

SCREENING FOR PEDICEL AND FRUIT CHARACTERS IN CHILLI GERMPLASM FOR BREEDING CULTIVARS FOR EASY HARVEST

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ABSTRACT

Chilli fruits do not have an abscission layer in pediceles and thus makes harvest difficult without damage to the stem. Force, to be applied to detach the fruit in chillies, is a genetic factor and also associated with pedicel and fruit characters. Seventythree genotypes were screened and evaluated in a field trial at Indian Institute of Horticultural Research, Bangalore for pedicel length (PL), fruit length (FL), fruit diameter (FD) and fruit weight (FW). Inter-relationships among PL, FL, FD and FW were studied by correlation analysis. Wide variation among the traits was established suggesting that the differences were attributable to genetic factors. Genotypes with longer PL and lesser FD would be useful in breeding for cultivars possessing lesser diameter PD scar at pedicel attachment with the stem leading to easy fruit removal in harvesting especially while harvesting with machines.

KEW WORDS : Chilli (*Capsicum annum L*), Pedicel Length, Pedicel Diameter, Fruit Length, Fruit Diameter, Fruit Weight, Correlation

Absence of abscission layer in pedicels of chilli (*Capsicum annum L*) fruit makes the pedicel attachment very strong especially in cultivars with large fruit (Villalon and Bryan, 1970). There is tearing of the pedicel and consequently stem breakage occurs while hand-harvesting. The deciduous character that controls fruit separation from the calyx (Smith, 1951) would be undesirable because fruit would fall to the ground. Small-diameter pedicel scar at the point of attachment to the stem makes easy harvest (Marshall, 1979). There is very little information on pedicel characters. Understanding the relationship between pedicel and fruit characters will be helpful in a breeding programme to develop genotypes for easy fruit removal while harvesting. Chilli fruits are harvested by hand as well as by machine. Hand harvesting incurs high cost and hence the cultivars that are suitable for harvest by hand are not preferred for commercial cultivation which requires cultivars suitable for machine harvest. The objectives of the present study were : i) to screen the chilli germplasm for PL, FL, FD and FW; ii) to determine the relation among these characters and iii) to suggest recommendations to follow in a breeding programme for successful development of genotypes for easy fruit removal in harvesting.

MATERIALS AND METHODS

A total of 73 genotypes with diverse pedicel and fruit characters was selected for the study from

the chilli germplasm maintained at the Indian Institute of Horticultural Research, Bangalore. The experiment was conducted in randomised complete block design with three replications during 1980 Kharif season. Seedlings were transplanted with 30 cm spacing apart in rows spaced 45 cm in between. The length of the row was 3.60 m. The transplant field received 20 t FYM, 60 kg N, 80 kg P₂O₅, 50 kg k₂O and 20 kg Furadan per hectare as basal dose. The crop was also top dressed with 60 kg N twice on 30th and 60th days after transplanting at 30 kg N on each time. Five plants at random were selected for observations. Red ripe fruits were harvested from each entry and replication. From randomly selected 50 fruits in each entry from the first picking, the observations on FL, FD, PL and FW were recorded. No data on pedicel diameter was collected. PL was measured as the distance between the points of attachment to the stem and to the fruit. FL was measured as the distance from the pedicel attachment to its apex. FD was measured at its maximum width. All measurements were made with vernier calipers. The average values were considered in the statistical analysis. Analysis of variance and correlation analysis between pedicel and fruit characters were carried out according to the procedure given by Snedecor (1967).

RESULTS AND DISCUSSION

Mean values for PL, FL, FD and FW for each entry are given in Table (1). Differences among the

Table 1. Pedicel and fruit characters recorded by the different chilli genotypes

Genotypes	Pedicel length (cm)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)
Pinocchio pepper	2.69	7.05	1.47	0.4722
IHR 45	1.69	2.99	1.16	0.4330
IHR 268	2.59	7.00	1.21	0.7638
MuliteoRogue	3.07	8.80	1.26	0.7802
Ducalc	2.56	8.61	1.83	1.2166
Santaka	3.07	5.96	0.85	0.3840
Salem local	2.28	6.26	1.19	0.5082
Anal	3.37	7.58	1.25	0.7902
Arun	2.73	8.21	1.36	1.0164
Arun (local)	2.85	8.67	1.30	0.8850
Attapadi local	2.56	8.33	1.22	0.8828
IHR-263	3.45	7.54	1.19	0.9108
IHR-264	2.35	7.14	1.19	0.6816
IHR-265	2.65	8.18	1.13	0.5180
IHR-266	2.51	7.06	1.06	0.5702
IHR-268	2.29	3.13	1.30	0.4918
IHR-270	2.13	11.79	1.42	0.8942
IHR-271	2.88	12.02	1.33	0.9986
Assam local	3.88	3.84	1.31	0.5508
Meerut local	2.97	10.20	1.17	0.6784
Shankeswar	3.37	13.74	1.06	0.7078
Byadagi khaddi	3.57	13.64	0.99	0.7142
IHR-302	3.38	13.23	1.05	0.7452
Examba	2.99	11.39	1.09	0.7306
DH-7-6-5	3.92	14.73	1.01	0.6242
DH-7-6-6	2.93	13.24	0.65	0.4898
DH-7-6-12	3.00	10.64	0.88	0.5318
Ronyal local	3.03	7.59	1.43	0.7760
Ronyal local	3.18	6.72	1.44	0.8882
Kortocal local	3.75	13.18	0.79	0.5818
Kortocal local	4.00	13.20	0.78	0.7756
Gowribidnur	3.20	8.57	1.02	0.7396
Gowribidnur	2.64	4.80	1.04	0.9086
Byadagi local	3.30	5.80	1.04	0.8168
Sardhana local - 3	2.80	4.73	1.73	0.8582
Sardhana local - 4	2.62	9.22	0.88	0.4462
Gowribidnur	2.81	4.50	1.19	0.8600
Red local	3.10	8.38	0.98	0.8402
V.Kolar local	2.89	4.71	1.23	0.6238
Anekal local	2.44	4.86	1.02	0.4962
Belgaum local	3.71	14.60	0.92	0.6724
Musalwadi	2.80	7.17	1.21	0.7924
Devdurg chilli	3.40	6.63	1.21	0.9664
Vijayawada local	2.91	6.69	1.25	0.8144
Raichur local	3.24	7.85	1.29	0.7870
Bellari khaddi	3.39	12.70	1.08	0.7004
Bellari khaddi	3.07	7.37	1.01	0.6156
Kurnool chilli	2.69	5.17	1.10	0.5966

Table 1. Contd.,

Genotypes	Pedicel length (cm)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)
JCA 20	3.04	10.42	1.55	1.1656
Charlapelly	2.99	8.02	1.07	0.8512
Guntur chilli	2.64	7.40	0.96	0.8002
Guntur chilli	3.44	10.85	1.32	1.2400
Varanasi local	2.68	6.49	0.87	0.4838
PM 217 from France	1.96	7.51	1.96	1.1548
Sardhana	2.86	8.03	1.55	0.8450
Kashmiri local	2.65	6.74	1.49	0.7928
IHR-525	2.87	8.81	1.35	0.9562
IHR-529	2.48	5.86	1.44	0.7702
IHR-531	2.91	10.37	1.45	0.8576
Kalyanpur red	4.35	10.09	1.05	0.8386
Kalyanpur chaman	2.74	9.90	1.15	0.6004
Kalyanpur chaman	2.80	8.29	1.14	0.6284
JCA 31B	3.15	8.71	1.66	1.1134
G 4	3.14	7.94	1.11	0.6682
G 5	2.45	4.38	1.73	0.7674
K 2	2.60	7.36	1.11	0.8146
Pant C - 1	3.15	6.32	1.20	0.5576
CA-960	2.88	8.41	1.26	0.7982
CO 1	3.35	7.96	1.17	0.8040
JCA - 154	2.88	5.72	2.43	1.4808
Pusa Jwala	3.24	12.25	1.07	0.6772
Mean	2.95	8.38	1.22	0.7458
Isd (P=0.05)	0.44	1.27	0.28	0.2678

characters were significant at $P = 0.01$ and such differences were due to the genetic make up of the genotypes (Setiamihardja and Knavel, 1990). Among the genotypes, FL varied from 2.99 cm in entry 2 (IHR 45) to 14.73 cm in entry 38 (DH-7-6-5). The significant differences were due to the genetic factors. For FD, the variation was from 0.65 cm in entry 39 (DH-6-6) to 2.43 cm in entry 88 (JCA 154). The differences among the genotypes were significant and this enabled the selection of genotypes of required FD. The PL also varied considerably from the shortest length of 1.69 cm in entry 2 (IHR 45) to the highest of 4.35 cm in entry 78 (Kalyanpur red). Differences ($P = 0.01$) among the genotypes in PL indicated the scope for selection of varieties of desirable length like short or long. Deshpande (1933) observed long pedicel was dominant to short pedicel and Odland (1948) found that pedicels of pendent fruits were dominant to that of erect fruits. Like other traits, FW also exhibited wide variation and significant differences. It varied from 0.3840 g in entry 7 (Santaka) to 1.4808 g in entry 88 (JCA 154). The genotypes

possessing heavier fruits are stronger in attachment and hence difficult to harvest them without damage to the stem. Marshall (1979) observed that genotypes which are weaker in pedicel attachment with the stem are easier for harvest and he identified such genotypes as those that are having small PD and recommended them for machine harvest. Factors that control FD also control PD and both are related to ease of fruit detachment (Setiamihardja and Knavel, 1990). Since selection of fruits with lesser diameter tends to decrease PD as well as FW, use of genotypes with lesser FD in a breeding programme might lead to success in the evolution of cultivars suitable for machine harvest. Werner and Hornma (1980) reported that the force required for the harvest was an inheritable character and hence selection with low detachment force for harvest would be possible by proper selection. As FD has no relation with FW, selection for FD will not improve the yield and hence selection may be concentrated on thinner fruits. The selection for longer pedicels may result in increased FD ($r = 0.526$ significant at $P = 0.01$) and

Table 2. Coefficients of correlation among the pedicel length, fruit length, fruit diameter and fruit weight in the different genotypes of Chilli germplasm

Character	Pedicel length	Fruit length	Fruit diameter	Fruit weight
Pedicel length	1.000	0.526**	-0.297*	0.168ns
Fruit length		1.000	-0.308**	0.233**
Fruit diameter			1.000	0.621**
Fruit weight				1.000

** = significant at P = 0.01

* = significant at P = 0.05

ns = not significant

reduced FD ($r = -0.297$ significant at $P = 0.05$) and it will not be effective in the improvement of dry fruit weight since its relation with PL is very negligible ($r = 0.168$, not significant) (Table 2). Selection based on longer PL and consequently decreased FD will be effective in breeding varieties with lesser diameter of the pedicel and consequently small diameter pedicel at the point of detachment to the stem facilitating easy harvest. The gene system that controls FD is the same as for PD (Setiamihardja and Knavel, 1990).

REFERENCES

- DESHPANDE, M.L. (1933). Studies in Indian chillies. *Indian J. Agric. Sci.*, 3: 219-300.
- MARSHALL, D.E. (1979). USDA Pepper harvest: A report for 1977-1978. Michigan State Univ. Lansing.
- ODLAND, M.L. (1948). Inheritance studies in the pepper *Capsicum frutescens*. *Minn.Agrl.Expt.Sta.Tech.Bul.* 179.
- SETIAMIHARDJA, R. and KNAVEL, D.E. (1990). Association of pedicel length and diameter with fruit length and diameter and ease of fruit detachment in pepper. *J. Amer.Soc.Hort.Sci.*, 115: 677-680.
- SMITH, P.G. (1951). Deciduous ripe fruit character in peppers. *Proc. Amer. Soc. Hort.Sci.*, 57: 343-344.
- SNEDECOR, W.G. (1967). *Statistical Methods*. 6th Ed. Iowa State University Press, Iowa, USA
- VILLALON, B. and BRYAN, H.H. (1970). Evaluation of fruit pedicel separation of fresh market tomato varieties for mechanical harvest. *Prof. Flo.State Hort.Soc.*, 83: 127-130.
- WERNER, D.J. and HORNMA, S. (1980). Inheritance of fruit detachment force in pepper. *J.Amer.Soc.Hort.Sci.*, 105: 805-807.

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FRUIT SEED WEIGHT AND SEED NUMBER AND THEIR RELATIONSHIP WITH OTHER CHARACTERS IN CHILLI

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ABSTRACT

Outstanding cultivars could be developed successfully and efficiently by concentrating breeding on yield components than on yield itself. Two yield components namely fruit seed weight (FSWT) and number of seeds/fruit (FSN) were studied utilizing the diverse chilli germplasm maintained at Indian Institute of Horticultural Research, Bangalore. A fourfold variability was observed in each of FSWT and FSN and also in some other fruit characters. FSWT and FSN showed significant differences among the genotypes which included several high yielding cultivars popular in different States in India. The order of performance of the genotypes in respect of FSWT and FSN was similar. Positive correlation between FSWT and FSN was observed. Regression analysis indicated that FSWT was mainly dependent on FSN and FD positively and on FL (fruit length) and fruit length : fruit diameter ratio negatively. For obtaining higher fruit yield, genetic improvement in the characters namely FSN, FSWT, FD and fruit weight is to be aimed at.

KEY WORDS: Chilli, Genotypes, Fruit Seed Weight, Fruit Seed Number, Fruit Weight, Correlation, Regression

Capsicum breeders aim to increase fruit yield which is complex in nature and dependent on its characters Mean fruit weight (FWT

and number of fruits/plant are the two major components of fruit yield/plant. Mehra and Peter 1980 and Singh and Rajput (1992) indicated that