Characterization of different *Lycopersicon* species

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ABSTRACT

Three wild relatives of Lycopersicon namely, L. pimpinellifolium, L. cheesmanii and L. peruvianum along with five varieties /lines of cultivated tomato belonging to L. esculentum were employed for species characterization of Lycopersicon.. For this purpose, growth characters namely, plant height, leaflet width (cm), leaflet length (cm); flower characters namely number of flower / cluster, sepal length (mm), petal length (mm), style length (mm) anther length (mm); fruit characters namely fruit/cluster, days from anthesis to turning, days from turning to ripening, equatorial length (cm), longitudinal length (cm), pericarp thickness (mm), fruit weight (g), locules/fruit were studied. . L. esculentum appeared to have close relation with L. pimpinellifolium compared to L. peruvianum.

***Key words*:** Characterization, *Lycopersicon* species and wild relatives

The cultivated tomato (*Lycopersicon esculentum* Miller) is a well endowed species of the family Solanaceae. It is one of the most important vegetable crops grown all over the world. The genus *Lycopersicon* consists of nine species. Bailey (1949) classified cultivated tomatoes into two speices *Lycopersicon esculentum* and *Lycopersicon pimpinellifolium* with five botanical varieties. However, earlier Muller (1940) divided the genus into two subgenera Eulycpersicon and Eriopersicon. Lebeda and Mieslerova (1998) divided the *Lycopersicon* genus into two groups, Esculentum complex and Peruvianum complex. Keeping the importance of wild relatives in breeding cultivated varieties in view, the present investigation was outlined to characterize four species of *Lycopersicon.*

MATERIALS AND METHODS

The material under investigation consisted of three wild relatives of tomato namely *Lycopersicon pimpinellifolium, L. cheesmanii*, and *L. peruvianum* received from Indian Institute of Vegetable Research, Varanasi. Five varities/lines of cultivated tomato (*L. esculentum*) namely, Punjab Chhuhara, Pusa Ruby, Arka Alok, Ratan and CLN 2413R received from the NATP Development of Hybrids in Vegetable Crops

were used to record the observations on different characters of *L. esculentum.* The *Lycoprsicon* species were grown in the green house of the Department of Vegetable Crops, Mohanpur during November to March period with 50 x 50 cm spacing keeping ten plants each for three wild species and five plants each for five varieties of cultivated tomato and all the plants were employed for recording observations on different growth, flower and fruit characters. Growth characters included growth habit, length, width and E

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mail: hazra.pranab05@gmail.com divisions of leaf let , among flower characters, petal colour, nature of stigma, number of flowers/ cluster, length of sepal, petal, style, and anther were recorded. For fruit characters number of fruits / cluster, days from anthesis to turning, days from turning to ripening, equatorial length, longitudinal length, pericarp thickness, fruit weight and locule numbers were recorded. *L. peruvianum* did not set fruits due to of self-incompatibility. Significance of the difference of means for different characters between the *Lycopersicon* species was tested through Fisher's't' test.

RESULTS AND DISCUSSION

Growth characters

The result revealed that wild *Lycopersicon* species were indeterminate in growth habit but *L esculentum* comprised of both determinate and indeterminate habit. Height of the wild species was more than that of the cultivated tomato. Among the wild species, maximum height of 352.80 cm was recorded in *L. cheesmanii* and lowest of 177.80 cm in *L. peruvianum* (Table1). In spite of significant mean differences, plant height could not be considered as index character due to its nature of variation with the environment.

Highest leaflet length and width was recorded in *L. cheesmanii* followed by *L. peruvianum,* and *L. pimpinellifolium*. Lowest leaflet length and width 6.12 cm and 2.64 cm respectively were recorded in *L. esculentum* (Table 1). It might have happened due to inverse relationship between fruit size and leaflet size that was operative at the time of selection and also due to reduction of growth period and erosion of perennially in the cultivated tomatos.

Table 1: Characterization of four *Lycopersicon* species based on different growth, flower and fruit characters

Characyers/ *Lycopersicon* species	*L. pimpinellifolium*	*L. cheesmanii*	*L. peruvianum*	*L. esculentum*
Growth character				
Plant height (cm)	321.80	352.80	177.80	126.84
Leaflet width (cm)	3.34	3.66	3.62	2.64
Leaflet length (cm)	7.32	8.06	7.86	6.12
Leaflet division	Less serrated	Less serrated	Lobed	Less to highly serrated
Growth habit	Indeterminate	Indeterminate	Indeterminate	Indeterminate
Flower Character				
Flowers / cluster	8.20	8.60	13.60	5.83
Sepal length (mm)	7.82	5.40	5.64	7.64
Petal length (mm)	7.34	11.56	15.22	11.74
Style length (mm)	6.56	8.98	10.56	7.14
Anther length (mm)	6.70	8.18	9.80	7.64
Flower colour	Greenish yellow	Yellow	Orange to Yellow	Light yellow and deep yellow
Nature of stigma	Inserted	Inserted	Exerted	Inserted
Fruit Character				
Fruits/cluster	4.80	5.80	----	4.47
Days from anthesis to turning	54.20	55.67	-----	59.58
Days from turning to ripening	6.20	5.60	----	4.10
Equatorial length(cm)	1.46	2.22	----	4.35
Longitudinal length(cm)	1.49	2.14	----	5.28
Pericarp thickness(mm)	1.28	2.37	----	4.82
Fruit weight (g)	2.83	4.36	----	61.14
Locules/fruit	2.00	2.00	----	3.28
Fruit shape	Round	Round	----	Pear shaped, Ovoid, Elliptical, Flattish globe
Fruit surface colour	Red	Yellow to orange	----	Red, Yellowish red
Fruit flesh colour	Red	Yellowish green	----	Red

Table 2: Significance of mean difference between *Lycopersicon* species for different characters.

Character/Comparison	LPL *vs* LC	LPL *vs* LP	LPL *vs* LE	LC *vs* LP	LC *vs* LE	LP *vs* LE
Growth character						
Plant height (cm)	13.19**	87.27**	32.82**	85.78**	37.28**	8.75**
Leaflet width(cm)	6.40**	5.60**	13.16**	0.83 (NS)	17.00**	16.33**
Leaflet length(cm)	18.50**	4.90**	24.0**	1.80 (NS)	48.50**	15.81**
Flower Character						
No. of flower / cluster	2.00 (NS)	22.50**	13.16**	23.80**	19.78**	38.85**
Sepal length(mm)	42.00**	31.14**	0.66(NS)	4.00**	8.29**	7.40**
Petal length(mm)	26.37**	98.50**	18.33**	21.52**	0.64	13.92**
Style length(mm)	26.88**	50.00**	4.14**	14.36**	16.72**	34.20**
Anther length(mm)	18.50**	51.66**	8.54**	16.20**	3.85**	16.61**
Fruit Character						
Fruits/cluster	5.56**	__	3.00*	__	7.39**	__
Days from anthesis to turning	2.31*	__	4.10**	__	3.10*	__
Days from turning to ripening	6.00**	__	26.25**	__	25.00**	__
Equatorial length(cm)	38.00**	__	28.90**	__	21.30**	__
Longitudinal length (cm)	65.00**	__	27.07**	__	22.42**	__
Pericarp thickness(mm)	36.33**	__	32.16**	__	20.41**	__
Fruit weight(g)	38.25**	__	31.35**	__	30.53**	__
Locules/fruit	0.00	__	21.33**	__	21.33**	__

Note: LPL, LC, LP, LE stands for *L. pimpinellifolium* , *L. cheesmanii*, *L. peruvianum* and *L. esculentum*, respectively

* and **denote significance at probability of 0.05 and0.01 level, respectively and.

Flower characters

Number of flowers per cluster was significantly higher in wild species (maximum of 13.60flower/ cluster in *L. peruvianum*) with respect to the genotypes of cultivated tomato (Table 1). Considering flower per cluster, number of fruit per cluster and fruit weight simultaneously, the following points emanated that appeared directly related to crop evolution.

The percentage of fruit set was high in *L. esculentum* as has been earlier reported by Rick and Dampsy (1969) that improved self pollination and consequent high fruit set and practically no out crossing characters have been introgressed in cultivated tomato in the course of selection and evolution of cultivated tomato.

High flower number in the wild relatives of *Lycopersicon* could be correlated with a compensatory factor operative for effective fruit set.

The length of sepal and petal were not enough conspicuous for separation of different *Lycopersicon* species.Considering the length of style and stamen together, *L. peruvianum* showed the typical exerted stigma character. In *L. cheesmanii* though style length was higher than the length of stamen stigma remains inserted below the level of anther cone because of its curved nature. In *L. pimpinellifolium* and *L. esculentum* stigma was inserted inside the anther cone favouring self-pollination. Such inserted stigma character has been acquired in the cultivated tomatoes during the course of evolution.

Fruit characters

Cultivated tomato (*L. esculentum*) took 59.58 days from anthesis to turning stage of the fruit while wild types (*L. pimpinellifolium and L. cheesmanii*) reached the turning stageat 54.20 and 55.67 days , respectively. *L. esculentum* showed early expression of carotenoid pigments in the fruits. All the wild species were typically small fruited (2.83-4.36g) contrast to very large fruit size in the cultivated tomatoes . Very thick pericarp was the characteristic features of cultivated tomato. Non-ribbing fruit character of wild species was associated with only two locules in all the wild species (Table-1).

From the detailed characterization studies, different *Lycopersicon* species may be depicted in terms of genetic relatedness to each other in the following scale.

L.esculentum L. pimpinellifolium, L cheesmanii L. peruvianum

The above results indicated that *L. peruvianum* is the most distantly related to and *L. pimpinellifolium* is close relative of cultivated tomato while *L. cheesmanii* maintains equal distance between *L. pimpinellifolium* and *L. peruvianum.*

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