

Genetic diversity in carrot (*Daucus carota* L.) germplasm using mahalanobis D² statistics

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ABSTRACT

Field experiment with 48 genotypes was carried out to assess the association between pairs of traits and their contribution towards root yield. The genetic divergence was estimated by utilizing Mahalanobis D² statistics. The range of D² values observed for the present material was 7.71 to 727.17. The lowest end of this D² range depicts between IPC-122 and CA-05-01, whereas the upper end is the D² between CCA-05-01 and Nantes. All the 48 genotypes were grouped into fourteen clusters and the pattern of clustering of genotypes is independent of their place of collection or development. The inter cluster distance ranged between 83 to 630.37, maximum inter cluster distance was recorded between cluster VI and I (D² value= 630.37) indicating wide diversity between these two clusters, while the minimum inter cluster distance with D² value of 83 was observed between cluster XI and V. The intra cluster values ranged from 118.26 (10.87) for cluster II to zero for cluster IV, XII and XIII. Selection based on weight of marketable roots per plot, root weight, shoot weight per plant and per cent marketable roots would be more efficient for the improvement of better quality roots in carrot crop.

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Carrot (*Daucus carota* L.) $2n=2x=18$ belongs to family Umbelliferae and is the native of Afghanistan (Banga, 1976) is an important root crop grown in India. Carrot roots are used as vegetables for soups, stews, curries and pies; grated roots as salads, tender roots as pickles and for canning. Carrot jam is also popular and roots in the form of discs and slices can also be used after dehydration. Carrot juice is a rich source of carotene and is sometimes used for colouring butter and other food articles. Carrots are an important source of pro-vitamin A, fiber and other dietary nutrients (Simon, 2000). In India, carrot occupies an area of 24,000 ha with a production of 350 thousand MT and an average yield of 145.83 q/ha (Anonymous, 2003). Diversity exists in pigmentation of wild and cultivated carrot roots. White, yellow, orange, red, purple and pink types are known to exist. Yellow carrots contain xanthophylls, which help develop healthy eyes and may prevent lung and other cancers. Red carrots also contain lycopene which help to prevent heart diseases and some cancers including prostate cancer. Purple carrots contain pigments called anthocyanin that act as a powerful antioxidants, grabbing and holding on to harmful free radicals in the body. Anthocyanins also help prevent heart diseases by slowing blood clotting. White carrots lack pigment, but contain other health promoting substances generally called phytochemicals. Carrot is also an important source of calcium, magnesium and potassium. There is as much calcium in a carrot as there is in a glass

(250 ml) of whole milk. For the improvement of yield, a dependant character, the knowledge about association of yield with its contributing traits is important pre-requisite for further breeding plan. The correlation study doesn't indicate the direct and indirect contribution of individual character towards yield. On the basis of these studies the importance of component characters are marked to facilitate the selection programme for better gains. Hence, present investigation was carried out to study diversity and correlation for fourteen characters.

MATERIALS AND METHODS

The present investigation was carried out during Oct 2007-08 and 2008-09 at Vegetable Experimental Area, Department of Vegetable Crops, Punjab Agricultural University, Ludhiana on sandy loamy soil in sub tropical climate. Forty eight diverse germplasm lines were grown on 20th October 2007-08 and 2008-09 in a randomized block design with three replications. All the genotypes were sown on ridges of 3m length in each replication with 45 cm spacing between rows and 7.5 cm between plants, respectively. All the recommended package of practices was followed during the course of investigation for raising a good carrot crop. The observations for fourteen traits were recorded on ten competitive plants of each genotype selected randomly in each replication after 120 days of sowing. Genetic diversity was carried out as per method of Rao (1952).