Introgression of strong resistance to Root Knot Nematode from the wild species *A. stenosperma* into elite peanut lines

Executive Summary

Currently there is only one source of root-knot nematode resistance in commercial cultivars. *This is vulnerable to being broken by the nematode pest.* This project has identified two new sources of nematode resistance from the wild peanut species *A. stenosperma* and has incorporated them into a genetic background that is more than 90% elite.

Overview of progress

The research, which begun about five years ago, has now completed the third backcross into elite southeast USA peanut genetic background. In the initial F_2 stage plants were selected for vigor, seed size, absence of disease in field conditions and the presence of desired genome regions. Each subsequent backcross generation has been selected, using DNA markers, for the presence of four genome regions we consider likely to confer disease resistance. Two of these regions convey robust nematode resistance (the two others may confer resistance to leaf diseases)

In the summer of 2018, selected BC_2F_1 plants were used as male parents for a further backcross into elite Georgia lines. Nematode assays using rooted detached leaves (Fig 1) from these BC_2F_1 plants and controls (susceptible peanut genotypes; the resistant cultivar Tifguard; the wild species *Arachis stenosperma* and *A. batizocoi* and an induced allotetraploid derived from these two wild species) are now complete. Detached leaf assays are preferred because individual genotypes used for crossing can be assayed for nematode resistance, with biological replications, whilst, at the same time they are used as male parents for advancing backcrossing.

Eight, second backcross male parents, selected by DNA markers, were used as male parents in a third round of backcrossing in 2018. Seven of these male parents were completely resistant to nematodes. The project will now move to genetic testing, and nematode screening of more than 200 BC_3F_1 plants (on average these plants will have about 94% elite genetic background)

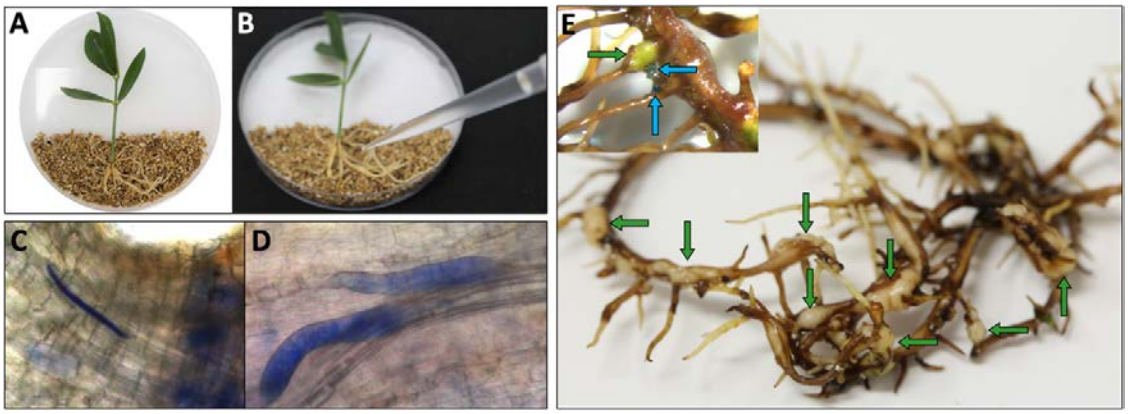

Fig 1: Overview of assay for root-knot nematode resistance using detached leaf bioassays. (A) Emerged roots in the detached leaves; (B) Inoculation with 1 ml of nematode solution at ~3,000 J2/ml after 30 days of root induction; (C) and (D) juvenile nematodes developing on susceptible controls, stained with cotton blue solution; (E) Galls and egg masses observed on the susceptible *A. hypogaea*. Eggs masses stained with Erioglaucine solution. Galls are indicated by green arrows and egg masses by blue arrows.