Small changes have large benefits for crop breeding

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Researchers from The University of Western Australia have developed a new method for breeding crops that will improve the potential for long-term, sustainable genetic improvement.

In a world first, Professor Wallace Cowling from The UWA Institute of Agriculture and his team have taken the breeding model commonly used by animal breeders, and implemented it in self-pollinating crops.

Self-pollinating crops, or 'selfing' crops, are plants that are normally fertilised from their own pollen. Self-pollinating crops such as rice, wheat and other cereals, soy beans and certain vegetable-derived oils, account for more than 60 per cent of world food calories for human consumption.

Farmers are used to saving the seed of wheat and other crops such as lupin, field pea and chickpea, knowing that the harvested seed is identical to the sown seed as a result of selfing. New varieties are 'pure lines' that have been tested for several generations and shown to be superior to previous varieties. Pure lines are normally used in crossing to start the next cycle of selection.

In contrast, animals cannot self, and pure lines are impossible to select. Animal breeders have developed a method of breeding that takes into account information from all relatives across all generations. The combined analysis of data across generations, as proposed in Professor Cowling's model for selfing crops, means there can be more accurate

selection and shorter generation intervals with more sustainable long-term genetic improvement.

Professor Cowling said crossing and recombination in self-pollinating crops normally occurs after selfing and selection of pure lines.

"In our research we changed the breeding process to allow 'crossing before selfing' rather than 'selfing before crossing," he said.

"The method should help retain additive genetic variance in breeding populations, which is permanently lost with 'selfing before crossing'.

"This relatively minor change in the practice of plant breeding has accelerated genetic gain and improved the potential for long-term and sustainable genetic improvement."

Coupled with new genomic technology, the new breeding method could speed up genetic improvements for desirable traits such as grain quality and yield.

More information: "Using the animal model to accelerate response to selection in a self-pollinating crop": g3journal.org/content/early/20 … .115.018838.full.pdf

Provided by University of Western Australia

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