

Evaluation of open-pollinated varieties and hybrids of cucumber for off-season production under naturally ventilated polyhouse

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ABSTRACT

Genetic variability, heritability in broad sense and expected genetic advance of fruit yield and twelve other characters were studied in eleven open pollinated varieties/ hybrids of cucumber. Significant differences among the genotypes were observed for all the characters except internodal length. Phenotypic coefficient of variation and genotypic coefficient of variation were found high for number of fruits per plant. Highest heritability in broad sense was recorded for number of fruits per plant and number of nodes on main shoot. High heritability coupled with high genetic advance as per cent of mean was observed for yield and number of primary branches per plant which indicated that these characters are more reliable for effective selection.

Key words: Genetic variability, heritability, genetic advance, cucumber, *Cucumis sativus* L.

INTRODUCTION

Cucumber (*Cucumis sativus* L., $2n = 2x = 14$) belonging to the family cucurbitaceae is one of the most preferred vegetables grown under protected conditions in the developed world. Its demand is throughout the year because of its popular use in salad dish, sandwich, pizza preparation, etc. In India, it is traditionally grown in *zaid* and *kharif* seasons. It is believed to be originated in India (De Candolle, 5). Improvement in any crop depends on the magnitude of its genetic variability. Knowledge of the available variability within the species for the desired characters enables the breeder in determining the most potential genotype. Burton and De Vane (3) suggested that genetic variability along with heritability should be considered for effective selection. Studies on the variability using genetic parameters like genetic coefficient of variation, heritability and genetic advance is essential for initiating a breeding programme.

MATERIALS AND METHODS

An independent trial was conducted during winter season of 2004-2005 at Vegetable Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar. Eleven open-pollinated varieties/hybrids including Poinsette, Pant Sankar Kheera-1, Pant Kheera-1, US-6125, Rani, Noori, Tripti, Phule Shubhangi, Sheetal, Kalyanpur Green and Ragini were tested for their off-season performance in a naturally ventilated polyhouse. Cucumber seeds were sown on November. The spacing was maintained at 80 cm x 50 cm having eight plants in each variety. Three

replications were adopted in a randomized block design. The crop duration was 6 months. The observations were recorded on days taken to anthesis of first female flower, nodal position of first female flower, days to first harvest, main vine length, number of primary branches per plant, number of nodes on main shoot, internodal length, fruit weight, fruit density, fruit length, fruit diameter, number of fruits per plant and yield per plant.

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant differences for all the characters studied except internodal length which indicated that the genotypes differed significantly for most of the characters. The range of coefficient of variation was 11.16 (days to first harvest) to 45.74 (yield per plant (kg) per cent). The extent of genotypic variability indicates the amenability of a given character for its improvement (Burton and De Vane, 3). PCV was recorded highest for number of fruits per plant (95.68 %) followed by yield per plant (88.43 %). The moderate value of PCV was observed in number of primary branches per plant (48.14 %) followed by average fruit weight (46.82 %). The lowest value of PCV was recorded for average fruit diameter (14.72 %). Based on this assumption, GCV values were highest for number of fruits per plant (88.09 %) followed by yield per plant (75.68 %). The moderate value of GCV was recorded in number of primary branches per plant (42.05 %) and main vine length (37.55 %). Internodal length showed the lowest value (4.86 %). Solanki and Seth (16), Joshi *et al.* (8), Abusaleha and Dutta (1), Rastogi and Arya (13), Singh (15), Verma

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(17), and Krishna Prasad and Singh (10) reported similar results in cucumber for these characters. The environmental coefficient of variation (ECV) ranged from 11.41 % (days to first harvest) to 45.74 % (yield per plant). In general, the estimates of GCV were lower than the corresponding estimates of ECV indicating greater role of environment on the expression of these characters.

The high values of heritability in broad sense were observed for number of fruits per plant (84.00 %) followed by nodes on main shoot (82.00 %). Similar results for number of fruits per plant have been reported in pointed gourd by Singh *et al.* (14), Abusaleha and Dutta (2), and Karuppaiah and Senthilkumar (9) in ridge gourd. The high value of heritability suggests that these characters are under the genotypic control and expected to give constant results under simple selection. Thus, the heritability in broad sense is helpful in identifying appropriate character for selection and enables the breeder to select superior genotypes on the basis of phenotypic expression of quantitative traits. The genetic advance as per cent of mean was recorded highest for yield per plant (133.17 %) followed by number of primary branches per plant (75.54 %). Similar observation was also reported by Ram *et al.*

(12). The knowledge of the heritability along with genetic advance aid in drawing valuable conclusions for effective selection based on phenotypic performance (Johnson *et al.*, 7). Detection of significant genetic variability indicates that genetic variance exists in the genotypes but says nothing about the range of genetic variability within a particular population. A broad sense heritability estimate from such a test provides information on relative magnitude of genetic and environmental variation in germplasm pool (Dudley and Moll, 6). High heritability coupled with high genetic advance were observed for main vine length, number of primary branches per plant, number of nodes on main shoot, average fruit weight and yield per plant indicating the importance of additive gene action controlling these characters. Simple selection therefore could be effective for improvement of these traits. In pumpkin, high heritability coupled with high genetic advance for these characters was reported by Kumaran *et al.* (11), and Dahiya *et al.* (4) in round melon. High heritability coupled with moderate genetic advance as per cent of mean were observed for number of nodes on main shoot. Despite high heritability, genetic advance as per cent of mean was low for number of fruits per plant which can be improved by development

Table 1. Analysis of variance for thirteen characters in cucumber.

Source of variation	df	Mean square						
		Days taken to anthesis of first female flower	Nodal position of first female flower	Days to first harvest	Main vine length (cm)	No. of primary branches per plant	No. of nodes on main shoot	Internodal length (cm)
Replication	2	44.32	3.90	44.57	0.17	2.05	36.65	0.51
Treatment	10	281.67**	8.21*	269.78*	2.03**	15.26**	378.49**	2.93
Error	20	74.40	2.9	85.54	0.30	1.43	24.83	2.64
CV (%)		13.77	29.66	11.16	26.86	23.45	15.72	25.35

Source of variation	df	Mean square					
		Fruit weight (g)	Fruit density (g/cc)	Fruit length (cm)	Fruit diameter (cm)	Number of fruits per plant	Yield per plant (kg)
Replication	2	74.56	0.29	0.60	0.25	28.35	0.61
Treatment	10	21534.62**	0.21*	17.28*	0.68*	283.14**	7.83**
Error	20	4280.68	0.64	5.80	0.25	16.01	0.85
CV%		30.58	15.76	14.00	11.74	37.35	45.74

*, ** Significant at 5 and 1% probability levels.

Table 2. Estimation of different genetic parameters of various characters in cucumber.

Character	Range	General mean \pm SE (m)	Coefficient of variation (%)			Heritability (%)	Genetic advance (GA)	Genetic advance as per cent of mean
			PCV	GCV	ECV			
Days taken to anthesis of first female flower	45.53-75.13	62.66 \pm 4.98	19.12	13.26	13.77	48.00	11.88	18.96
Nodal position of first female flower	3.1-7.93	5.75 \pm 0.98	37.60	23.11	29.66	37.00	1.68	29.22
Days to first harvest	66.67-95.00	81.06 \pm 5.34	14.95	9.67	11.41	41.00	10.44	12.88
Main vine length (cm)	0.57-3.17	2.02 \pm 0.31	46.17	37.55	26.86	66.00	1.27	62.87
No. of primary branches per plant	1.73-10.23	5.11 \pm 0.69	48.14	42.05	23.45	76.00	3.86	75.54
No. of nodes on main shoot	11.10-47.77	31.70 \pm 2.88	37.69	34.25	15.72	82.00	20.33	64.13
Internodal length (cm)	4.78-7.57	6.41 \pm 0.94	25.81	4.85	25.35	3.50	0.12	1.87
Fruit weight (g)	122.2-400	213.92 \pm 37.77	46.82	35.45	30.58	57.00	118.29	55.30
Fruit density (g/cc)	1.13-1.97	1.60 \pm 0.15	20.94	13.78	15.76	43.00	0.30	18.75
Fruit length (cm)	14.03-22.2	17.20 \pm 1.39	18.04	11.37	14.00	39.00	2.54	14.77
Fruit diameter (cm)	3.67-5.37	4.25 \pm 0.29	14.72	8.88	11.74	36.00	0.47	11.06
Number of fruits per plant	1.13-32.80	10.71 \pm 2.31	95.68	88.09	37.35	84.00	17.90	1.67
Yield per plant (kg)	0.87-5.27	2.02 \pm 0.53	88.43	75.68	45.74	73.00	2.69	133.17

of hybrid varieties or utilization of transgressive segregants in heterosis breeding programme.

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