

Integrated weed management strategies in maize: Agronomic, environmental and economic impact

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A long-term field experiment was set up in April 2011 in north-eastern Italy, within the European Project PURE (Pesticide Use-and-Risk reduction in European farming systems with Integrated Pest Management, <http://www.pure-ipm.eu>), to evaluate two strategies with different IPM level against the conventional one in four-year maize-based cropping systems. For the first-year maize crop, the conventional strategy (CONV) to control weeds involved a pre- as well as a post-emergence herbicide application, whereas the integrated weed management (IWM) strategies involved pre- and post-emergence band application (30 cm band, 60% reduction in spraying volume) of herbicides (IWM1) and only a post-emergence in band application (IWM2). After the post-emergence herbicide application, hoeing was also practiced in all strategies to incorporate the urea applied. For the pre-emergence application (CONV, IWM1) a commercial product containing a mixture of mesotrione (3.75%), S-metolachlor (31.25%) and terbuthylazine (18.7%) was used at 4.5 l/ha, while for the post-emergence application in all strategies a tank mix of rimsulfuron (25%, 60 g/ha), dicamba (21%, 1 l/ha) and paraffin oil (1.25 l/ha) was applied. Three weed assessments were conducted (after pre- and post-emergence herbicide application and after hoeing). The models SYNOPSIS and MEBOT were used to evaluate the environmental and economic impact of the strategies, respectively. Statistical analysis showed significantly higher weed density under the IWM2 strategy after the first assessment. After-post-emergence and after-hoeing weed assessments indicated significantly lower density under the CONV strategy in both cases. Maize grain yields for the IWM strategies were lower compared to the CONV; however, effects were not significant. SYNOPSIS evaluation (using risk categories of very low, low, medium and high) indicated a low chronic terrestrial risk for the CONV strategy, whereas both IWM1 and IWM2 had a very low risk (84% and 99% risk reduction). The chronic aquatic risk was evaluated as medium for the CONV, followed by IWM1 and IWM2, having a low (78% risk reduction) and very low risk (>99% risk reduction), respectively. Total weed control costs were 70€ and 120€/ha less under IWM1 and IWM2, respectively. These first results indicate that the IWM-based strategies tested have a lower environmental impact, whereas the risk of yield reduction could be partly compensated for by the lower costs due to the reduced herbicide use. Evaluation of the long-term effects of these IWM strategies through further experimentation will be crucial before recommending them for implementation.