

Successful Implementation of Speed Breeding Techniques in a Peanut Breeding Program

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Traditional peanut breeding strategies used in Australia have been based on a pedigree breeding system after initial glasshouse hybridisation. Utilising this strategy, new peanut varieties are commercially released to industry in around 12 years after initial hybridisation. Over the past decade the Australian Peanut Genetic Improvement Program (APGIP) and now the Future Peanut Breeding Program (FPBP) have developed new strategies to reduce the time taken to release new varieties and improve the efficiency of the breeding program. Speed breeding, the growing of plants under controlled environment conditions, in conjunction with marker-assisted backcrossing provides an opportunity to not only reduce generation time but also to simultaneously incorporate genetic marker selection tools. A speed breeding facility (SPF) has been established in a 40 foot insulated shipping container on site at the Kingaroy Research Station in Queensland, Australia. Lighting is provided by 12 light emitting diode (LED) units with two reverse cycle air conditioners installed to ensure temperature remains at optimum levels. Preliminary trials, run through the 2020 winter, indicated viable seed could be achieved harvested at 85 days after planting (DAP). A follow up study will assess if growing time can be further reduced, in order to turn-around and entire generation, including post-harvest processing in around 90 DAP. This will enable four generations to be grown in a calendar year, significantly reducing generation time. In order to facilitate a marker assisted backcrossing program, cuttings were taken from F1 plants grown in a North Queensland winter nursery in August 2020. These cuttings were transported to and successfully established in the SBF the following day. The F1 cuttings continued to grow and flower successfully in the SBF and the flowers from these males were subsequently used for crossing in the facility. Crossing was generally successful, however more research is required to improve the success rate. In summary, peanuts have been shown to grow successfully from seed and cuttings in the SPF, as well as being able to be crossed. This is a critical step in rapid generation of a marker assisted backcrossing program to the BC3F3 generation, before plants are then grown out in the field for further assessment of yield and quality traits.