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Path Coefficient Analysis of Seed Yield and Quantitative Traits in Chickpea (*Cicer arietinum* L.)

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ABSTRACT

A set of twelve elite chickpea lines including one standard were evaluated for grain yield and other related characters for path coefficient analysis in a triplicated randomized complete block design. Seed yield was positively correlated with all yield attributes except days taken to flowering. Number of seeds per plant had maximum positive direct effect on yield. Number of pods per plant and plant weight had maximum negative direct effects on seed yield but contributed indirectly through other characters. The study revealed that selection may be done with optimistic compromise between number of seeds per pod, number of secondary branches per plant, number of seeds per plant, number of pods per plant and plant weight.

Key Words: Path analysis; Seed yield; Correlation; Chickpea

INTRODUCTION

Path analysis is a standardized partial regression coefficient measuring the direct influence of one variable upon the other and permits separation of correlation coefficients into components of direct and indirect effects. Thus a crucial evaluation can be made of the specific factors producing correlation. Sharma *et al.* (1989) observed that number of pods per plant gave the highest direct positive contribution towards seed yield. Yadav (1990) reported that seed yield per plant was positively associated with seeds per plant, pods per plant, number of secondary branches, 100-seed weight and plant height. All crosses had positive direct effects for seeds per plant and 100-seed weight on yield. Tagore and Singh (1990) observed that number of primary branches had the highest direct effect on seed yield followed by pods per plant, 100-seed weight and plant height. Sandhu *et al.* (1991) worked out path analysis in chickpea showing that pods per plant had the greatest genotypic and phenotypic effect on seed yield. Dasgupta *et al.* (1993) observed that pods per plant, seeds per plant, 100-seed weight and seeds per pod had high positive direct effects on grain yield. Roshan *et al.* (1993) reported that number of pods had the highest direct effect on yield followed by plant height. Ozdemir (1996) studied that pods per plant had direct positive effect on grain yield in chickpea.

MATERIALS AND METHODS

Eleven elite lines of chickpea namely 1128, CS 30, 918, 678, 679, 4012, 1115, 4001, 4005, 4004, AUG 480 and one standard variety C44, were sown in the field in three replications using a Randomized Completed Block Design in a plot size 4 x 1.20 meters keeping plant to plant distance of 15 cm and rows 30 cm apart. Data for seed yield and 11 other characters were recorded and subjected to variance and co-variance analysis. Phenotypic and genotypic correlation coefficients were computed according to Kwon and Torrie (1964). Direct and indirect effects were calculated as proposed by Dewey and Lu (1959).

RESULTS AND DISCUSSION

The data pertaining to direct and indirect effects of various yield attributes on seed yield per plant are given in Table I. Days taken to flowering produced positive direct effect and indirect effects via plant height, number of primary and secondary branches per plant, number of pods per plant, number of seeds per pod and 100-seed weight. The negative indirect effects via days taken to maturity, number of seeds per plant and protein contents cancelled the positive effects resulting in negative association between days taken to flowering and seed yield per plant. Days taken to maturity had a negative direct effect but maximum positive indirect effects through plant height, number of pods per plant, number of seeds per plant and 100-seed weight nullified these negative effects and produced a strong positive association between seed yield and days taken to maturity. Plant height had positive direct effect with seed yield (Roshan *et al.*, 1993). The negative effects of plant height through plant weight and protein content cannot be ignored while selecting desirable genotypes. Number of primary branches per plant had negative direct effect but number of secondary branches per

Table I. Direct (diagonal) and indirect effects of various yield components on chickpea seed yield

	DF	DM	PH	NPB	NSB	PW	NPP	NSPO	NSP	HSW	PC	GC	GMS
DF	0.29	-0.24	0.60	0.04	0.11	0.01	3.72	0.01	-4.81	0.48	-0.51	-0.28	25.38**
DM	0.14	-0.49	0.72	0.04	0.17	-0.89	0.33	-0.05	0.66	0.96	-0.34	0.58*	17.66**
PH	0.14	-0.30	1.20	0.17	0.10	-0.61	-0.33	0.01	O.30	0.35	-0.65	0.39*	55.12**
NPB	0.02	0.04	-0.39	-0.52	0.41	-1.48	-4.79	-0.07	7.46	0.31	-0.38	0.55*	0.12**
NSB	0.07	-0.20	0.28	-0.50	0.43	-1.82	-5.22	-0.09	8.04	0.49	-0.71	0.76*	2.40**
PW	-0.00	-0.22	0.36	-0.38	0.39	-2.01	-5.30	-0.08	7.94	0.76	-0.57	0.89*	71.08**
NPP	-0.14	-0.02	0.05	-0.34	0.30	-1.45	-7.34	-0.10	10.34	-0.36	-0.12	0.80*	135.47**
NSPO	-0.05	-0.24	-0.13	-0.33	0.34	-1.49	-6.73	-0.11	9,51	-0.06	0.05	0.75*	0.03**
NSP	-0.13	-0.03	0.03	-0.37	0.33	-1.54	-7.32	-0.10	10.36	-0.25	-0.16	0.80*	220.09**
HSW	0.07	-0.27	0.23	-0.09	0.12	-0.87	1.53	0.00	-1.47	1.76	-0.60	0.42*	3.28**
PC	0.14	-0.16	0.73	-0.18	0.29	-1.07	-0.84	0.00	1.59	1.00	-1.06	0.43*	4.15**
Y/P	-	-	-	-	-	-	-	-	-	-	-		6.62**

*Sigificant at 5% level; **Highly significant at 1% level.

DF= Days taken to flowering; DM= Days taken to maturity; PH= Plant height; NPB= Number of primary branches per plant; NSB= Number of secondary branches per plant; PW= Plant weight; NPP= Number of pods per plant; NSPO= Number of seeds per pod; NSP= Number of seeds per plant; HSW= 100–seed weight; PC= Protein content; GC= Genotypic correlation

plant and number of seeds per plant produced positive indirect effects through this character. Therefore, indirect selection through these traits might be helpful in yield improvement. Number of secondary branches per plant had positive direct effect and indirect effects via plant height and number of seeds per plant. The negative direct effect of plant weight and indirect effects via number of primary branches per plant and protein content were neutralised by its positive indirect effects via plant height, number of secondary branches per plant and number of seeds per plant. Maximum indirect positive effect of plant weight was observed through number of seeds per plant and therefore plant weight in turn had a positive and strong association with seed yield. So it demands a good compromise between plant weight and number of seeds per plant.

Number of pods per plant had maximum negative direct effects, however, the noxious effects were partly counterbalanced by its positive indirect effects via number of secondary branches per plant and number of seeds per plant. The results are in line with the findings of Yadav (1990). Number of seeds per pod had negative direct and indirect effects through plant weight and number of pods per plant but its positive indirect effects via number of secondary branches per plant and number of seeds per plant counterbalanced these negative effects and produced a strong positive association between number of seeds per pod and seed yield per plant. Number of seeds per plant had positive direct effect and indirect effects via plant height and number of secondary branches per plant on seed yield. Although 100-seed weight produced positive direct effect yet negative indirect effects via number of seeds per plant should also be considered during selection. A strong negative direct effect of protein contents was nullified by its indirect positive effects through plant height, number of secondary branches per plant and number of seed per plan. From the present studies it is concluded that maximum positive direct effect of number of seeds per plant on seed yield coupled with a relatively high value of genotypic correlation suggested that direct selection for this trait for high seed yield would be effective.

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