

Marker Assisted Selection for Sclerotinia

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Sclerotinia blight is one of the most important yield- and quality-limiting diseases of peanut in the Virginia-Carolina region. The disease, caused by the soil-borne pathogen *Sclerotinia minor*, can cause substantial losses either in the form of lost yield and quality or as a cost of control. The objective of this project is to incorporate Sclerotinia blight resistance into peanut cultivars, specifically with the aid of molecular markers linked to genes conditioning resistance. During 2005, crosses were made between Sclerotinia resistant line N96074L and the tolerant virginia-type cultivar Perry. F₁ hybrids from this cross were sent to the Puerto Rico Winter Nursery to obtain an F₂ segregating population. The population was advanced by single-seed descent in order to develop recombinant inbred lines and we are currently in the F₆ generation. A total of 112 lines plus appropriate susceptible and resistant check cultivars were tested in replicated field plots for Sclerotinia resistance. During 2009 the parents and lines were evaluated and the average number of diseased plants for NC96074L was 16.7% whereas Perry had 81.9% disease incidence. The lines ranged from 7.1 to 95.0% disease incidence. During 2010, a second year of testing in the field was performed with the same entries but there was no field incidence of the disease. Thus, no data was obtained in the experiment. The same materials will be planted in 2011 for a second year evaluation.

During 2010, the parents N97074L and Perry were screened with simple sequence repeat markers (SSRs) to find polymorphism which may be associated with Sclerotinia resistance. SSRs are being used as the marker system because they have been shown to be polymorphic even between closely related cultivated types. To date, more than 300 SSRs have been evaluated, of which 26.2% are different between N97074L and Perry. DNA bulks of the 10 most resistant lines and the 10 most susceptible lines to use as testers for marker associations with resistance. The two bulks were evaluated with the SSRs found to be polymorphic between the two parents to conduct the association research, i.e., resistant bulks should match only with N97074L and susceptible bulks should match with Perry. To date, no positive associations have been identified, which means that the polymorphisms observed between the two parents are for traits other than Sclerotinia resistance. We are obtaining additional markers from cooperators in Georgia and will continue screening to associate SSRs with resistance.

Impact Statement

Transferring a gene conferring high levels of resistance for Sclerotinia into peanut will potentially have a large impact on the peanut industry. Cultivars with moderate levels of resistance are currently available, but higher levels of resistance are needed to avoid yield losses. Sclerotinia is a soil-borne fungus and difficult to select, so the process is slow and pyramiding genes with resistances to other pathogens is extremely difficult and time consuming. Associating molecular markers with Sclerotinia resistance will allow peanut breeders to select resistant plants in environments even when the disease is not present. Further, markers associated with resistance will permit selection for multiple resistances at the same time and greatly enhance the efficiency of selection. This project will lead to improved peanut cultivars with high levels of Sclerotinia resistance.