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Correlation and path coefficient analysis in chickpea (*Cicer arietinum* L.) varieties in organic condition

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Abstract
Aim: The present investigation entitled "Correlation and path coefficient analysis in chickpea (*Cicer arietinum* L.) varieties in organic condition" was conducted to evaluate correlation, and path coefficient analysis in 12 chickpea (*Cicer arietinum* L.) genotypes, including two check varieties.
Study Design: The genotypes were evaluated using a randomized block design (RBD) with three replications.
Place and Duration of Study: During the Rabi 2024-25 season at Organic Agriculture Research Farm, Narayanbagh, Institute of Agricultural Sciences, BU, Jhansi (U.P.).
Methodology: Data were recorded on eleven Agro morphological traits: Days to 50% flowering, Days to maturity, Plant height (cm), Primary branches per plants, Secondary branches per plants, Number of pods per plants, Seeds per pod (No), 100 seed weight (g), Seed yield per plants (g).
Results: Correlation coefficient was higher than the phenotypic correlation coefficient value for all the characters under study. This indicated how much of the phenotypic correlation coefficient is influenced by the environment. The seed yield per plant had a positive and significant association with 100SW, NSP and NPP. Whereas, negative and significant correlation expressed with DM and PH. The results of path coefficient based on genotypic coefficient taking seed yield per plant as dependent variable indicated that the characters PH, NPP, 100-SW showed positive direct effect on seed yield per plant while traits like DF, DM, PBP, NSP exhibited negative direct effect on seed yield per plant.

Keywords: Correlation, path coefficient, genotype, Phenotype, Morphological, positive

Introduction
Chickpea (*Cicer arietinum* L.) is a self-pollinating diploid legume (2n = 16) with a genome size of approximately 738 Mbp, belonging to the Fabaceae family (Sofi *et al*. 2020) [7]. It is an important pulse crop cultivated since ancient times for its high nutritional value, containing 18-29% protein, 52-70% carbohydrates, 4-10% fat, 50-60% starch, along with dietary fiber, vitamins, calcium, phosphorus, and iron (Alka *et al*. 2025) [1], (Sofi *et al*. 2020; Vandemark *et al*. 2018) [7, 12]. Chickpeas are used in multiple forms including whole grains, splits (dal), flour (besan), salads, curries (chole), falafel, and hummus, and also serve as green fodder and dry straw for animals (Gaur *et al*., 2015) [5]. Based on seed characteristics, chickpeas are classified into Desi, which have small, angular, rough-textured seeds with pink flowers and anthocyanin pigmentation, and Kabuli, which are large, smooth, beige-seeded types with white flowers and no anthocyanin (Singh, 2013) [8]. Path coefficient analysis is a statistical technique that helps to identify traits that can be used to improve crop yield. It is employed to investigate the direct and indirect effects of variables on one another. Path analysis operates by separating the correlation coefficient between two traits into direct and indirect effects. Path analysis was used for determination of the amount and direction of direct and indirect effects of different yield and other yield related components. In India, chickpea is primarily a *rabi* (winter) crop, sown from October to November and harvested from February to March, mainly in states like Maharashtra, Madhya Pradesh, and Rajasthan, with limited *kharif* cultivation under irrigation in regions such as Andhra Pradesh and Karnataka (Gaur *et al*. 2015) [5]. India is the world's largest chickpea producer, expected to contribute approximately 11.337 million metric tonnes to the projected 2025 global

production of 17.1 million tonnes, although its productivity per hectare is lower than countries like Ethiopia and the USA (AgPulse Analytica, 2025; ANGRAU, 2025; IGC, 2025) [2, 3]. To establish a cause and effect relationship the first step was used to partition genotypic and phenotypic correlation coefficient into direct and indirect effects by path analysis as suggested by Dewey and Lu (1959) [4] and developed by Wright (1921) [11]. Therefore, the present investigation has been undertaken to study the association between different characters and find out the direct and indirect effects of various quantitative characters on seed yield.

Materials and Methods

The experimental material used in the present study comprised of the 12 genotypes. The experiment was laid-out in randomized block design with three replications of the plant geometry was maintained at 30 cm x 10 cm. the material was shown with the onset of monsoon on 2024-25. Organic Agriculture Research Farm, Narayanbagh, Institute of Agricultural Sciences, BU, Jhansi (U.P.). A comprehensive evaluation of 12 chickpea genotypes RVG-201, IPC-6-77, RLBGK-1, JG-315, RVSJKG-102, IPC-10-134, IPC-4-98, IPC-10-62, JG-13, Pusa Manav, RVG-202, JG-14 revealed significant genetic variability across all traits studied such as Days to 50% flowering, Days to maturity, Plant height (cm), Primary branches per plants, Secondary branches per plants, Number of pods per plants, Seeds per pod (No), 100 seed weight (g), Seed yield per plants (g). Observations were recorded by selecting randomly five competitive plants from each plot on eleven characters were analyzed first by randomized block design to test the significance of differences among the genotypes. Trait association studies were conducted using correlation and path analysis to quantify the interrelationships between different traits and to investigate the direct and indirect effects of different traits on yield and quality components respectively.

Results and Discussion

Chickpea germplasm data analysis was done to evaluate correlation coefficient, path coefficient analysis and their direct and indirect effects of various characters on seed yield in chickpea, and Further discussion are mentioned below:

Correlation Coefficient Analysis

When a breeder is trying to combine high yield potential with desirable agronomical and quality parameters, knowledge of genetic correlation for yield, its components and various quality characters becomes important. The type, extent and direction of selection may all be determined using association studies. The degree of mutual relationship between yield and their component traits was worked out by estimating the correlation coefficient at the phenotypic and genotypic levels using 12 genotypes of chickpea and estimates are presented in Table 1. Perusal of results revealed that the estimates of genotypic correlation coefficients were higher in magnitude than their respective phenotypic correlation coefficients for all the character pairs under study. The correlations between different characters are being presented as under: These findings were also found by Singh *et al.* (2014) [9], Pravalika *et al.* (2024) [6].

Path Coefficient Analysis

The amount of contribution of various yield contributing characteristics to yield in the form of cause and effect was determined using path coefficient analysis. In the present study, seed yield per plant was taken as dependent variable where as other traits *viz*., days to 50 per cent flowering, days to maturity, Plant height (cm), Primary branches per plants, Secondary branches per plants, Number of pods per plants, Seeds per pod (No), 100 seed weight (g) were taken as independent variables. It revealed whether the association of these independent traits with seed yield is due to their direct effect on yield or is consequence of their indirect effect via other component traits. The estimates of path coefficient analysis using genotypic and phenotypic correlation are presented in Table 2. These findings work in conformity with Tadesse *et al*. (2020) [10].

Table 1: Estimates of phenotypic and genotypic correlation coefficients between eleven characters in chickpea genotypes in Organic condition

Traits		Days to 50% flowering	Days to maturity	Plant height (cm)	Primary branches per plants	Secondary branches per plants	Number of pods per plants	Seeds per pod (No)	100 seed weight (g)	Seed yield per plants (g)
Days to 50% flowering	G		0.9212**	0.8678**	-0.7434**	-0.42	-0.7143**	-0.8906**	-0.8316**	-0.7356**
	P		0.7532**	0.7208**	-0.398*	-0.2896	-0.6263**	-0.5208**	-0.7177**	-0.6535**
Days to maturity	G			0.8605**	-0.6707*	-0.3714	-0.7661**	-0.8393**	-0.8528**	-0.8802**
	P			0.6816**	-0.4053*	-0.2646	-0.6157**	-5431**	-0.7349**	-0.6726**
Plant height (cm)	G				-0.7779**	-0.5544	-0.812**	-0.7998**	-0.9247**	-0.755**
	P				-0.3364*	-0.455**	-0.6415**	-0.5922**	-0.7799**	-0.5993**
Primary branches per plants	G					1.0647**	0.8001**	0.4975	0.5499	0.3561
	P					0.568**	0.5389**	0.0549	0.3252	0.2062
Secondary branches per plants	G						0.5961*	0.2225	0.393	0.2238
	P						0.4768**	0.0616	0.3297*	0.175
Number of pods per plants	G							0.4874	0.7025*	0.6403*
	P							0.2286	0.6283**	0.5562**
Seeds per pod (No)	G								1.0023**	0.9177**
	P								0.7097**	0.5752**
100 seed weight (g)	G									0.9219**
	P									0.8621**

Table 2: Direct and indirect effect (Organic condition) of 10 characters on seed yield per plant in chickpea (*Cicer arietinum* L.)

Traits		Days to 50% flowering	Days to maturity	Plant height (cm)	Primary branches per plants	Secondary branches per plants	Number of pods per plants	Seeds per pod (No)	100 seed weight (g)	Seed yield per plants (g)
Days to 50% flowering	G	0.777	-0.853	0.5399	-0.112	0.0544	0.129	-0.2977	-0.7142	-0.73 **
	P	-0.120	-0.078	0.1662	0.0476	0.0178	-0.050	0.0475	-0.683	-0.65 **
Days to maturity	G	0.7161	-0.926	0.5353	-0.1013	0.0481	-0.138	-0.280	-0.732	-0.88 **
	P	-0.09	-0.103	0.1572	0.0485	0.0162	-0.050	0.0495	-0.699	-0.672**
Plant height (cm)	G	0.6745	-0.797	0.6222	-0.117	0.071	-0.146	-0.26	-0.7943	-0.755 **
	P	-0.08	-0.070	0.230	0.040	0.027	-0.052	0.0540	-0.74	-0.599**
Primary branches per plants	G	-0.577	0.6216	-0.484	0.1511	-0.138	0.1445	0.1663	0.4723	0.3561
	P	0.047	0.041	-0.077	-0.119	-0.034	0.0438	-0.005	0.3097	0.2062
Secondary branches per plants	G	-0.326	0.3443	-0.3449	0.1609	-0.129	0.1077	0.0743	0.3375	0.223
	P	0.034	0.024	-0.104	-0.067	-0.061	0.0388	-0.005	0.3140	0.175
Number of pods per plants	G	-0.555	0.7101	-0.505	0.12093	-0.07	0.1807	0.16295	0.6034	0.640 *
	P	0.0752	0.067	-0.147	-0.064	-0.029	0.0813	-0.020	0.5984	0.556 **
Seeds per pod (No)	G	-0.692	0.7779	-0.497	0.0751	-0.028	0.088	0.3343	0.8609	0.917 **
	P	0.062	0.056	-0.136	-0.006	-0.003	0.0186	-0.091	0.6759	0.575 **
100 seed weight (g)	G	-0.646	0.79044	-0.575	0.0831	-0.050	0.12694	0.3351	0.85900	0.917**
	P	0.086	0.076	-0.179	-0.038	-0.020	0.0511	-0.064	0.9524	0.862**

Conclusion

The correlation of different traits with seed yield was examined both at phenotypic and genotypic levels and the study showed that genotypic correlation coefficient values were higher than the phenotypic values in organic condition. This indicated that how much of phenotypic correlation coefficient are influenced by environment. The seed yield per plant was positive and significant with 100-SW, NSP and NPP at genotypic and phenotypic levels. The maximum direct positive effect on seed yield per plant was observed in PH, NPP, 100-SW. In the present investigation, genotypes *viz*., IPC-10-62, JG-315 and RVG-202 were superior not only for seed yield per plant but also related traits like biological yield, test weight and number of pods per plant. These diverse genotypes can be used in future breeding programme of chickpea.

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Authors Contribution

SH-performed the experiments, data curation, execution of the experiment, draft manuscript writing; MS, AD-conceptualization, planning, execution, supervisor, editing if review of the manuscript, Data analysis & Visualization; YK- genotype data curation and draft review and performed phenotypic data analysis; SKM, VJ, JK-review of manuscript.

References

1. Yadav A, Singh N, Kant S, Kumar A, Singh P, Kumawat Y, *et al*. Correlation and path coefficient analysis for yield and its component traits in chickpea (*Cicer arietinum* L.). Int J Adv Biochem Res. 2025;9(7):1762-1764. doi:10.33545/26174693.2025.v9.i7v.5044.
2. AgPulse Analytica. India's chickpea production outlook 2025. 2025.
3. ANGRAU. Chickpea productivity report: comparative study among major producing nations. 2025.
4. Dewey DR, Lu KH. Correlation and path coefficient analysis of components of crested wheat grass seed production. Agron J. 1959;51:515-518.
5. Gaur PM, Jukanti AK, Varshney RK. Impact of genomic technologies on chickpea breeding strategies. Agronomy. 2015;5(3):356-370.
6. Pravalika Y, Aggarwal N, Kumar R, Tutlani A, Parveen S, Rathore M. Genotypic variability, correlation and path coefficient analysis for elite genotypes of chickpea (*Cicer arietinum* L.). Int J Bioresour Stress Manag. 2024;15(4):1-10.
7. Sofi PA, Wani SA, Wani SH. Nutritional and health benefits of chickpea. J Food Legumes. 2020;33(2):83-91.
8. Singh A. Chickpea genetic resources: types and classifications. Int J Agric Sci. 2013;5(1):124-129.
9. Singh TP, Raiger HL, Kumari J. Evaluation of chickpea genotypes for variability in seed protein content and yield components under restricted soil moisture condition. Indian J Plant Physiol. 2014;19:273-280.
10. Tadesse M, *et al*. Correlation and path coefficient analysis for various quantitative traits in desi chickpea genotypes under rainfed conditions. J Agric Sci. 2020.
11. Wright S. Correlation and causation. J Agric Res. 1921;20:557-565.
12. Vandemark GJ, Miklas PN, Coyne CJ. Chickpea: breeding and genetics. Plant Breed Rev. 2018;42:419-444.