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Response of growth, root-shoot biomass allocation and N uptake to irrigation and nitrogen fertigation on two and three-year old triploid Populus tomentosa plantation: resource availability can alter pattern of growth

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Abstract: A field experiment has been conducting in 2017-2018 to research the effects of irrigation and nitrogen fertigation regimes on diameter and height growth, root-shoot biomass allocation and N uptake in different organs in a triploid Populus tomentosa plantation in the North China Plain. The experiment included 12 water-nitrogen coupling treatments (combination of 4 nitrogen treatments each year: N0, N80, N150, N220 (0, 80,150,220 kg/ha·yr-1) in 2017 and N0, N120, N190, N260(0, 120,190,260 kg/ha·yr-1) in 2018 and 3 irrigation treatments: W20, W33, W45 (To start irrigation when soil water potential in 20 cm depth reached -20kPa, -33kPa and -45kPa)), and also a control treatment that only irrigation once in the spring each year according to the local farming system. Diameter, height, root-shoot biomass allocation and N uptake monitored in consistent 2 years, aboveground growth and biomass allocation responded positively to both N and W compared with the control, and the high level nitrogen treatment has the bigger effect on growth in 2017 than in 2018, but the interaction between 2 factors is significant only in 2018; N uptake is influenced by the age of tree, and W20N150 is significant higher in 2017 and W20N260 is better in 2018. N fertigation results in a shift in biomass allocation from roots to leaves, and irrigation has less effect on it, but both of W and N had no effect on relative allocation aboveground, this may be under ontogenetic control.