# Effects of complementary herbicides on agronomic characteristics and composition of herbicide-tolerant GM soybean

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## Abstract

Crops genetically modified (GM) for herbicide tolerance allow an expanded range of weed control methods. Data for pre-commercial risk assessments of herbicide tolerant (HT) GM crops may include comparisons with conventional crops for agronomic characteristics and/or composition of forage and grain. These comparisons can be made with the HT crop either treated (T) or not treated (NT) with complementary herbicides. The objectives of this research were to assess complementary herbicide effects on agronomic characteristics and composition of HT GM crops and consider implications for risk assessment. Data were obtained for seven HT soybean (*Glycine max*) products grown in diverse environments (a total of 46 field sites in the USA and Argentina during 2009-2016). The MON 89788, MON 87708, and/or A5547-127 GM traits, providing tolerance to the herbicidal compounds glyphosate, dicamba, and glufosinate, respectively, were present in each product. Some products also contained the MON 87705 GM trait (providing enhanced oil quality and glyphosate tolerance) or the MON 87701 and MON 87751 GM traits (providing insect protection). Trial entries at each site included HT soybean (T and NT) and conventional varieties. Treated entries received an application of each complementary herbicide during early growth stages. Results indicated that complementary herbicides had little impact on measured characteristics of HT products. In agronomic data, complementary herbicides (including both main and interaction effects) contributed an average of 1.2% of total variability, far less than main effects of site (62.0%) or variety (9.1%). In composition data, complementary herbicide effects similarly contributed only 2.0% of total variability, far less than site (35.6%) or variety (28.0%). Given the history of safe use of soybeans from diverse environments and varietal backgrounds, the minimal nature of the observed complementary herbicide effects merits consideration when determining treatment conditions (T or NT) needed in agronomic or composition studies intended for risk assessment.

**Key words:** agronomic, composition, herbicide tolerance, genetically modified, complementary herbicide