

Fast Faba - delivering rapid homozygosity

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Faba bean (*Vicia faba* L.) is established as a high-value, high-protein pulse crop option for Southern Australia. In 2018, prices were double that of lentil and up to \$200/ T more than chickpea. Faba bean breeding has led to substantial genetic improvement over the past decade, resulting in improved crop resilience and reliability. We propose herein a new tool for plant breeding in faba – an accelerated single seed descent (aSSD) platform for year-round growth under fully artificial conditions. It is expected the aSSD platform will provide the basis for rapid delivery of improved traits such as herbicide resistance to the farm gate.

Faba bean is well known to be difficult to grow indoors due to a reliance on insect vectors for pollination and the resulting low seed set when grown under controlled environment conditions. We have been researching methods to achieve both a rapid onset of flowering and robust pod set in the absence of insects. Our efforts have resulted in the turnover of up to five generations per year in segregating populations. These segregating populations represent a wide phenotypic spectrum within the breeding program.

An 18 h photoperiod, 22/ 18 °C temperature regime and optimised Red:Far Red light ratio provided by AP67 LED light fixtures (Valoya, Finland) is optimal for acceleration of faba flowering and successful seed set. We mimic bee pollination using vibration and individual tripping of flowers. We manipulate plant height to facilitate multi-tier controlled environment growth through application of the anti-gibberellin agent Topflor® (SePro Corporation) enabling a density of up to 95 plants/ m². A rigorous regime of pest control, watering and weekly liquid fertiliser maintains plant health. At time of writing, the Faba aSSD platform has delivered >550 F6/ F7 lines to the breeding program, with a further 1960 lines under development.