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CROPS, CLIMATE, CULTURE AND CHANGE

IOWA STATE UNIVERSITY

Integrated Pest Management, Filling in the Cracks

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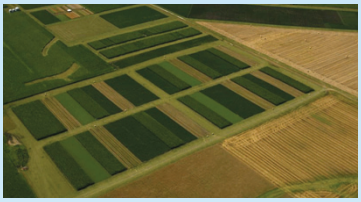
(1)

(2)

(3)



(4)

Disease such as white mold (1); insects such as spider mites (2); and weeds such as Palmer Amaranth (3; credit: Joseph LaForest, University of Georgia, Bugwood.org), are affected by climate.

Photograph 4: Rotation experiment at Iowa State Research Farm in Boone Co. Iowa. Credit: Matt Liebman, Iowa State University.

Farming practices are modified continually for a variety of reasons, including in response to changing weather patterns. Weather patterns not only affect crop growth and development, but also the plant pathogens, beneficial and harmful insects, and weed species present in the agro-ecosystem. In recent years, there have been disease outbreaks directly related to extreme weather events including white mold and sudden death. Researchers predict that leaf and root pathogens will be more problematic because of an overall increase in humidity and frequency of heavy rainfall events projected for many parts of the United States. However, other extreme weather events such as drought, hail events, and high winds also will affect diseases from year to year and region to region. Insects have also been affected by weather in recent years; the newest example being the increases in populations of spider mites across much of the Midwest. There also have been documented changes in spring arrival of many insect species due to climate change, specifically warmer temperatures, which is the single most important climatic factor for insects. The arrival of invasive species such as the brown marmorated stinkbug and kudzu bug and problems with other damaging insects underscores the importance of understanding how climate may affect insect pest survival and movement. Weed competition and habitable zones of many weed species will be affected by changing CO_2 and temperature.

The agro-ecosystem is interconnected and dynamic. Amendments to production practices in response to changing climate may affect more than corn and soybean agronomics. New or modified production practices can alter the microclimate within each field which can directly affect diseases, insects, and weeds. Because of this, an increased understanding of how crops and pests are affected by climate and subsequent changes in production practices will improve the resiliency of corn and soybean production across the United States. Insects, diseases, and weeds can be affected by plant growth and development, which adds to the complexity of monitoring changes in agronomic practices. This underscores the importance of recognizing the role of pests when interpreting agronomic data, as exemplified by a long-term crop rotation study that had high levels of sudden death syndrome in 2010 and 2011 near Ames, Iowa (Table 1) (Leandro et al.).

Table 1. Effect of crop rotation on sudden death syndrome (SDS) and yield of two soybean varieties in 2010 and 2011 in Iowa

	SDS Severity (%)				Yield (bu/ac)			
	2010		2011		2010		2011	
Rotation[z]	K-287RR	K-2918	K-287RR	K-2918	K-287RR	K-2918	K-287RR	K-2918
2-year	41 a	93 a	10 ab	41 a	42 b	22 b	56 a	48 a
3-year	11 b	59 b	20 b	19 b	54 a	55 a	60 b	57 a
4-year	10 b	39 b	0 a	0 c	55 a	53 a	65 c	59 a

[z]2-year rotation: corn-soybean; 3-year rotation: corn-soybean-oat/red clover; 4-year rotation: corn-soybean-oat/alfalfa-alfalfa

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USDA United States Department of Agriculture National Institute of Food and Agriculture

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