which recorded 87.7 per cent heterobeltiosis. The inter-subspecific hybrids produced better hybrids for pod yield than the intra-subspecific hybrids, the mean heterobeltiosis percentages being 54.6 and 29.7 respectively.

In general, the inter-subspecific crossess exhibited greater magnitude of heterobeltiosis for pod number, pod and kernel weights and ultimately for pod yield than the intra subspecific crosses. The reports of Hammons (1973), Garet (1976) and Ramakrishna Raju *et al.*, (1979) are also in agreement with these findings. Reddy (1980) while suggesting the stretegy for varietal improvement also states that the Spanish x Virginia types would result in superior hybrids because the desirable attributes are clustered separately in each group and the intrasubspecific crosses may be avoided (unless a specific trait is to b incorporated) since no superior derivative are likely to be recorded in such programme.

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# GENETICS OF RUST (PUCCINIA ARACHIDIS SPEG.) IN GROUNDNUT

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## ABSTRACT

Rust (**Puccinia arachidis** Speg.) resistant groundnut genotype NC Ac 17090 was crossed with susceptible genotype VG5 and their segregating populations of $F_1$, $F_2$ and $B_1$ and $B_2$ were studied for the reaction to the disease. The additive component (d) was significant, while the dominance (h) was not significant. The epistatic interactions, additive x dominance (j) and dominance x dominance (l) were not significant.

KEY WORDS : Groundnut, Rush resistance, Gene action

Groundnut rust caused by *Puccinia arachidis* Speg. has become of increasing economic importance over the last few years. It has long been regarded as endemic to the western hemisphere (Bromfield, 1971). Since 1969, rust has been reported in all major groundnut producing areas of the world according to Hammons (1977). In India it was first observed in 1969 and subsequently, severe damage in major groundnut growing states was reported by subrahmanyam *et al.*, (1979). In the semi-arid tropics, where chemical control is rarely used, losses in excess of 50% are common (Gibbons, 1979). Although the disease can be controlled by certain fungicides, these are costly and are not readily available to small farmers in developing counteries. Hence evolving resistant genotypes with good

**Table 1. Mean rust score in parents, F1, F2 and back cross generations.**

| Generation | Mean rust grade and standard error | Sample size scored |
|---|---|---|
| $\overline{P}_1$ | 6.74 ±0.13 | 50 |
| $\overline{B}_1$ | 4.23 ±0.11 | 100 |
| $\overline{F}_1$ | 5.38 ±0.14 | 100 |
| $\overline{F}_2$ | 5.12 ±0.12 | 200 |
| $\overline{B}_2$ | 6.26 ±0.10 | 100 |
| $\overline{P}_2$ | 2.16 ±0.09 | 50 |
| Scales | | |
| A | $-3.66^{**}$ ± 0.29 | |
| B | $4.98^{**}$ ± 0.26 | |
| C | $0.82^{NS}$ ± 1.01 | |

$\overline{P}_1$ and $\overline{P}_2$ refers to VG 5 and NC Ac 17090 respectively.
** Significant at 1% level. NS not significant.

economic attributes will be a boon to the groundnut growers. Fortunatly resistant genotypes for this disease have been reported by Subrahmanyam *et al.*, (1980b). With a view to understand the genetics of rust resistance the present study was undertaken.

## MATERIALS AND METHODS

The material consists of the following generations *viz.*, $P_1$, $P_2$, $F_1$, $F_2$, $B_1$ and $B_2$ of the cross combinations NC Ac 17090 x VG5. The parent NC Ac 17090 was resistant to rust as reported by Subrahmanyam *et al.*, (1980 a.). The growth habit of this genotype comes under valencia form (ssp. *fastigiata* var. *fastigiata*). This land race was originally collected in Peru by Dr. N.C. Gregory and obtained from ICRISAT for hybridisation. VG5 (MK374 x R33-1) is highly susceptible to rust. It belongs to virginia bunch type (ssp. *hypogaea*) maturing in 110 days. The segregating and non segregating populations were studied in randomised blocks design replicated twice.

The method of rust disease scoring was done at maturity according to the method described by Subrahmanyam et al., (1980 a, 1982). The known susceptible cultivar $TMV_2$ (ssp. *fastigiata* var. *vulgaris*) was sown 14 days before the test populations, as infector rows.

Artificial inoculation of rust spores was done periodically. The populations were scored prior to harvest on a 9-point field scale (1 = free from rust and 9 = 50 to 100% defoliation caused by rust).

To test the adequacy of the additive-dominance model, the following scales *viz.* A, B and C were estimated using the means and variances of the six generations available (Mather and Jinks, 1982). The non significance of the scale C indicate the inadequacy of additive - dominance model (Table 1); hence the model was extended to additive, dominance and interaction (six parameter model). The perfect fit solution given by Jinks and Jones (1958) was adopted.

## RESULTS AND DISCUSSION

The estimates of additive, dominance and interaction parameters for rust scoring are presented in Table 2. The additive component (d) was significant, while the dominance (h) component was not significant. The epistatic component, additive x dominance interaction (j) was significant, while additive x additive

Table 2. Estimates of the additive, dominance and interaction parameters for rust score

| Parameters | Estimated values and their Significance |
|---|---|
| m | $3.95^{**} \pm 0.57$ |
| ( d ) | $2.29^{**} \pm 0.08$ |
| ( h ) | $3.25^{NS} \pm 1.55$ |
| ( i ) | $0.50^{NS} \pm 0.57$ |
| ( j ) | $-8.64^{**} \pm 0.23$ |
| ( 1 ) | $1.82^{NS} \pm 0.83$ |

* * Significant at 1% level NS Not Significant.

interaction (d) and dominance x dominance (l) components were not significant. However the proportion of (j) component was greater in magnitude indicating preponderance of dominance x dominance as compared to other interaction components.

Due to the greater magnitude of additive type of gene action, the present material could be profitably utilised for effecting selection of resistant derivatives through resistant lines. However, as the non allelic interactions in the present population may hinder the improvement of rust resistance breeding programmes to harness the three types of gene interactions, the population could be improved upon by increasing the frequency of rust resistant derivatives coupled with high yield through repeated cycles of selections.

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