AS> Vol.2 No.3, August 2011

OPEN ACCESS

Pollination dynamics, grain weight and grain cell number within the inflorescence and spikelet in oat and wheat

PDF (Size:591KB) PP. 283-290 DOI: 10.4236/as.2011.23037

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ABSTRACT

Oat (Avena sativa L.) and wheat (Triticum aestivum L.) vary in the structure of their inflores-cences and also in how pollination proceeds within the inflorescence. In both species the grain position in the spikelet determines grain weight potential. Primary grains in oat and proximal grains in wheat weigh more than secondary and distal grains. This variation in grain weight can potentially result from differences in post-pollination cell division in the grain. In this study pollination duration and dynamics were analyzed from head samples collected at two-day intervals, starting from the pollination of the most advanced floret. The number of grain cells was determined for individual grains throughout the inflorescence, starting from the pollination event. When mature, grain position in the spikelet and spike was noted and grain weight assessed. Pollination advance in oat proceeded from the uppermost primary floret towards the basal spikelets in ten to eleven days. Within the spikelet, the primary floret was pollinated on average one day earlier than the secondary floret. In wheat, pollination duration was four to five days, starting from the proximal florets in the mid-section of the inflorescence progressing towards the apical and basal spikelets. Proximal florets were pollinated one to two days earlier than distal florets. Maximum cell number in primary grains exceeded that of secondary grains in two oat cultivars. Similarly, primary grains were heavier than secondary grains. Cell number and single grain weight were correlated in terms of grain position in the spikelet (primary – secondary) and cultivar. Oat cultivar Belinda had a higher single grain weight than Fiia, which was also expressed as larger grain cell number. In wheat, proximal grains had higher maximum cell numbers and were also heavier than distal grains. This grain weight gradient was apparent throughout the inflorescence. Consequently, grain cell number is one of the possible regulators of grain-filling capacity in both cereal crops.

KEYWORDS

Cell Number; Distal Grain; Filling Potential; Floret; Oat; Pollination; Primary Grain; Proximal Grain; Secondary Grain; Wheat Cell-PLoc; Signal-CF; Signal-3L

Cite this paper

Rajala, A. and Peltonen-Sainio, P. (2011) Pollination dynamics, grain weight and grain cell number within the inflorescence and spikelet in oat and wheat. *Agricultural Sciences*, 2, 283-290. doi: 10.4236/as.2011.23037.

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