

Herbicide efficacy evaluation using sap flow method

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In 2009, the evaluation of herbicide efficacy using direct measurement of water flow through the stems was verified under the field conditions. The measurement was applied to 9 individual plants of *Helianthus annuus* L. in the period from 7.7. to 22.7.2009. The water flow was continually monitored by Sap Flow Systems T 4.2 (EMS) Brno, CZ). The comparative measurement was done by photosynthesis intensity evaluation (CIRAS 2 - PP) Systems, UK). Herbicide treatment was carried out on 13.7. 2009. Three plants were untreated, three plants were treated with the herbicide Pardner 22.5 EC (225 g a.i. bromoxynil/I) at 1.5 I/ha while the three remaining plants were treated with Lontrel 300 (300 g a.i. *clopyralid*/l) at 0.4 l/ha. Growth stage of *H. annuus* was BBCH 56 at the beginning of the experiment.

Influence of herbicide treatment on water flow decline was proved by computing correlation coefficients comparing transpiration average daily values (Q, kg of water/day) – in the period from 8.7. to 13.7. with the calculated values of sap flow (Q_{ca}, kg of water/day). Mean values of Q in untreated plants exceeded the values of Q_{cal}. This can be explained with unlimited growth of control plants. Average daily Q values in plants treated with herbicide Lontrel 300 was in sunny days (14.7.-21.7.) lower than Q_{cal} before herbicide treatment. This illustrates that plants transpired less than before herbicide treatment and their growth was reduced perhaps even stopped. Clopyralid caused the stem to lean over and become slightly yellow in colour. Strong herbicide effect on Q decrease was evident following application of Pardner 22.5 EC (Figure). Average daily values of sap flow determined on untreated plants were 0.37 kg of water/day from 14.7. to 21.7. Pardner 22.5 EC reduced water flow to 0.12 kg water/day and Lontrel 300 to 0.22 kg water/day.











Influence of herbicide treatment on average daily values of sap flow .

Plants of *H. annuus* 2 days after the herbicide treatment (*a* – control plants, b - application of Lontrel 300 and c - application of Pardner 22.5 EC).

Influence of herbicides on transpiration rate (Tr) in plants measured with sap-flow confirmed the results determined with CIRAS. The lowest values of transpiration were recorded in plants treated with Pardner 22.5 EC. Tr values in plants treated with Lontrel 300 were also statistically lower than the non-treated ones. Clopyralid significantly decreased the transpiration values; while a decline in photosynthesis intensity was detected later. This study showed that measurement of transpiration will be more suitable for assessing herbicides which have



