The European project WATBIO aims to improve non-food biomass production in water-limited marginal lands. The European Commission promotes the use of forest biomass for energy generation and poplar is a serious candidate for biomass production (EC COM 2006 302). Maintenance of biomass production under water stress depends partly on soil exploration by roots for water foraging, which is favored by maintenance of root growth under water deficit. Technological advances in imaging associated to kinematic concepts allow the characterization of organ growth spatially and temporally.

**Introduction**

The European project WATBIO aims to improve non-food biomass production in water-limited marginal lands. The European Commission promotes the use of forest biomass for energy generation and poplar is a serious candidate for biomass production (EC COM 2006 302). Maintenance of biomass production under water stress depends partly on soil exploration by roots for water foraging, which is favored by maintenance of root growth under water deficit. Technological advances in imaging associated to kinematic concepts allow the characterization of organ growth spatially and temporally.

**Objective**

Monitor the growth of poplar roots in response to osmotic stress, with a high spatial resolution, in order to analyze the division and elongation components.

**Methods**

**Experimental setup**

- Defiltered camera (Nikon D5200)
- Raking infrared light placed in front of the root apex to bring root surface relief out
- Cutting of *P. nigra* cv. 6J-29
- Circuit of hydroponic solution. Osmotic stress is applied with polyethylene glycol (4000 g mol⁻¹) without roots manipulation.

**Analysis of images**

Kineroot (Basu et al., 2007), a software based on particle image velocimetry (PIV), is used to obtain velocity profiles along the root.

**Preliminary results**

- **Velocity profiles in control condition and after application of osmotic stress (0.5h and 3h)**
  - After 0.5h of stress, root growth was decreased significantly while the growth zone length was not affected: mechanical effect?
  - After 3h of stress, velocity profile was non-homothetically modified. Growth was less affected in the apical part of the elongation zone than in the basal one and the length of the growth zone was reduced. Meanwhile the length of the division zone seemed to be not shortened.

**Conclusions & Perspectives**

- The length of the division zone seemed to be less affected than that of the elongation zone. It must be confirmed by cell length data on longitudinal root sections.
- Elongation rate was strongly reduced after 0.5h and partly recovered after 3h of osmotic stress.
- Regulation of gene expression in the division zone and in the elongation zone will be analyzed by RNA-Seq in order to decipher the crosstalk between the molecular pathways controlling growth and signaling drought.