The Acquisition of Gravisensitivity During the Development of Nodes of *Avena fatua*

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Abstract. Acquisition of gravisensitivity in the uppermost nodes of flowering stems of *Avena fatua* occurs during the period when the internode is extending from 30 to 100 mm. Within individual leaf sheath bases this event correlates with the development of 14–16 statocytes (cells containing sedimentable statoliths) in lateral association with each vascular bundle. This further correlates with the development of an ability by the leaf sheath base to control both the rate of transport of applied $^3$H-IAA and the level of endogenous IAA in response to the gravity vector. Estimates of the level of endogenous IAA in pooled extracts were similar using either HPLC with coulometric detection or GC-MS measurement of the molecular ion.

Gravitropic growth of the flowering stems of grasses is localized in the nodal regions (Maeda 1958, Arslan and Bennet-Clark 1960, Bridges and Wilkins 1973, Dayanandan et al. 1976, Wright and Osborne 1977). It results from cell elongation of the leaf sheath base (Dayanandan et al. 1976, Wright and Osborne 1977), where it is accompanied both by changes in the level (Wright et al. 1978) and polarity of transport (Wright 1982) of endogenously produced auxin. These changes have been considered as an integral part of the gravitropic mechanism which restores normal orientation (Wright 1981), the auxin-promoting cell elongation, and the reduced polarity in accord with a reduced transport away from the region of elongation.

In *Avena fatua*, the uppermost node of the flowering stem acquires competence for gravitropic growth around the time panicle emergence begins. For about 1 week immediately prior to this, although nodes cannot grow in re-

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response to gravity, they are similar in size and appearance and may be compared with those that can. The stages of development spanning this period of acquisition of gravisensitivity are now described; they form the basis for the selection of nodes with a range of gravisensitivities which in turn can be quantified from the bending response. In the experiments reported here, nodes of known gravisensitivity have been excised immediately after bending and their endogenous IAA levels estimated by an HPLC coulometric detection method (Wright and Doherty 1985), the validity of this method being checked by GC-MS using deuterated IAA as an internal standard. In parallel experiments, nodes of similar gravisensitivities were used for measurement of auxin transport (during a further period of gravistimulation) and assessment of statocyte development. The results obtained are discussed in relation to the ontogeny of the graviperception mechanism.

Methods and Materials

Plants of *A. fatua* were grown as described previously (Wright 1981). Flowering stems were selected in which the panicles either had not quite emerged or were in the process of emerging from the leaf sheath (Fig. 1). The sheath of the second leaf immediately below the flag leaf was removed. This exposed the uppermost node which was cut out in a nodal segment (Wright and Osborne...