Character Association and Path Coefficient Studies in Ridge Gourd (*Luffa acutangula* (Roxb.) L.)

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ABSTRACT

Yield per vine in ridge gourd was significantly and positively associated with number of fruits per plant and the node number at which first female flower appeared, fruit volume and fruit weight. Path coefficient analysis revealed that number of fruits per vine, node number, at which first female flower appeared and fruit volume were the major yield contributing characters with high direct effects on yield per vine.

Keywords: Correlation, Path analysis, Ridge gourd.

Ridge gourd (*Luffa acutangula* (Roxb.)L.) is an important crop among cucurbitaceous vegetables grown in different parts of India. Its immature fruits are cooked as vegetable and used in the preparations of chutney and curries. Its ability to tolerate hotter conditions makes it suitable for its wide spread cultivation throughout the tropics of both hemispheres. Its productivity varies from season-to season and region-to-region. Thus there is a need to identify stable varieties for a particular season and location. A direct selection for yield is often misleading as the yield is polygenically controlled and also subjected to the effect of fluctuating environments like temperature, humidity, rainfall *etc*. Efficiency of selection in breeding programme mainly depends on knowledge of association of characters. Although correlation coefficients indicate nature of association among the traits, path analysis splits the correlation coefficients into direct and indirect effects so as to measure the relative importance of causal factors involved. However, such information is inadequate in ridge gourd. Therefore, the present sutdy was carried out to establish correlation among different characters and their direct and indirect effects on fruit yield in ridge gourd.

MATERIAL AND METHODS

Five diverse varieties of ridge gourd viz., Jaipur Long, PHS-10, Chitrada, Pottibeera and Arka Sujat and crosses Jaipur long x Chitrada, Jaipur long x Potti beera, PHS-10 x Chitrada, Jaipur long x Arka Sujat and Chitrada x Arka Sujat were assessed for fourteen characters in a randomized block design with three replications during *rabi* 2005-2006 at Agricultural College farm, Bapatla. Spacing adopted was 2 m between the rows and 1 m between the plants. Observations were recorded on four plants in each row for the characters vine length, number of branches, node number at which first female flower appeared, sex ratio, number of fruits per plant, fruit shape index, fruit weight, fruit volume, fruit diameter, thickness of skin of fruit, flesh thickness, TSS and yield per plant.

The phenotypic and genotypic correlation coefficients were computed using the formula given by Weber and Murthy (1952) and path coefficient analysis by Wright (1921) and Dewey and Lu (1959)

RESULTS AND DISCUSSION

Magnitude of genotypic correlation coefficients was higher than corresponding phenotypic correlation coefficients in most of the characters studied, indicating a strong inherent association of characters (Table 1). Among the characters studied, yield per vine exhibited a strong positive and significant association with number of fruits per plant node number at which first female flower appeared, fruit shape index and flesh thickness. Such association of yield per vine with these characters were also reported by Daljit Singh and Nandpuri (1978), Khattra *et al*.(1994) and Mukundalakshmi *et al*. (2002). This type of strong positive association between yield and the above characters indicated that the selection for these characters which simultaneously result in improved yield per vine in ridge gourd.

Vine length showed non significant positive association with number of branches, sex ratio and fruit weight. Number of branches showed positive association with fruit weight. Node number at which first female flower appeared showed significant positive association with fruit diameter and flesh thicknees. Number of fruits per plant exhibited positive association with fruit weight, fruit volume, fruit length and yield per plant. Similar results were reported by Laltaprasad *et al*. (1988), Mukundalakshm*i et al*. (2002) and Narasimharao *et al*. (2000).

Table 1. Phenotypic and Genotypic correlation coefficients among certain characters in ridge gourd (*Luffa acutangula* (Roxb.) L.)

(Note: the value "-0.16" appears detached above the table near the top, in the Yield per Plant column area.)

	P/G	Vine length	Number of branches	Node number at which first female flower appeared	Sex Ratio	Number of fruits per plant	Fruit shape index	Fruit weight	Fruit volume	Fruit length	Fruit diameter	Thickness of skin of fruit	Flesh thickness	TSS (°Brix)	Yield per Plant
1. Vine length	P		0.11	-0.14	0.04	-0.40	-0.39	-0.05	-0.19	-0.08	-0.19	0.09	-0.17	-0.40	-0.03
	G		0.32	-0.24	0.11	-0.64*	-0.42	0.04	-0.25	-0.20	-0.28	-0.07	-0.32	0.10	-0.08
2. Number of branches	P			-0.24	0.42	-0.11	0.27	0.37	0.22	0.43	-0.00	-0.39	-0.20	0.10	-0.15
	G			-0.27	0.64*	-0.29	0.39	0.50	0.41	0.76*	0.08	-0.72**	-0.18	-0.19	-0.24
3. Number of node at which first female flower appeared	P				0.09	0.24	0.29	-0.09	0.27	-0.13	0.58	0.01	0.62	-0.12	0.41
	G				0.08	0.43	0.31	-0.19	0.31	-0.20	0.96**	0.02	0.99**	0.08	0.46*
4. Sex Ratio	P					0.33	0.45	0.38	0.67**	0.67**	0.17	-0.19	-0.00	0.14	0.28
	G					0.39	0.45	0.46	0.70**	0.74*	0.36	-0.37	0.03	0.15	0.34
5. Number of fruits per plant	P						0.57	0.31	0.43	0.23	0.08	-0.20	0.12	0.20	0.60**
	G						0.72**	0.49	0.49	0.37	0.28	-0.35	0.72*	0.39	0.82**
6. Fruit shape index	P							0.41	0.75**	0.53	0.19	-0.40	0.42	0.45	0.45*
	G							0.56	0.81**	0.62	0.38	-0.67*	0.69*	-0.19	0.50*
7. Fruit weight	P								0.41	0.65*	-0.03	-0.17	0.21	-0.18	0.06
	G								0.57	0.76**	0.05	-0.58	0.32	0.10	0.09
8. Fruit volume	P									0.56	0.38	-0.19	0.41	0.10	0.26
	G									0.66**	0.73**	-0.29	0.64*	0.23	0.29
9. Fruit length	P										0.06	-0.24	0.06	0.38	0.07
	G										-0.05	-0.65*	-0.08	-0.32	0.12
10. Fruit diameter	P											0.00	0.58	-0.45	0.04
	G											0.10	0.88**	-0.14	0.13
11. Thickness of skin of fruit	P												-0.03	-0.07	-0.44
	G												-0.22	-0.14	-0.58**
12. Flesh thickness	P													-0.26	0.31
	G														0.45*
13. TSS (°Brix)	P														0.12
	G														0.08

* = Significant at 5 % level
** = Significant at 1 % level
P = Phenotypic
G = Genotypic
TSS = Total Soluble Solids

Table 2. Phenotypic path coefficient analysis showing direct and indirect effects of different characters on yield per plant in ridge gourd (*Luffa acutangula* (Roxb.) L.)

	Vine length (m)	Number of branches	Node number at which first female flower appeared	Sex Ratio	Number of fruits per plant	Fruit shape index	Fruit weight (g)	Fruit volume (cc)	Fruit length (cm)	Fruit diameter (cm)	Thickness of skin of fruit (cm)	Flesh thickness (cm)	TSS (°Brix)	r_p with yield
1. Vine length (m)	**0.2510**	0.0282	-0.0356	0.0125	-0.1009	-0.0800	-0.0122	-0.0272	-0.0194	-0.0481	0.0226	-0.0434	-0.0394	-0.0325
2. Number of branches	-0.0314	**-0.2791**	0.0670	-0.1175	0.0321	-0.0764	-0.0938	-0.0614	-0.1216	0.0004	0.1096	0.0568	-0.0291	-0.1538
3. Number of node at which first female flower appeared	-0.0199	-0.0338	**0.1407**	0.0128	0.0343	0.0407	-0.0128	0.0383	-0.0179	0.0813	0.0012	0.0879	-0.0251	0.4107
4. Sex Ratio	0.0234	0.1984	0.0430	**0.4712**	0.1565	0.2115	0.1810	0.3141	0.3282	0.0803	-0.0877	-0.0003	0.0363	0.2833
5. Number of fruits per plant	-0.1753	-0.0502	0.1065	0.1448	**0.4361**	0.2487	0.1353	0.1888	0.1024	0.0316	-0.0893	0.0868	0.0676	0.5981**
6. Fruitshape index	-0.0972	0.0834	0.0880	0.1368	0.1738	**0.3047**	0.1258	0.2290	0.1622	0.0591	-0.1226	0.1297	0.1179	0.4465*
7. Fruit weight (g)	0.0080	-0.0555	0.0151	-0.0635	-0.0513	-0.0682	**-0.1652**	-0.0676	-0.1071	0.0047	0.0279	-0.0355	0.0318	0.0595
8. Fruit volume (cc)	0.0437	-0.0888	-0.1098	-0.2690	-0.1747	-0.3034	-0.1650	**-0.4036**	-0.2281	-0.1556	0.0784	-0.1666	-0.0389	0.2647
9. Fruit length (cm)	0.0095	-0.0538	0.0157	-0.0859	-0.0290	-0.0657	-0.0800	-0.0697	**-0.1234**	-0.0077	0.0298	-0.0080	-0.0280	0.0708
10. Fruit diameter (cm)	0.0353	0.0002	-0.1066	-0.0315	-0.0134	-0.0358	0.0053	-0.0711	-0.0115	**-0.1845**	-0.0009	-0.1080	0.0600	0.0455
11. Thickness of sking of fruit (cm)	-0.0370	0.1613	-0.0036	0.0765	0.0841	0.1653	0.0695	0.0797	0.0991	-0.0021	**-0.4107**	0.0117	0.0591	-0.4431
12. Flesh thickness (cm)	0.0503	-0.0592	0.1816	-0.0002	0.0579	0.1238	0.0625	0.1200	0.0188	0.1703	-0.0083	**0.2908**	-0.0413	0.3087
13. TSS (°Brix)	0.0076	-0.0050	0.0086	-0.0037	-0.0075	-0.0186	0.0093	-0.0046	-0.0109	0.0157	0.0069	0.0068	**-0.0482**	0.1228

Residual effect : 0.495   rp = Phenotypic correlation   Bold and diagonal values are direct effects

*,** = significant at 5% and 1% level of probability, respectively.

Table3 . Genotypic path coefficient analysis showing direct and indirect effects of different charcters on yield per plant in ridge gourd (*Luffa acutangula* (Roxb.)L.)

	Vine length (m)	Number of branches	Node number at which first female flower appeared	Sex Ratio	Number of fruits per plant	Fruit shape index	Fruit weight (g)	Fruit volume (cc)	Fruit length (cm)	Fruit diameter (cm)	Thickness of skin of fruit (cm)	Flesh thickness (cm)	TSS (°Brix)	r_p with yield
1. Vine length (m)	**1.6280**	0.5365	-0.4015	0.1885	-1.0405	-0.6855	0.0651	-0.4077	-0.3237	-0.4545	-0.1166	-0.5237	-0.6474	-0.0819
2. Number of branches	-0.9701	**-2.9437**	0.8062	-1.8906	0.8618	-1.0269	-1.4833	-1.2007	-2.2361	-0.2506	2.1353	0.5446	-0.3106	-0.2379
3. Number of node at which first female flower appeared	-0.1194	-0.1326	**0.4840**	0.0427	0.2087	0.1523	-0.0907	0.1526	-0.0980	0.4657	0.0123	0.4793	-0.0585	0.4578*
4. Sex Ratio	-0.1166	-0.6465	-0.0887	**-1.0066**	-0.3909	-0.4517	-0.4626	-0.7048	-0.7496	-0.3629	0.3754	-0.0324	-0.1435	0.3393
5.Number of fruits per plant	-0.2268	-0.1039	0.1531	0.1378	**0.3549**	0.2555	0.1755	0.1735	0.1330	0.0844	-0.1245	0.2556	0.0711	0.8210**
6. Fruitshape index	0.3950	-0.3272	-0.2952	-0.4210	-0.6754	**-0.9381**	-0.5231	-0.7620	-0.5826	-0.3539	0.6277	-0.6527	-0.4261	0.4962*
7. Fruit weight (g)	-0.1570	-1.9783	0.7360	-1.8044	-1.9413	-2.1892	**-3.9262**	-2.2299	-2.9685	-0.2008	2.2945	-1.2656	0.4612	0.0931
8. Fruit volume (cc)	-0.7725	1.2582	0.9728	2.1596	1.5080	2.5056	1.7519	**3.0846**	2.0353	2.2583	-0.9013	1.9877	0.3071	0.2898
9. Fruit length (cm)	-0.8398	3.2086	-0.8550	3.1455	1.5827	2.6233	3.1937	2.7872	**4.2240**	-0.2314	-2.7607	-0.1157	1.6214	0.1211
10. Fruit diameter (cm)	0.5411	-0.1650	-1.8646	-0.6987	-0.4607	-0.7312	-0.0991	-1.4188	0.1062	**-1.9380**	-0.2050	-1.7102	0.8745	0.1356
11. Thickness of sking of fruit (cm)	0.1333	1.3495	-0.0474	0.6938	0.6525	1.2449	1.0872	0.5436	1.2159	-0.1968	**-1.8604**	0.4044	0.1053	-0.5781**
12. Flesh thickness (cm)	-0.2157	-0.1240	0.6641	0.0216	0.4828	0.4666	0.2162	0.4321	-0.0184	0.5917	-0.1457	**0.6706**	-0.1727	0.4553*
13. TSS (°Brix)	0.6386	-0.1694	0.1941	-0.2289	-0.3213	-0.7294	0.1866	-0.1598	-0.6164	0.7246	0.0909	0.4135	**-1.6057**	0.0760

Residual effect :1-2.3089   rp = Phenotypic correlation   Bold and diagonal values are direct effects

*,** = significant at 5% and 1% level of probability, respectively.

Direct and indirect effects of all the traits were estimated at phenotypic and genotypic levels (Table 2 and 3). Number of fruits per plant have high direct effect on yield at both phenotypic and genotypic levels. This suggests good scope for improvement of yield in ridge gourd by selecting plants with more number of fruits per vine. The direct effect of fruit weight on yield per plant was negative but this negative effect was nullified by high positive indirect effect of node number at which first female flower appeared. Node number at which first female flower appeared and fruit volume also showed high direct effect on yield.

Among the crosses Jaipur long x Chitrada, PHS-10 x Chitrada and Jaipur long x Arka Sujat are found to be superior in the descending order of priority with regard to their performance for the advancement in the later generations.

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