Effect of Soil Moisture on Growth and Phosphorus Uptake by Wheat

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ABSTRACT. A greenhouse experiment was conducted to investigate the effect of soil moisture on growth and phosphrus uptake by wheat. The experiment consisted of three soils and five available water depletion levels: 30, 40, 50, 60, and 70%, each replicated four times in randomized complete block design. The plants were harvested 50 days after planting. In all soils, both shoot and root growth as well as P uptake increased significantly (P = 0.05) with the decrease in available water depletion (AWD). Decrease in AWD from 70 to 30% increased shoot growth in the loamy sand, sandy loam, and sandy clay loam soils by 33.6, 22.9, and 9.9%, respectively. While root dry matter increased in the same soils 33.1, 29.3 and 10.1, respectively. Dry matter yield and phosphorus uptake uptake as a function of water availability were described using the model Y = a + b In X.

Plant growth is accomplished by cell division, followed by cell expansion and differentiation of individual cells. However, there are other related events that are required for growth such as uptake of water and nutrients and transport of substances between cells. Therefore, the rate of growth is strongly influenced by water status.

Ion transport in the soil can be affected by soil properties, water content, ion concentration and ion distribution in the soil and by the rate of root growth (Barrow 1980; Barber and Mackay 1985). Adequacy of soil moisture level is important to ensure non-limiting availability of water as a vital growth factor but also to provide less resistant pathways for nutrient movement. Soil water content affects nutrient uptake by influencing solute transport to the root surface by diffusion and mass flow (Barber and Mackay 1985; Classen *et al.* 1986). Nye and Tinker (1977) noted that, in dry soil, movement of ions to plant roots is restricted by low rates of mass flow and diffusion. Barber *et al.* (1963) stated that mass flow can account for most of the transport of Ca, Mg, and N but is inadequate to account for much of the transport of P and K. Begg and Turner (1976) reported