

## **Root:shoot ratios in old and modern australian wheats**

K.H.M. Siddique, D. Tennant and R.K. Belford

Western Australian Department of Agriculture, Baron-Hay Court, South Perth W.A. 6151

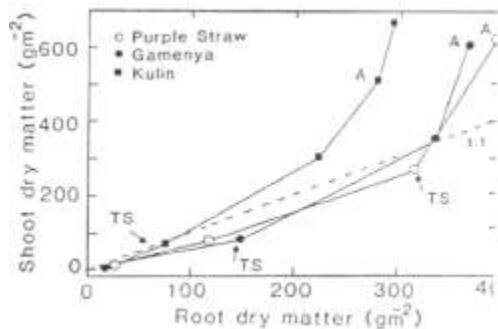
Increase in harvest index (HI) appears to be a consistent result of selection for higher grain yield in Australian wheats (1 and 2). However there is no information available on the root dry matter and root:shoot ratio of old and modern wheats. In this study we tested the hypothesis that modern varieties invest a lesser proportion of the total dry matter in the root system as compared to old varieties.

### **Methods**

A field study was conducted on a duplex soil at Merredin in the eastern wheat belt of Western Australia. The varieties chosen represented a sub set of old and modern varieties used in earlier experiments (2). The experiment was sown on May 24, 1988, using a randomized block experimental design with four replications. Plots were 2.16 m wide (12 rows, 18 cm apart) x 50 m long. Here we describe changes in root and shoot dry matter, with time.

### **Results and discussion**

The root:shoot ratio decreased with crop growth stage and was closely related to the developmental pattern of a variety. The modern variety Kulin (released 1986) started accumulating more dry matter into the shoot than the roots as early as 55 days after sowing (DAS) at its terminal spikelet (TS) stage (Fig. 1); for the variety Gamenya (1960) and older variety Purple Straw (1860), this change did not take place until 90 DAS. At anthesis (A) root dry matter reached its maximum and shoot dry matter was similar in all the varieties. Thus, at anthesis, root dry matter and root:shoot ratio decreased from Purple Straw to Kulin (Fig. 1). Purple Straw had also significantly higher root dry matter and root length density in the top 35 cm layer than either Gamenya or Kulin, and this may be a consequence of Fig. 1. Shoot v. root dry large numbers of shallow nodal roots matter, from emergence associated with the high number of to anthesis. leaves and tillers in this variety. There were no varietal differences in rooting depth, water extraction and water use. Grain yield and HI consistently increased from old to modern varieties.



These results suggest that modern varieties invest a higher proportion of their dry matter in shoots than in roots from an earlier stage of crop development.

1. Perry, M.W. and D'Antuono, M.F. (1989). Aust. J. Agric. Res. 40 (in press).
2. Siddique, K.H.M., Belford, R.K., Perry, M.W. and Tennant, D. (1989). Aust. J. Agric. Res. 40 (in press).