Bio-Tech Crops Improve Water Quality

In the past, residual herbicides commonly used in the production of corn and soybean are frequently detected in rivers, streams, and reservoirs at concentrations that exceed drinking water standards in areas where these crops are extensively grown. When these bodies of water are used as sources of drinking water this contamination can lead to increased treatment costs or a need to seek alternative sources of supply. Atrazine detection in the Blue River System is certainly one example. These herbicides can also have negative effects on aquatic ecosystems at low concentrations.

When genetically modified, herbicide-tolerant, corn and soybean became commercially available in the 1990s it became possible to replace some of the problematic residual herbicides with strongly sorbed, short half-life, contact herbicides that may be more environmentally benign. Today 99% of the soybean grown in the Southeast Nebraska and 75% of the corn crop is genetically modified for tolerance to the contact herbicide glyphosate (Roundup), which is currently the most widely used herbicide in the world.

In a four-year study, researchers at the USDA-ARS's North Appalachian Experimental Watershed near Coshocton, OH compared relative losses of both herbicide types when applied at normal rates to seven small watersheds planted with Liberty-Linked corn or Roundup Ready soybean. In their report, published in the March-April issue of the Journal of Environmental Quality, soil scientists Martin Shipitalo and Lloyd Owens, and agricultural engineer Rob Malone, noted that losses of contact herbicides in surface runoff were usually much less than those for the residual herbicides, as a percentage of the amount of herbicide applied.

Averaged for all soybean crop years, glyphosate loss was about one-seventh that of metribuzin and one half that of alachlor, residual herbicides it can replace. Similarly, average loss of the contact herbicide glufosinate (Liberty) was one-fourth that of atrazine, a residual corn herbicide it can replace.

Project leader Martin Shipitalo, noted the concentrations of the contact herbicides in the runoff never exceeded their established or proposed drinking water standards while the residual herbicides frequently exceeded their standards, in the months after application. Concentrations of atrazine in runoff were up to 240 times greater than its drinking water standard while alachlor concentrations were up to 700 times greater than its standard.

Conversely, the maximum glyphosate concentration noted was nearly four times less than its standard. Glufosinate currently has no established standard, but was only detected at low concentrations and was below its detection limit 80 days after application.

Increased economic incentives to grow more corn and soybean for biofuel production, can be done safely if farmers and the regulatory community focus to reduce herbicide losses and concentrations in runoff. Herbicide-tolerant crops are an effective method of replacing some of the residual herbicides with the contact herbicides compared in this study and keeping our river water cleaner.

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