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Emergence Characteristics of Several Annual Weeds

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Abstract
No other event in the life cycle of weeds affects scouting and management timing as greatly as weed emergence. The timing and intensity of weed emergence affect everything from the effectiveness of burndown herbicides and preplant tillage, to timing of postplant tillage and herbicide application, to competitiveness of weeds that escape control, to seed production by surviving plants, to eventually population shifts. Given the importance of weed emergence to all forms of weed management, it seems logical that we should give greater attention to understanding and predicting weed emergence as affected by environmental factors, weed species, and management practices.

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Introduction

No other event in the life cycle of weeds affects scouting and management timing as greatly as weed emergence. The timing and intensity of weed emergence affect everything from the effectiveness of burndown herbicides and preplant tillage, to timing of postplant tillage and herbicide application, to competitiveness of weeds that escape control, to seed production by surviving plants, to eventually population shifts. Given the importance of weed emergence to all forms of weed management, it seems logical that we should give greater attention to understanding and predicting weed emergence as affected by environmental factors, weed species, and management practices.

Materials and Methods

An area maintained in sod was tilled during the summer of 1997, and 12 in. diameter PVC pipes were buried vertically with one inch extending above the soil surface. Seeds from eleven weed species were collected in central Iowa during the 1997 growing season for use in these studies. In October, 1000 seeds of a single species were buried in the upper two inches of soil contained within a PVC pipe. Due to their large size, only 50 cocklebur burs were buried within a pipe. Each treatment was replicated three times. During the 1998 and 1999 growing season the number of seedlings emerging within a pipe was determined weekly and then seedlings were removed by hand. A second experiment using seed collected during 1998 was established in the fall of 1998.

Results and Discussion

In 1998 common sunflower and giant ragweed were the first weeds to emerge, with seedlings present on April 4 (Table 1). Fall panicum was the latest emerger with emergence first observed on May 1. The rate at which seedlings emerge can influence weed management as much as the initial date of emergence. Common sunflower, fall panicum, giant ragweed and woolly cupgrass all reached 50% of cumulative emergence for the year within a week of initial emergence. Eastern black nightshade and tall morningglory were the slowest emergers, requiring more than five weeks to reach 50% emergence.

As in 1998, giant ragweed and common sunflower were the first weeds to emerge in 1999 (Table 2). Common lambsquarter emerged on the same date (April 2) as these species, whereas in 1998 lambsquarter emerged two weeks later than common sunflower and giant ragweed. Giant ragweed and woolly cupgrass again were the first species to reach 50% emergence; common sunflower and fall panicum were much slower at reaching 50% emergence in 1999 than 1998. Whereas fall panicum only required four days to reach 50% emergence in 1998, it took 28 days in 1999. Tall morningglory was the slowest emerging weed, requiring more than 100 days to reach 50% emergence.

Although initial emergence dates and the rate of emergence for individual species varied between the two experiments, the relationship among species was fairly consistent within experiments. Giant ragweed and woolly cupgrass were among the first species to reach 50% emergence in both experiments, whereas tall morningglory and eastern black nightshade were the slowest to reach 90% emergence. Fall panicum was among the most variable species in the study. In 1998 fall panicum reached 50% emergence in four days, which ranked second fastest among the weeds. In 1999 28 days were required for fall panicum to reach 50% emergence, which was the eighth slowest species. These differences may be due to a differential response to the environment or differences in the seed used for the studies.

Similar experiments have been conducted at four other locations across Iowa. This large database should help provide a better understanding of factors that influence weed emergence patterns under different environment conditions. In addition, the results provide estimates of the impact of escaped weeds on future weed infestations.

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Table 1. Emergence characteristics of weed seeds buried in the upper two inches of soil in October, 1997.

Species	Initial date of emergence (1998)	Days to reach % emergence (1998)		% emergence	
		50%	90%	1998	1999
Common cocklebur	April 24	11	63	37	8
Common lambsquarter	April 17	22	62	11	8
Common sunflower	April 4	4	13	33	1
Fall panicum	May 1	4	20	4	2
Eastern black nightshade	April 17	40	89	5	3
Giant foxtail	April 17	24	49	21	5
Giant ragweed	April 4	4	28	9	4
Pennsylvania smartweed	April 10	10	15	38	5
Tall morningglory	April 17	56	78	19	16
Waterhemp	April 17	22	63	12	2
Woolly cupgrass	April 17	3	18	9	<1
Velvetleaf	April 10	19	40	33	13

Table 2. Emergence characteristics of weed seeds buried in the upper two inches of soil in October, 1998.

Species	Initial date of emergence (1999)	Days to reach % emergence (1999)		% emergence	
		50%	90%	1999	2000
Common cocklebur	April 30	15	43	37	2
Common lambsquarter	April 2	35	74	8	4
Common sunflower	April 9	20	35	20	7
Fall panicum	April 16	28	63	15	11
Eastern black nightshade	April 9	27	72	20	<1
Giant foxtail	April 9	31	55	36	5
Giant ragweed	April 2	1	14	41	5
Pennsylvania smartweed	April 9	16	28	31	1
Tall morningglory	April 16	108	112	6	9
Waterhemp	April 16	21	60	6	1
Woolly cupgrass	April 9	8	29	23	3
Velvetleaf	April 9	12	35	25	10