A potential risk to larvae of non-target Lepidoptera is the ingestion of harmful amounts of Bt-maize pollen containing Cry1 toxins deposited on their host-plants. The greatest source of variability in estimated mortality was species sensitivity, so a range of scenarios were considered assuming species sensitivity follows a Gaussian distribution. The mean of this distribution is defined by data from a range of bioassays from known species, but the sensitive species in the tails of this distribution are hypothetical. These scenarios were used to explore the potential efficacy of mitigation measures (non-Bt-maize strips of different widths around the field edge) using a mathematical model.

Before allowance for effects of large-scale exposure, with moderate within-crop host-plant density and with no mitigation, estimated mortality locally was <10% in the case of Bt-maize 1507 for species of average sensitivity (e.g., Vanessa cardui). For hypothetical extremely sensitive species, which have not been identified yet, estimated mortality locally was 99.6% with no mitigation; this estimate was reduced to below 40% with mitigation of 24-m-wide strips of non-Bt-maize. For hypothetical highly sensitive species, a 12-m-wide strip reduced estimated local mortality under 1.5%, when within-crop host-plant density was zero. Allowance for large-scale exposure effects would reduce these estimates of local mortality by a highly variable amount, but typically of the order of 50-fold. Mitigation efficacy depended on assumed within-crop host-plant (weed) density; if this could be assumed negligible, then the estimated effect of mitigation would reduce local mortality below 1% even for very highly sensitive species.

In conclusion, risk mitigation measures can be effective, but depend on host-plant densities which are in turn affected by weed management regimes. The relevance for management of Bt-maize expressing both insect-resistance and herbicide-tolerance traits is discussed.

For further details, see:


Keywords: Non-target organisms, Non-target Lepidoptera, Bt-maize pollen, Mathematical model of exposure