The Pharma Innovation Journal 2022; 11(1): 184-188

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(1): 184-188

www.thepharmajournal.com
Received: 19-11-2021
Accepted: 21-12-2021

Tengse SM
M.Sc Department of Genetics and Plant Breeding, College of Agriculture, Badnapur, Maharashtra, India

Sarode SB
Assistant Professor (Agricultural Botany), Agricultural Research Station, Badnapur, Maharashtra, India

Deshmukh SS
M.Sc, Department of Genetics and Plant Breeding, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

Shinde AV
Ph.D., Department of Genetics and Plant Breeding, College of Agriculture, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:
Tengse SM
M.Sc Department of Genetics and Plant Breeding, College of Agriculture, Badnapur, Maharashtra, India

Assessment of correlation and path analysis in chickpea (*Cicer arietinum* L.)

Tengse SM, Sarode SB, Deshmukh SS and Shinde AV

Abstract
The present investigation was carried out for correlation studies and path analysis (*Cicer arietinum* L.). Correlation studies showed that the traits *viz.* harvest index, 100 seed weight, number of pods per plant and number of secondary branches per plant recorded a highly positive significant correlation with seed yield at both genotypic and phenotypic level and days to 50% flowering at genotypic level with seed yield.
From path coefficient analysis it is indicated that the characters *viz.*, 100 seed weight, harvest index, number of pods per plant, days to 50% flowering and number of secondary branches per plant showed a positive direct effect on seed yield.

Keywords: chickpea, correlation, path analysis, direct effect and significant

Introduction
Chickpea (*Cicer arietinum* L.) belongs to the genus *Cicer* and the Leguminosae family. Chickpea is a self-pollinated pulse crop with chromosome 2n=14. Chickpea is an important *Rabi* crop in India, and it is one of the major pulse crop. Chickpea ranks first among the pulses grown in the country with the most acreage and production in the globe. Chickpea seed is high in proteins and carbohydrates, which account for 80% of the seed's total dry weight. An analysis of the correlation between seed yield and yield components is required for determining the selection criteria of a specific character.
Correlation coefficient analysis in plant breeding determines the component characters on which selection can be based for genetic improvement in yield by measuring the mutual relationship between various variables. The correlation coefficient is a statistical measure used to determine the strength (degree) and direction of a relationship between two or more variables. The genotypic and phenotypic paths are commonly estimated to determine yield contributing characters.
Correlation coefficients statistically elaborate the association of one or more characters influenced by a large number of genes. The genotypic correlation coefficient measures genotype conjugation between characters. The method of partitioning the correlation into direct and indirect effects by path coefficients analysis was suggested by Wright (1921). It provides important information on the relative advantages of the selection criteria's traits.
Path coefficient analysis can be used to determine the direct effects of traits on other traits as well as their indirect effects on other traits.

Material and Methods
The present investigation entitled, "Genetic Divergence Studies in Chickpea **(***Cicer arietinum* L.)" was conducted at the College of Agriculture, Badnapur, during the *Rabi* 2020-21.
Experimental material comprising of 60 germplasm lines with wider variability for different characters received from NBPGR, Akola (50 germplasm) and ARS, Badnapur (10 genotypes). Total 60 genotypes of chickpea were evaluated in randomized block design with two replications during the *Rabi* 2020-21. Each genotype was sown in one rows of 4 m length with the spacing of 45 cm between rows and 10 cm within the plant.

Table 1: List of sixty genotypes of chickpea

Sr. No.	Genotypes	Sr. No.	Genotypes
1	EC0440552	31	IC0095060
2	EC0440556	32	IC0095063
3	EC0441771	33	IC0095068
4	EC0441854	34	IC0095069
5	EC0441856	35	IC0095073
6	IC0094877	36	IC0095106
7	IC0094880	37	IC0095108
8	IC0094882	38	IC0095114
9	IC0094902	39	IC0095116
10	IC0094913	40	IC0095117
11	IC0094930	41	IC0095130
12	IC0094934	42	IC0095133
13	IC0094943	43	IC0095136
14	IC0094949	44	IC0095139
15	IC0094951	45	IC0095169
16	IC0094952	46	IC0272668
17	IC0094953	47	IC0272669
18	IC0094968	48	IC0275855
19	IC0094994	49	IC0275856
20	IC0095016	50	IC0327624
21	IC0095042	51	BCG 37-12
22	IC0095043	52	BCG 25-8
23	IC0095044	53	BCG 10-4
24	IC0095045	54	BCG 2-29
25	IC0095046	55	BDNG 2016-6
26	IC0095047	56	Phule Vikram
27	IC0095048	57	Phule Vikrat
28	IC0095052	58	JAKI 9218
29	IC0095057	59	Digvijay
30	IC0095058	60	BDNG 797

Observations Recorded

1. Days to 50% flowering 2. Days to Maturity 3. Plant height (cm) 4. Number of primary branches per plant 5. Number of secondary branches per plant 6. Number of pods per plant 7. Number of seeds per pod 8. 100 seed weight (g) 9. Harvest Index (%) 10. Seed yield per plant (g)

Result and Discussion

Tables 2 and 3 show the genotypic and phenotypic correlations for yield and its component characters studied. This chapter describes the only significant correlations, either positive or negative. In general, the genotypic correlation coefficients were higher than the phenotypic correlation coefficients. Correlated characters are of interest for three main reasons: first, because of the genetic cause of correlation through linkage and pleiotropic action of genes, and second, because of the change brought about by selections. It is essential to understand how the improvement of one character causes simultaneous changes in other characters, as well as natural selection (Falconer, 1960) [2]

In the current study, the genotypic correlation coefficients were greater than the phenotypic correlation coefficients, showing that, while there is an intrinsic association between the characters analysed, the environment has little influence in determining these associations (Johanson *et al*.1955) [4].

Seed yield per plant had significant positive correlation with harvest index (p=0.5044; g=0.6752), 100 seed weight (p=0.3738; g=0.4779), number of pods per plant (p=0.2999; g=0.4321) and number of secondary branches per plant (p=0.2629; g=0.3401) at both phenotypic and genotypic level and days to 50% flowering (g=0.2081) at genotypic level. While significant negative correlation with number of primary branches per plant (p=-0.2216; g=-0.3462) at both phenotypic and genotypic level.

Shedge *et al.* (2019) [8] found a positive significant relationship between harvest index, number of pods per plant, number of secondary branches per plant, number of primary branches per plant and number of seeds per pod. Shara *et al.* (2019) [7] observed that seed yield per plant had a significant and positive correlation with number of secondary branches, 100 seed weight, number of pods per plant. Shanmugam *et al.* (2019) [6] reported that seed yield per plant showed a highly significant positive correlation with number of seeds per pod, number of secondary branches per plant, 100 seed weight and harvest index.

From the foregoing discussion on character associations, it is evident that characters *viz.*, harvest index, 100 seed weight, number of pods per plant and number of secondary branches per plant displayed a positive correlation with yield per plant at both genotypic and phenotypic levels. Hence, these characters could be given due emphasis in formulating selection criteria for the improvement of seed yield in chickpea.

Path coefficient analysis was used to determine the direct and indirect effects of each of the characters on seed yield per plant. The phenotypic and genotypic correlation coefficients, which are more important, are only partitioned into direct and indirect effects, as shown in Tables 4 and 5. Figures 1 and 2 shows phenotypic and genotypic path diagrams respectively.

Among all the components, at phenotypic level harvest index exhibited the highest positive direct effect (p=0.3911) on seed yield followed by 100 seed weight (p=0.2653), number of pods per plant (p=0.2183), days to 50% flowering (p=0.1100), number of secondary branches per plant (p=0.1090), plant height (p=0.0567), number of seeds per pod (p=0.0336) and number of primary branches per plant (p=0.0313) while days to maturity (p=-0.0370) recorded negative direct effect.

At genotypic level 100 seed weight exhibited the highest positive direct effect (g=0.4854) on seed yield followed by harvest index (g=0.4642), days to 50% flowering (g=0.2683), number of pods per plant (g=0.2326), number of secondary branches per plant (g=0.1681), plant height (g=0.1209), number of primary branches (g=0.0781) and number of seeds per pod (g=0.0204) while days to maturity (g=-0.3348) recorded negative direct effect.

The characters *viz.*, 100 seed weight, harvest index, number of pods per plant, days to 50% flowering, number of secondary branches per plant and plant height on seed yield in decreasing order of magnitude revealing that these were major yield contributing traits in chickpea.

Similar results were reported by Talebi *et al.* (2007) [9] for number of seeds per pod, number of pods per plant and harvest index. Thakur and Sirohi (2009) [10] reported the highest positive direct effect of harvest index and number of pods per plant on grain yield. Harvest index showed a positive direct effect on seed yield as reported by Ozveren and Anlarsal (2010) [5], Yucel and Anlarsal (2010) [5] and Chopdar *et al.* (2016) [1]. Number of pods per plant had also a direct effect on grain yield as reported by Gaikwad and Monpara (2011) [3].

Table 2: Estimation of phenotypic (above diagonal) correlation coefficients in chickpea

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of primary branches / plant	Number of secondary branches / plant	Number of pods / plant	Number of seeds / pod	100 seed weight (g)	Harvest Index (%)	Seed yield / plant (g)
	1	2	3	4	5	6	7	8	9	10
Days to 50% flowering	1.000	0.4986 **	0.2356 **	-0.1400	0.0853	0.1800 *	0.1516	-0.0654	0.1396	0.1647
Days to maturity		1.000	0.4135 **	-0.1990 *	0.3142 **	0.0953	0.0489	0.3469 **	-0.0018	0.1361
Plant height (cm)			1.000	0.0269	0.1719	0.2385 **	0.1495	-0.1644	-0.0320	0.0256
Number of primary branches per plant				1.000	-0.3136 **	0.0464	0.0286	-0.4383 **	-0.2658 **	-0.2216*
Number of secondary branches per plant					1.000	0.0860	-0.0262	0.3901 **	0.1389	0.2629**
Number of pods per plant						1.000	-0.0009	0.0417	0.1457	0.2999**
Number of seeds per pod							1.000	-0.1322	-0.0229	-0.0062
100 seed weight (g)								1.000	0.2195*	0.3738**
Harvest index (%)									1.000	0.5044**
Seed yield per Plant (g)										1.000

***** Significant at 5% level of probability or level of significance.
****** Significant at 1% level of probability or level of significance.

Table 3: Estimation of genotypical (above diagonal) correlation coefficients in chickpea.

Characters	Days to 50% flowering	Days to maturity	Plan Height (cm)	Number of primary branches / plant	Number of secondary branches / plant	Number of pods / plant	Number of seeds / pod	100 seed weight (g)	Harvest Index (%)	Seed yield /plant (g)
	1	2	3	4	5	6	7	8	9	10
Days to 50% flowering	1.000	0.5855**	0.2970**	-0.1480	0.1243	0.2183*	0.1976*	-0.0747	0.2065*	0.2081*
Days to maturity		1.000	0.4586**	-0.2233*	0.3894**	0.1093	0.0564	0.3690**	0.0010	0.1299
Plant height (cm)			1.000	-0.0169	0.2185*	0.3039**	0.2579**	-0.1837*	-0.0508	0.0353
Number of primary branches per plant				1.000	-0.3898**	0.0732	-0.0023	-0.5249**	-0.3317**	-0.3462**
Number of secondary branches per plant					1.000	0.1168	-0.0593	0.4222**	0.0856	0.3401**
Number of pods per plant						1.000	-0.0067	0.0539	0.2323*	0.4321**
Number of seeds per pod							1.000	-0.1373	-0.0656	-0.0638
100 seed weight (g)								1.000	0.2434**	0.4779**
Harvest index (%)									1.000	0.6752**
Seed yield per Plant (g)										1.000

***** Significant at 5% level of probability or level of significance.
******Significant at 1% level of probability or level of significance.

Table 4: Direct and indirect effect of yield and its component characters on grain yield at phenotypic level in chickpea

Sr. No.	Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of primary branches/ plant	Number of secondary branches/ plant	Number of pods/ plant	Number of seeds/ pod	100 seed weight (g)	Harvest index (%)	Total phenotypic correlation with seed yield / plant (g)
1.	Days to 50% flowering	0.1100	0.0548	0.0259	-0.0154	0.0094	0.0198	0.0167	-0.0072	0.0154	0.1647
2.	Days to maturity	-0.0185	-0.0337	-0.0153	0.0074	-0.0116	-0.0035	-0.0018	-0.0128	0.0001	0.1361
3.	Plant height (cm)	-0.0133	-0.0234	0.0567	-0.0015	-0.0097	-0.0135	-0.0085	0.0093	0.0018	-0.0256
4.	No. of primary branches per plant	-0.0044	-0.0062	0.0008	0.0313	-0.0098	0.0015	0.0009	-0.0137	-0.0083	-0.2216
5.	No. of secondary branches per plant	0.0093	0.0342	0.0187	-0.0342	0.1090	0.0094	-0.0029	0.0425	0.0151	0.2629
6.	Number of pods per plant	0.0393	0.0208	0.0521	0.0101	0.0188	0.2183	-0.0002	0.0091	0.0318	0.2999
7.	Number of seeds per pod	0.0051	0.0016	0.0050	0.0010	-0.0009	0.0000	0.0336	-0.0044	-0.0008	-0.0062
8.	100 seed weight (g)	-0.0174	0.0920	-0.0436	-0.1163	0.1035	0.0111	-0.0351	0.2653	0.0582	0.3738
9.	Harvest index (%)	0.0546	-0.0007	-0.0125	-0.1040	0.0543	0.0570	-0.0090	0.0858	0.3911	0.5044

Residual effect = 0.7760, Underlined figures indicate direct effect.

Table 5: Direct and indirect effect of yield and its component characters on grain yield at genotypic level in chickpea

Sr. No.	Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of primary branches / plant	Number of secondary branches / plant	Number of pods / plant	Number of seeds / pod	100 seed weight (g)	Harvest index (%)	Total genotypic correlation with seed yield / plant (g)
1.	Days to 50% flowering	0.2688	0.1574	0.0798	-0.0398	0.0334	0.0399	0.0531	-0.0201	0.0555	0.2081
2.	Days to maturity	-0.1960	-0.3348	-0.1535	0.0747	-0.1304	-0.0366	-0.0189	-0.1235	-0.0003	0.1299
3.	Plant height (cm)	0.0359	0.0554	0.1209	-0.0020	0.0264	0.0367	0.0312	-0.0222	-0.0061	0.0353
4.	No. of primary branches per plant	-0.0116	-0.0174	-0.0013	0.0781	-0.0304	0.0057	-0.0002	-0.0410	-0.0259	-0.3462
5.	No. of secondary branches per plant	0.0209	0.0654	0.0367	-0.0655	0.1681	0.0196	-0.0100	0.0709	0.0144	0.3401
6.	Number of pods per plant	0.0345	0.0254	0.0707	0.0170	0.0272	0.2326	-0.0015	0.0125	0.0540	0.4321
7.	Number of seeds per pod	-0.0040	-0.0011	-0.0053	0.0000	0.0012	0.0001	0.0204	0.0028	0.0013	-0.0638
8.	100 seed weight (g)	-0.0362	0.1791	-0.0892	-0.2548	0.2049	0.0262	-0.0667	0.4854	0.1181	0.4779
9.	Harvest index (%)	0.0958	0.0005	-0.0236	-0.1540	0.0397	0.1078	-0.0305	0.1130	0.4642	0.6752

Residual effect = 0.5531, Underlined figures indicate direct effect.

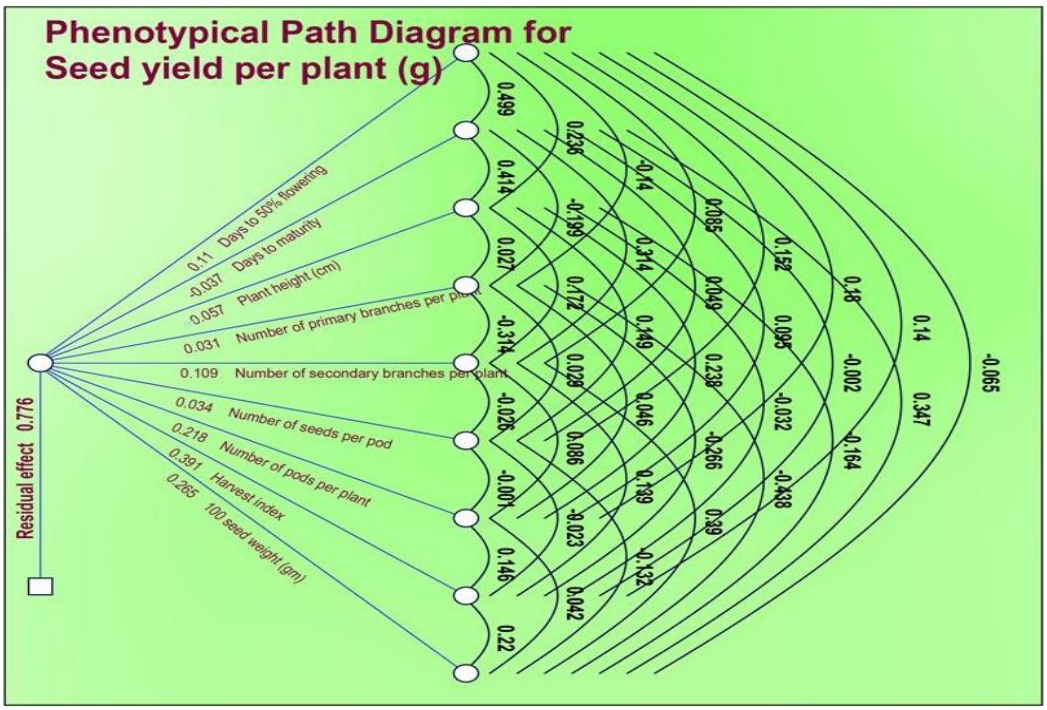

Fig 1: Diagram showing the phenotypic path correlation of yield and its component characters of chickpea

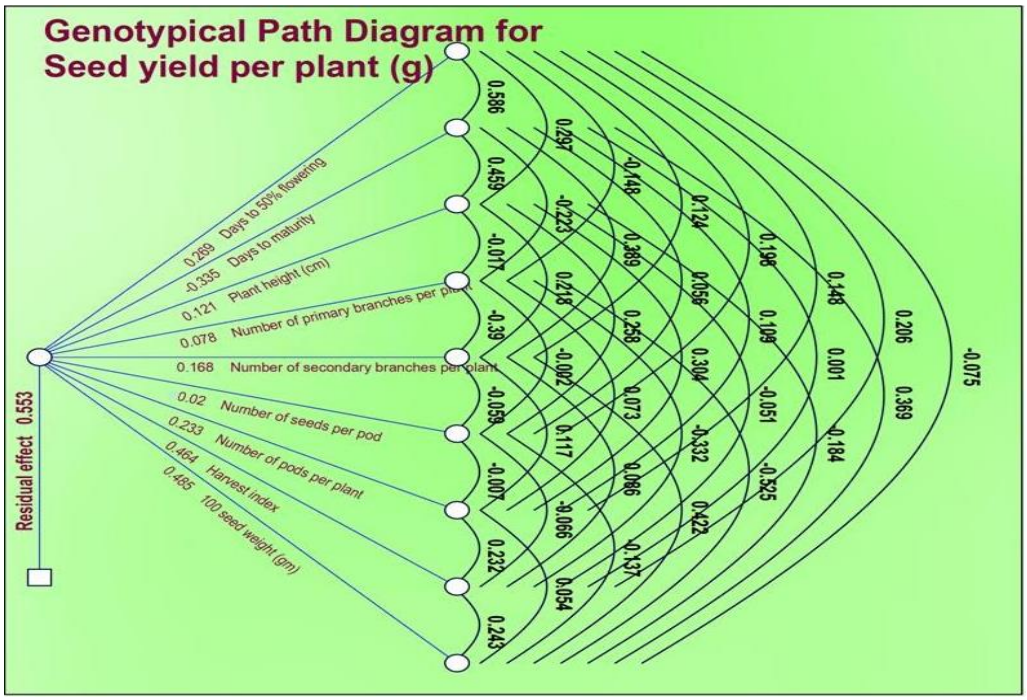

Fig 2: Diagram showing the genotypic path correlation of yield and its component characters of chickpea

References

1. Chopdar DK, Baudhbharti, Sharma PP, Dubey RB, Bragendra, Meena BL. Studies on genetic variability, character association and path analysis for yield and its contributing traits in chickpea (*Cicer arietinum* L.). Agril. Res. Communiction Centre J Legume res. 2016;40(5):824-829.
2. Falconer DS. Correlated character, introduction to quantitative genetics, 312, published by Longman Group Ltd., London. 1960.
3. Gaikwad SR, Monpara BA. Genetic variation in F2 populations and their potential in the improvement of seed yield in chickpea (*Cicer arietinum* L.). J Agric. Res. Technol. 2011;36(3):527-530.
4. Johnson HW, Robinson HF, Comstock RE. Genotypic and phenotypic correlation in soybean and their implications in selection. Agron. J. 1955;47:477-482.
5. Ozveren YD, Anlarsal AE. Determination of selection criteria with path coefficient analysis in chickpea breeding. Bulg. J. Agric. Sci. 2010;16:42-48.
6. Shanmugam, Mohan, Kalaimagal, Thiyagarajan. Genetic variability, correlation and path coefficient analysis in chickpea (*Cicer arietinum* L.) for yield and its component traits. Int. J Curr. Microbiol. App. Sci. 2019;8(05):1801-1808.
7. Shara J Hama. Correlation and path coefficient analysis for seed yield and yield components in chickpea under rainfed condition. Journal of Kerbala for Agricultural Sciences. 2019;(6):1.
8. Shedge PJ, Patil DK, Misal MR. (b) Assessment of genetic variability in chickpea (*Cicer arietinum* L.). Int. J Curr. Microbiol. App. Sci. 2019;8(07):xx-xx.
9. Talebi R, Faydz F, Jelodar A. Correlation and path coefficient analysis of yield and yield components of chickpea under dryland condition in the west of Iran. Asian J of Plant Sci. 2007;6(7):1151-1154.
10. Thakur S, Sirohi A. Correlation and path analysis in chickpea under different seasons. Legume Res. 2009;32(1):1-6.
11. Wright S. Correlation and causation. J Agric. Re. 1921;20:557-565.
12. Yucel DO, Analarsal AE. Determination of selection criteria with path coefficient analysis in chickpea (*Cicer arietinum* L.) breeding. Bulgarian J Agric. Sci. 2010;16(1):42-48.