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GENETIC DIVERGENCE STUDIES IN NAGA KING CHILLI (*Capsicum chinense* Jacq.)

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ABSTRACT

Eight landraces of Naga King Chilli (*Capsicum chinense* Jacq.) have been evaluated at Central Institute of Horticulture (CIH), Medziphema, Nagaland under polyhouse conditions for various genetic parameters. The 8 Naga King Chilli landraces were grouped into three clusters. Cluster II was the largest one comprising of four landraces followed by cluster I with 3 landraces and cluster III with 1 landrace. High genetic divergence was found between Cluster I and II, indicating wide genetic diversity between these two clusters. The maximum relative contribution to the total divergence was made by 1000 seed weight, fresh fruit weight and number of seeds per fruit.

Key words : *Naga king chilli, cluster, diversity.*

Capsicum is a herbaceous plant belonging to the family Solanaceae and is one of the most important crops of the world and has the distinction of being the first plant to be cultivated in the new world. The cultivated species of the genus are *Capsicum annuum, Capsicum chinense, Capsicum frutescens, Capsicum baccatum* and *Capsicum pubescens*. Naga King Chilli is considered as India's hottest chilli and was formerly acknowledged as the world's hottest chilli measuring 1,001,304 Scoville Heat Units (SHU). However, this chilli was superseded by the Infinity chilli in 2011, followed by the Naga Viper, the Trinidad Moruga Scorpion in 2012, and the Carolina Reaper in 2013 (Hottest Chilli, 2015). Naga King Chilli is native to the Northeastern states of India. Since time immemorial, people of Northeastern region, particularly the Naga people have close sodality with this chilli. Nagas are kenned to have utilized this chilli as remedial agents for treating myriads of ailments. The Government of Nagaland has patented this chilli and has registered as the proprietor with the Government of India under Geographical Indication Registry (3). Although earlier studies have treated this chilli as *C. frutescens*, the taxonomic relationship of 'Naga King Chilli' based on RAPD markers have placed 'Naga King Chilli' in a taxonomic position between *C. chinense* and *C. frutescens* with 'Naga King Chilli' clustering more closely to the *C. chinense* group (4). The occurrence of high cross pollination and adaptation to micro-climatic conditions has led to the formation of variants and landraces within the species (5). However, study on its genetic diversity and molecular evolution remains unexplored as far as our knowledge is concerned.

MATERIALS AND METHODS

The present investigation was conducted for two growing seasons i.e 2014 and 2015 under the protected cultivation practice in polyhouse condition of Central Institute of Horticulture Medziphema, Nagaland. The experiment was conducted in Randomized Block Design (RBD) with three replications accommodating 12 plants in each plot of (3x2.25) m^2 with a spacing of 75 cm between the plants and rows.

The experimental materials in the present study comprise of eight landraces of Naga King Chilli procured from five districts of different growing locations in Nagaland. The particulars of the landraces are presented in Table-1. The observations were recorded for the characters such as days to first flowering, plant height, days to 50% fruiting, number of fruits per plant, fruit yield per plant, fresh fruit weight (g), dry fruit weight (g), number of seeds per fruit, 1000-seed weight (g), fruit length (cm), fruit width (cm) and number of fruits per cluster.

Table-1 : Particulars of the landraces.

Code	Place of collection	District
1.	Mangkolemba	Mokokchung
2.	Mon	Mon
3.	Tsiephama	Dimapur
4.	Rhazaphema	Dimapur
5.	Medziphema	Dimapur
6.	Jaluki 1	Peren
7.	Jaluki 2	Peren
8.	Thekrezhüma	Kohima

RESULTS AND DISCUSSION

All the landraces were grouped into 3 different clusters Table-1. The intra cluster distance ranged from 23.26 to 51.43. The inter cluster distance was observed to be 51.43 between cluster I and cluster II indicating that these two clusters were genetically diverse.

The mean performances of all the characters are presented in Table 4. All the three Clusters showed highest mean value for fruit yield per plant and days to 50% fruiting. Among the different characters studied, 1000 seed weight, fresh fruit weight, number of seeds per

Table-1 : Clustering pattern of 8 landraces of Naga King Chilli based on the basis of genetic divergence

Cluster Number	Number of Genotypes	Genotype Member
Cluster 1	3	C1, C2 and C3
Cluster 2	4	C4, C5, C7 and C8
Cluster 3	1	C6

Table-2 : Average inter and intra cluster distances of 8 landraces of Naga King Chilli

Cluster Number	Cluster 1	Cluster 2
Cluster 1	23.26	51.43
Cluster 2	51.43	0.00

Table-3 : Contribution of each characters towards divergence

Sl. No.	Characters	Contribution (%)
1.	Days to first flowering	0.00
2.	Plant height (cm)	3.57
3.	Days to 50% fruiting	3.57
4.	Number of fruit per plant	0.00
5.	Fresh fruit weight (g)	14.29
6.	Fruit length (cm)	7.14
7.	Fruit width (cm)	0.00
8.	Number of fruits per cluster	10.71
9.	Number of seeds per fruit	14.29
10.	Dry fruit weight (g)	3.57
11.	1000 seed weight (g)	42.86
12.	Fruit yield per plant (g)	0.00

distances were larger than the intra-cluster distances. The inter cluster D^2 values were found to be 51.43 between Cluster I and II, indicating wide genetic diversity between these two clusters. This is in conformity with (7) Thus the cross between the landraces from cluster I and II can be used in Naga King Chilli breeding programmes to achieve maximum heterosis. Landraces from these two clusters if involved in hybridization may result in a wide spectrum of segregating populations as genetic diversity is very. The intra cluster divergence was found to be 23.26 in Cluster I, while Cluster II showed zero intra cluster distance even though there were four landraces, which signifies that the landraces were similar in their genetic makeup. Cluster III showed zero intra cluster distance due to containing of only one landrace. Similar findings were reported by (8).

Difference in cluster means existed for almost all the characters studied and are presented in Table 4. Cluster III had highest mean values for different characters viz fruit yield per plant (g) followed by plant height (cm), number of fruits per plant, fruit length (cm), fresh fruit weight (g), number of fruits per cluster, fruit width (cm) and dry fruit weight (cm). Therefore the landrace fallen in cluster III have the genetic potentiality to contribute better for yield maximization of Naga King Chilli landraces. The maximum relative contribution to the total divergence was made by 1000 seed weight (42.86%), fresh fruit weight and number of seeds per fruit (14.29%) each, number of fruits per cluster (10.71%) and plant height, days to 50% fruiting and dry fruit weight each contributing 3.57%

Table-4 : Cluster wise mean value of 12 characters in Naga King Chilli.

Characters	Days to first flowering	Plant height (cm)	Days to 50% fruiting	No. of fruit per plant	Fresh fruit weight (g)	Fruit length (cm)	Fruit width (cm)	No. of fruits per cluster	No. of seed per fruit	Dry fruit weight (g)	1000 seed weight (g)	Fruit yield per plant (g)
Cluster 1	154.72	138.04	196.39	67.29	5.30	5.17	2.79	2.62	40.05	0.75	4.59	371.72
Cluster 2	156.75	131.17	193.12	63.91	5.22	5.51	2.68	2.51	39.33	0.73	4.68	315.02
Cluster 3	154.00	165.47	193.67	138.25	6.11	6.33	2.88	3.08	32.28	0.81	4.47	578.61

fruit and number of fruits per cluster contributed maximum towards divergence (Table-3).

The computations from distance matrix gave non-hierarchical clustering among the 8 Naga King Chilli landraces and they were grouped into three clusters (Table 1). Cluster II was the largest one comprising of four landraces followed by cluster I with 3 landraces and cluster III with 1 landrace, indicating heterogeneity among the landraces. This was supported by (6) in a study of genetic diversity in 30 chilli genotypes and they were grouped into 6 clusters. Intra and inter cluster distances (D values) are shown in Table-2. The inter-cluster

respectively (Table-3). Similar results were observed by (9, 10).

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