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SOYBEAN

YIELD-LIMITING FACTORS IN WISCONSIN

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TABLE OF CONTENTS

INTRODUCTION

WISCONSIN SOYBEAN FARMERS face many unique challenges during the growing season, most notably the impact of the weather on planting, growing and harvest conditions. The variability in weather can play a major role in determining the level of soybean insect, weed and disease pressure. Making timely decisions during the crop season can be the key to maximizing yields.

These decisions include variety selection; planting date; deciding to apply inputs such as potassium; calibrating their planters for maximum yield; and managing for seedling and plant diseases, yield-robbing pests and seedling.

Timely decision-making can be the key to maximizing profit potential with these most yield-limiting challenges.

This guide provides valuable information for Wisconsin soybean farmers to manage their most yield-limiting challenges.

GENETICS AND VARIETY SELECTION

VARIETY SELECTION CAN BE THE MOST IMPORTANT FACTOR IN MAXIMIZING SOYBEAN YIELDS.

Soybean farmers need to compare variety performance results from multiple sources (university and private), locations and environments. One common mistake can be *only* looking at local data (your farm, neighbor, county, etc.). Local data, while interesting, only provide a glimpse at how well that soybean variety performed last year in a narrow area. Comparing variety performance over many different environments and factors will offer farmers the best predictive ability for next year's environment.

GENETICS AND VARIETY SELECTION

Planting multiple soybean varieties to diversify plant genetics may be a good strategy in lowering risks of yield loss due to stress factors.

Pay attention to maturity groups because later-maturity-group soybeans often lead to increased yield; however, timeliness of harvest and frost must be considered.

Once a group of high-yielding soybean varieties has been selected, the next decision is choosing varieties that meet specific disease, insect and weed resistance/tolerance characteristics keeping specific fields in mind.

PLANTING DATE

PLANTING DATE CAN BE ONE OF THE MOST IMPORTANT AND LEAST EXPENSIVE CULTURAL CONSIDERATIONS THAT IMPACT SOYBEAN YIELD.

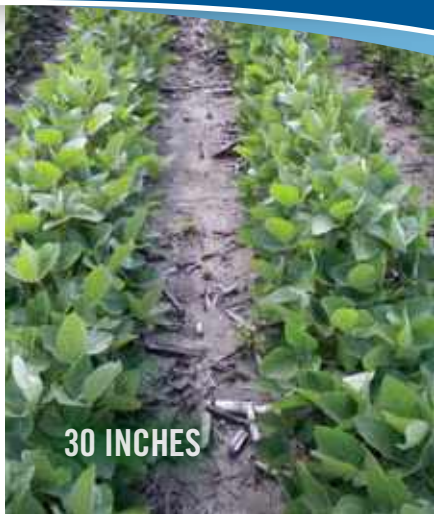
Research conducted at the University of Wisconsin's Arlington Agricultural Research Station has shown an average yield loss of 0.4 bushels per acre per day when soybean planting has been delayed past the first week in May.

Yield loss in delayed plantings can be attributed to decreased pod number per acre.

Delayed plantings of soybeans can partially compensate for reduced pod number per acre through increased seed size.

Early soybean planting dates can lead to increased risk of seedling diseases, white mold, brown stem rot (BSR) and sudden death syndrome (SDS).

ROW SPACING



The yield response of soybeans in wide rows versus narrow can vary by zero to 18 percent.

- The amount of water and light drives yield. The photos above show wide- and narrow-rowed soybeans on June 29, 2011. Notice the difference in the canopy between each image.
- On average, research shows a 7 percent yield difference between wide (more than 30 inches) and narrow (less than 15 inches) rows.


ROW SPACING

There can be greater yield loss in wide rows (more than 30 inches) versus narrow (less than 15 inches) because of increased weed competition.

Row spacing does not affect canopy penetration of foliar fungicides.

Narrow row spacing may increase incidence of white mold; however, genetics (disease tolerance) and environment play a much greater role in managing this disease than row spacing.

Wheel tracks from ground-driven sprayers decrease grain yield in 7.5- and 15-inch-spaced rows when applied to R3 and R5 (reproductive stages) soybeans. The extent of yield loss can be based on sprayer boom width.

POTASSIUM (K) DEFICIENCY

CHLOROSIS AND NECROSIS OF LEAF MARGINS CHARACTERIZE K DEFICIENCY

Soybeans use large amounts of potassium (K). Approximately 1.4 pounds of K_2O is removed in every bushel of grain and 19 pounds of K_2O is contained in each dry matter ton of straw.

K uptake is reduced in soils with low available K and in compacted soils.

Plants deficient in K tend to have weak stems, become more susceptible to some diseases and can be more predisposed to increased aphid population.

POTASSIUM (K) DEFICIENCY

On medium- and fine-textured soils, soil test K levels should be maintained above 80 parts per million (ppm). In the southern and eastern parts of Wisconsin, a K level of 100 ppm should be sustained. In central and northern Wisconsin, K levels should be kept above 100 ppm. Maintaining soil test levels over 60 ppm is desirable on all coarse-textured soils.

SEEDLING DISEASES

SYMPTOMS CAN OFTEN BE MISSED IN THE FIELD.

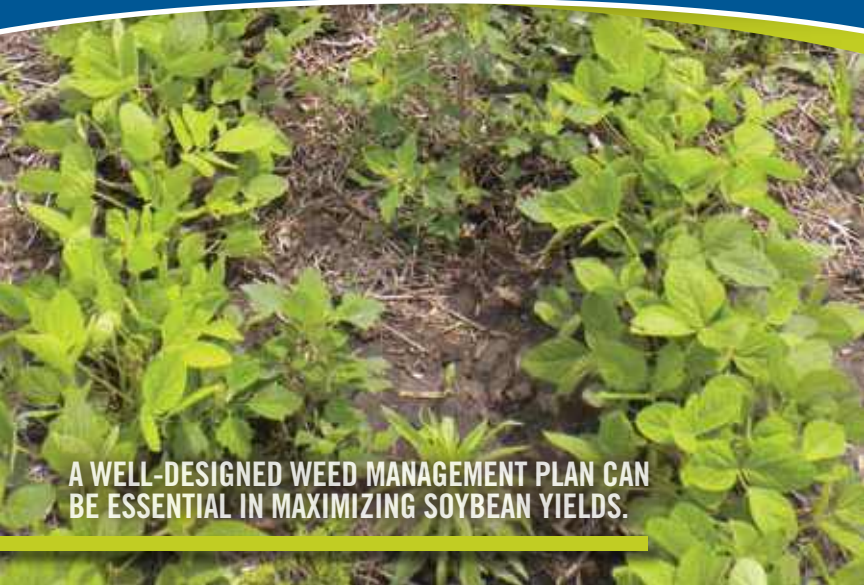
Includes diseases caused by *Pythium, Phytophthora, Phomopsis* and *Rhizoctonia spp*. Early-season issues can include seed rots or seedling mortality (damping-off).

Conditions that favor the development of early-season seedling issues include wet soil conditions at planting, slow germination and/or slow growth of seedlings, and poor seed quality.

Early-season infection can also have a long latent period with symptoms not showing up until reproductive periods (for example, *Phytophthora* or "root rot" as most farmers know it).

MANAGEMENT – Prevention management includes the use of high-quality soybean seed, fungicide seed treatments and resistant varieties.

POOR WEED MANAGEMENT



A WELL-DESIGNED WEED MANAGEMENT PLAN CAN BE ESSENTIAL IN MAXIMIZING SOYBEAN YIELDS.

Effective weed control can be vital in minimizing the negative effects from competition for light, water and other essential elements for plants. Reduced weed competition maximizes early-season crop growth rate, which quickens the time to full canopy closure and in turn maximizes intercepted light converted to soybean yield.

POOR WEED MANAGEMENT

A weed management plan should include:

- Scouting reports that identifies target weed species so control efforts can be appropriately focused.
- Effective weed control preplanting so soybean seeds have a weed-free seedbed.
- Herbicides, with residual weed control activity, increases the flexibility for the proper timing of postemergence applications. This reduces the number of weeds exposed to postemergence herbicides and reduces the variability in the size of weeds at postemergence spray timings.
- Rotate herbicide modes of action and tank-mix combinations to delay the increase of weed species that are difficult to control with specific herbicides and delay herbicide resistance.

SUDDEN DEATH SYNDROME (SDS) AND BROWN STEM ROT (BSR)

BSR and SDS are two soybean diseases that farmers and others can easily confuse in the field. Foliar symptoms of SDS typically occur earlier than BSR.

(SDS) SYMPTOMS – Yellow to brown discoloration of the leaves around veins, beginning initially as small, circular spots. Roots can be black and rotted with a slightly blue hue due to growth of the fungus.

SUDDEN DEATH SYNDROME (SDS) AND BROWN STEM ROT (BSR)

(BSR) SYMPTOMS – Yellow to brown disease discoloration of leaves around veins, upward curling of the leaves and chocolate brown discoloration of the vascular and pith tissues.

Both pathogens overwinter in soybean debris and thrive in good to high soil moisture. BSR typically favors soil when the pH is less than 6.5 in acidity.

MANAGEMENT – Management for both diseases revolves around planting resistant varieties, crop rotation and tillage to improve compaction and moisture drainage.

WHITE MOLD

WHITE MOLD IS MOST PREVALENT IN HIGH-YIELDING SOYBEAN ENVIRONMENTS. CANOPY DEVELOPMENT CAN INCREASE THE RISK.

SYMPTOMS – Stems that appear watery then gray to white in color with a cottony growth (mycelium) on the stem, petioles and pods. Sclerotia (small, black structures) can be found within the mycelium or within stems and pods. Wilting and plant death often occur.

Seasonal risk factors include cooler temperature (less than 80-85˚F), rain, fog and/or high humidity, especially during the flowering period.

MANAGEMENT – Core prevention management practiced for control of this disease include variety selection, seeding rate, reduced tillage, crop rotation, foliar fungicides and biological control.

SOYBEAN CYST NEMATODE (SCN)

SCN HAS BEEN NAMED THE NUMBER ONE YIELD-LIMITING PEST IN WISCONSIN AND THE NORTH-CENTRAL REGION OF THE UNITED STATES.

SYMPTOMS – Symptoms of SCN include roots that have small, white to tan protrusions, which are really the body of the female nematode burrowed in the roots. SCN causes smaller bulges than nitrogen-fixing nodules. Canopy closure can be slow or incomplete. In severely infected fields, stunting and chlorosis of the soybean canopy can be observed.

SCN survives in the soil. It favors warmer temperatures for growth and development. Higher soil pH and several weed species have been identified as hosts for SCN.

MANAGEMENT – Core prevention management remains focused on using resistant soybean varieties, crop rotation and good weed management.

SOYBEAN APHIDS

EXPERTS RECOMMEND REGULAR SCOUTING TO DETERMINE IF APHID POPULATIONS HAVE INCREASED.

Soybean aphids cause direct damage (yield impact) by sucking plant sap. Soybean aphid outbreaks have been associated with reduction in pod number, soybean size and quality.

The insect can be identified by a small (1/16 inch), pear-shaped soft body. Soybean aphids can be bright green to yellow with two dark cornicles, or “tailpipes,” on the tip of the abdomen. Soybean aphids may be winged, wingless or a combination of both.

SOYBEAN APHIDS

Symptoms of feeding damage include plant stunting and/or leaves covered with honey dew (sticky substance excreted by aphids) and black sooty mold, a fungal growth on honeydew-coated leaves.

The economic threshold or damage level of this pest can be reached when an average of 250 aphids have been found in a soybean field that has reached the R1 through R5 soybean growth stages. Soybean fields that have reached economic thresholds need to be treated with a foliar insecticide.

The price per bushel of soybeans aside, treating your soybean fields below 250 aphids per plant results in no detectable yield increase. In addition, early application of insecticide kills beneficial insects, allowing soybean aphid populations to rebound more quickly.

UNITED SOYBEAN BOARD (USB) FARMER-LEADERS initiated a program in 2011 between the USB, numerous state soybean checkoff boards and their respective land grant universities to increase the transfer of checkoff-funded production research information. The program helps improve the profit potential for U.S. soybean farmers and includes efforts like this guide. USB neither recommends nor discourages the implementation of any advice contained herein, and is not liable for the use or misuse of the information provided.

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thesoyreport.blogspot.com

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