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DEVELOPMENT AND APPLICATION OF GENETIC MARKERS LINKED TO NEMATODE RESISTANCE IN SOYBEAN.

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Abstract

To be competitive on the world market, locally grown soybeans need to be adapted to typical South African environmental conditions such as low humidity or high shattering risk, low night temperatures, diverse growing conditions impacting on plant structure and seed chemical and physical quality, local pests, local disease pressures, etc. Soybean cultivars introduced from the USA or elsewhere cannot compete with cultivars selected locally. Some characteristics however, require special logistics in order to breed for. Using laboratory procedures to screen for genetic markers which correspond to the desired characteristic will cut down on complicated and labour intensive plant screening methods and provide a more reliable and cost effective way to identify progeny with the desired trait. This is especially applicable in the case of breeding for nematode resistance, which is crucial for the expansion of the soybean production area into the western regions with sandy soils and high risk of nematode infestation.

More than one root-knot nematode species are involved in damage to soybean crops, with the additional complication of different races of a given species occurring in South African soils and elsewhere. This fact complicates breeding for specific resistance, since you have to test the breeding population for resistance with artificially inoculation methods in a greenhouse facility. Two root-knot nematode species are predominant in South Africa on soybean, namely *M. javanica* and *M. incognita* racè 2. Markers linked to resistance to *M. javanica* in Gazelle were developed in a previous project and are ready for use in our breeding program. It is therefore necessary to develop markers for resistance to *Mi* race 2 in order to facilitate selection of resistance for both the predominant nematodes (*Mi* race 2 and *Mj*), as the resistance is controlled by different genes.

Sixty-one soybean cultivars were evaluated for host suitability to *M. incognita* race 2 in the greenhouse. Cultivars LS5995, Potties, PAN660, TXS89/10/29 and D82-3298 (USA genotype resistant to *M. incognita*) were identified as poor hosts to this species and exhibited RF –values less than 1. These cultivars and Prima2000 (susceptible) were included in micro plot (Potchefstroom - 2000 / 2001 & 2001/2002) and field trials at Greytown (2000 / 2001 & 2001/2002) and Vaalharts during the 2001/2002 season to verify their poor host suitability to *M. incognita* race 2. LS5995 maintained the lowest numbers of *M. incognita* race 2 in both these trials followed by PAN660, TXS89/10/29, D82-3298 and Potties. These genotypes differed significantly from the susceptible standard Prima2000.

Crosses between LS5995 (resistant) and Prima2000 (susceptible) resulted in twenty-five plants being identified as being F_1 's. This material was planted in the greenhouse and the F_2 population will consequently be planted and inoculated with *M. incognita* race 2. The

disease resistance rating will be determined to facilitate the marker identification process. Amplified fragment length polymorphism (AFLP) using bulked segregant analysis will be utilized in marker identification.