Groundnut Rosette Virus: Breeding for Resistance in Southern Africa

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Groundnut rosette virus (GRV), although not widespread every year, induces loss approaching 100% in some years when there is a pandemic outbreak of the disease. It is the most serious groundnut virus disease in southern Africa.

The SADCC/ICRISAT Groundnut Project initiated a breeding program in 1982 to develop agronomically acceptable, GRV-resistant groundnut *(Arachis hypogaea* L.) varieties adapted to the growing conditions of the region. Incorporating resistance into short-duration varieties is one of the major aims of this program.

GRV may be controlled in many ways, one of which is the use of insecticides. But, this is beyond the reach of resource-poor farmers in the semi-arid tropics. Resistance to the vector has been identified in several genotypes and this may afford a useful level of protection. However, genetic resistance to the virus itself is likely to be the most effective method of minimizing yield reductions due to GRV.

Breeding for Resistance

Genetic resistance to GRV is available in cultivated groundnuts but has been demonstrated only in a limited range of germplasm. Most of these are of the alternately-branched Virginia type and are similar in many respects.

Crosses have been made using a number of the available sources of resistance. Few sources of rosette resistance have been reported in sequentially-branching genotypes but we are making extensive use of a recently-purified introduction of KH 241 D from West Africa. Recovery of adapted GRV-resistant Spanish types from crosses involving long-season sources is small because of the combination of two traits both of which have long probability. The use of short-season sources of resistance would improve recovery of suitable resistant genotypes.

F_1 populations from crosses made in 1987/88 and 1988/89 between sequentially-branching varieties which were adapted but susceptible and this genotype were of the same type as the adapted parent. A number of these populations show promise for yield potential.

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Screening

We have perfected a technique for screening breeding populations for rosette resistance. Rosette-infected and heavily aphid-infested seedlings grown in greenhouse are transplanted into susceptible spreader rows. Single spreader rows are sown after every pair of test rows, and infector plants are introduced into spreader rows at 1.5 m intervals. We have succeeded in inducing regularly, GRV incidence exceeding 92% in susceptible test entries. Symptomless plants (a mixture of resistant plants and "escapes") are selected and are tested in the nursery the following summer.

Selection

We have delayed entry of segregating populations into the rosette nursery until the F_3 generation, when populations advanced by single-seed descent are entered into the screening nursery. This procedure allows duplicate populations for screening and selection for other attributes. Screening in F_2 results in eliminating all susceptible segregants.

Progress in Breeding

In 1987/88, we selected 12 high-yielding alternately-branching lines from F_5 breeding populations. In 1988/89, these were the first rosette-resistant selections to be entered into replicated yield trials. They were concurrently entered into the rosette nursery and were all confirmed resistant.

Their performance in these trials was very promising and four ICGV-SM—88709, 88710, 88711, and 88734—were selected on the basis of yield, shelling percent, and seed color for inclusion in regional yield trials grown in Malawi, Swaziland, Zambia, and Zimbabwe in 1989/90.

Performance of these varieties at Chitedze, Malawi, compared favorably with those of local controls but their performance in Zambia was inferior to that of local controls. In Zimbabwe, they compared favorably with only one of the local controls. Their seed size was disappointing but three of them have suitable tan seed color.

Nineteen new GRV-resistant virginia-type selections made in 1988/90 were included in a yield trial for the first time in 1989/90. Six of these significantly outyielding RG 1 ($P < 001$), the GRV-resistant control. Most of these have variegated seed color and their seed size is inferior to that of local controls.