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EVALUATION OF CORRELATION AND PATH ANALYSIS FOR YIELD AND YIELD-RELATED TRAITS IN RIDGE GOURD (*LUFFA ACUTANGULA* (L.) ROXB.) GENOTYPES

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ABSTRACT

The present investigation was made to determine correlation and path coefficient analysis of fruit yield with 12 yield-contributing traits in ridge gourd. Correlation studies indicated that genotypic correlation was higher than phenotypic correlation. Yield trait exhibited significant positive correlation with vine length at final harvest, number of primary branches, number of fruits per vine, average fruit weight, fruit length and fruit diameter. Path analysis identified the number of fruits per vine and average fruit weight as the key contributors to fruit yield per vine as they showed high positive direct effect, highlighting the potential to improve fruit yield in ridge gourd genotypes by selecting for these traits.
Keywords : Correlation, Path analysis, Ridge gourd, Genotypic, Direct and Indirect effect

Introduction

Cucurbits constitute a significant and extensive category of vegetable crops, among which Ridge gourd [*Luffa acutangula* (Roxb.) L.], 2n=2x=26, stands out as a crucial vegetable originating from the old world in the subtropical Asian region, specifically India (Kalloo, 1993). This versatile vegetable is commonly called as kalitori and is also known by various other names such as angled gourd, angled loofah, Chinese okra, silky gourd and ribbed gourd. Ridge gourd fruit is rich in essential nutrients and is an excellent source of calcium, phosphorus, vitamin C, iron and fiber (Aykroyd 1963). It is recommended for individuals suffering from malaria and other seasonal fevers due to its easy digestibility and appealing taste (Gautam *et al*., 2017). As a low-calorie vegetable, it is considered beneficial for individuals with diabetes (Pullaiah, 2006).

Cucurbitaceous vegetables, being high-volume crops, offer substantial potential for improvement by developing high-yielding varieties and hybrids to bridge the gap between supply and demand. Achieving this goal requires robust breeding programs. Yield is determined by multiple genes and can be affected by various environmental factors, making the selection process more complex. Therefore, understanding the relationship between different traits is crucial (Choudhary *et al*., 2008). Correlation analysis serves as a biometrical method to determine the nature and extent of relationship among different characteristics, whereas path coefficient analysis partition the correlation into direct and indirect effects and thus may be useful in choosing the characters that have direct and indirect effects on yield. Therefore, the examination of correlations and the path coefficient analysis for yield can assist in the identification and selection of yield component traits for the genetic

enhancement of quantitative traits, which exhibit a positive correlation (Methela *et al*., 2019; Ramesh *et al*., 2018) in ridge gourd.

Materials and Methods

The experiment was carried out at the field of Vegetable Farm, College of Horticulture, Bagalkot, during the rabi-summer season of the year 2023-24. The experiment was laid out in Randomized Block Design, with 38 genotypes in two replications. Ten plants per replication were raised. Two-week-old seedlings were planted at 2m x 1m spacing. Recommended agronomic practices were applied to the crop. Observations were recorded on five randomly-selected plants in each replication on vine length at final harvest (cm), number of primary branches per vine at final harvest, days to appearance of first male flower, days to appearance of first female flower, node to first male flower, node to first female flower, days taken to first harvest, sex ratio, number of fruits per vine, average fruit weight (g), fruit length (cm), fruit diameter (cm) and fruit yield per vine (kg).

Statistical analysis: Correlation co-efficient among all the possible character combinations at genotypic (rg) and phenotypic (rp) levels were estimated using the formula of Al-Jibouri *et al.* (1958) and path coefficient analysis was done as per Dewey and Lu (1959).

Results and Discussion

In the present study, correlation co-efficient analysis between the components of ridge gourd was worked out for 12 parameters as these characters influences the yield. The genotypic correlation was higher than the phenotypic correlation for all the traits, signifying minimal environmental influence and the existence of intrinsic association among various traits. In each case, more importance was placed on the genotypic correlation.

Fruit yield per vine showed positive and significant correlation with vine length at final harvest (0.481), number of primary branches per vine at final harvest (0.666), number of fruits per vine (0.719), average fruit weight (0.896), fruit length (0.459) and fruit diameter (0.234) both at genotypic (Table1) and phenotypic level. Since, these association of characters are in the desirable direction, selection for these traits may improve the yield per vine. Whereas fruit yield per vine had negative significant association with days to appearance of first male flower (-0.510), days to appearance of first female flower (-0.349), node at first male flower (-0.344), days taken to first harvest (-0.356) and sex ratio (-0.238) which implies that as days to first female and male flowering increases, fruit yield per vine decreases and might be due to fact that, lower number of nodes for first flower opening indicates earliness. A positive correlation between the desirable traits is favourable to plant breeder as it helps in the simultaneous improvement of both the characters, Similar findings were reported by Rao *et al*. (2000), Hanumegowda *et al*. (2012), Dubey *et al*. (2013b), Choudhary *et al*. (2014a), Narasannavar *et al*. (2014), Varalakshmi *et al.* (2015), Khatoon *et al*. (2016), Manoj *et al*. (2018a) and Ramesh *et al.* (2018) in ridge gourd.

In the present investigation, interrelations among these parameters were also seen to be positive and significant. Vine length was found to have a highly significant and positive association with the number of primary branches per vine at final harvest, number of fruits per vine, average fruit weight and fruit length. Therefore, selecting plants with greater vine length can enhance fruit yield, as a longer vine tends to increase the number of fruits per vine, thereby boosting overall yield. However, vine length showed a significant negative correlation with the days to appearance of the first male flower, days to appearance of the first female flower, node at the first male flower, node at the first female flower, days to first harvest and sex ratio (Table 1). Negative correlation with node number and days to appearance of first flowers influences the early bearing of the fruits which is a desirable character for the crop improvement. Similar results were also found by Choudary *et al*. (2014), Narasannanavar *et al.* (2014), Koppad *et al*. (2016), Bhusnar (2019) and Vijayakumar *et al*. (2020) in ridge gourd.

The number of primary branches per vine at final harvest exhibited a significant positive correlation with the number of fruits per vine, average fruit weight and fruit length. This implies that, by selecting for a higher number of primary branches, improvements in these associated traits can also be achieved. However, this trait showed a significant negative correlation with the days to appearance of the first male flower, days to appearance of the first female flower, node at first female flower, node at first male flower, days to first harvest and sex ratio. This indicates that while selecting for an increased number of primary branches, there may be a need to do some compromise on these other traits to achieve balanced improvement. Similar results were also noticed by Narasannanavar *et al*. (2014), Koppad *et al.* (2016), Ramesh *et al.* (2018) Bhusnar (2019) and Vijayakumar *et al.* (2020) in ridge gourd.

The number of fruits per vine showed a significant positive association with both average fruit weight and fruit length. Additionally, average fruit weight was significantly and positively correlated with fruit length,

fruit diameter and fruit yield per vine. Fruit length and fruit diameter also had a significant positive association with fruit yield per vine (Table 1). This implies that indirect selection for all these traits can help to improve fruit yield in ridge gourd. Therefore, applying selection pressure on these traits such as increasing the number of fruits per vine, average fruit weight, fruit length and fruit diameter can enhance the overall yield of the plant. This suggests that vines producing heavier fruits and having more fruits per vine are likely to yield more. These results are in agreement with the findings of Rao *et al*. (2000), Choudhary *et al*. (2008), Hanumegowda *et al.* (2012), Rabbani *et al*. (2012), Choudhary *et al.* (2014), Varalakshmi *et al.* (2015, Manoj *et al*. (2018), Mitu *et al* (2018), Kannan *et al*. (2019) and Vijayakumar *et al.* (2020) in ridge gourd.

Though correlation analysis can quantify the degree of association between any two characters, it does not provide the reasons for such an association. Simple linear correlation coefficient is designed to detect presence of linear association between two variables. This does not imply absence of any functional relationship between the two variables. Path coefficient analysis resolves this mystery by breaking the total correlation into components of direct and indirect effects. Thus, path analysis was performed to assess direct and indirect effects of various characters on fruit yield per vine. Considering fruit yield per vine as dependable character, the following direct and indirect effect was observed. On the trait, fruit yield per vine number of primary branches per vine at final harvest (0.2507), days to appearance of first female flower (0.9562), node at first female flower (0.2171), node at first male flower (0.0094), sex ratio (0.1861), number of fruits per vine (0.3173), average fruit weight (0.5061), fruit length (0.0109) and fruit diameter (0.0082) (Table 2) were found to have positive direct effect. Thus, the higher magnitude of positive direct effect of these traits explains the higher value of association between these traits on yield per vine. Indirect effects of most other parameters through these stated parameters were also positive. Therefore, direct selection for these traits would reward for yield improvement in ridge gourd, while vine length at final harvest (-0.0849), days to first male flower (-0.9308) and days taken to first harvest (-0.2699) had direct negative effect (Table 2), indirect effects via these parameters were also negative for several of the traits. These results are in line with the findings of Narasannanavar *et al*. (2014), Varalakshmi *et al.* (2015), Harshitha *et al*. (2019b), Vijayakumar *et al.* (2020), Dissanayaka *et al.* (2023) and Suvedha *et al*. (2024) in ridge gourd, Manikandan *et al*. (2017)in bottle gourd and Gangadhara *et al.* (2019) in cucumber.

Table 1: Genotypic correlation coefficients of yield and yield attributing components in ridge gourd genotypes.

Traits	1	2	3	4	5	6	7	8	9	10	11	12	13
1	**1.000**	0.362**	-0.584**	-0.505**	-0.341**	-0.304**	-0.445**	-0.450**	0.593**	0.503**	0.297**	0.017	0.481**
2		**1.000**	-0.694**	-0.656**	-0.571**	-0.383**	-0.595**	-0.500**	0.473**	0.579**	0.411**	0.170	0.666**
3			**1.000**	0.976**	0.418**	0.629**	0.968**	0.704**	-0.579**	-0.419**	-0.264**	-0.009	-0.510**
4				**1.000**	0.387**	0.593**	0.964**	0.700**	-0.397**	-0.296**	-0.185	0.021	-0.349**
5					**1.000**	0.316**	0.437**	0.528**	-0.328**	-0.319**	-0.131	-0.224	-0.344**
6						**1.000**	0.710**	0.302**	-0.417**	0.050	-0.120	-0.120	-0.113
7							**1.000**	0.604**	-0.375**	-0.285*	-0.187	-0.136	-0.356**
8								**1.000**	-0.348**	-0.289*	-0.173	-0.022	-0.238*
9									**1.000**	0.451**	0.281*	0.104	0.719**
10										**1.000**	0.435**	0.235*	0.896**
11											**1.000**	-0.002	0.459**
12												**1.000**	0.234*
13													**1.000**

* and ** indicate significant at 5% and 1% respectively

1-Vine length at final harvest(cm)
2-Number of primary branches per vine at final harvest
3-Days to appearance of first male flower
4-Days to appearance of first female flower
5-Node at first male flower
6- Node at first female flower
7- Days taken to first harvest
8- Sex ratio (M: F)
9- Number of fruits per vine
10- Average fruit weight (g)
11- Fruit length (cm)
12- Fruit diameter (cm)
13- Fruit yield per vine (kg)

Table 2: Genotypic path coefficient analysis among yield components in ridge gourd genotypes.

Traits	1	2	3	4	5	6	7	8	9	10	11	12	rG
1	**-0.0849**	0.0907	0.5438	-0.4825	-0.0032	-0.0659	0.1200	-0.0837	0.1882	0.2546	0.0033	0.0001	0.481**
2	-0.0307	**0.2507**	0.6459	-0.6275	-0.0054	-0.0831	0.1605	-0.0930	0.1501	0.2931	0.0045	0.0014	0.666**
3	0.0496	-0.1739	**-0.9308**	0.9331	0.0039	0.1366	-0.2613	0.1311	-0.1836	-0.2121	-0.0029	-0.0001	-0.510**
4	0.0428	-0.1645	-0.9083	**0.9562**	0.0037	0.1288	-0.2602	0.1303	-0.1261	-0.1500	-0.0020	0.0002	-0.349**
5	0.0290	-0.1431	-0.3894	0.3697	**0.0094**	0.0685	-0.1179	0.0983	-0.1042	-0.1612	-0.0014	-0.0019	-0.344**
6	0.0258	-0.0960	-0.5856	0.5672	0.0030	**0.2171**	-0.1915	0.0562	-0.1322	0.0251	-0.0013	-0.0010	-0.1130
7	0.0378	-0.1491	-0.9014	0.9220	0.0041	0.1541	**-0.2699**	0.1124	-0.1189	-0.1443	-0.0021	-0.0011	-0.356**
8	0.0382	-0.1253	-0.6556	0.6694	0.0050	0.0656	-0.1630	**0.1861**	-0.1104	-0.1461	-0.0019	-0.0002	-0.238*
9	-0.0503	0.1186	0.5386	-0.3799	-0.0031	-0.0905	0.1011	-0.0648	**0.3173**	0.2281	0.0031	0.0009	0.719**
10	-0.0427	0.1452	0.3900	-0.2834	-0.0030	0.0108	0.0769	-0.0537	0.1430	**0.5061**	0.0048	0.0019	0.896**
11	-0.0252	0.1030	0.2461	-0.1770	-0.0012	-0.0260	0.0506	-0.0321	0.0893	0.2201	**0.0109**	0.0000	0.459**
12	-0.0015	0.0425	0.0084	0.0197	-0.0021	-0.0260	0.0366	-0.0041	0.0330	0.1189	0.0000	**0.0082**	0.234*

Residual effect =**0.02006** Diagonal values indicate direct effect r G: Genotypic correlation coefficient of fruit yield per vine
* and ** indicate significant at 5% and 1% respectively

1- Vine length at final harvest (cm)
2- Number of primary branches per vine at final harvest
3- Days to appearance of first male flower
4-Days to appearance of first female flower
5-Node at first male flower
6- Node at first female flower
7- Days taken to first harvest
8- Sex ratio (M: F)
9- Number of fruits per vine
10- Average fruit weight (g)
11- Fruit length (cm)
12- Fruit diameter (cm)
13- Fruit yield per vine (kg)

Conclusion

The number of fruits per vine and average fruit weight were identified as the most significant contributors to fruit yield per vine, demonstrating high positive direct effects at both phenotypic and genotypic levels. For breeders, traits that exhibit a high positive correlation and direct effects at the genotypic level are particularly valuable for selection. Therefore, it can be concluded that the number of primary branches per vine, number of fruits per vine and average fruit weight are the most crucial traits affecting yield, due to their direct effects and strong positive correlations.

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References

Al-Jibouri, H., Miller, P.A. and Robinson, H.F. (1958). Genotypic and environmental variances and covariances in an upland Cotton cross of interspecific origin 1. *Agronomy Journal.*, **50(10),** 633-636.

Aykroyd, W.R. (1956). The nutritive value of Indian foods and the planning of satisfactory diets (No. 23). Manager of Publications.

Bhusnar, A.D. (2019). Genetic studies of f3 and f4 generation in ridge gourd *(Luffa Acutangula L.)* (Doctoral dissertation, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani).

Choudhary, B.R., Kumar, Suresh. and Sharma, S.K. (2014). Evaluation and correlation for growth, yield and quality traits of ridge gourd (*Luffa acutangula*) under arid conditions. *Indian Journal of Agricultural Sciences*, **84(4),** 498-502.

Choudhary, B.R., Pandey, S., Bhardwaj, D.R., Yadav, D.S. and Rai, M. (2008). Component analysis for qualitative traits in ridgegourd (*Luffa acutangula* (Roxb.) L.). *Vegetable Science*, **35(2),** 144-7.

Dewey, D.R. and Lu, K. (1959). A correlation and path-coefficient analysis of components of crested wheatgrass seed production 1. *Agronomy journal*, **51(9)**, 515-518.

Dissanayaka NB, Malathy P, Hettiarachchi K, Nilanthi WD, Ekanayaka EM, Kotandeniya WM, Pootan PN. (2023). Estimation of Genetic Parameters and Path Analysis on Yield and Yield-Related Characteristics of Ridged Gourd (*Luffa acutangula* L. Roxb.). Tropical Agriculturist. **171(2).**

Dubey, R.K., Singh, V. and Upadhyay, G. (2013). Variability, interrelationship, and path analysis for yield improvement in Luffa. *International Journal of Vegetable Science*, **19(4),** 342-351.

Gangadhara, K., Kumar, R., Selvakumar, R., Apparao, V.V. and Yadav, L.P. (2019). Evaluation of cucumber hybrids/lines for yield and quality under polyhouse. *International Journal of Current Microbiology and Applied Sciences*, **8(6)**, 1652-1661.

Gautam, A., Maurya, S.K. and Yadav, H. (2017). Genetic divergence and character association studies in indegenous ridge gourd (*Luffa Acutangula* (L.) Roxb.) genotypes. *Journal of Pharmacognosy and Phytochemistry*, **6(4),** 1769-1774.

Hanumegowda, K., Shirol, A.M., Mulge, R., Shantappa, T., Prasad Kumar, P.K. and Prasadkumar, P. (2012). Correlation co-efficient studies in ridge gourd [*Luffa acutangula* (L.) Roxb.].

Harshitha, S., Sood, M., Indiresh, K.M. and Prakash, B.G. (2019). Correlation Studies and Path Coefficient Analysis in Ridge Gourd [*Luffa acutangula* (L.) Roxb.] Genotypes. *Int. J. Curr. Microbiol. App. Sci*, **8(12),** 454-460.

Kalloo, G. (1993). Loofah: Luffa spp. In *Genetic improvement of vegetable crops*. 265-266. Pergamon.

Kannan, A., Rajamanickam, C., Krishnamoorthy, V. and Arunachalam, P. (2019). Genetic variability, correlation and path analysis in f4 generation of ridge gourd (Luffa acutangula (Roxb) L.). *International journal of chemical studies*, **7(3)**, 208-213.

Khatoon, U.Z.M.A., Dubey, R.K., Singh, V., Upadhyay, G. and Pandey, A.K. (2016). Selection parameters for fruit yield and related traits in [*Luffa acutangula* (Roxb.) L.]. *Bangladesh Journal Botany*, **45(1),** 75-84.

Koppad, S.B., Chavan, M. and Hallur, R. (2016). Character association studies and path coefficient analysis for yield and yield attributing traits in Ridge gourd [*Luffa acutangula* (L.) Roxb.]. *Electronic Journal of Plant Breeding*, **7(2),** 275-281.

Manikandan, M., Yassin, G.M., Kanthaswamy, V. and Kamaladevi, S. (2017). Correlation and path coefficient analysis in ash gourd [*Benincasa hispida* (Thunb) Cogn.] for yield and yield attributing traits. *ChemSci Rev Lett*, **6(23),** 1399-1403.

Manoj, Y.B., Lakshmana, D., Ganapathi, M. and Chandana, B.C. (2018). Studies on character association and genetic variability for important traits in ridge gourd (*Luffa acutangula* L.).

Methela, N.J., Islam, M.S., Mitu, N. and Latif, M.A. (2019). Mean performance and heritability studies of some ridge gourd (Luffa acutangula L.) genotypes. *Research in Agriculture Livestock and Fisheries*, **6(1),** 45-55.

Mitu, N., Islam, M.S., Sharmin, D., Latif, M.A. and Methela, N.J. (2018). Correlation and path analysis in some ridge gourd genotypes. *J. Agroforestry Environ*, **12(1),** 9-12.

Narasannavar, A., Gasti, V.D. and Malghan, S. (2014). Correlation and Path Analysis Studies in Ridge Gourd [*Luffa acutangula* (L.) Roxb.]. *Trends in Biosciences*, **7(13),** 1603-1607.

Pullaiah, T., (2006). *Encyclopaedia of world medicinal plants* (Vol. 1). Daya books.

Rabbani, M.G., Naher, M.J. and Hoque, S. (2012). Variability, character association and diversity analysis of ridge gourd (*Luffa acutangula* Roxb.) genotypes of Bangladesh.

Ramesh, N.D., Choyal, P., Dewangan, R., Gudadinni, P.S., Ligade, P.P. and Seervi, K.S., (2018). Correlation and path analysis study in studied in ridge gourd (*Luffa acutangula* (L.) Roxb.). *Int. J. Curr. Microbiol. App. Sci*, **7(08),** 1511-1519.

Rao, B.N., Rao, P.V. and Reddy, B.M.M. (2000). Correlation and path analysis in the segregating population of ridge gourd [*Luffa acutangula* (Roxb.) L.].

Suvedha, M., Marichamy, M.S., Kanthaswamy, V., Vengadessan, V. and Jyothsna, J. (2024). Trait Association and Path Analyses for Yield and Its Attributes in Ridge Gourd Commercial Hybrids (*Luffa acutangula* L.). *Journal of Advances in Biology & Biotechnology*, **27(6)**, 812-823.

Varalakshmi, B., Pitchaimuthu, M., Rao, E.S., Manjunath, K.S. and Swathi, S.H. (2015). Genetic variability, correlation and path analysis in ridge gourd [*Luffa acutangula* (Roxb.) L.]. *Journal of Horticultural Sciences*, **10(2),** 154-158.

Vijayakumar, R., Rajamanickam, C., Beaulah, A. and Arunachalam, P. (2020). Genetic variability, correlation and path analysis in F6 generation of ridge gourd (*Luffa acutangula* (Roxb) L.) for yield and quality. *Int. J. Curr. Microbiol. App. Sci*, **9(7),** 1012-1019.