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Inter-correlation and path co-efficient analysis for agro-morphological and yield traits in bottle gourd (*Lagenaria siceraria*)

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Abstract

The study was carried on Inter-correlation and path co-efficient analysis of bottle gourd (*Lagenaria siceraria*) at Vegetable Research Farm, RLBCAU, Jhansi, Uttar Pradesh during *kharif* 2022. A total of 30 genotypes were sown in a randomized block design with three replications. Observations were recorded on 15 characters. Higher magnitude of GCV and PCV was recorded for fruit length (cm), fruit width (cm) and yield/plant (Kg/plant). The insignificant difference between GCV and PCV was recorded for most of the traits indicated that traits were less impacted by the environment. The inter-character association at phenotypic and genotypic correlation coefficients suggested that yield/plant recorded highly positive significant correlation with fruit width, average fruit weight and number of fruits/plant at both genotypic and phenotypic levels. Path coefficient analysis revealed highly positive direct contribution towards yield/plant with number of fruits/plant, fruit width and average fruit weight at both genotypic and phenotypic level. On the other hand, vine length, days to first flowering bud, days to first fruit setting, days to first fruit picking and fruit length showed negative direct effect on fruit yield/pant.

Key words: Genotypes, Correlation, Path, Genotypic correlation, Phenotypic correlation

Bottle gourd (*Lagenaria siceraria* L.)*;* 2n= 2x=22 belonging to family Cucurbitaceae is most significant vegetable in India. It is widely grown in the tropics and sub-Tropics, primarily for its fruit. It is a monoecious, diploid, annual and climbing or prostrate plant with delicate pubescence (Singh and Kumarnag, 2023). The correlation coefficient would indicate the relationship among independent and dependent variables without specifying cause and effect (Akinnola, 2012). The genetic improvement in dependent parameters can be achieved by applying strong selection to a character which is genetically correlated with dependent parameters (Al-Jibouri *et al*., 1958). Selection for yield and quality traits can be achieved to best possible extent if information about correlation between such traits is available followed by better understanding of association between the relevant characters provided by path coefficient analysis (Muralidharan *et al.,* 2017).

MATERIALS AND METHODS

The study was undertaken during *kharif* 2022 at Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh. Total 30 genotypes were collected from different sources like State Agricultural universities, ICAR-Institutions, local collections and private companies. The genotypes are laid out in 3 m × 3 m plot size with a spacing of 0.6 m between each 5 plants in a plot. The observations were recorded from 3 randomly selected plants from each genotype for 15 different characters. Correlation coefficient analysis reveals the association of characters, i.e. a change in one character brought about by a change in other character. Phenotypic and genotypic correlation coefficients between different variables were calculated by using the covariance technique (Al-Jibouri *et al.* 1958). Path coefficient analysis term coined by Wright (1921) and explained by Dewey and Lu (1959) was executed separately to know the direct and indirect effects of the important component traits on yield per plant.

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RESULTS AND DISCUSSION

Fruit width showed positively significant correlation with average fruit weight and yield/ plant revealing that these characters may be given importance in the selection of high-yielding genotypes. It also showed negatively significant association with fruit length at both genotypic and phenotypic levels, indicating that these traits would be eliminated during selection (Muralidhara *et al.* 2017). Ascorbic acid content recorded highly positive significant association with days to first fruit setting, first fruit picking and vine length and highly significant negative association with protein content at phenotypic level. Whereas, total soluble solid, protein content and ascorbic acid content at both genotypic and phenotypic level showed non-significant association with yield/plant (Table 1).

So, it can be inferred that simultaneous selection for fruit yield/plant and quality may not be possible and balanced selection criteria must be worked out to find out acceptable level of characters under improvement. Chandrashekhar *et al.* (2018), Rehan *et al.* (2020), Ahmad

et al. (2019) and Rambabu *et al.* (2017) also reported similar findings. The node number to first female flower appearance, average fruit weight, number of fruits/plant and fruit length recorded highest positive direct effect on fruit yield/plant followed by days to first flowering and vine length indicating that simultaneous improvement in fruit yield/plant is possible though manifestation of this trait. Node number to first male flower appearance, days to first fruit picking, days to first fruit setting, total soluble solids, protein content and ascorbic acid content recorded negative direct effect on yield/plant suggesting that this can be nullified by selecting positive indirect effects during the selection (Table 2). These results are similar to those of Panigrahi *et al.* (2018), Muralidharan *et al.* (2017), Husna *et al.* (2011) and Janaranjani and Kanthaswamy (2019).

Table 1. Estimation of genotypic correlation coefficients for different characters

Trait	DFFB	FMFEN	FFFEN	FFS	FFP	FL	FW	FWt	NFPP	VL	TSS	PC	AAC	YPP
DFFB	1													
FMFEN	-0.098	1												
FFFEN	0.065	0.950 **	1											
FFS	0.842 **	-0.171	0.062	1										
FFP	0.854 **	-0.199	0.017	0.995 **	1									
FL	-0.277	0.126	-0.016	-0.139	-0.110	1								
FW	0.164	0.056	0.100	0.022	-0.014	-0.840 **	1							
FWt	0.007	0.129	0.057	0.048	0.010	-0.177	0.533 **	1						
NFPP	-0.060	-0.059	-0.031	-0.083	-0.135	0.107	0.130	0.312	1					
VL	0.308	-0.189	-0.097	0.290	0.269	-0.090	-0.022	-0.283	0.023	1				
TSS	-0.062	0.061	0.020	-0.198	-0.209	0.002	0.069	0.004	-0.100	-0.143	1			
PC	0.016	0.498 **	0.507 **	-0.081	-0.081	0.078	0.089	0.051	0.013	-0.145	0.177	1		
AAC	0.185	-0.302	-0.272	0.323	0.316	0.135	-0.045	-0.036	0.022	0.255	-0.021	-0.325	1	
YPP	-0.069	0.033	-0.006	-0.050	-0.106	-0.035	0.396 *	0.817 **	0.799 **	-0.172	-0.055	0.032	-0.019	1

*Significance at 5% level, **Significance at 1% level

Table 2. Direct (diagonal) and indirect diagonal (above and below diagonal) genotypic path effects of different characters towards yield

Trait	DFFB	FMFEN	FFFEN	FFS	FFP	FL	FW	FWt	NFPP	VL	TSS	PC	AAC	YPP
DFFB	**0.08591**	0.03781	0.02245	-0.00366	-0.16009	-0.02772	0.00211	0.0052	-0.03252	0.00058	0.0013	-0.00026	-0.00073	-0.0696
FMFEN	-0.00842	**-0.38564**	0.32654	0.00075	0.03744	0.01265	0.00072	0.09008	-0.03162	-0.00036	-0.00128	-0.00814	0.00119	0.0339
FFFEN	0.00561	-0.36652	**0.34358**	-0.00027	-0.0032	-0.00165	0.00129	0.0401	-0.01708	-0.00018	-0.00042	-0.00829	0.00107	-0.006
FFS	0.07237	0.06611	0.02159	**-0.00435**	-0.18663	-0.01389	0.00029	0.03387	-0.04493	0.00055	0.0041	0.00133	-0.00127	-0.0509
FFP	0.07337	0.07703	0.00586	-0.00433	**-0.18746**	-0.011	-0.00019	0.00755	-0.07265	0.00051	0.00435	0.00133	-0.00125	-0.1069
FL	-0.02384	-0.04886	-0.00569	0.00061	0.02065	**0.09988**	-0.0108	-0.12286	0.05772	-0.00017	-0.00004	-0.00129	-0.00053	-0.0352
FW	0.0141	-0.02162	0.03458	-0.0001	0.00276	-0.08394	**0.01285**	0.37045	0.06999	-0.00004	-0.00143	-0.00147	0.00018	0.3963 *
FWt	0.00064	-0.05005	0.01985	-0.00021	-0.00204	-0.01768	0.00686	**0.69408**	0.1676	-0.00054	-0.00009	-0.00085	0.00014	0.8177 **
NFPP	-0.00521	0.02274	-0.01094	0.00036	0.0254	0.01075	0.00168	0.21693	**0.53626**	0.00004	0.00209	-0.00023	-0.00009	0.7998 **
VL	0.02648	0.07322	-0.03349	-0.00126	-0.05054	-0.00906	-0.00028	-0.19649	0.01246	**0.0019**	0.00297	0.00237	-0.00101	-0.1727
TSS	-0.00539	-0.02376	0.00689	0.00086	0.03935	0.00021	0.00089	0.00292	-0.05408	-0.00027	**-0.0207**	-0.0029	0.00009	-0.0559
PC	0.00137	-0.19219	0.17433	0.00035	0.01531	0.00787	0.00115	0.03601	0.00739	-0.00028	-0.00368	**-0.01634**	0.00128	0.0326
AAC	0.01597	0.11659	-0.09361	-0.00141	-0.05941	0.01353	-0.00058	-0.02535	0.01211	0.00048	0.00045	0.00532	**-0.00393**	-0.0198

Residual effect - 0.0024

The DFFB, days to first flowering bud, FMFEN, first male flower at early node, FFFEN, first female flower at early node, FFS, days to first fruit setting, FFP, days to first fruit picking, FL, fruit length (cm), FW, fruit width (cm), F Wt, average fruit weight (g), NFPP, number of fruits per plant, YPP, yield per (kg/plant), YPH, yield per (q/ha), VL, vine length (cm), TSS, total Soluble Solid (°Brix), PC, protein content (mg/100g), ACC and ascorbic acid content (mg/100g)

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