

ABSTRACT

Late leaf spot (LLS) and groundnut rosette disease (GRD) can cause groundnuts yield loss of up to 100% especially when the crop is water-stressed. Although progress has been made to breed for groundnut varieties with combined resistance to these stresses in Uganda, A thorough understanding of the effect of genes which combine disease resistance with tolerance to soil moisture stress on yield is needed to inform selection of groundnut cultivars with resistance to these stresses and high yields. The objectives of this study were therefore to: (i) Screen groundnut genotypes for yield and resistance to LLS and GRD; (ii) Evaluate groundnut genotypes for yield and tolerance to soil moisture stress; (iii) Determine the mechanisms of resistance to LLS and GRD in drought-tolerant genotypes; and (iv) Identify combining ability and heterosis for yield and resistance to diseases and drought. A total of 38 genotypes were evaluated at Serere Research Institute for two seasons in 2015 in a randomized complete block design with 4 replications. A total of 9 genotypes exhibited resistance to both LLS and GRD and also yielded highly. To study the effect of soil moisture stress on yields, the 38 genotypes were evaluated at three watering regimes in a screen house at Namulonge Research Institute, in a split plot design with two replications. Some genotypes showed increase in relative water content (RWC) and leaf membrane stability index (LMSI) with increasing soil moisture stress. Cultivars SGV0080, SGV0074, Serenut2 and SGV0084 recorded the highest drought tolerance index. Eleven drought tolerant genotypes combining resistance to both diseases were selected to study their response under soil moisture stress. The experiments were conducted in the screen house and arranged in a complete randomized design and data collected on aphid counts and plant metabolites. The GRD resistant genotypes recorded the lowest aphid counts and the highest tannin contents whereas LLS susceptible genotypes exhibited the lowest total chlorophyll. The tannin and total phenolic contents correlated negatively with aphid counts. The results indicated that an increase in these metabolites suppressed disease occurrence. Eight genotypes exhibiting resistance to LLS, GRD and drought were selected and crossed to produce 12 F1 hybrids. The hybrids and parents were evaluated for combining ability and heterosis. ICGV 03590 recorded desirable GCA for yield, LLS and harvest index indicating the ability to transmit these traits. C9, C8, C3, and C6 proved promising for yield and drought tolerance. C12 proved superior for yield, diseases resistance and tolerance to soil moisture stress, based on SCA and heterosis and is potentially, the best candidate for further field evaluation for release to farmers.