Public Abstract

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Title:INFLUENCE OF TILLAGE METHODS AND WATERFOWL MIGRATION ON WEED SEED DISTRIBUTION

Identical field experiments were conducted in 2014 and 2015 in Arkansas, Illinois, Indiana, Ohio, Tennessee, Wisconsin and at two sites in Missouri to determine the effects of four tillage treatments combined with one of two herbicide programs on season long emergence of Amaranthus species in glufosinate-resistant soybean. The tillage systems evaluated were deep tillage (fall moldboard plow fb one pass with a field cultivator in the spring), conventional tillage (fall chisel plow fb one pass with a field cultivator in the spring), minimum tillage (one pass of a vertical tillage tool in the spring), and a no-tillage treatment (burndown application of paraquat (0.84 kg ai/ha) at approximately the same time as the spring tillage). Each tillage system also received one of two herbicide programs; PRE application of flumioxaxin (0.09 kg ai/ha) fb a POST application of glufosinate (0.59 kg ai/ha) plus S-metolachlor (1.39 kg ai/ha), or POST-only applications of glufosinate (0.59 kg ai/ha). The deep tillage system resulted in a 62, 67, and 73% reduction in Amaranthus emergence when compared to the conventional, minimum, and no-tillage systems, respectively. The residual herbicide program also resulted in an 87% reduction in Amaranthus species emergence compared to the POST-only program. The deep tillage system, combined with the residual program, resulted in a 97% reduction in Amaranthus species emergence when compared to the minimum tillage system combined with the POST-only program, which had the highest Amaranthus emergence. Soil cores taken prior to planting and herbicide application revealed that only 28% of the Amaranthus seed in the deep tillage system was placed within the top 5-cm of the soil profile compared to 79, 81, and 77% in the conventional, minimum and no-tillage systems. Overall, the use of deep tillage with a residual herbicide program provided the greatest reduction in Amaranthus species emergence, thus providing a useful tool in managing herbicide resistant Amaranthus species where appropriate.

Migratory waterfowl have often been implicated in the movement of troublesome agronomic weed species. Previous research has shown that waterfowl have the ability to transport wetland weed species. However, little to no research has been conducted to investigate the long-distance dispersal of agronomically-important weed species such as Palmer amaranth and waterhemp. Thus, two objectives were set forth for this research project: 1) to determine what weed species are being transported throughout Missouri by ducks and snow geese, and 2) to determine the recovery rate and viability of 13 agronomic weed species after passage through a duck's digestive system. A field collection experiment was conducted with ducks harvested in the fall and winter of 2014-15 and 2015-16 and geese harvested in March of 2015. Seed recovered from the digestive tracts of the 238 birds harvested in the first duck season had 14,395 plants emerge, representing 47 species with the three most common being barnyardgrass (38%), waterhemp (30%), and smartweed species (24%). The 125 birds collected in the second duck season had 19,337 plants emerge, representing 28 species with the three most common being smartweed species (90%), common ragweed (3%), and barnyardgrass (3%). The 111 geese harvested in March 2015 had 87 plants emerge, representing 11 species with the three most common being field corn (45%), smartweed species (31%), and waterhemp (8%). From the 13 agronomically-important weed species fed to mallards in the controlled feeding study, 11 species were recovered and at least 1 seed from each of those species was still viable. Recovery rate ranged from 30% for common lambsquarters to 0% for yellow nutsedge tubers and common sunflower. Seed mass and size had a negative correlation to percent recovered intact seed and percent recovered viable seed, while seed neutral detergent fiber content had a positive correlation.

Calculations from the viability rate and gut retention times identified in this research indicate that all of the 11 species recovered have the potential to be dispersed up to 312 km while Palmer amaranth, waterhemp and common lambsquarters have the potential to be dispersed up to 2964 km from the source location. The results of this study confirm that waterfowl are consuming a variety of agronomically-important weed species which can remain viable after passage through their digestive tracts and can be dispersed over long distances.