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Short communication

Genetic divergence for yield and yield-contributing traits in cucumber (*Cucumis sativus* L.)

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ABSTRACT

The cluster analysis grouped the thirty one genotypes of cucumber, collected from different sources in India, into seven clusters. The genotypes Jorji Local, Bengal 60, JJL and Derabassi Local were promising with respect to yield per plant and fruit length, while Gyn-2, Gyn-3 and Gyn-4 were superior for number of fruits per plant. However, genotypes Chakkimore local, Farukabad Local, Chamoli Local and Chamba Local were promising for average fruit weight and fruit breadth.

Key words: Cluster analysis, cucumber, genetic divergence, *Cucumis sativus* L.

Cucumber (*Cucumis sativus* L.) is an important vegetable crop that has its origins in the Indian sub-continent. A lot of diversity in this crop exists in the country. But, most of the farmers grow their own land races to fulfil their domestic or local market demands. A huge portion of the diversity is, thus, still restricted to kitchen gardens or individual farms. Hence, efforts were made to collect this diversity from farmers' fields or kitchen gardens from all over India and to use it in active crop improvement programmes. In this study, the non-hierarchical clustering approach was employed to evaluate and assess genetic divergence among genotypes/land races and to select elite ones for further crop improvement.

The experimental material comprised of 31 genotypes/land races of cucumber collected from different sources in India. The experiment was laid out at Dr. Y.S. Parmar University of Horticulture and Forestry, Horticultural Research Station, Kandaghat, Solan (Himachal Pradesh) during *Kharif*, 2005.The experimental site is situated at an altitude of 1270m above mean sea level, lying between latitude 30°52' North and longitude 77°11' East. It falls under the mid hill zone of Himachal Pradesh. The climate ranges from sub-tropical to sub-temperate. Sixteen plants of each genotype were transplanted at the recommended spacing of 1.5 X 1.0 m. Standard cultural practices to raise the cucumber crop in mid hills were followed as per recommendations of package of practices developed by the University.

The observations on number of fruits per plant, yield per plant, average fruit weight, fruit length and fruit width were recorded on 10 randomly selected competitive plants from each plot. Mean values in each replication for all the traits were subjected to statistical analysis. Genetic divergence analysis was performed using non-hierarchical Euclidean cluster analysis (Spark, 1973).

The performance of 31 genotypes of cucumber with respect to fruit yield and fruit traits is given in table 1.

Cluster analysis grouped the genotypes of cucumber into seven clusters. The maximum number of genotypes (7 genotypes) were grouped in cluster I followed by cluster V and Cluster VII (5 genotypes each), cluster II and Cluster VI (4 genotypes each), and, cluster III and cluster IV (3 genotypes each). The composition of the clusters is given in table 2.

Intra-cluster distances (Table 3) revealed that the maximum divergence was present in cluster II (1.319), followed by cluster VI (1.135) and cluster VII (1.127). The lowest value of intra-cluster distance (0.769) was observed for cluster III indicating limited genetic divergence in this group. The maximum inter-cluster distance (4.875) was observed for cluster II and cluster III, followed by cluster

Table 1. Performance of cucumber genotypes for fruit yield traits

Genotype	Number of fruits per plant	Fruit yield per plant (kg)	Average fruit weight (g)	Fruit length (cm)	Fruit width (cm)	Sex form	Fruit colour
K-75	12.0	3.6	300.0	17.5	7.1	Monoecious	Light green
K-90	13.0	4.1	320.0	20.1	7.6	Monoecious	Light green
Gyn-1	18.0	4.5	250.0	13.5	6.0	Gynoecious	Dark green
Gyn-2	19.0	4.7	250.0	17.0	8.0	Gynoecious	Light green
Gyn-3	20.0	5.5	275.0	21.5	7.5	Gynoecious	Dark green
Gyn-4	19.0	5.7	300.0	20.0	8.5	Gynoecious	Light green
MNCC 01	11.0	2.7	250.0	12.5	6.2	Monoecious	Light green
MNCC 02	12.0	3.0	250.0	13.0	6.5	Monoecious	Light green
MNCC 03	12.0	3.7	312.5	13.5	7.0	Monoecious	Light green
EC 173931	8.0	3.4	425.0	26.0	6.4	Monoecious	Green
EC 173940	9.0	2.5	277.7	20.5	6.8	Monoecious	Green
EC 173971	7.0	2.8	407.1	19.2	7.3	Monoecious	Green
Poinsett-76	8.0	2.0	250.0	12.9	5.7	Monoecious	Dark green
Market More	10.0	3.6	366.0	19.5	6.8	Monoecious	Green
Sheetal	11.0	3.0	280.0	23.4	7.6	Monoecious	Light green
Orissa Local	9.0	3.1	350.0	21.8	6.9	Monoecious	Dark green
Sanech Local	6.0	3.6	600.0	22.5	6.5	Monoecious	Light green
Subathu local	7.0	2.8	407.1	19.7	7.0	Monoecious	Light green
Jorji Local	14.0	5.9	425.0	29.0	7.5	Monoecious	Light green
Chakkimor Local	9.0	4.5	500.0	25.0	8.5	Monoecious	Light green
Faizabad Local	8.0	3.6	450.0	17.8	6.3	Monoecious	Green
Hisar Local	7.0	3.3	471.4	19.5	6.4	Monoecious	Green
Farukabad Local	12.0	5.2	433.3	22.5	9.0	Monoecious	Light green
Bengal 60	14.0	6.1	439.2	18.0	7.5	Monoecious	Dark green
Kanpur Local	7.0	3.2	464.2	20.5	7.0	Monoecious	Dark green
Chamoli Local	8.0	3.8	475.0	22.0	9.0	Monoecious	Green
Pilibhit Local	6.0	2.8	475.0	17.0	6.4	Monoecious	Green
JJK	10.0	6.2	625.0	25.0	8.0	Monoecious	Light green
Derabassi Local	11.0	5.9	536.3	22.0	7.5	Monoecious	Light green
Chamba Local	6.0	3.9	650.0	19.5	8.5	Monoecious	Green
Himangi	13.0	4.4	338.4	15.5	7.5	Monoecious	White
Mean	10.4	4.1	392.0	19.5	7.2	-	-

III and cluster VI (4.703), cluster I and cluster IV (4.251), and cluster III and cluster IV (4.221). Parents selected from these clusters may, thus, provide a broader genetic base for crop improvement programmes and may produce heterotic hybrids or transgressive segregants in later generations. Similar findings have also been reported earlier in some genotypes of cucumber (Prasad *et al* 1993, 2001; More and Seshadri 2002; Rao *et al*, 2003; Xu *et al* 2003). They too adopted the clustering approach to identify parents for crop improvement programmes.

Cluster means (Table 4) for different traits indicated that maximum number of fruits per plant (19.3) was produced by members of cluster IV, whereas, yield per plant and fruit length were maximum for cluster II (6.0 kg and 23.5 cm, respectively). However, maximum average fruit weight (514.5 g) and fruit breadth (8.7 cm) were observed for cluster VI.

The genotypes Jorji Local, Bengal 60, JJL and Derabassi Local are promising with respect to yield per plant and fruit length while, Gyn-2, Gyn-3 and Gyn-4 are superior for number of fruits per plant. However, genotypes Chakkimore local, Farukabad Local, Chamoli local and

Table 2. Composition of clusters in cucumber

Cluster	Number of genotypes	Genotypes
I	7	EC 173971, Sanech Local, Subathu local, Faizabad Local, Hisar Local, Kanpur Local, Pilibhit Local
II	4	Jorji Local, Bengal 60, JJK, Derabassi Local
III	3	MNCC 01, MNCC 02, Poinsett-76
IV	3	Gyn-2, Gyn-3, Gyn-4
V	5	EC 173931, EC 173940, Market More, Sheetal, Orissa Local
VI	4	Chakkimor Local, Farukabad Local, Chamoli Local, Chamba Local
VII	5	K-75, K-90, Gyn-1, MNCC 02, Himangi

Table 3. Intra and inter cluster distance values in cucumber

Cluster	I	II	III	IV	V	VI	VII
I	0.831						
II	3.162	**1.319**					
III	2.760	4.875	**0.675**				
IV	4.251	2.914	4.221	**0.769**			
V	1.461	3.074	2.659	3.450	**0.959**		
VI	2.729	2.152	4.703	3.626	2.807	**1.135**	
VII	2.508	3.130	2.058	2.267	2.048	3.325	**1.127**

Table 4. Cluster means for five characters in cucumber

Cluster	Number of Fruits per plant	Yield per plant (kg)	Average fruit weight (g)	Fruit length (cm)	Fruit width (cm)
I	6.8	3.1	467.8	19.4	6.7
II	12.2	6.0	506.4	23.5	7.6
III	10.3	2.5	250.0	12.8	6.1
IV	19.3	5.3	275.0	19.5	8.0
V	9.4	3.1	339.7	22.2	6.9
VI	8.7	4.3	514.5	22.2	8.7
VII	13.6	4.0	304.1	16.0	7.0

Table 5. Promising genotypes for different traits

Trait	Genotypes
Number of fruit per plant	Gyn-2, Gyn-3, Gyn-4
Yield per plant	Jorji Local, Bengal 60, JJK, Derabassi Local
Average fruit weight	Chakkimor Local, Farukabad Local, Chamoli Local, Chamba Local
Fruit length	Jorji Local, Bengal 60, JJK, Derabassi Local
Fruit width	Chakkimor Local, Farukabad Local, Chamoli Local, Chamba Local

Chamba Local are the promising ones for average fruit weight and fruit breadth (Table 5).

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