Agric. Res. J. Kerala 30 (1992) : 113 - 116

PATH ANALYSIS FOR HARVEST INDEX IN BLACK GRAM

Harvest index is an important parameter in determining seed yield. Donald (1962) pointed out that a high production of total dry matter is not necessarily of great value when the economic yield is only a small part of it. A variety with a plant type capable of high dry matter production, must possess the additional attribute of converting a relatively large part of it in the form of economic yield, thereby having a high harvest index. An improved plant type in grain legumes shall be one capable of giving a high harvest index. In Kerala, availability of garden land for extending the cultivation of black gram is limited. Therefore, the utilization of interspaces in coconut gardens is inevitable for extending the area under this crop. Hence, a knowledge of the components having direct contribution to harvest index, under partially shaded conditions is essential. Path analysis helps to identify those components having direct contribution to harvest index so that the breeder can make use of these components during selection programmes for varieties with high harvest index suited to coconut gardens.

Varshney *et al.* (1986) reported that economic yield is the major component contributing to genetic variability in the harvest index. Hence, for path coefficient analysis (Wright, 1921) six major yield components viz., pod clusters per plant, pods per plant, pod length, seeds per pod and leaf area index at 50 per cent and 100 per cent flowering were considered as causes and harvest index as the effect.

Nineteen varieties of black gram were studied in a randomised block design in three replications in a partially shaded coconut garden: (1) NPRB-3, (2) NPRB-2, (3) UPUG 40-4, (4) TAU-1, (5) TAU-2, (6) Co-Bg-10, (7) PDU-1, (8) Pant U-30, (9) MBG 162, (10) B3-8-8, (11) PDU-3, (12) UH 80-4, (13) PU-19, (14) T-9, (15) UH 80-9, (16) Co-4, (17) TMV-1, (18) UG 218 and (19) Co-2. The periodical light intensity in each plot was measured in kilolux at 11 am, 1.30 pm and 4 pm and the percentage of shade was calculated as follows:

$$\frac{L1 - L2}{L1} \times 100$$

where, L1 = Light intensity in the open condition

L2 = Light intensity in the shaded condition

Observations for pod clusters per plant, pods per plant, pod length, seeds per pod, leaf area index at 50 per cent and 100 per cent flowering and harvest index were taken from a random sample of five plants in each plot and their average values recorded.

Path analysis at genotypic level brings out the cause and effect relationship among a system of variables and helps to measure the direct influence along each separate path in such a system. The genotypic correlation coefficient of the above component characters with harvest index were partitioned into direct and indirect effects as per Deway and Lu (1959).

The simultaneous equations which give solutions for path coefficients are:

$$r_{iy} = r_{i1} P_{1y} + r_{i2}P_{2y} + \ldots\ldots + P_{iy} + \ldots\ldots + r_{ik} P_{ky}$$

where i = 1,2,. . . . . .k.

r_{iy} is the genotypic correlation of the i^{th} independent variable (x_i) with dependent variable (y). P_{iy} is the direct effect of Xj on y and $r_{ik}P_{ky}$ is the indirect effect of Xj vis x_k on y.

AH the characters studied had high genotypic correlation with harvest index. Maximum positive genotypic correlation was observed between leaf area index at 100 per cent flowering and harvest index, but the direct effect of leaf area index at 100 per cent flowering was negative and low (-0.183). Eightysix per cent of this correlation is due to the indirect effect of leaf area index at 100 per cent flowering through leaf area index at 50 per cent flowering. Pod clusters per plant contributed 21 per cent indirectly to this character. The negative direct effect had contributed for 17 per cent reduction in the correlation. While pods per plant had influenced indirectly by 10 per cent, the contribution of pod length and grains per pod was very low.

Leaf area index at 50 per cent flowering and harvest index was correlated by 66.8 per cent. Though leaf area index at 50 per cent flowering had a high direct contribution of 72.9 per cent to harvest index, its influence through leaf area index at 100 per cent flowering was negative resulting in a reduction in its contribution via leaf area index at 100 per cent flowering by 23.4 per cent. Pods per plant had a 25 per cent contribution to this correlation while 22 per cent contribution came from pod length, both indirectly.

Pod length and harvest index were correlated by 75.6 per cent. The direct contribution of pod length to harvest index was 38.4 per cent while its indirect contribution via leaf area index at 50 per cent flowering was 48.3 per cent and via grains per pod was 17.7 per cent. The indirect contribution of other factor was low.

A positive genotypic correlation of 71.3 per cent was observed between pods per plant and harvest index. The direct effect of pods per plant to harvest index was low (19.6 per cent) than this correlation. The positive indirect effect through leaf area index at 50 per cent flowering contributed significantly to this correlation. The indirect contribution of grains per pod was positive (16.8 per cent) while that of leaf area index at 100 per cent flowering was negative (20.5 per cent).

Pod clusters per plant and harvest index was correlated by 85.4 per cent positively, while its direct effect was negative with a 23 per cent contribution. But its indirect contribution through leaf area index at 50 per cent flowering was about 63.2 per cent. Pods per plant and leaf area index at 100 per cent flowering had an indirect contribution of 21.0 per cent and 24.7 per cent respectively. An indirect contribution of 10 per cent was from pod length and 3.6 per cent from grains per pod.

The genotypic correlation of grains per pod and harvest index was 54.7 per cent while its direct effect was positive but low (10.7 per cent). This correlation is mainly due to the indirect influence of grains per pod through pod length (66.7 per cent) and through pods per plant (28.7 per cent). From the study it was found that leaf area index at 50 per cent flowering is the major character influencing the harvest index both directly and indirectly.

Table 1. Direct and indirect effects of six components on harvest index

	Pod clusters per plant	Pods per plant	Pod length	Grains per pod	LAI at 50 % flowering	LAI at 100 % flowering	Total correlation
Pod clusters per plant	-0.196	0.179	0.089	0.031	0.540	0.211	0.854
Pods per plant	-0.252	0.140-	0.006	0.120	0.858	-0.146	0.713
Pod length	-0.060	-0.003	0.290	0.134	0.365	0.031	0.756
Grains per pod	-0.057	0.157	0.365	0.107	0.051	-0.076	0.547
Leaf area index at 50 per cent flowering	-0.145	0.165	0.145	0.008	0.729	-0.234	0.669
Leaf area index at 100 per cent flowering	0.226	0.112	-0.048	0.044	0.933	<u>-0.183</u>	1.083

Residue = 0.708

Direct effects are underlined

This paper forms a part of the M.Sc. (Ag) thesis of the senior author submitted to the Kerala Agricultural University.

College of Agriculture
Vellayani 695 522, Trivandrum, India

Saji T. Abraham
S.G. Sreekumar
P. Saraswathy
V. Gopinathan Nair
P. Manikantan Nair

REFERENCES

Donald, C.M. 1962. In search of yeild. /. *Aust. Inst. agric. Sci.* 28 : 171-178

Dewey, D.R. and Lu, N.H. 1959. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J.* **51** : 515-518

Varshney, S.K., Rai, B. and Singh B. 1986. Componental analysis of harvest index in brassica seeds. *Indian J. agric. Res.* 20 : 129-134

Wright, S. 1921. Correlation and causation /. *agric. Res. 20* : 557-587

□□□