

SELECTION PARAMETERS FOR FRUIT YIELD AND RELATED TRAITS IN *LUFFA ACUTANGULA* (ROXB.) L.

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Abstract

Forty genotypes of ridge gourd were evaluated in RCBD with three replications. Analysis of variance revealed significant differences among genotypes for all the traits. High PCV, GCV, heritability, genetic advance were observed for number of nodes per vine, number of node to I pistillate flower appearance, days to first staminate and pistillate flower anthesis, days to first fruit harvest, pedicel length, fruit length, fruit diameter, number of fruits per plant and fruit yield per plant. Correlation indicated that fruit yield per plant was positively and significantly correlated with vine length, number of nodes per vine, inter nodal length, crop duration, pedicel and fruit length, fruit diameter, number of fruits per plant and average fruit weight. Maximum positive direct effect on fruits yield per plant was imposed by average fruit weight and length.

Introduction

Ridge gourd (*Luffa acutangula* (Roxb.) L., Cucurbitaceae, $2n = 26$), a monoecious gourd is one of the fruit vegetables consumed and relished by most local people in India (Dubey *et al.* 2013a). Despite its health and dietary benefits, the production of ridge gourd in North eastern (NE) region of India is mostly done on a small scale and the average yield of the crop is low (Dubey *et al.* 2013a). A large number of ridge gourd accessions are cultivated in NE region of India but no serious attempts have been made to improve them for higher productivity and acceptability. Therefore, there is a need to improve the productivity and fruit yield of the crop to meet the nutritional and dietary need of the people in particular the rural populations who are among the poorest and most vulnerable to malnutrition and poverty. The success of any crop improvement programme depends to a large extent on the amount of genetic variability present in the population. Very few research works relating to variability of ridge gourd accessions have been conducted in Arunachal Pradesh of India (Dubey *et al.* 2013a). So, intensive research efforts are needed in several areas particularly in selection of superior ridge gourd genotypes. The breeding programmes depend on the knowledge of key traits, their inheritance, genetic and the environmental factors that influence their expression. The determination of correlation among the characters is important in selection. But, it does not give an exact contribution of the various characters on the fruit yield. Path analysis would help in partitioning the correlation coefficient into direct and indirect effects of various traits on the fruit yield.

Materials and Methods

The present research was carried out in Vegetable Research Farm, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh, India (Altitude 153 m, latitude of 28°04'N and longitude of 95°22'E). The soil is sandy loam with pH 6.5. The experimental material for present study comprised of 40 genotypes of ridge gourd. The experiment

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was laid out in RCBD with three replications. The spacing between row to row 3.0 m and plant to plant 1.0 m was maintained with accommodating 5 number of plant in each plot of 3×1.0 m. About 15 metric tonne of well rotten farm yard manure was mixed in the soil at the field preparation. Fertilizer was applied @ 100 kg N, 80 kg P_2O_5 and 60 kg K_2O per hectare. One third dose of nitrogen and entire dose of phosphorous and potassium were applied as basal dose and remaining 2/3 dose of nitrogen was applied in two equal split doses i.e. 30 and 40 days after seed sowing as top dressing. The standard cultural operations were adopted whenever needed. The observations were recorded on five randomly selected plants of each genotype in accordance with the descriptor list of International Plant Genetic Resources Institute for Cucurbitaceae (Esquinas - Alcazar and Gallic 1983) on days to 50% emergence, vine length (m), number of node per vine, inter nodal length (cm), crop duration, number of node to first pistillate flower, days to first staminate flower anthesis, days to first pistillate flower anthesis, days to first harvest, pedicel length (cm), fruit length (cm), fruit diameter (cm), number of fruit per plant, average fruit weight (g) and fruit yield per plant (kg). Analysis of variance was calculated according to Singh and Chaudhary (1985). Traits that differed significantly were further utilized for estimation of the genetic parameters. The PCV, GCV and heritability (bs) were calculated as per formula given by Burton and de Vane (1953). The expected genetic advance resulted from selection of 5 per cent superior individuals were worked out as suggested by Johnson *et al.* (1955). Genotypic and phenotypic correlation coefficients were estimated according to the formulae given by Al-Jibouri *et al.* (1958). The direct and indirect effects were calculated by solving the following set of simultaneous equations proposed by Dewey and Lu (1959).

Results and Discussion

Analysis of variance indicated significant differences among genotypes for all traits (Table 1). Sufficient genetic variability for many traits had been reported by Dubey *et al.* (2013a). It was revealed from Table 2 that genotype CHFRG1 had minimum node number to first pistillate flower appearance (5.20) whereas maximum was recorded in genotype CHFRG 43 (12.27). The genotype CHFRG3 was earliest in first pistillate flowering (40.27) whereas genotypes CHFRG38 took highest number of days to appearance of first pistillate flower (64.40). Maximum fruit diameter was observed in genotype CHFRG22 (12.17 cm) while CHFRG17 recorded minimum (6.90 cm). Maximum number of fruit per plant was recorded in CHFRG10 (41.40) while minimum was noted in CHFRG27 (16.73). Maximum fruit yield per plant was recorded in genotype CHFRG22 (4.45 kg) while minimum was recorded in CHFRG27 (1.73 kg) (Table 2). Phenotypic and genotypic variances were highest 5682.80 and 3769.73, respectively for vine length and lowest 0.73 and 0.49, respectively for fruit yield per plant (Table 3). The highest estimates of PCV and GCV were observed for fruit yield per plant (27.62 and 22.52%). However, the lowest estimates were recorded for crop duration (8.79 and 5.92%). High heritability estimates was recorded for vine length, number of node per vine, number of node to 1st pistillate flower appearance, days to first staminate flower anthesis, days to first pistillate flower anthesis, days to first fruit harvest, pedicel length, fruit length, fruit diameter, number of fruit per plant and fruit yield per plant which ranged between 60.26 and 78.32%. These results were in agreement with Dubey *et al.* (2013a). Genetic advance was high for vine length (103.01%). However, a low value was observed in fruit yield per plant (1.17%) (Table 3). This was in conformity with Dubey *et al.* (2013 b). From the study on mean performance and other genetic parameters it was revealed that the characters *viz.* vine length, pedicel length, number of fruits per plant, fruit length, fruit diameter and average fruit weight were the most important traits for improving the genotypes for higher yield and may be applied for selection in ridge gourd. In general, genotypic correlation was higher than phenotypic

Table 1. Analysis of variance, mean, coefficient of variation and least significant differences for studied traits in ridge gourd genotypes.

df	Mean square															
	Days to 50% emergence	Vine length	Number of node per vine	Number of internodal length	Crop duration	Number of node to 1st pistillate flower appearance	Days to first staminate flower anthesis	Days to first pistillate flower anthesis	Days to 1st fruit harvest	Pedicel length	Fruit length	Fruit diameter	Number of fruit per plant	Average fruit weight	Fruit yield per plant	
Replication	2	1.233	719.084	1.910	2.003	12.158	0.072	3.916	1.876	11.802	0.802	0.645	0.101	2.917	127.099	0.131
Geno-type	39	8.615**	13222.349**	66.027**	5.755**	308.710**	8.692**	70.467**	90.061**	89.589**	9.874**	82.433**	4.356**	133.644**	303.841**	1.704**
Error	78	2.310	1913.070	5.576	2.425	88.389	1.330	7.592	9.556	9.939	1.407	10.036	0.785	16.537	87.333	0.245
Mean	13.83	282.53	21.35	11.79	144.72	8.87	44.91	51.63	59.44	10.39	23.98	9.49	30.43	101.81	3.10	
CV%	10.99	15.48	11.06	13.20	6.50	13.00	6.14	5.99	5.30	11.41	13.21	9.34	13.36	9.18	15.99	
CD	2.47	71.10	3.84	2.53	15.28	1.87	4.48	5.02	5.12	1.93	5.15	1.44	6.61	15.19	0.81	

*** and ns significant at $p < 0.05$, $p < 0.01$ and non significant, respectively.

Table 2. Mean performance of ridge gourd accessions for different characters.

Genotype	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CHFRG1	14.00	324.01	21.40	13.80	163.67	5.20	42.53	47.80	57.07	8.21	23.10	10.30	38.80	96.24	3.75
CHFRG2	14.33	339.25	21.40	14.13	155.00	5.60	41.73	45.80	53.07	9.44	13.34	10.53	39.53	92.65	3.61
CHFRG3	13.67	162.44	13.07	9.97	162.67	5.47	35.93	40.27	48.27	7.71	15.70	9.43	31.73	89.19	2.81
CHFRG5	14.00	209.87	15.20	12.00	151.33	6.73	33.40	42.53	49.40	12.40	25.30	8.07	29.07	94.68	2.74
CHFRG6	15.33	336.00	24.13	12.83	157.00	9.13	49.60	54.33	62.40	10.41	37.63	10.67	30.73	105.11	3.23
CHFRG7	16.00	189.10	16.27	9.97	141.33	5.93	49.93	54.20	61.73	10.63	15.20	7.20	19.47	93.89	1.83
CHFRG8	16.33	316.48	27.27	10.47	154.33	6.40	47.60	53.87	61.00	10.73	27.60	10.07	38.60	101.31	3.90
CHFRG9	13.33	140.43	13.47	8.53	154.00	8.60	47.00	52.87	59.27	13.27	24.63	9.20	27.47	84.30	2.31
CHFRG10	12.33	347.36	26.60	12.17	149.00	10.07	46.27	54.00	59.60	15.13	26.57	9.63	41.40	98.78	4.10
CHFRG11	13.67	247.16	17.00	12.60	152.33	8.83	48.00	54.07	60.00	11.30	25.27	8.77	29.73	102.52	3.05
CHFRG12	12.00	360.70	28.53	11.60	161.00	7.53	48.67	53.93	62.00	12.57	30.53	9.73	35.20	98.74	3.48
CHFRG13	14.33	243.17	22.97	9.50	130.33	11.47	41.00	48.47	59.67	12.13	21.30	9.43	28.13	106.52	3.01
CHFRG14	16.33	261.06	16.80	13.70	149.67	10.13	55.73	61.07	69.13	7.07	24.43	8.50	20.73	88.27	1.85
CHFRG15	11.67	282.65	21.20	11.57	149.67	7.53	48.80	55.53	62.80	10.23	25.97	8.83	23.13	99.37	2.30
CHFRG16	12.67	363.39	28.07	11.93	134.33	9.47	40.60	46.47	54.53	11.07	20.30	9.77	33.00	99.49	3.28
CHFRG17	12.33	262.07	21.27	10.90	141.67	7.07	46.60	54.00	61.80	11.57	17.41	6.90	20.73	100.68	2.09
CHFRG18	12.00	206.39	14.00	12.63	134.67	8.00	36.27	41.40	49.60	9.30	22.60	7.97	26.33	90.16	2.39
CHFRG19	12.67	177.27	14.87	10.30	132.33	7.87	38.93	46.13	53.33	9.30	14.07	9.27	30.00	86.12	2.59
CHFRG21	16.67	396.23	29.27	12.33	149.33	10.33	44.53	50.13	57.60	11.53	22.70	11.17	35.80	94.16	3.37
CHFRG22	13.33	326.55	24.20	12.43	153.67	9.80	44.60	49.47	55.13	14.47	39.21	12.17	36.87	121.08	4.45
CHFRG23	14.33	329.80	25.40	11.67	136.33	9.33	40.07	47.33	55.07	9.13	26.81	9.73	31.87	109.56	3.47
CHFRG24	12.33	184.01	13.67	11.47	134.67	8.13	42.07	47.67	55.87	10.87	30.13	9.40	29.73	90.99	2.68
CHFRG25	15.00	310.83	24.40	11.57	134.33	8.33	41.53	48.40	55.27	8.80	24.23	10.10	30.33	115.14	3.49

(Contd.)

Genotype	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CHFRG26	13.33	335.47	23.40	13.03	144.33	10.27	42.67	47.87	54.27	9.27	24.53	10.37	36.87	86.85	3.21
CHFRG27	13.67	223.81	20.00	10.03	135.00	8.33	45.60	53.53	60.60	8.73	25.01	8.83	16.73	103.35	1.73
CHFRG28	11.67	357.08	26.53	12.67	144.67	9.67	45.67	52.13	61.80	11.33	24.43	11.10	33.27	124.23	4.14
CHFRG29	13.00	326.95	22.00	13.30	126.67	7.53	40.67	45.67	54.00	9.23	22.33	10.50	32.07	107.87	3.46
CHFRG30	13.67	322.98	23.87	12.20	142.33	10.27	44.20	54.80	61.53	9.93	24.51	11.07	38.73	111.76	4.31
CHFRG31	11.33	309.30	22.73	12.27	139.67	9.93	44.00	50.33	60.40	11.23	23.13	10.40	39.07	91.42	3.55
CHFRG32	18.00	385.77	28.07	12.73	150.33	9.67	45.27	49.27	58.20	9.93	26.53	9.77	30.53	111.77	3.42
CHFRG33	13.67	337.00	22.13	13.70	146.00	9.33	45.27	51.87	59.87	9.57	26.53	9.90	38.47	114.37	4.39
CHFRG34	15.00	206.65	15.93	11.30	130.00	9.87	43.47	50.67	59.20	11.63	24.23	7.10	17.53	117.66	2.05
CHFRG35	14.00	232.47	22.07	9.43	148.00	10.27	45.20	50.40	57.73	11.53	22.80	9.97	36.67	112.66	4.16
CHFRG36	15.33	323.35	25.00	11.83	135.00	10.07	44.87	53.67	61.47	9.67	24.33	11.50	34.13	104.59	3.56
CHFRG37	13.67	275.73	23.13	10.67	154.67	9.93	46.73	54.27	64.00	9.87	24.67	9.07	27.93	108.76	3.04
CHFRG38	12.00	268.69	16.07	14.77	158.33	9.13	53.13	64.40	71.33	9.47	24.53	8.50	21.67	102.57	2.25
CHFRG39	17.67	241.26	19.67	10.60	130.00	10.73	52.93	62.07	69.53	10.53	24.11	8.70	20.33	103.86	2.11
CHFRG40	11.33	228.07	17.67	11.00	147.33	9.53	50.53	60.87	68.73	9.31	23.31	7.53	25.00	113.18	2.83
CHFRG43	12.33	262.25	19.33	12.03	131.67	12.27	41.40	51.93	62.13	5.93	14.60	9.10	27.07	103.81	2.79
CHFRG46	15.00	348.05	25.93	12.13	142.00	11.20	53.47	61.53	69.13	11.27	25.47	9.17	32.87	94.89	3.11
Mean	13.83	282.53	21.35	11.79	144.72	8.87	44.91	51.63	59.44	10.39	23.98	9.49	30.43	101.81	3.10
CV (%)	10.99	15.48	11.06	13.20	6.50	13.00	6.14	5.99	5.30	11.41	13.21	9.34	13.36	9.18	15.99
SEm±	0.88	25.25	1.36	0.90	5.43	0.67	1.59	1.78	1.82	0.68	1.83	0.51	2.35	5.40	0.29
CD (5%)	2.47	71.10	3.84	2.53	15.28	1.87	4.48	5.02	5.12	1.93	5.15	1.44	6.61	15.19	0.81

1. Days to 50% emergence, 2. Vine length (cm), 3. Number of nodes per vine, 4. Internodal length, 5. Crop duration, 6. Number of nodes to 1st pistillate flower appearance, 7. Days to first staminate flower anthesis, 8. Days to first pistillate flower anthesis, 9. Days to first fruit harvest, 10. Pedicel length, 11. Fruit length (cm), 12. Fruit diameter (cm), 13. Number of fruits per plant, 14. Average fruit weight (g), 15. Yield per plant (kg).

Table 3. Genetic parameters of yield and its component characters in ridge gourd.

Character	Mean		Range		Variance		Coefficient of variability (%)		Heritability (%)	Genetic advance	Genetic advance as % of mean
	Min.	Max.	Phenotypic	Genotypic	PCV	GCV					
Days to 50% emergence	13.83	18.00	4.41	2.10	15.18	10.48	47.64	2.06	14.90		
Vine length	282.53	396.23	5682.80	3769.73	26.68	21.73	66.34	103.01	36.46		
Number of node per vine	21.35	29.27	25.73	20.15	23.76	21.03	78.32	8.18	38.33		
Internodal length	11.79	14.77	3.54	1.11	15.94	8.93	31.39	1.22	10.31		
Crop duration	144.72	163.67	161.83	73.44	8.79	5.92	45.38	11.89	8.22		
Number of node to 1st pistillate flower appearance	8.87	12.27	3.78	2.45	21.92	17.65	64.85	2.60	29.28		
Days to first staminate flower anthesis	44.91	55.73	28.55	20.96	11.90	10.19	73.41	8.08	17.99		
Days to first pistillate flower anthesis	51.63	64.40	36.39	26.83	11.69	10.03	73.74	9.16	17.75		
Days to 1st fruit harvest	59.44	71.33	36.49	26.55	10.16	8.67	72.76	9.05	15.23		
Pedicel length	10.39	15.13	4.23	2.82	19.79	16.16	66.73	2.83	27.20		
Fruit length	23.98	39.21	34.17	24.13	24.38	20.49	70.63	8.50	35.47		
Fruit diameter	9.49	12.17	1.98	1.19	14.82	11.50	60.26	1.74	18.39		
Number of fruit per plant	30.43	41.40	55.57	39.04	24.50	20.53	70.24	10.79	35.44		
Average fruit weight	101.81	124.23	159.50	72.17	12.40	8.34	45.25	11.77	11.56		
Fruit yield per plant	3.10	4.45	0.73	0.49	27.62	22.52	66.47	1.17	37.82		

Table 4. Phenotypic (P) and genotypic (G) correlation coefficients among 15 characters in ridge gourd.

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	P	1.000	0.108	0.149	-0.050	0.097	0.183*	0.100	0.109	-0.177	0.046	0.076	-0.139	0.039	-0.105
	G	1.000	0.198*	0.258**	-0.076	0.046	0.264**	0.149	0.119	-0.008	0.094	0.084	-0.045	0.053	-0.018
2	P	1.000	1.000	0.848**	0.607**	0.097	0.164	0.088	0.049	0.088	0.259**	0.459**	0.488**	0.114	0.474**
	G	1.000	1.000	0.948**	0.578**	0.202*	0.283**	0.195*	0.121	0.103	0.360**	0.756**	0.654**	0.521**	0.788**
3	P	1.000	1.000	1.000	0.114	0.066	0.228*	0.092	0.056	0.205*	0.257**	0.465**	0.445**	0.245**	0.504**
	G	1.000	1.000	1.000	0.292**	0.057	0.349**	0.187*	0.128	0.145	0.274**	0.693**	0.602*	0.516**	0.736**
4	P	1.000	1.000	1.000	1.000	0.088	0.039	0.035	0.053	-0.137	0.144	0.160	0.244**	-0.085	0.164
	G	1.000	1.000	1.000	1.000	0.362**	0.011	0.124	0.084	0.055	0.227*	0.432**	0.347**	0.277**	0.430**
5	P	1.000	1.000	1.000	1.000	1.000	-0.263**	0.168	0.085	0.050	0.219*	0.063	0.268**	-0.094	0.205*
	G	1.000	1.000	1.000	1.000	1.000	-0.503**	0.288**	0.139	0.072	0.306**	0.241**	0.341**	-0.196*	0.248**
6	P	1.000	1.000	1.000	1.000	1.000	1.000	0.344**	0.453**	0.516**	0.195*	0.114	-0.056	0.279**	0.081
	G	1.000	1.000	1.000	1.000	1.000	1.000	0.222*	0.342**	0.373**	0.121	0.235**	0.208*	0.389**	0.168
7	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.929**	0.876**	0.061	0.223*	-0.164	-0.251**	0.058
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.947**	0.935**	0.102	0.320**	-0.141	-0.295**	0.132
8	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.951**	0.035	0.170	-0.183*	-0.300**	0.137
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.992**	0.042	0.252**	-0.241**	-0.356**	0.194*
9	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.145	-0.194*	-0.317**	0.176	-0.193**
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-0.021	-0.252**	-0.381**	0.218*	-0.256**
10	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.327**	0.098	0.170	0.031	0.161
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.501**	0.101	0.271**	0.190*	0.323**
11	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.269**	0.137	0.248**	0.243**
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.420**	0.203*	0.447**	0.373**
12	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.620**	0.193*	0.646**
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.883**	0.226*	0.897**
13	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-0.017	0.875**
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.046	0.927**
14	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.458**
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.411**
15	P	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	G	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

*, ** indicate significant at 5.0 and 1.0% level of probability. 1. Days to 50% emergence, 2. Vine length, 3. Number of node per vine, 4. Internodal length, 5. Crop duration, 6. Number of node to 1st pistillate appearance, 7. Days to 1st staminate flower anthesis, 8. Days to 1st pistillate flower anthesis, 9. Days to 1st fruit harvest, 10. Pedicel length, 11. Fruit length, 12. Fruit diameter, 13. Number of fruits per plant, 14. Average fruit weight, 15. Fruit yield per plant.

Table 5. Direct and indirect effects of yield component on fruit yield per plant at phenotypic and genotypic level in ridge gourd genotypes.

Characters	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Correlation with yield
1. P	-0.0074	-0.0008	-0.0011	0.0004	0.0010	-0.0007	-0.0014	-0.0007	-0.0008	0.0013	-0.0003	-0.0003	0.0010	-0.0003	-0.1053
G	0.0097	0.0019	0.0025	-0.0007	0.0014	0.0004	0.0026	0.0014	0.0012	-0.0001	0.0009	0.0008	-0.0004	0.0005	-0.0180
2. P	-0.0068	-0.0630	-0.0534	-0.0382	-0.0061	-0.0103	-0.0055	-0.0031	-0.0044	-0.0055	-0.0163	-0.0289	-0.0307	-0.0072	0.4735
G	0.1605	0.8112	0.7686	0.4691	0.1639	0.2292	0.1578	0.0979	0.1002	0.0838	0.2918	0.6134	0.5304	0.4229	0.7878
3. P	0.0057	0.0325	0.0384	0.0044	0.0025	0.0088	0.0035	0.0021	0.0030	0.0079	0.0099	0.0178	0.0171	0.0094	0.5038
G	-0.1791	-0.6576	-0.6940	-0.2026	-0.0397	-0.2423	-0.1300	-0.0889	-0.1009	-0.1905	-0.2449	-0.4807	-0.4176	-0.3584	0.7358
4. P	-0.0009	0.0105	0.0020	0.0173	0.0015	0.0002	0.0007	0.0006	0.0009	-0.0024	0.0025	0.0028	0.0042	-0.0015	0.1638
G	0.0184	-0.1395	-0.0704	-0.2413	-0.0872	-0.0028	-0.0030	-0.0202	-0.0132	0.0854	-0.0547	-0.1042	-0.0837	-0.0669	0.4296
5. P	-0.0015	0.0011	0.0007	0.0010	0.0111	-0.0029	0.0019	0.0010	0.0006	0.0019	0.0024	0.0007	0.0030	-0.0011	0.2050
G	-0.0162	-0.0230	-0.0065	-0.0412	-0.1140	0.0574	-0.0328	-0.0159	-0.0082	-0.0123	-0.0348	-0.0275	-0.0389	0.0223	0.2478
6. P	0.0004	0.0007	0.0009	0.0000	-0.0011	0.0041	0.0014	0.0019	0.0021	0.0002	0.0008	0.0005	-0.0002	0.0011	0.0810
G	-0.0012	-0.0071	-0.0088	-0.0003	0.0127	-0.0252	-0.0056	-0.0086	-0.0094	-0.0030	-0.0059	-0.0052	-0.0006	-0.0098	0.1681
7. P	0.0105	0.0050	0.0053	0.0022	0.0096	0.0197	0.0573	0.0532	0.0502	0.0035	0.0128	-0.0094	-0.0144	0.0033	-0.1828
G	0.0243	0.0179	0.0172	0.0114	0.0265	0.0205	0.0920	0.0872	0.0861	0.0094	0.0295	-0.0130	-0.0271	0.0122	-0.1993
8. P	-0.0038	-0.0019	-0.0021	-0.0013	-0.0033	-0.0173	-0.0355	-0.0383	-0.0364	-0.0013	-0.0065	0.0071	0.0115	-0.0052	-0.1946
G	0.0026	0.0021	0.0022	0.0014	0.0024	0.0059	0.0164	0.0173	0.0171	0.0007	0.0043	-0.0042	-0.0062	0.0033	-0.2379
9. P	-0.0010	-0.0007	-0.0007	-0.0005	-0.0005	-0.0048	-0.0082	-0.0089	-0.0093	0.0002	-0.0014	0.0018	0.0030	-0.0016	-0.1931
G	-0.0075	-0.0078	-0.0091	-0.0034	-0.0045	-0.0234	-0.0587	-0.0623	-0.0623	0.0026	-0.0112	0.0158	0.0239	-0.0137	-0.2562
10. P	0.0017	-0.0009	-0.0020	0.0013	-0.0017	-0.0006	-0.0006	-0.0003	0.0002	-0.0098	-0.0032	-0.0010	-0.0017	-0.0003	0.1613
G	0.0004	-0.0047	-0.0124	0.0160	-0.0049	-0.0055	-0.0046	-0.0019	0.0019	-0.0452	-0.0226	-0.0046	-0.0123	-0.0086	0.3225
11. P	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2429
G	0.0110	0.0417	0.0409	0.0263	0.0354	0.0272	0.0372	0.0292	0.0208	0.0581	0.1160	0.0488	0.0236	0.0519	0.3727
12. P	0.0015	0.0090	0.0091	0.0031	0.0012	0.0022	-0.0032	-0.0036	-0.0038	0.0019	0.0053	0.0196	0.0122	0.0038	0.6457
G	-0.0121	-0.1091	-0.0999	-0.0622	-0.0348	-0.0299	0.0204	0.0347	0.0363	-0.0146	-0.0606	-0.1442	-0.1273	-0.0325	0.8968
13. P	-0.1224	0.4279	0.3909	0.2141	0.2351	-0.0490	-0.2206	-0.2630	-0.2783	0.1490	0.1200	0.5441	0.8776	-0.0148	0.8746
G	-0.0467	0.6850	0.6304	0.3632	0.3571	0.0247	-0.3088	-0.3735	-0.3992	0.2839	0.2132	0.9250	1.0477	0.0484	0.9272
14. P	0.0186	0.0539	0.1158	-0.0400	-0.0446	0.1317	0.0274	0.0647	0.0830	0.0145	0.1170	0.0912	-0.0079	0.4719	0.4576
G	0.0180	0.1768	0.1751	0.0940	-0.0665	0.1319	0.0449	0.0657	0.0740	0.0643	0.1517	0.0765	0.0157	0.3391	0.4108

Residual effect (G) = 0.0650. Direct effect values are shown as underline and bold. 1. Days to 50% emergence, 2. Vine length, 3. Number of node per vine, 4. Internodal length, 5. Crop duration, 6. Number of node to 1st pistillate appearance, 7. Days to 1st staminate flower anthesis, 8. Days to 1st pistillate flower anthesis, 9. Days to 1st fruit harvest, 10. Pedicel length, 11. Fruit length, 12. Fruit diameter, 13. Number of fruits per plant, 14. Average fruit weight.

correlation, indicated low influence due to the environment and expression of the characters being mainly due to genetic factors (Table 4). Correlation studies revealed that characters like vine length, number of node per vine, inter nodal length, crop duration, pedicel length, fruit length, fruit diameter, number of fruits per plant, average fruit weight and fruit yield per plant had significant positive correlation with fruit yield per plant both at phenotypic and genotypic level. Similar, result was also reported by Dubey *et al.* (2013a) in their experiment. However, negative and significant association of fruit yield per plant was illustrious with days to 1st staminate and pistillate flower anthesis and days to first fruit harvest at both phenotypic and genotypic level, indicated that fruit yield per plant and days to 1st staminate and 1st pistillate flower anthesis and days to first fruit harvest could not be improved simultaneously through selection and it is strongly suggested that these characters should not be emphasized for direct selection of high yielding genotype. Partitioning of the total correlation into direct and indirect effects provides information on contributions of traits and forms the basis for selection to improve yield. In the present investigation, fruit yield per plant was taken as dependant variable and other 14 traits were considered as causal variables (Table 5). Number of fruits per plant had maximum positive direct effect on fruit yield per plant and indicated that this was the real independent character and has maximum contribution towards increase in fruit yield per plant. This observation was in agreement with Dubey *et al.* (2013a). Path coefficient analysis revealed that average fruit weight, fruit length and days to 1st staminate flower anthesis were the most important traits affecting fruit yield per plant. However, relative importance of vine, pedicel length, fruit length and fruit diameter cannot be ignored when selection is practiced for improving the fruit yield per plant in ridge gourd. The residual factor determines how best the causal factors account for variability of the dependant factors that is fruit yield per plant. The residual effect at genotypic level (0.065) was of moderate and negligible in magnitude (Table 5). The variables studied explain about 93.5 % of the variability. It indicates that some characters which have not been studied here need to be included in this analysis to account fully for the variation in fruit yield per plant.

In conclusion, the correlation coefficient analysis revealed that fruit yield per plant had significant positive genotypic correlation with vine length, inter nodal length, crop duration, pedicel length, fruit length and fruit diameter. Path analysis revealed that number of fruit per plant, average fruit weight and length and days to 1st staminate flower anthesis had strong influence on fruit yield per plant and the main determiners of fruit yield per plant. Therefore, improvement in fruit yield can be achieved by selecting the genotypes which have more number of fruits per plant with more average fruit weight.

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