

L 6.15 - More efficient breeding of drought resistant peanuts

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Drought is a major constraint to productivity where peanut is grown under dryland conditions. While breeding of drought-resistant genotypes by direct selection for yield can be effective for a given target environment, more rapid progress can be aided by a prior knowledge of the physiological basis of crop performance under drought conditions. A crop physiological model to analyse yield variation under water limited conditions following the framework proposed by Passioura (1977), where:

Pod Yield = Water Transpired (T) × Water-Use Efficiency (W) × Harvest Index (HI), has been used to screen world peanut germplasm at the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) to select genotypes possessing high levels of these traits. Low cost, rapid and easily measured surrogate measures for each of these traits were developed.

A large collaborative project involving breeders, physiologists and modellers between QPI&F, ICRISAT and Indian Council of Agricultural Research agencies was implemented to apply this physiological knowledge to test whether indirect selection using the trait approach could improve the efficiency of selection in large-scale peanut-breeding programs.

The research found that both direct and indirect (trait-based) selection methods for yield were able to select out high-yielding genotypes under water-limited conditions. Yields were significantly (up to 30%) higher than local check varieties, suggesting that parental selection was more critical than the breeding methodology followed.

Although there were small differences in the efficiency of selection between breeding approaches, there was clear evidence that the trait approach was able to identify genotypes with high levels of W, which contributed to yield benefits in diverse water-limited environments. In India and Australia a number of drought-resistant peanut varieties were developed by using trait-based selection approach and are being commercially grown.



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ABSTRACTS



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