

Pollen and seed mediated gene flow in commercial alfalfa seed production fields

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Alfalfa, the world's most important forage crop, routinely ranks as a top four crop in terms of economic value and total acreage in the US next to wheat, corn, and soybean. It was the first perennial genetically-engineered (GE) crop to resist glyphosate herbicide and was initially deregulated in 2006, and again in 2011. The potential for gene flow has been widely recognized since alfalfa is largely pollinated by bees. The Western US is a major exporter of alfalfa seed and hay and the organic dairy industry is one of the fastest growing agricultural sectors. Because of this, many alfalfa producers are impacted by market sensitivity to adventitious presence (AP) of GE traits. Our objective was to quantify the extent of transgene movement from GE seed fields to conventional seed fields on a landscape level based on the spatial distribution of commercial seed fields and to provide industry with information to support coexistence strategies. In spring 2013, alfalfa seed and hay fields were mapped in the Touchet Valley, Walla Walla County, WA. GE seed fields (source fields) and 14 conventional seed fields (sink fields), located at various distances from GE sources, were identified. Sink fields were combine and hand harvested along field edges every 30 m and within fields for every 15 m. For constructing a predictive equation, the % AP was transformed to the logit scale. The relationship between AP proportion and distance to source fields at 0.1%, 0.5%, and 0.9% AP threshold levels were modeled using a quadratic regression. Though AP was detected in the original seed lots used to plant the sink seed fields sampled, the levels were within the company standards of threshold level 0.9% AP. If the distance from the source seed field is 330 m, about 95% of the samples will be below 0.9% detectable level while at 2441 m, 95% of the samples will be below 0.1% detectable level. Since we sampled field edges, overall field AP would likely be lower than our established thresholds. With increase in distance from GE seed field and distance from domiciles in GE seed field, the AP proportion decreased. Number of domiciles in conventional seed fields were negatively correlated with AP proportion while slope and distance from alkali bee beds were positively correlated with AP proportion.