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Root Traits of Durum Wheat Vary With the Level of Soil Phosphorus Availability in a Long Term Fertilization Experiment

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Root traits play a key role in soil exploration and belowground resource acquisition. However, *in situ* measured traits remain scarce due to methodological challenges. In this study, we hypothesized that changes in soil available and total P contents would impact durum wheat root traits. We expected specific root length (SRL), root length density (RLD) and fine roots proportion (FRP) to increase with soil fertility while root tissue density would decrease.

The study was performed in 2016 on durum wheat (cv. Isildur) grown on the long term field experiment at INRA-Auzeville (France). Since 1968, this experiment tests 4 P regimes arranged in 8 randomized repetition blocks with P0 (no P), P1, P2, and P4 levels, respectively 11, 22 and 33 kg P ha⁻¹ year⁻¹.

Soil and roots were sampled at flowering stage with a hydraulic soil core of 5 cm in diameter, at two depths (0-30 cm and 30-60 cm). Three cores were collected per horizon for each plot, leading to 96 samples by depth thus a total of 192 soil cores. Roots were washed, scanned and analyzed using WinRhizo software then analyzed for C, N and P concentration. One additional sample per treatment and depth was collected for soil solution C, N and P analyses

Results showed that durum wheat root system was modified by soil P availability at the two soil depths. As hypothesized, SRL and RLD increased between P0 and P4 treatments while FRP was higher in the upper soil horizon as related to higher soil plant available P content. Root N content did not change across treatment while root P content was significantly affected by P fertilization rate leading to a significant relationship between the root N/P and soil available N/P ratios.

Key words: Wheat; root traits; soil; phosphorus; field experiment.

