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Correlation coefficient analysis for yield and yield attributing traits in ridge gourd (*Luffa acutangula* (L.) Roxb.)

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Abstract
An experiment was conducted with 14 genotypes and 18 different characters in Ridge gurd (*Luffa acutangula* (L.) Roxb.). To study the correlation of different characters on fruit yield. The experiment was conducted in a randomized block design. The overall analysis reveals that fruit yield was positively and significant correlated with fruit percent, number of fruits per plant, fruit length, average fruit weight, fruit diameter, vine length at 90 days, sex ratio and rind thickness while selecting a good hybrids for enhancing the yield of ridge gourd.

Keywords: correlation coefficient, attributing traits, ridge gourd, *Luffa acutangula*

Introduction
Ridge gourd [*Luffa acutangula* (Roxb.) L.], 2n=2x=26, is one of the important cucurbitaceous vegetable crop with old world origin in subtropical Asian region including particularly India. Ridge gourd, is grown throughout India in tropical and subtropical climate, both as spring-summer and rainy season crop known as ribbed gourd or angled gourd or silky gourd or angled loofah or vegetable gourd. Fruits of Luffa spp are very nutritious and good source of vitamin A, calcium, phosphorus, ascorbic acid and iron (Aykroyd 1963) [1]. In Karnataka, it occupies an area of 2,753 ha with an annual production of 18,706 tonnes of fleshy marketable fruits. Its immature fruits which are used as a vegetable, in many ways and are quite commonly used in cooked, fried and stuffed forms. Ridge gourd is monoecious in nature, which is considered as one of the fruit vegetables consumed and relished by most local people in India. Its tender fruits are used as cooked vegetable and also for making sweets in Africa and Asia.
The dried fruits are used as containers, utensils, fishing floats and some musical instruments. Genotypic correlation coefficient provides a measure of genotypic association between the characters and reveals the characters that might be useful as an index of selection. This also helps to decide the dependability of the characters that have little or no character could be hurtful for proper choice of parents for hybridization programme. The degree of association between independent and dependent variables was first suggested by Galton (1888) [3], its theory was developed by Pearson (1904) [9] and their mathematical utilization at phenotypic, genotypic and environmental levels was described by Searle (1961) [13]. The phenotypic correlateds were normally of genetic and environmental interaction which provided information about the association between the two characters. Genotypic correlated provided a measure of genetic association between the characters and normally used in selection while, environmental as well as genetic architecture of a genotype plays a great role in achieving higher yield combined with better quality.

Materials and Methods
The experiment was carried out at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology &Sciences, Allahabad. The experiment was conducted in Randomized Block Design having fourteen varieties in three replications. The allocation of treatments of the individual plots using random number in each replications. Allahabad is situated at an elevation of 78 meters above sea level at 25.87 degree North latitude and 81.15 degree E longitude. This region has a sub-tropical climate prevailing in the south-east part of U.P. with both the extremes in temperature, i.e. the winter and the summer. In cold winters, the temperature sometimes is as low as 32°F in December – January and very hot summer with temperature reaching up to 115°F in the months of May and June.

During winter, frosts and during summer, hot scorching winds are also not uncommon. The average rainfall is around 1013.4 mm, with maximum concentration during July to September months with occasional showers in winter.

The analysis of variance was done as suggested by Panse and Sukhatme. The correlation coefficients among all possible character combinations at phenotypic (rp) and genotypic (rg) level was estimated employing formula by Johnson *et al*. (1955) [4].

Results and Discussion

Data were recorded on 18 traits viz. days to taken first male flower, days to taken first female flower, days to 50 percent flowering, node to first male flower, node to first female flower, sex ratio, vine length cm at 90 days after sowing, days to first harvest, days to last harvest, fruit length (cm), flesh thickness (cm), rind thickness (mm), fruit set percent, fruit diameter (cm), number of fruits per plant, average fruit weight (g), fruit yield per plant (kg), fruit yield (q) per ha were subjected to analysis of variance to test the significance of difference among the varieties. Analysis of variance presented in showed that the varieties differed significantly for all the 18 characters.

As correlated coefficients are the index of association between two variables; these have been worked out in all possible combinations at genotypic (G) and phenotypic (P) levels are presented in (Table 1a & b).

Days to first male flowering had highly significant and positively associated with days to 50% flowering (0.966) days to taken first female flower (0.962), and days to 1st harvest (0.565), node to first female flower (0.564), vine length at 90 Days (0.403).

Days to first female flowering was highly significant and positively associated with days to 50 per cent flowering (0.97), days to first harvest (0.756), node to first female flower (0.675), node to first male flower (0.479).

Days to 50 per cent flowering had highly significant and positive association with days to first harvest (0.739), node to first female flower (0.608), days to last harvest (0.437), node to first male flower (0.385).

Node to first male flowering had highly significant and positive association with node to first female flower (0.833), days to first harvest (0.526), days to last harvest (0.332).

Node to first female flowering had highly significant and positive correlation with days to first harvest (0.589).

Sex ratio was highly significant and positive association with vine length at 90 days (0.774), average fruit weight (0.694), fruit yield per plant (0.590), fruit length (0.546), per cent fruit set (0.468), number of fruits per plant (0.461), and fruit diameter (0.422).

Vine length at 90 days after sowing was highly significant and positively associated with fruit length (0.779), average fruit weight (0.714), fruit yield per plant (0.624), fruit set percent (0.538), number of fruits per plant (0.517)), fruit diameter (0.479), rind thickness (0.43), flesh thickness (0.362).

Days to first harvest had highly significant and negative association with fruit set percent (-0.379), fruits per plant (-0.457), also positive and non significant with days to last harvest (0.369), fruits diameter (0.053), average fruit weight (0.048).

Days to first harvest had positive and non significant association with days to last harvest (0.369), fruit diameter (0.0539), average fruit weight (0.0480).

Days to last harvest had highly significant and positive association with rind thickness (0.47).

Fruit length cm had highly significant and positive association with fruit diameter (0.849), average fruit weight (0.828), fruit yield per plant (0.812), rind thickness (0.68), fruit percent (0.657), number of fruits per plant (0.629), rind thickness (0.446), flesh thickness.

Rind thickness cm was highly significant and positively associated with fruit diameter cm (0.561), fruit yield per plant (0.535), number of fruits per plant (0.481), fruit set percent (0.444), average fruit weight (0.416). Fruit set percent was highly significant and positively associated with number of fruits per plant (0.999), fruit yield per plant (0.927), fruit diameter (0.531), average fruit weight (0.529).

Fruit diameter was highly significant and positively associated with average fruit weight (0.876), fruit yield per plant (0.763), number of fruits per plant (0.495).

Number of fruits per plant was highly significant and positively associated with fruit yield per plant (0.920), average fruit weight (0.493). Similar results were obtained by Srivastava *et al*. [14], Mangal *et al*., Khattra *et al*. [6], and Rajeswari [11].

Average fruit weight was highly significant and positively associated with fruit yield per plant (0.800).

Fruits yield per plant kg was highly significant and positively associated with fruit percent (0.927), number of fruits per plant (0.920), fruit length (0.812), average fruit weight (0.800), fruit diameter (0.763), vine length at 90 days (0.624), sex ratio (0.590), rind thickness (0.535). These results are in confirmed with Varalakshmi *et al*., (1995) [15], Rao *et al*., (2000) [12], Chowdhury and Sarma (2002) [2] and Prasanna *et al*., (2002) [2] in ridge gourd.

Table 1a: Genotypic correlation coefficients among growth, earliness, yield and yield components in ridge gourd

Chr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1.00	0.962**	0.966**	0.314	0.564**	0.188	0.403*	0.565**	0.228	0.195	0.112	-0.2010	-0.0870	0.0348	-0.1900	0.2120	-0.0930	-0.0946	-0.0947
2		1.0000	0.97**	0.479**	0.675**	0.122	0.2341	0.756**	0.2461	0.0991	-0.006	-0.294	-0.297	-0.005	-0.388*	0.1537	-0.247	-0.246	-0.248
3			1.0000	0.384*	0.608**	0.106	0.271	0.739**	0.437*	0.155	-0.0836	-0.2025	-0.1917	-0.0259	-0.2671	0.124	-0.1768	-0.1745	-0.1730
4				1.0000	0.833**	0.010	-0.0129	0.5269**	0.3325*	-0.0563	-0.4283**	-0.1031	-0.569**	-0.0754	-0.516**	0.0995	-0.3406	-0.3380	-0.37*
5					1.0000	0.032	-0.0033	0.589**	0.2843	-0.2644	-0.352*	-0.2765	-0.572**	-0.2599	-0.596**	0.0152	-0.444**	-0.449**	-0.447**
6						1.0000	0.7742**	-0.1666	0.0357	0.5463	0.1271	0.2648	0.468**	0.422**	0.461**	0.694**	0.590**	0.589**	0.593**
7							1.0000	-0.1918	0.1161	0.7793**	0.362*	0.43**	0.538**	0.479**	0.517**	0.714**	0.624**	0.621**	0.622**
8								1.0000	0.3694	-0.0255	-0.2612	-0.3085	-0.379**	0.0539	-0.457**	0.0480	-0.2907	-0.2865	-0.2892
9									1.0000	0.2413	-0.392*	0.47**	-0.0237	0.0092	0.0583	-0.0158	0.0413	0.0360	0.0330
10										1.0000	0.446**	0.68**	0.657**	0.849**	0.629**	0.828**	0.812**	0.805**	0.809**
11											1.0000	0.45**	0.276	0.498**	0.165	0.348*	0.2619	0.2620	0.2625
12												1.0000	0.444**	0.561**	0.481**	0.416**	0.535**	0.531**	0.534**
13													1.0000	0.531**	0.999**	0.529**	0.927**	0.918**	0.923**
14														1.0000	0.495**	0.876**	0.763**	0.762**	0.766**
15															1.0000	0.493**	0.920**	0.919**	0.925**
16																1.0000	0.800**	0.796**	0.800**
17																	1.0000	1.007**	1.011**
18																		1.0000	1.008**
19																			1.0000

1 Days to Taken 1st Male Flowering 2. Days to Taken 1st Female Flowering 3. Days to 50% Flowering 4. Node to First Male Flower 5. Node to First Female Flower 6.Sex Ratio 7.Vine Length cm At 90 Days 8.Days to 1st harvest 9.Days to Last harvest 10.Fruit Length cm 11.Flesh Thickness cm 12.Rind Thickness mm 13.Fruit Set % 14.Fruit Diameter 15.Fruits/ Plant 16.Average Fruit Weight (g) 17.Fruit Yield/ Plant (g) 18.Fruit Yield/ Plot (kg) 19.Fruit Yield Q/ha

Table 1b: Phenotypic correlation coefficients among growth, earliness, yield and yield components in ridge gourd

Chr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1.0000	0.935**	0.905 **	0.2818	0.5469 **	0.1812	0.390*	0.536**	0.1674	0.1975	0.0929	-0.187	-0.082	0.033	-0.176	0.204	-0.099	-0.096	-0.096
2		1.00	0.924 **	0.455**	0.654 **	0.1243	0.2255	0.713**	0.2113	0.0845	-0.0228	-0.268	-0.258	-0.002	-0.363 *	0.152	-0.235	-0.238	-0.235
3			1.00	0.3571*	0.5882 **	0.1039	0.2665	0.6726**	0.3853*	0.1373	-0.0902	-0.195	-0.177	-0.031	-0.251	0.106	-0.160	-0.165	-0.168
4				1.0000	0.7704 **	0.0185	-0.0322	0.4729**	0.3138*	-0.0679	-0.411**	-0.089	-0.527 **	-0.062	-0.472 **	0.092	-0.299	-0.304	-0.306 *
5					1.0000	0.0267	0.0100	0.5386**	0.2354	-0.2576	-0.338*	-0.262	-0.536 **	-0.266	-0.584 **	0.024	-0.443 **	-0.434 **	-0.437 **
6						1.0000	0.7495**	-0.1477	0.0404	0.5246**	0.1174	0.259	0.434 **	0.415 **	0.454 **	0.682 **	0.580 **	0.582 **	0.57 **
7							1.0000	-0.1868	0.0881	0.7473**	0.349 *	0.411 **	0.519 **	0.461 **	0.482 **	0.690 **	0.596 **	0.602 **	0.600 **
8								1.0000	0.2999	-0.0163	-0.2568	-0.297	-0.328 *	0.041	-0.413 **	0.050	-0.261	-0.269	-0.264
9									1.0000	0.2106	-0.334 *	0.411 **	-0.007	0.024	0.061	0.010	0.040	0.050	0.055
10										1.00	0.429**	0.647**	0.590 **	0.829 **	0.607 **	0.793 **	0.769 **	0.781 **	0.775 **
11											1.00	0.436 **	0.254	0.474 **	0.148	0.310 *	0.247	0.247	0.246
12												1.00	0.437 **	0.546 **	0.458 **	0.402 **	0.508 **	0.517 **	0.511 **
13													1.00	0.496 **	0.925 **	0.500 **	0.841 **	0.857 **	0.849 **
14														1.00	0.477 **	0.849 **	0.751 **	0.754 **	0.745 **
15				*											1.00	0.472 **	0.878 **	0.891 **	0.880 **
16																1.00	0.770 **	0.777 **	0.768 **
17																	1.00	0.986 **	0.978 **
18																		1.00	0.983 **
19								*											1.00

1 Days to Taken 1st Male Flowering 2. Days to Taken 1st Female Flowering 3. Days to 50% Flowering 4. Node to First Male Flower 5. Node to First Female Flower 6.Sex Ratio 7.Vine Length cm At 90 Days 8.Days to 1st harvest 9.Days to Last harvest 10.Fruit Length cm 11.Flesh Thickness cm 12.Rind Thickness mm 13.Fruit Set % 14.Fruit Diameter 15.Fruits/ Plant 16.Average Fruit Weight (g) 17.Fruit Yield/ Plant (g) 18.Fruit Yield/ Plot (kg) 19.Fruit Yield Q/ha

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