=0.186). For every 100 meter increase in geographical elevation, SUC content increased by 11.0 $mg.g^{-1}$ DW. Kernel INO content showed an inverse relationship with increase in elevation (R^2=0.149). Similarly, seed and kernel phenotypic characters, except stone colour, had no significant effect on amygdalin and sugar content. Therefore, apricots growing at high geographical elevation contain higher sugar, SUC and low INO content in the kernel. Low amygdalin content (2.4±1.2 $mg.g^{-1}$) in apricot kernel with white stone phenotype confirmed our previous finding that white stone apricot is always linked to the sweet kernel.

Morphological and SRAP markers based genetic diversity studies of apricots of trans-Himalaya

Forty seven apricot genotypes were used to assess GD based on morphological and SRAP (Sequence-related amplified polymorphism). Six qualitative and 16 quantitative characters were studied among the genotypes. Twenty combinations of SRAP markers were used and 115 polymorphic bands out of 134 with an average of 5.75 polymorphic bands per combination were observed. The overall GD estimated as percentage polymorphic loci (85.06%), Nei's genetic diversity (0.27±0.19) and Shannon's information index (0.40±0.25) were high. Analysis of molecular variance (AMOVA) revealed higher GD (92%) within the groups of apricot. The unweighted pair group method (UPGMA) demonstrated that the apricot genotypes had a similarity range from 0.96 to 0.48 with a mean value of 0.72 similarity coefficient. Furthermore, UPGMA clustering and Bayesian-based STRUCTURE analysis revealed an intermixing in the clustering of apricot genotypes. There is no clear grouping between apricots according to their kernel taste and stone colour which revealed that these genotypes have a similar genetic background. Knowledge gained from the present study has practical utility in the management of germplasm conservation and in breeding programs.