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Gene Effects in Vegetable Cowpea

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ABSTRACT

The nature of gene effects involved in the inheritance of days to 50 per cent flowering, leaf area, number of branches per plant, plant height, number of pods per plant and pod yield per plant was investigated in vegetable cowpea (*Vigna unguiculata* (L.) Walp.). Graphical analysis revealed the presence of partial dominance for days to 50 per cent flowering near to complete dominance for leaf area and number of branches per plant, whereas overdominance was observed for plant height, number of pods per plant and pod yield per plant. Both additive and non-additive type of gene effects may be simultaneously exploited by recurrent selection for improvement of these traits.

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INTRODUCTION

Vegetable cowpea has a great potential in the Indian vegetable scenario. It plays an important role in Indian diet. Green tender pods form an excellent nutritious vegetable and have got a potential to solve the protein deficiency problem of human diet. Sometimes it is also known as poor man's meat. The success of breeding programme depends upon understanding the genetics of characters in relation to material to be utilized. Information on genetic architecture through graphical analysis in vegetable cowpea is meagre and hence the present investigation was undertaken to know the genetic architecture for pod yield and its associated characters.

MATERIALS AND METHODS

The experimental material comprised of seven diverse lines of vegetable cowpea viz., Line Selection-102, Punjab-263, Pusa Barsati, Gujarat-1, GC-82-7, Arka Garima, In-103 and their 21 F_1s were evaluated in randomized block design with three replications during kharif 1996 at Vegetable Research Station, GAU, Junagadh. Each genotype was grown in 3 meter long single row plot spaced 60 x 30 cm. Data were recorded on five randomly selected plants in each replication except for days to 50 per cent flowering. The mean data were utilized for graphical analysis following Hayman(1954).

RESULTS AND DISCUSSION

The fulfilment of the assumptions underlying diallel analysis was revealed by non-significant t^2 values for all the characters studied. The results are graphically presented for days to 50 per cent flowering leaf area, number of branches per plant, plant height, number of pods per plant and pod yield per plant (Figure 1, 2, 3, 4, 5 and 6 respectively). Perusal of these figures indicated that array points were scattered below the limiting parabola for days to 50 per cent flowering and number of branches per plant. It suggested that these traits were more responsive to environmental effects which could also be supported by large standard error for days to 50 per cent flowering (0.544) and branches per plant (0.720). The environmental influence seems to have caused wobbling of the array points. Consequently neither the presence nor the absence of interallelic interaction could be confirmed. In general, wide scattering of parental array points along regression line in the Vr-Wr graph (1-6) indicated genetic diversity among the parents for all the traits studied.

In the Vr - Wr graph (Fig. 1), the intercept of regression line on Wr axis was above the origin, indicating partial dominance for days to 50 per cent flowering. Similar findings were also reported by Mak and Yap (1980), Zaveri *et al.* (1980) and Buhecha (1981). The parent In - 103 possessed more number of dominant genes, while Gujarat -1 contained more recessive genes. The wide gap between regression line and parabole curve suggested greater influence of environment on the expression of this character with resepct to leaf area the regression line which cut the Wr - axis slightly below the point of origin revealed complete dominance. The array points of GC-82-7 which was the nearest to the point of origin possessed most of the dominant alleles, while the array point of line Selection-102 was away from the point of origin indicating that it possessed most recessive alleles. Gujarat-1 and Arka Garima had equal proportion of dominant and recessive alleles. Parental point of Punjab-263 fell relatively far below the regression line indicating complementary type of gene interaction.

For number of branches per plant (Fig. 3) the regression line passed through the origin thereby indicating presence of the complete dominance. However, Zaveri (1978) observed overdominance which was at variance with the present finding. The dispersion of parental array points inidicated presence of large number of dominant genes in Gujarat-1 and more number ofceressivegenes in In-103. The wide gap between regression line and parabola curve suggested greater influence of environment on the expression of this character. In case of plant height (Fig. 4) the regression line intercepted Wr-axis below the origin indicating the presence of overdominance. Similar findings were also reported by Sawant (1994). The parent Arka Garima and GC-82-7 whose array points were situated near the point of origin possessed more dominant genes, whereas Punjab-263 falling away from the point of original possessed maximum numberr of recessive alleles.

The regression line intercepted the Wr-axis below the origin for number of pods per plant (Fig. 5) indicating overdominance. Results were in agreement with Mak and Yap (1980). The array points of Arka Garima had excess of dominant alleles, whereas Gujarat-1 had maximum number of recessive alleles. The Vr-Wr graph for pod yield per plant indicated the presence of overdominance as Wr-axis was intercepted by regression line below the point of origin. Line selection 102 was more closer and GC-82-7 was farthest from point of origin suggesting the presence of most dominant and recessive alleles, respectively in them.

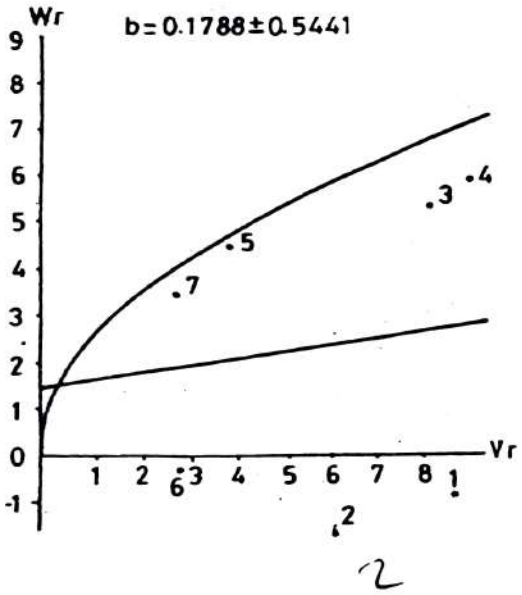


Fig. 1 : Days to 50 per cent flowering

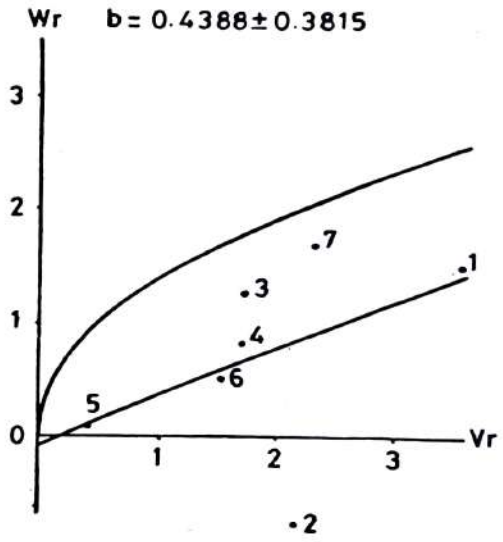


Fig. 2 : Leaf area

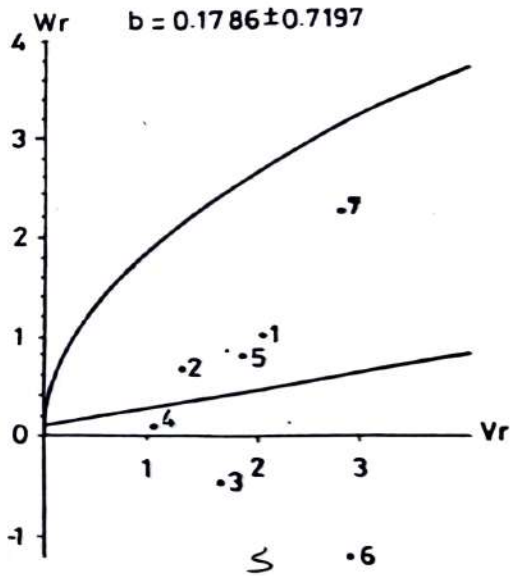


Fig. 3 : Number of branches per plant

1 = Line Selection – 102, **2 = Punjab – 263,** **3 = Pusa Barsati,** **4 = Gujarat – 1,** **5 = GC – 82-7,** **6 = Arka Garima,** **7 = In – 103**

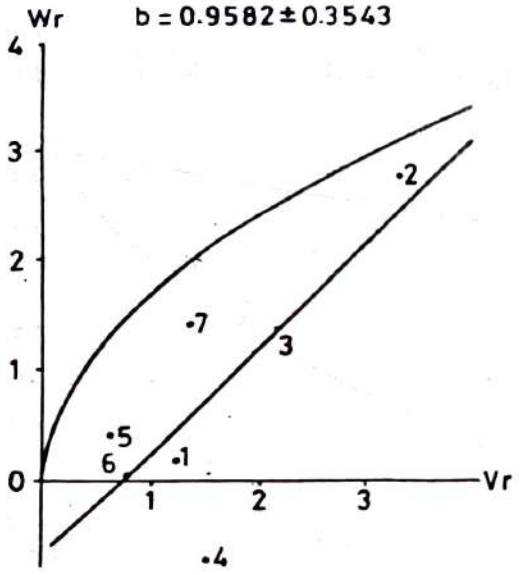


Fig. 4 : Plant height

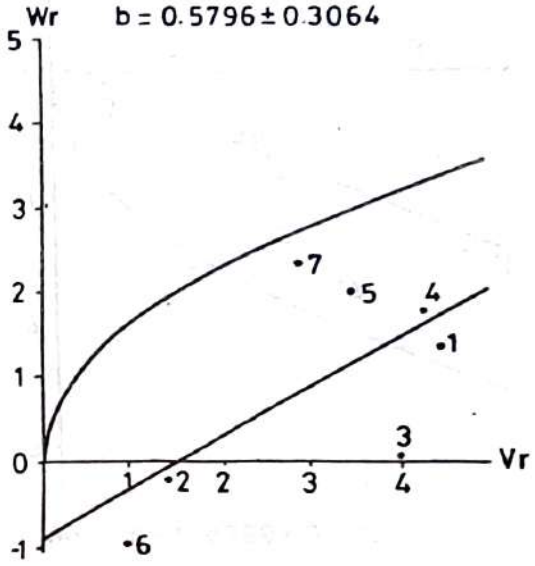


Fig. 5 : Number of pods per plant

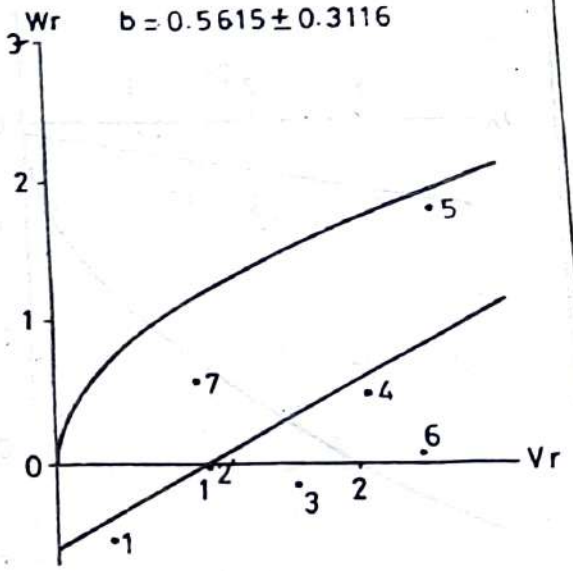


Fig. 6 : Pod yield per plant

1 = Line Selection – 102, 2 = Punjab – 263, 3 = Pusa Barsati, 4 = Gujarat – 1, 5 = GC – 82-7, 6 = Arka Garima, 7 = In – 103

It can be ascertained on the basis of graphical analysis that none of the parents had the possible complete set of dominant or recessive genes for all the traits. It would therefore be possible to accumulate desirable alleles in any of the parents by recurrent selection to achieve high mean performance with high levels of dominance. In the present study Line Selection-102 and Arka Garima could be used in further breeding programme to combine attributes like number of pods per plant and pod yield per plant.

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