

MODELLED DETERMINATION OF THE HERBICIDE EFFICACY EVALUATION USING THE SAP FLOW METHOD



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INTRODUCTION

Changes in transpiration rate can be used to examine the herbicide's effect on plants, but also to determine the length of the competition between crop and weeds for water after herbicide application. By default, the effects of herbicides on weeds are evaluated by gas-exchange methods. But, to determine plant transpiration demands can also be used the method of sap flow.

OBJECTIVES

The aim of the work was to verify the sap flow method for determining the effect of herbicides on the basis of continuous measurements of the transpiration flow, and demonstrate effects of different active ingredients on the plant transpiration demands.

METHODOLOGY

The sap flow system T 4.2 (EMS Brno, CZ) was used to determine the impact of active ingredients on plant's transpiration demands in laboratory and field conditions within the years 2009 – 2011. As a model species was used *Helianthus annuus* L. The effectiveness of three active ingredients, *bromoxynil* (dose 337.5 g ha⁻¹, PSII inhibitor), *clopyralid* (120 g ha⁻¹, synthetic auxin) and *glyphosate* (1350 g ha⁻¹, EPSPS inhibitor), was verified compared to untreated. Influence of active ingredients on water flow decline was proved by computing correlation coefficients comparing measured transpiration average daily values (Q , kg day⁻¹) with the calculated values of sap flow (Q_{calc} , kg day⁻¹). Q_{calc} values were calculated from regression dependency between measured Q and global radiation and vapour pressure deficit before herbicides application.

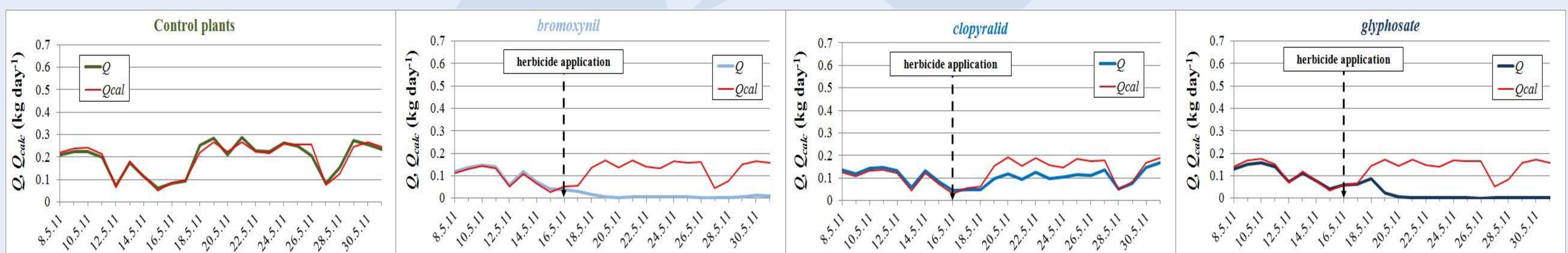
Measurement of the transpiration and photosynthesis (CIRAS-2, PP Systems)

Measurement of the chlorophyll fluorescence (FMS 2, Hansatech)

Sap flow system (T 4.2, EMS Brno)



Determining the effect of herbicides on the plants in the year 2010



Influence of herbicide treatment on average daily values of sap flow in the year 2011.



Plants of *H. annuus* 2 days after the herbicide treatment in the year 2009 (a – control plants, b -bromoxynil and c - clopyralid).

RESULTS

The results proved significant effect of herbicides on plant transpiration demands, determined by the sap flow method. The treatment of *bromoxynil* significantly eliminated transpiration for the second day and *glyphosate* for the fifth day after the application, respectively. The usage of *clopyralid* reduced growth of plants, but even after fourteen days after application any significant influence on transpiration has been shown. The experiments confirmed the suitability of sap flow method for determining the effects of herbicides.