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Abstract

Harnessing Asexual Seed Formation to Preserve Hybrid Vigour and Complex Yield Traits †

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Abstract: Efficiencies in plant breeding can fast-track the development of high yielding, resilient seeds to support food requirements of a growing world population. Seeds typically form via a sexual pathway resulting in diverse progeny through recombination during gamete formation and gamete fusion during fertilization. Breeders rely on sexual reproduction to generate diverse trait combinations, however, sexual reproduction makes it difficult to keep traits together during backcrossing required to stabilize a variety for evaluation. Hybrid crops can give significantly higher seed yields as a result of what is known as hybrid vigour (or heterosis). However, seeds from high yielding hybrids cannot simply be re-sown as heterosis is lost or inefficiently transmitted to the next generation because sexual reproduction breaks up heterosis and induces trait segregation in subsequent generations. Harnessing asexual reproduction (or apomixis) in plant breeding would enable rapid fixation of traits in F1 hybrids and the progeny of breeding crosses in a single generation as the progeny are derived from a cell that is not a product of meiosis or fertilization. The genotype is thus fixed and the seeds are clonal. In this talk, progress towards harnessing apomixis in a Bill and Melinda Gates Foundation funded project called Capturing Heterosis (CapHet) will be described. This multi-party project aims to develop the capability to synthesize apomixis in sorghum and cowpea and develop self-reproducing hybrid sorghum and cowpeas from which hybrid seeds can be economically saved and grown by smallholder farmers in sub-Saharan Africa without loss of yield or quality over multiple generations.

Keywords: apomixes; seed; hybrid vigour; plant reproduction; cowpea; sorghum