Correlation and path coefficient analysis among different characters in germplasm ofridge gourd [Luffaacutangula L. (Roxb.)]

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Abstract: Correlation and path analysis studies conducted in thirty two germplasm of ridge gourd with the objective to know association among the characters viz.,node number to anthesis of first staminate flower,node number to anthesis of first pistillate flower, days to anthesis of first staminate flower, days to anthesis of first pistillate flower, days to first fruit harvest, average fruit length (cm), average fruit diameter (cm), number of fruits per plant, average fruit weight (g),total fruit yield/plant (kg) and vine length (m).

Keywords: Ridge gourd [LuffaacutangulaL. (Roxb.)], fruit yield (kg/plant),correlationand path analysis

1. INTRODUCTION

Ridge gourd [*Luffaacutangula*L. (Roxb.)]isone of the most popular vegetable both as spring summer and rainy season crop. The crop originated in India. It is cultivated in India, Indonesia, Malaysia, Myanmar, Philippines, SriLanka and Taiwan Saxena et al., (2018). Wide genetic variation for various morphological and fruit characteristics is observed in different parts of India Balakumar et al., (2008). Among the cucurbitaceous vegetables grown in India, gourd vegetables occupy an area of 73273 ha with an annual production of 685224 tonnes, Srivastava et al., (2014). In India, it is largely grown in Karnataka, Andhra Pradesh, Kerala, Tamil Nadu, Uttar Pradesh, Madhya Pradesh and Maharashtra states. In Karnataka, it occupies an area of 2,753 ha with an annual production of 18,706 tonnesof fleshy fruits (Anonymous, 2014).

Ridge gourd belongs to genus *Luffa* of family Cucurbiteceae Vaid et al., (2014). The genus derives its name from the product loofah, which is used in bathing sponges, scrubber pads, door mats, pillows, matteressa and also for cleaning utensils Chaudhary and Singh (2012). It contains a gelatinous compound called luffein and has medicinal importance Patel, S. (2012). Green fruits are cooked as vegetable Nagpal et al., (2012). Considering its medicinal use, commercial use of its by product in manufacturing household utensils, consumption of fleshy fruit as vegetable in daily food and its contribution to the welfare of people, there is a need to enhance the productivity level of this crop, Sharma et al., (2012).

Plants are generally monoecious in sex form with staminate and pistillate flowers, are borne separately in the same plant. Gynoecious, andromonocious, androecious, gynomonoecious and hermaphrodite sex from are also found in some genotypes. Inflorescence is axillary, solitary or clustered. The pistillate flowers are single which may or may not develop on the same leaf axil (in ridge gourd both the inflorescences appear on the same leaf axil). Sepals are 5-partite, glandular.

Ridge gourdfruits contain moisture (95.2g), fat (0.1%), minerals (0.5g), energy (17kcal), protein (0.5%), calcium (18mg), phosphorus (26mg), carbohydrate (3%), iron(0.5mg),carotene (33mg) and vitamin C (5 mg) in per 100 g of edible portion Singh et al., (2017). It has great medicinal value. A glycoprotein was isolated from seeds of *L. acutangula***L.,** which was found to be immunologically distinct from abortifacient proteins isolated from other members of the Cucurbitaceaefamily Yeung*et al*., (1991). Recently, this crop has been tested for its antioxidant (free radical scavenging-FRS) activity confirming the great interest of the nutraceutical sciences Ansari *et al*., (2005). Effectiveness of its extract as larvicidePrabakar and Jebanesan, (2004) and its seed oils as grain protectant against certain insects are not very far discoveries Mishra *et al*., (2007). Varietal uniformity is one of the main requirements for the improved cultivars Ansari et al., (2016.

2. MATERIALS AND METHODS

The experimental material for the present investigation comprised of 32 germplasm of ridge gourd, including PusaNasdar a national check collected from different places in India and being maintained at Main Experiment Station in the Department of Vegetable Science, N.D. University of Agriculture & Technology, Kumarganj, Faizabad (U.P.).The experiment was conducted in Randomized Block Design with three replications during summer season in 2014 to assess the performance of 32 germplasm.Six plants were maintained in each row and replicated thrice. Sowing was done at a spacing of 2.5 cm between row to row and 50 cm plant to plant having net plot size of 3x2.5 m. The germplasm were sown in 23-03-2014. All the recommended agronomic package of practices and plant protection measures were followed to raise a good crop.Observations were recorded on randomly selected six plants from each germplasm in each replication for the following characters,node number to anthesis of first staminate flower,node number to anthesis of first pistillate flower, days to anthesis of first staminate flower, days to anthesis of first pistillate flower, days to first fruit harvest, average fruit length (cm), average fruit diameter (cm), number of fruits per plant, average fruit weight (g),total fruit yield/plant (kg) and vine length (m).The correlations between different characters at genotypic (g) and phenotypic (p) levels were worked out between characters as suggested by Searle (1961). Path-coefficient analysis was carried out according to Dewey and Lu (1959).

3. RESULTS AND DISCUSSION

Correlation coefficient:-

Genetic correlation between characters could be due to linkage and pleiotropic effect of genes. Therefore, selection made for one trait influenced the other linked or pleiotropically affected traits. The fruit yield or economic yield in almost all the crops is referred as super characters, which result from multiple interactions of several other component characters that are termed as yield components. Thus identification of important yield components and information about their inter relationship with each other will be very useful for developing efficient breeding strategy.

In this respect, the correlation coefficient which provides symmetrical measurement of degree of association between two variables or characters helped in understanding the nature and magnitude of association among fruit yield and yield components.

The phenotypic correlation coefficients between different characters were generally similar in sign and nature to the corresponding genotypic correlation coefficient in the experiment. However, in general genotypic correlations were larger in magnitude from the corresponding phenotypic values. In the present study highly significant and positive correlation with fruit yield per plant, was observed at phenotypic level with number of fruits per plant followed by average fruit weight, days to first fruit harvest, days to anthesis of first pistillate flower, node number to anthesis of first pistillate flower and average fruit diameter. Significant and positive correlation was revealed highest with node number to anthesis of first staminate flower followed by average fruit length and days to anthesis of first staminate flower. Similar observations were also reported by Singh (2006), Jnawali (2016) in sponge gourd and Kumaran *et al*. (1998) in pumpkin.

Path coefficient analysis:-

The path coefficient analysis revealed appreciable amount of direct positive effect of number of fruits per plant followed by average fruit weight and days to first fruit harvest on fruit yield per plant while it shows direct negative effect of days to anthesis of first staminate flower followed by average fruit length and node number to anthesis of first staminate flower. The present findings are supported by Mohanty (2001) in pumpkin Mishra (2018); Pudake (2013); Singh (2015); Gupta et al., (2014). .The direct effect of remaining component traits may be highly influenced by the environmental factor and may be inconsistent in their expression with the change of environment. The present findings are supported by Rajput *et al.* (1996), Shrama and Bhutani (2001) in bitter gourd and Shah and Kale (2002) in ridge gourd.

Number of fruits per plant and average fruit weight showed indirect positive effect via. days to first fruit harvest on fruit yield whereas days to anthesis of first staminate flower and node number to anthesis of first staminate flower via. days to first fruit harvest on fruit yield. Such findings are in agreement of Bhave*et al.* (2003) in bitter gourd.

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S.	Char	Node	Node	Days	Days	Day	Ave	Ave	Nu	Ave	Vin	Tot

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Table-1Estimates of phenotypic correlation coefficients among eleven characters in ridge gourd

No.	**acter**	**No. to anthesis of 1st staminate flower**	**No. to anthesis of 1st pistillate flower**	**to anthesis of 1st staminate flower**	**to anthesis of 1st pistillate flower**	**s to first fruit harvest**	**rage fruit length (cm)**	**rage fruit diameter (cm)**	**mber of fruits per plant**	**rage fruit weight (g)**	**e length (m)**	**al fruit yield per plant (kg)**
1	Node No. to anthesis of 1st staminate flower	**1.0000**	0.7798**	0.4428**	0.4392**	0.4240**	0.0383	0.2483*	0.3833**	0.0237	0.0025	0.2406*
2	Node No. to anthesis of 1st pistillate flower		**1.0000**	0.4111**	0.4261**	0.4632**	0.1259	0.2554*	0.4359**	0.2287*	0.0539	0.4009**
3	Days to anthesis of 1st staminate flower			**1.0000**	0.6566**	0.4942**	-0.1624	0.0726	0.1770	0.2331*	0.2324*	0.1489*
4	Days to anthesis of 1st pistillate flower				**1.0000**	0.8673**	0.0681	0.3628**	0.4017**	0.5451**	-0.1305	0.4912**
5	Days to first fruit harve					**1.0000**	0.2034*	0.4179**	0.6247**	0.6288**	-0.0659	0.6972**

	st											
6	Average fruit length (cm)						**1.0000**	0.3047**	0.0878	0.3738**	0.0651	0.2386*
7	Average fruit diameter (cm)							**1.0000**	0.3136*	0.2327*	-0.2862**	0.3487**
8	Number of fruits per plant								**1.0000**	0.4787**	0.0597	0.8389**
9	Average fruit weight (g)									**1.0000**	0.0331	0.7451**
10	Vine length (m)										**1.0000**	0.0761

*, ** Significant at 5% and 1% probability levels, respectively.

Table-2Estimates of genotypic correlation coefficients among eleven characters in ridge gourd

S. No.	**Character**	**Node No. to anthesis of 1st staminate flower**	**Node No. to anthesis of 1st pistillate flower**	**Days to anthesis of 1st staminate flower**	**Days to anthesis of 1st pistillate flower**	**Days to first fruit harvest**	**Average fruit length (cm)**	**Average fruit diameter (cm)**	**Number of fruits per plant**	**Average fruit weight (g)**	**Vine length (m)**	**Total fruit yield per plant (kg)**
1	Node No to anthe	**1.0000**	0.7996	0.3837	0.3658	0.3466	-0.0401	0.1662	0.3212	-0.1486	-0.1388	0.1214

	sis of 1st stami nate flowe r											
2	Node No to anthe sis of 1stpist illate flowe r		**1.000 0**	0.324 3	0.334 8	0.38 19	0.03 83	0.15 92	0.39 92	0.10 31	-0.0 682	0.3 394
3	Days to anthe sis of 1st stami nate flowe r			**1.000 0**	0.535 1	0.27 40	-0.42 28	-0.21 24	-0.01 31	-0.08 81	0.0 405	-0.1 567
4	Days to anthe sis of 1stpist illate flowe r				**1.000 0**	0.82 88	-0.08 62	0.21 50	0.29 99	0.38 84	-0.4 268	0.3 539
5	Days to first fruit harve st					**1.00 00**	0.06 74	0.28 07	0.59 65	0.50 00	-0.3 799	0.6 382
6	Avera ge fruit lengt h (cm)						**1.00 00**	0.23 40	0.01 15	0.30 27	-0.0 279	0.1 483
7	Avera ge fruit diame ter (cm)							**1.00 00**	0.23 23	0.07 22	-0.5 017	0.2 417
8	Num								**1.00**	0.39	-	0.8

	ber of fruits per plant								**00**	55	0.0834	687
9	Average fruit weight (g)									**1.0000**	-0.1896	0.7246
10	Vine length (m)										**1.0000**	-0.1835

Table-3 Direct and indirect effects of 10 characters on total fruit yield/plant (kg) at phenotypic level in ridge gourd

S. No.	**Character**	**Node No. to anthesis of 1st staminate flower**	**Node No. to anthesis of 1stpistillate flower**	**Days to anthesis of 1st staminate flower**	**Days to anthesis of 1stpistillate flower**	**Days to first fruit harvest**	**Average fruit length (cm)**	**Average fruit diameter (cm)**	**Number of fruits per plant**	**Average fruit weight (g)**	**Vine length (m)**	**Total fruit yield per plant (kg)**
1	Node No to anthesis of 1st staminate flower	**-0.0593**	-0.0462	-0.0263	-0.0260	-0.0251	-0.0023	-0.0147	-0.0227	-0.0014	-0.0001	0.2406
2	Node No to anthesis of 1stpistillate flower	0.0823	**0.1056**	0.0434	0.0450	0.0489	0.0133	0.0270	0.0460	0.0242	0.0057	0.4009
3	Days to	-0.081	-0.075	**-0.183**	-0.120	-0.09	0.0299	-0.01	-0.03	-0.04	-0.0	0.1489

	anthesis of 1st staminate flower	4	6	**9**	7	09		33	25	29	427	
4	Days to anthesis of 1st pistillate flower	0.0088	0.0086	0.0132	**0.0202**	0.0175	0.0014	0.0073	0.0081	0.0110	-0.0026	0.4912
5	Days to first fruit harvest	0.0636	0.0695	0.0741	0.1300	**0.1499**	0.0305	0.0627	0.0937	0.0943	-0.0099	0.6972
6	Average fruit length (cm)	-0.0024	-0.0077	0.0100	-0.0042	-0.0125	**-0.0614**	-0.0187	-0.0054	-0.0230	-0.0040	0.2386
7	Average fruit diameter (cm)	0.0167	0.0171	0.0049	0.0244	0.0281	0.0205	**0.0671**	0.0211	0.0156	-0.0192	0.3487
8	Number of fruits per plant	0.2022	0.2300	0.0934	0.2119	0.3296	0.0463	0.1655	**0.5276**	0.2526	0.0315	0.8389
9	Average fruit weight (g)	0.0098	0.0941	0.0959	0.2242	0.2586	0.1537	0.0957	0.1969	**0.4113**	0.0136	0.7451
10	Vine length (m)	0.0003	0.0056	0.0241	-0.0136	-0.0068	0.0068	-0.0297	0.0062	0.0034	**0.1039**	0.0761

Table-4 Direct and indirect effects of 10 characters on total fruit yield/plant (kg) at genotypic level in ridge gourd

S. No.	Character	Node No to anthesis of 1st staminate flower	Node No to anthesis of 1stpistillate flower	Days to anthesis of 1st staminate flower	Days to anthesis of 1stpistillate flower	Days to first fruit harvest	Average fruit length (cm)	Average fruit diameter (cm)	Number of fruits per plant	Average fruit weight (g)	Vine length (m)	Total fruit yield per plant (kg)
1	Node No to anthesis of 1st staminate flower	**-0.1406**	-0.1124	-0.0539	-0.0514	-0.0487	0.0056	-0.0234	-0.0451	0.0209	0.0195	0.1214
2	Node No to anthesis of 1stpistillate flower	0.1463	**0.1829**	0.0593	0.0613	0.0699	0.0070	0.0291	0.0730	0.0189	-0.0125	0.3394
3	Days to anthesis of 1st staminate flower	-0.0697	-0.0589	**-0.1817**	-0.0972	-0.0498	0.0768	0.0386	0.0024	0.0160	-0.0074	-0.1567
4	Days to anthesis of 1stpistillate flower	0.0123	0.0113	0.0180	**0.0337**	0.0279	-0.0029	0.0072	0.0101	0.0131	-0.0144	0.3539
5	Days to first fruit harve	0.0210	0.0231	0.0166	0.0502	**0.0605**	0.0041	0.0170	0.0361	0.0303	-0.0230	0.6382

	st											
6	Average fruit length (cm)	0.0028	-0.0027	0.0294	0.0060	-0.0047	**-0.0696**	-0.0163	-0.0008	-0.0211	0.0019	0.1483
7	Average fruit diameter (cm)	0.0007	0.0007	-0.0009	0.0009	0.0012	0.0010	**0.0042**	0.0010	0.0003	-0.0021	0.2417
8	Number of fruits per plant	0.2042	0.2538	-0.0083	0.1906	0.3793	0.0073	0.1477	**0.6358**	0.2514	-0.0530	0.8687
9	Average fruit weight (g)	-0.0582	0.0403	-0.0345	0.1520	0.1957	0.1184	0.0283	0.1547	**0.3913**	-0.0742	0.7246
10	Vine length (m)	0.0026	0.0013	-0.0007	0.0079	0.0070	0.0005	0.0092	0.0015	0.0035	**-0.0184**	-0.1835

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