

Impact of various rates of glyphosate applications and other herbicides on stomatal density of glyphosate-resistant corn and soybean

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This research aims at clarifying the effects of glyphosate-based treatments on leaf stomatal density, total plant biomass and yields in transgenic RR (Roundup Ready) soybeans, (*Glycine max*) and corn (*Zea mays*). As elsewhere around the world, the use of this class of herbicide in field crop practices in Québec has dramatically increased over the last few years. During this experiment conducted in experimental fields at the Grain Research Center (CEROM) in the city of St-Mathieu-de-Beloeil (Quebec, Canada), we studied the effects of different agricultural treatments, comparing mechanical weeding, to one or two applications of glyphosate based herbicides and eventually a third herbicide of a different class. Total plant biomass parameters have been measured, for fresh and dry weight, depending on growth stages. The number of stomata per mm² has also been determined using microscopy. In the past, a few studies have been made about stomatal behaviors in drought period in culture but less on stomatal densities influence. The main stomata's implication for the plant development is to regulate CO₂ assimilation and water transpiration on the leaves. The upscale used of glyphosate based herbicides in culture needs to review the current practices and to improve the understanding of the relationships between stomatal densities and glyphosate. Knowing the fact that herbicide can pass through the stomata for reaching the mesophyll cells in the leaves and, at the same time, altering the opening response and conductance of stomatal, it is possible that glyphosate treatment will affect stomatal densities and by thus fact, affect the development of the plants and minimize the biomass. Results show that for the corn strain used, there is no significant difference in stomatal density depending on the various herbicide treatments or mechanical work. Stomatal density in soybean leaves was correlated to plant biomass according to the various agricultural practices. Mechanical weeding corresponded to the lower stomatal density, biomass, while the treatment with two glyphosate applications with half the doses at each step led to the best results for all studied variables. This suggests that variations in stomatal density in soybean have an effect on plant biomass and ultimately on yields and might be used as a marker for best practices during the growing season. At the light of these results, we suggest to drastically reduce the use of herbicide in corn production and apply less herbicide but in several steps for soybean.

Palavras-chave: maize, soybean, stomatal density, herbicides