Australian National University

Flowering genes and yield potential in wheat

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Slatyer Seminar room R N Robertson Building, Research School of Biology, ANU

Cereal yield potential is determined by a combination of the number of grains formed in a given area and the average grain weight. A major limit on yield is the number of fertile florets/grains that develop, and the number of fertile florets per plant is a major target for genetic improvement of cereals, including wheat. In wheat, florets are produced by groups of approximately 20 specialized branches (spikelets) that together form the spike. Altering spike architecture, for example by modifying the number of fertile florets produced by each spikelet, can potentially increase the number of grains per spike, and hence yield potential.

We are using three complementary approaches to investigate the genetic control of spike architecture and yield potential in wheat, particularly the roles of 'flowering time' related genes: (1) MAGIC, a unique mapping population that displays variation in several components of spike development, including the number and positioning of spikelets, (2) a panel of isolines in which alleles of the major flowering time genes VRN1 and PPD-D1 have been introgressed into a common genetic background, and (3) a collection of novel induced mutants with altered flowering time and/or spike architecture.

One trait we are investigating is the formation of supernumerary spikelets that can form adjacent to normal spikelets leading to a pair of spikelets at a single rachis node of the spike. Mutants with paired spikelets produce more grains per spike, potentially increasing yield potential. Paired spikelet formation also varies along the length of the spike, and their number is affected by different growing conditions, particularly photoperiod. Several experiments suggest that flowering signals play an important role in paired spikelet development, suggesting that the major flowering genes regulate spike development and have direct effects on yield potential beyond controlling heading date.

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