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Path analysis studies in red onion

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Abstract
The present study on "Path analysis studies in red onion" was undertaken on forty five genotypes of onion in Randomized Block Design with three replications during *rabi* season of 2022- 2023 at Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola to find out path coefficient of direct and indirect effect of yield contributing characters on bulb yield of red onion. The path coefficient analysis revealed that, the characters like equatorial bulb diameter (10.46432) and bulb shape index (4.5347) exhibited very high and positive direct effect on total bulb yield/ha. High direct positive effect on total bulb yield was imposed by neck thickness (0.7571), bolting percent (0.54342), days to maturity (0.45069) and average bulb weight (0.438).

Keywords: Onion, genotypes, path analysis, yield

Introduction
One of the most significant bulb crops grown commercially for both domestic and international markets is the onion (*Allium cepa* L.). Onion production in India is around 266.4 lakh MT from an area of 16.4 lakh hectares with a productivity of 16.4 MT/ha during 2020-2021 (Anon., 2021) [1]. The major onion producing states in India are Maharashtra, Karnataka, Madhya Pradesh, Gujarat, Bihar, Andhra Pradesh, Rajasthan, Haryana and Telangana. Maharashtra has the largest cultivation area of 703.80 thousand hectares, with a production of 10476.46 thousand tonnes and the productivity 14.89 metric tons/ha. The primary onion-producing districts in Maharashtra are Nasik, Ahmednagar, Solapur, Pune and Jalgaon (Anon., 2021) [1]. So, the Rabi onion crop is the mainstay of India. Normally, the price of the onion is lower during these months due to greater supply. It is critical for India to successfully store Rabi onions to maintain its market supply during lean months.

Path analysis uses statistical models to investigate the direct and indirect contributions of several variables to overall onion quality, yield, and resilience. A path coefficient analysis is an excellent method of analyzing direct and indirect reasons for association, allowing for a careful assessment of the individual factors that contribute to a given correlation. The estimation of the path coefficient analysis indicates the nature and amount of the direct and indirect effects of yield- contributing components on yield. A path coefficient analysis is an excellent method of analyzing direct and indirect reasons for association, allowing for a careful assessment of the individual factors that contribute to a given correlation. In view of the above aspects, the present investigation on onion entitled "Path analysis studies in red onion." was carried out to find path coefficient of direct and indirect effect of yield contributing characters on bulb yield of red onion.

Materials and Methods
The present investigation "Path analysis studies in red onion" was carried out at Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *rabi* season of year 2022-2023. The material under study was constituted of 45 genotypes of onion which were collected from different institutes in a Randomized Block design with three replications planted in a plot size 1.00 m × 1.00 m at spacing of 10 cm × 10 cm. Five representative plants were selected randomly from each genotype and were tagged for identification and for recording observations on various traits. Plant height (cm), number of leaves, neck thickness (cm), bolting (%), days to maturity, polar bulb diameter (cm), equatorial bulb diameter (cm), bulb shape index, average bulb weight (g), TSS of bulb (%), double bulb (%) and total yield (t/ha). Recommended doses of manures and fertilizers were applied and spraying of

insecticides and fungicides were given where ever felt necessary. Irrigation and other cultural operations were undertaken as and when required. The treatments (genotypes) were allotted randomly into blocks. Path coefficient analysis was carried out according to the procedure suggested by Dewey and Lu (1959) [7].

Results and Discussion

Path coefficient analysis

When two or more variables are included in the correlation studies, it becomes difficult to determine which characters enhance the yield. The technique of path coefficient analysis overcomes this situation, which partitions the forces of association and examines the relative contribution of direct and indirect effects of the independent variables on the dependent variables. The path coefficient analysis, a statistical device developed by Wright (1921) [17], which takes into account the cause and effect relationship between the variables which in unique in partitioning then association into direct and indirect effects through other dependent variables.

The path coefficient analysis also measures the relative importance of the cause's factors involved. This is simply standardized regression analysis; wherein total correlation value is subdivided into a causal scheme. Li (1956) [9] emphasized the importance of path diagrams, which facilitate the understanding of the nature of the cause-and-effect system. The path analysis suggested by Dewey and Lu (1959) [7] helps to resolve this correlation further and throws more light on the way in which component traits contribute towards specifically identifying important component traits.

A perusal of genotypic path analysis in onion indicated that maximum direct positive effect on total bulb yield was imposed by equatorial bulb diameter (10.46432) followed by shape index (4.5347), neck thickness (0.7571), bolting percent (0.54342), days to maturity (0.45069), average bulb weight (0.438), plant height (0.07363) and TSS (0.1776). Whereas, maximum negative direct effect on yield was recorded by polar bulb diameter (-13.3967), double bulb (-0.507788) and number of leaves per plant (-0.28725). The residual effect at the genotypic level was high (0.47766).

Plant height (0.07363) showed positive direct effect on total yield/ha. Similar results were obtained by Chattopadhyay *et al.* (2013) [5] and Visalakshmi *et al.* (2018) [16]. Number of leaves per plant (-0.28725) had negative and significant association with total yield. Results were in line with Singh and Dubey (2011) [14] and Singh *et al.* (2018) [15]. Neck thickness (0.7571) had positive and significant association with total yield/ha. Similar results were obtained by Pyasi and Tiwari (2016) [11] and Singh *et al.* (2018) [15]. Polar bulb diameter (-13.3967) had negative direct effect on total yield. This result agrees with the findings of Dhotre *et al.* (2010) [8] and Sahu *et al.* (2018) [12]. Equatorial bulb diameter (10.46432) had direct and positive association with total yield. This result is in confirmation with the findings of Dhotre *et al.* (2010) [8] and Nikhil *et al.* (2016) [10]. Bulb shape index (4.5347) had direct and positive association with total yield. This result is in confirmation with the findings of Dhotre *et al.* (2010) [8] and Basha and Lakshmi (2018) [3, 4]. Average bulb weight (0.438) had positive direct effect on total bulb yield. Similar results were obtained by Chattopadhyay *et al.* (2013) [5] and Bal *et al.* (2019) [2]. Total soluble solids (0.01776) had direct and positive association with total bulb yield. This result is in confirmation with the findings of Dewangan and Sahu and Nikhil *et al.* (2016) [10]. Doubles bulbs (-0.57788) had negative direct effect on total bulb yield. This result agrees with the findings of Dhotre *et al.* (2010) [8] and Saini and Maurya (2014) [13].

Table 1: Path coefficient showing direct and indirect effect of different characters on total bulb yield

Characters	Plant height @ 90 DAP	No of leaves/plant @ 90 DAP	Neck Thickness @ 90DAP	Bolting %	Days to maturity	Polar bulb diameter (cm)	Equatorial bulb diameter (cm)	Shape index	Average bulb weight (gm)	Total soluble solids	Double bulb	Genotypic correlation with Total yield/ha
Plant height @ 90 DAP	0.07363	-0.26656	0.03934	0.07251	0.06103	-6.21655	3.79611	2.48406	0.27128	0.00841	-0.01977	0.304**
No. of leaves/plant @ 90 DAP	0.06833	-0.28725	0.48383	0.13737	0.07097	-2.15729	3.06669	-0.84033	0.10585	0.00242	0.01266	0.663**
Neck Thickness @ 90DAP	0.00383	-0.18357	0.7571	-0.05426	-0.04043	-3.35071	3.76001	-0.38159	0.12542	0.00836	-0.16011	0.484**
Bolting (%)	0.00983	-0.07262	-0.07559	0.54342	0.0837	4.79637	-3.14413	-1.60718	-0.14599	-0.00245	-0.30885	0.077NS
Days to maturity	0.00997	-0.04524	-0.06792	0.10092	0.45069	-1.77517	1.05471	0.63449	0.00865	-0.00312	-0.05456	0.313**
Polar bulb diameter (cm)	0.03417	-0.04626	0.18936	-0.19456	0.05972	-13.3967	9.9532	3.16838	0.24138	0.00845	0.14255	0.160NS
Equatorial bulb diameter (cm)	0.02671	-0.08418	0.27204	-0.16328	0.04543	-12.7424	10.46432	2.00902	0.20527	0.0086	0.14193	0.183*
Shape index	0.04034	0.05323	-0.06371	-0.1926	0.06306	-9.36026	4.63603	4.5347	0.22615	0.00485	0.09609	0.038NS
Average bulb weight (gm)	0.0456	-0.06942	0.21679	-0.18112	0.0089	-7.38288	4.90418	2.34134	0.438	0.0082	0.01207	0.342**
Total soluble solids	0.03488	-0.03911	0.35652	-0.07486	-0.07928	-6.37381	5.06792	1.2388	0.2022	0.01776	0.03214	0.383**
Double bulb	0.00252	0.0063	0.20976	0.29043	0.04255	3.30471	-2.56999	-0.75404	-0.00915	-0.00099	-0.57788	-0.056NS

Residual effect= 0.47766, Direct effect = Bold diagonal, *, ** Significant at 5 % and 1% level

Conclusion

In present study, equatorial bulb diameter exhibited high positive and direct effect and significant positive correlation with the total bulb yield followed by bulb shape index. As a result, these characteristics should be taken into account while choosing genotypes to increase yield. Hence, these are

the main characters, contributing towards the yield potential of an onion plant. Therefore, these characters should be an ideal criterion for selection for yield in onion crop.

References

1. Anonymous. Horticultural statistics at a glance. Indian Horticulture Database [Internet]. 2021 [cited 2021 Feb]. Available from: http://www.nhb.gov.in.
2. Bal S, Maity TK, Sharangi AB, Majumder A. Quality assessment in association with yield attributes contributing improved yield in onion (*Allium cepa* L.). J Crop Weed. 2019;15:107-115.
3. Basha DR, Mukunda Lakshmi L. Correlation and path coefficient analysis for some yield and related traits in onion (*Allium cepa* L.) genotypes. Int J Pure App Biosci. 2018;6(5):1249-1254.
4. Basha DR, Mukunda Lakshmi L, Sadarunnisa SS, Venkataramana KT. Genetic variability studies for yield and yield components in onion (*Allium cepa*) genotypes. Int J Pure App Biosci. 2018;6(5):1140-1146.
5. Chattopadhyay A, Sharangi AB, Dutta S, Das S, Denre M. Genetic relatedness between quantitative and qualitative parameters in onion (*Allium cepa* L.). Vegetos. 2013;26(1):151-157.
6. Dewangan SR, Sahu GD. Genetic variability, correlation, and path coefficient analysis of different kharif onion genotypes in Chhattisgarh plains. Indian Hortic J. 2012;2:9-12.
7. Dewey OR, Lu KH. A correlation and path coefficient analysis of components of crested wheatgrass seed production. Agron J. 1959;57:515-518.
8. Dhotre M, Allolli TB, Athani SI, Halemani LC. Genetic variability, character association, and path analysis studies in kharif onion (*Allium cepa var*. Cepa L.). Asian J Hort. 2010;5(1):143-146.
9. Li CC. The concept of path coefficient and its impact on population genetics. Biometrics. 1956;12:190-210.
10. Nikhil BSK, Jadhav AS. Estimation of genetic diversity in kharif onion (*Allium cepa* L.). Eco Env Cons. 2016;(S445-S448).
11. Pyasi R, Tiwari A. Genetic variability and character association for yield and its component traits in kharif onion genotypes. Int J Basic App Agric Res. 2016;14:43-49.
12. Sahu K, Sharma PK, Dixit A, Nair SK. Correlation and path coefficient analysis in kharif onion (*Allium cepa* L.). Int J Curr Microbiol App Sci. 2018;6:256-263.
13. Saini MC, Maurya IB. Character association and path coefficient analysis in kharif onion (*Allium cepa* L.). Indian J Agric Res. 2014;2(6):692-696.
14. Singh RK, Dubey BK. Interrelationship and path coefficient studies on yield attributing factors in onion (*Allium cepa* L). Prog Hortic. 2011;43:874-879.
15. Singh P, Soni AK, Khandelwal SK, Diwaker P, Agarwal H, Regar OP. Character association and path coefficient analysis in onion (*Allium cepa* L.). J Pharmacogn Phytochem. 2018;7:1882-1886.
16. Visalakshi M, Porpavai C, Pandiyan M. Correlation and path coefficient analysis of yield and yield associated traits in small onion. Int J Curr Microbiol App Sci. 2018;7(7):2319-2706.
17. Wright S. Correlation and causation. J Agric Res. 1921;20:557-585.