

The Impact of Roundup Ready Alfalfa on Organic Systems

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Alfalfa's Importance in Organic Systems- an Introduction

Alfalfa has great importance as a forage in both organic and conventional agriculture due to its high protein content and yields that surpass other legume forages (Figure 1) (Canadian Organic Growers 2001). As a nitrogen-fixer, alfalfa also plays an integral role in replenishing nitrogen in the soil through its capacity as a green manure, or by being cycled through livestock as manure (COG 2001). Organic farmers rely on alfalfa to maintain soil nutrient levels and organic matter, prevent nitrogen leaching, and to be a valuable source of livestock feed (COG 2001) (Organic Agriculture Centre of Canada 2003). Of course, alfalfa can only be considered useful to the organic farmer for on-farm and saleable feed and seed if it can be confirmed to be free of contamination from genetically modified (GM) organisms. The introduction of the genetically modified "Roundup Ready" alfalfa to North American markets will present organic farmers with the overwhelming task of protecting their alfalfa crops from the risk of GM contamination.

The Threat of Genetically Modified Alfalfa

The Roundup Ready Concept

Organic farmers are concerned over the introduction of another genetically modified crop to enter the market in 2004, Roundup Ready Alfalfa. Roundup Ready crops will survive the application of Roundup Ultra herbicide, whereas other plants without this resistance will be killed by the glyphosphate herbicide (Croplan Genetics 2002). The marketing strategy for this crop focuses on the alfalfa's resistance to Roundup application, thereby allowing longer spreading periods of herbicide, and eliminating "unwanted" cover crops for weed control (Croplan Genetics 2002). The Roundup Ready cropping strategy encourages excessive herbicide application, which causes leaching into the soil and groundwater, and the absence of cover crops, which would deprive the soil of their soil-building and nutrient-stabilizing benefits.

Roundup Ready Alfalfa's threat to Organic Alfalfa crops

While Roundup Ready crops produce serious environmental issues, they also threaten the livelihood of neighbouring organic farmers. Alfalfa is cross-pollinated by bees, and this creates an opportunity for GM alfalfa to cross-pollinate with organic alfalfa, thereby causing GM contamination of the seed produced by the organic alfalfa (Center for Life Sciences and Department of Soil and Crop Sciences 2002). Along with the threat of cross-pollination creating GM contaminated progeny, seeds from GM fields can also be transported to a field by wind/animals/dirty equipment, and volunteer GM plants will result (Figure 2). Organic farmers with contracts to provide non-GM alfalfa seed will lose their contracts if even the slightest amount of GM contamination is detected (Associated Press 2002). Farmers have already faced the "seed invasion" posed by GM canola and soybeans which have blown into the fields and germinated, or have cross-pollinated with their crops and produced GM contaminated seed (Figure 3) (Cropchoice 2002). Roundup Ready alfalfa also poses this cross-pollination threat to crops, and Forage Genetics' response to these concerns is that they have seen no cross-contamination between crops at least 2,000 feet apart during their two-year field trial (Fitzpatrick et al. 2002). However, other studies showed that escaped mutated alfalfa plants can be produced

by plants a great distance away, as the closest alfalfa plants in the study, 230m away, did not contain the mutations (Amand et al. 1995). This alternative data suggests that it is not possible to contain the transgenic material within the seed/hay fields under current agricultural production techniques, as long distance escaped plants were discovered during the study which could produce GM contaminated populations (Amand et al. 1995). Another difficulty in determining "safe" distances from GM crops is that field trials are done on a small-scale, which skews the results, and does not provide an accurate representation of gene flow from large-scale farming operations (Moyes and Dale 1999). The percentages may be very small for the chance of GM contamination to a crop, but if even a few GM contaminated seeds develop, they will be directly in the field, and the chance of cross-pollination with the organic alfalfa is then great (Moyes and Dale 1999).

Reducing the Risk of Contamination

The only advice given for GMO containment is to plant non-transgenic barriers around the GM fields to limit the spread of transgenes-- but it is the responsibility of the farmer to implement this courtesy (Amand et al. 1995). The organic farmer can reduce the risk of GMO contamination by placing fields the recommended distance away from the GM crops, rigorously cleaning equipment used on other farms, and planting barriers around the fields (COG 2001). Equipment from farms using GM crops should be avoided as stray seeds could contaminate a whole load of organic seed (Figure 4) (COG 2001). Another way of dealing with contamination lies in crop rotation, so that if GM volunteer crops germinate the next year, they can be mechanically removed as they will be visible from the rest of the crop, and will also be sexually incompatible with a different crop (Lamkey 2002). The risk of contamination cannot be completely eliminated, especially in the case of insect-pollinated alfalfa, so the choice of a neighbouring farmer to plant GM crops can severely impact an organic farmer's livelihood.

Ecological Concerns

Beyond the immediate concerns of crop contamination, there are questions regarding genetically engineered organisms which could alter entire ecosystems. The genetic construct being introduced into alfalfa originates from a sexually incompatible organism, and this transgene has the potential to be passed not only from one crop field to the next, but also to weeds, and into the wild (Lamkey 2002). Additionally, there is the question of horizontal gene transfer, in which genetic material can be passed nonsexually from one organism to another (Lamkey 2002). Under this circumstance, the genetic construct of GM crops could potentially be transferred to microorganisms, earthworms, arthropods, insects, birds, mammals and even human beings that interact with the crops (Ho, 2002). There is an increasing amount of evidence that this genetic transfer is occurring, and the cauliflower mosaic virus used as a promoter for Roundup Ready crops has the potential to reactivate dormant viruses in any genome and recombine with them to develop into new viruses (Ho, 2002). Currently, studies are examining the risk of transgenes from feed being passed on to gut microflora-- a very real concern in the case of alfalfa (Moyes and Dale 1999).

The Fall of Roundup?

As Roundup Ready crops begin to command a large share of North American crop markets, five-fold increases in glyphosate spraying occurred in the United States, and along with this increase came the increase in Roundup-resistant weeds (Brasher 2003). Recommendations to contain the growing resistance are to limit application of glyphosate to twice a year, and to not plant glyphosate-resistant crops in the same field each year (Brasher, 2003). If Roundup is unsuccessful, farmers will have to resort to additional chemicals, which means a further impact on the environment, and more cost-- and there is no Roundup alternative (Brasher 2003). Tests on the resistant weed horsetail required an application of ten times the recommended dosage of glyphosate (Brasher 2003). It is becoming apparent that the utilization of Roundup Ready crops is not a strategy that can be maintained.

Conclusions

Roundup Ready alfalfa poses a threat to organic farmers through the GM contamination of their crops by cross-pollination and volunteer plants. Roundup Ready crops also increase the influx of herbicides to soils and groundwater, create resistant weeds, and potentially transfer their genetic constructs to a wide variety of other organisms. Not only do Roundup Ready crops threaten the viability of organic farming practices through rampant contamination, but they also threaten the genetic stability of our environment.



Figure 1- Alfalfa, "Queen of the Forages"

Taken from www.sarahsarchangels.com/images/alfalfa.jpg

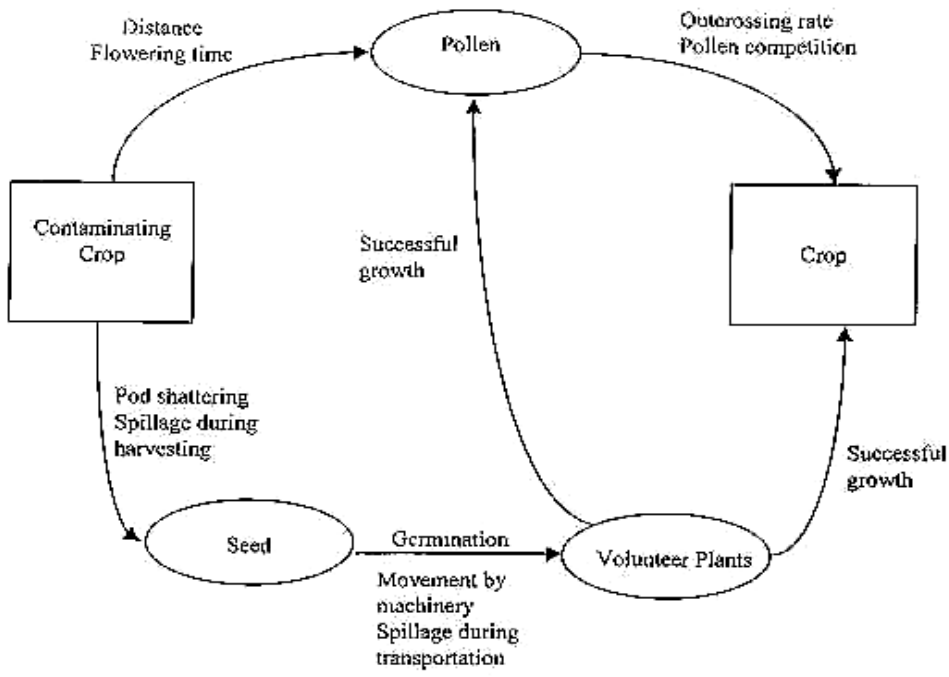


Figure 2- The path of contamination from genetically modified crops to the organic crop--contamination occurs via cross-pollination and volunteer plants. Taken from <http://www.gmissues.org/organic%20report.htm>



Figure 3 - Saskatchewan Organic Farmers fight to keep their wheat safe from GM contamination and the subsequent losses of revenue. Taken from <http://www.saskorganic.com/oapf/images/ifoam-interest.jpg>



Figure 4- Testing for GM contamination. Taken from http://www.greenpeace.org/multimedia/image-view?campaign_id=3997

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