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Correlation Studies for Yield Attributing Traits in Cauliflower (*Brassica oleracea* L. var. *botrytis*)

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ABSTRACT: For crop improvement, having access to varied parental lines is crucial. Yield being a complex and polygenic trait is influenced by number of component characters. Study on correlation between yield and its component characters may be helpful in making selection of superior genotypes. Thus, an attempt was made to estimate genotypic and phenotypic correlation by conducting experiment at Vegetable Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar (U.K.) during 2019. 43 genotypes of cauliflower were grown in Randomized Block Design. The study was primarily focused on assessing correlation coefficient analysis. For each parameter, the genotypic correlation coefficient was greater than the matching phenotypic correlation coefficient. Curd yield per hectare was shown to be extremely positive and significantly correlated with marketable curd weight, net curd weight, number of leaves per plant, and gross plant weight according to estimates of phenotypic and genotypic correlation. Hence, selection for these traits may be feasible to enhance breeding programmes like hybridization and yield.

Keywords: Cauliflower, Genotypic correlation, Phenotypic correlation, curd yield.

INTRODUCTION

Cauliflower (*Brassica oleracea* var. *botrytis* L.) is one of the most important cool season crop which is commonly consumed in almost every household in India. It belongs to the family *Brassicaceae* and is cultivated for its white edible component known as curd. It has chromosome number (n=9) which is also shared by all *Brassica oleracea* variants. *Brassica oleraceae* is a triple tetrasomic plant having six basic genomes and some secondary pairs. Its genomic formula is ABBCCDEEF (Gerhard, 1960). Cauliflower is a cruciferous vegetable crop that is highly nutritious, vital, and naturally high in fibre and B-vitamins. It contains vitamins to the tune of 70 IU vitamin A, 56 mg/100 g vitamin Band 75mg/100g vitamin C. Among the minerals, it constitutes of 0.35 per cent Ca, 0.76 percent P, 3.58 per cent K, 117mg Fe and 36 mg Cu. Besides vitamins and minerals cauliflower also contains 2.4 per cent protein, 4.9 per cent total carbohydrate, 0.2 per cent fat and 91.7 per cent water (Brown and Hutchison 1949). Nonetheless, given that a sizeable section of the population is undernourished, it is vital to ensure nutritional security to the population through a balanced diet. Given that yield in a plant is the result of the interplay of many correlated characteristics, understanding the relationships between characters can be very helpful in making an objective choice of desired characters. In addition to being poly genetically regulated, it is also influenced by the shifting environment. It is possible to improve the yield of cauliflower by a methodical and planned selection programme for one or more direct or indirect yield components due to the availability of a large range of variability. The current investigation was carried out with the aforementioned facts in mind to ascertain the type and degree of correlation between different yield attributing traits of cauliflower.

MATERIALS AND METHODS

The present investigation was conducted at Vegetable Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar, U.S. Nagar (Uttarakhand) during 2018-2019. The experimental material comprised of 43 genotypes (30 F_1 and 13 parents). The experiment was laid out in Randomized Block Design at Vegetable Research Centre. Observations were recorded for nine quantitative characters *viz.,* plant spread (cm), plant height (cm), gross plant weight (g), number of leaves per plant, marketable curd weight (g), net curd weight (g), days to harvest, curd size index (cm^2) and curd yield per hectare (q/ha). The collected data was statistically analysed to determine the correlation co-efficient as per method suggested by Searle's (1961).

RESULTS AND DISCUSSION

As yield is a significant result of numerous associated features, it is crucial to understand how different traits correlate with one another. As a result, research on the connection is required for efficient selection. Table 1 provides the estimates of the phenotypic and genotypic correlation coefficients for various features. In the present investigation the plant spread, gross plant weight, number of leaves per plant, marketable curd weight, net curd weight, curd size index and curd yield per hectare showcased positive and significant genotypic as well as phenotypic correlation with plant spread whereas, days to harvest had non-significant correlation values for the same. In case of plant height all the traits showcased positively significant correlation values except for days to harvest which had negative values for plant height. Marketable curd weight also expressed positively significant correlated with plant spread, plant height, number of leaves, and gross plant weight. The positively significant correlation values were observed for the net curd weight and curd size index for plant spread, plant height, number of leaves, gross plant weight, and marketable curd weight. However, the days to harvest expressed non-significant positive to negative ranged values for all the above-mentioned traits. Therefore, these traits did not show any significant relation with days to harvest but perhaps have indirect effect which might affects the curd quality. The curd yield established significantly positive correlation with plant spread, plant height, number of leaves, gross plant weight, marketable curd weight, net curd weight and curd size index but showcased negative non-significant correlation with days to harvest.

Table 1: Correlation coefficient between different characters of cauliflower at phenotypic (P) and genotypic (G) level.

Characters	Plant spread	Plant height	Gross plant weight	Number of leaves per plant	Marketable curd weight	Net curd weight	Curd size index	Days to harvest	Curd yield per hectare
Plant spread (G)	1								
(P)	1								
Plant height (G)	0.668**	1							
(P)	0.636**	1							
Gross plant weight (G)	0.5864**	0.715**	1						
(P)	0.568**	0.645**	1						
Number of leaves per plant (G)	0.352**	0.559**	0.568**	1					
(P)	0.349*	0.523**	0.545**	1					
Marketable curd weight(G)	0.5198**	0.671**	0.897**	0.649**	1				
(P)	0.504**	0.643**	0.882**	0.623**	1				
Net curd weight (G)	0.455**	0.619**	0.868**	0.623**	0.998**	1			
(P)	0.441**	0.591**	0.851**	0.589**	0.984**	1			
Curd size index (G)	0.473**	0.703**	0.810**	0.657**	0.914**	0.911**	1		
(P)	0.465**	0.678**	0.780**	0.629**	0.893**	0.889**	1		
Days to harvest (G)	0.171	-0.062	0.105	-0.096	-0.006	-0.008	-0.052	1	
(P)	0.155	-0.054	0.096	-0.009	-0.006	-0.008	-0.053	1	
Curd yield per hectare (G)	0.519**	0.671**	0.892**	0.649**	0.962**	0.998**	0.914**	-0.006	1
(P)	0.504**	0.643**	0.882**	0.623**	0.942**	0.984**	0.893**	-0.006	1

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Crop improvement programmes heavily rely on the presence of sufficient variability and associations between various traits, which are necessary for carrying out an efficient selection programme. Correlation analysis thus serves as an essential strategy in a breeding programme. It provides insight into the relationships between the numerous characters and identifies the component characters for which selection can be made to improve the yield genetically. Yield is regarded as a complex, polygenic, and highly variable character that is influenced by the interactions between its component characters. As a result, direct selection for yield might not be very efficient and accurate. Therefore, finding the direction and degree of association between two characters at the phenotypic and genotypic levels becomes important. According to Johnson *et al.* (1955), utilizing correlation between several characters can increase selection efficiency. The genotypic correlation coefficient gives a true association between two traits and is most helpful in selection. The phenotypic correlation reveals the amount of the observed relationship between two characters and includes both inherited and environmental factors.

Significant correlation between yield and number of other traits has also been reported in number of studies. According to Meena *et al.* (2011), the genotypic correlation coefficient is greater than the equivalent phenotypic correlation coefficient for all the factors. To successfully screen possible genotypes in a breeding programme, these features might be employed as a selection criterion. Moreover, at both genotypic and phenotypic levels, Santhosha *et al.* (2015) found a highly significant positive correlation between marketable curd weight and gross plant weight, number of leaves, plant spread, and plant height. Net curd weight was substantially connected with curd output per hectare, followed by marketable curd weight, curd

size index, gross plant weight, and the number of leaves per plant Chittora and Singh (2014). Kanwar and Korla (2002) observed significant positive association of net curd weight with gross plant weight, leaf length and leaf breadth at genotypic and phenotypic level. A significant and favourable association between net curd weight and marketable curd weight were also reported by Nimkar and Korla (2008); Kumar *et al.* (2005); Sheemar *et al*. (2012); Nimkar (2013). The yield was found to be positively and significantly linked with net curd weight and observed by Kumar *et al*. (2010); Kumar *et al*. (2011). Meena *et al.* (2014) noticed that yield was positively and significantly correlated with all the characters except days to maturity and stalk length at both genotypic and phenotypic level. This indicated that selection based on these characters either in combination or alone will result in selection of genotypes having high yield potential. Manaware *et al.* (2017) observed a significant negative correlation of stalk length at 45 DAT with days to curd initiation, days to 50% curd formation and number of leaves per plant at 45 DAT. Significant and positive correlation was observed for number of leaves per plant at 45 DAT with curd circumference, curd width, days to curd initiation, total plant weight, curd weight, curd length, days to 50% curd formation, core length and days to harvest. Also, net curd weight was found to be significantly and positively correlated with curd weight.

CONCLUSIONS

Curd production per hectare was shown to be extremely positive and significantly connected with marketable curd weight, net curd weight, curd diameter, number of leaves per plant, and gross plant weight, according to estimates of phenotypic and genotypic correlation. As a result, selection for these traits may be possible to increase yield. It is therefore possible to draw the conclusion that the genotypic and phenotypic correlation parameter could be taken into account for the formation of elite hybrids through heterosis breeding or for the establishment of inbred lines after pure line selection in subsequent generations.

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Conflict of Interest. None.

REFERENCES

Brown, H. D. and Hutchison, C. S. (1949). Vegetable Science. J.B. Lippincot Company. New York, pp. 21-30.

Chittora, A. and Singh, D. K. (2014). Genetic diversity and correlation studies in early cauliflower (*Brassica oleracea* var. *botrytis* L.). M.Sc. Thesis, G.B.P.U.A & T., Pantnagar, Uttarakhand (2014).

Gerhard, R. (1960). Beitragezur Analyse des *Brassica* Genomes. *Chromosoma, 11*, 205.

Johnson, H. W., Robinson, H. F. and Comstock, R. E. (1955). Genotypic and phenotypic correlations in soybeans and their implications in selection. *Agronomy J.*, *47*(10), 477-483.

Kanwar, M. S. and Korla, B. N. (2002). Evaluation of biparental progenies for horticultural and quality traits in late cauliflower (*Brassica oleracea* var. *botrytis* L.). *Indian J. Genet. Plant Breed., 62*(4), 328-330.

Kumar, D., Kohli, U. K., Kanwar, H. S. and Mehta, S. (2005). Correlation and path analysis in snowball type cauliflower (*Brassica oleracea* var. *botrytis* L.). *Indian J. Hort*., *62*(4), 409-410.

Kumar, M., Sharma, S. R., Kalia, P. and Saha, P. (2010). Genetic variability and character association for quantitative and quality traits in early maturing Indian cauliflowers. *Indian J. Hort*., *67*, 218-223.

Kumar, M., Sharma, S. R., Kalia, P. and Saha, P. (2011). Genetic Variability and character association for yield and quality traits in early maturing Indian cauliflowers. *Indian J. Hort*., *68*(2), 206-211.

Manaware, D., Naidu, A.K. & Lal, N. (2017). Genetic Diversity assessment for growth and yield traits in cauliflower. *Int. J. Curr. Microbiol. App. Sci., 6*(8), 3016-3027.

Meena, M. L., Ram, R. B., Rubee, L. and Sharma, S. R. (2011). Interrelationship and path analysis for quality traits in Cabbage (*Brassica oleracea* var. *capitata* L.). *Cruciferae newsletter, 30,* 37-41.

Meena, M. L., Ram, R. B. and Sharma, S. R. (2014). Inter-trait association and genetic variability assessment in cabbage under Lucknow conditions. *Indian J. Hort., 71*(2), 202-206.

Nimkar, S. A. and Korla, B. N. (2008). Correlation and path coefficient studies in F_4 progenies of cross PSB-1×KT-9 in cauliflower (*Brassica oleracea* var. *botrytis* L.). *Orissa J. of Hort., 36*(1), 97-101.

Nimkar, S. A. (2013). Correlation and path coefficient studies in biparental progenies in cauliflower (*Brassica oleracea* var. *botrytis* L.). *Res. J Agric. Sci.*, *4*(5/6), 667-669.

Santhosha, H. M., Varalakshmi, B. and Krishnamanohar, R. (2015). Evaluation of early cauliflower (*Brassica oleracea* var. *botrytis* L.) germplasm under tropical conditions for various horticultural traits. *The Bioscan*. *10*(4), 1631-1635.

Searle, S. R. (1961). Phenotypic, genotypic and environmental correlations. *Biometric*., *17*, 474-480.

Sheemar, G., Singh, D., Malik, A. and Kumar, A. (2012). Correlation and Path analysis studies of economic traits in cauliflower (*Brassica oleracea*var. *botrytis* L.). *J. Agr. Tech*., *8*(5), 1791-1799.

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