

Managing RCR in Soybeans

Where the Research Stands and Where It's Headed

By Christina Xie

Red Crown Rot (RCR) has emerged as a significant threat to soybean production in the United States, expanding northward from traditional southern strongholds into the Midwest. To provide farmers and industry stakeholders with current, expert-grounded guidance on RCR management, we interviewed six specialists representing academic institutions, agricultural associations, and agrochemical companies.

Stephanie Porter, Outreach Agronomist for the Illinois Soybean Association, draws on extensive grower feedback through the ISA Growing Concerns



■ Red crown rot has caused significant damage to soybean cultivation.

Survey, documenting yield losses of 20–50% in affected field areas. From the university sector, Martin Chilvers, Professor of Plant Pathology and Extension Specialist at Michigan State University, and Carl Bradley, Professor

of Plant Pathology and Extension Specialist at the University of Kentucky, contribute complementary perspectives grounded in multistate field research, controlled laboratory work, and fungicide efficacy trials. Both emphasize the importance of accurate diagnosis, characterization of variety responses, and integrated management approaches. From the seed treatment industry, Leo Zappe, Global Portfolio Management Seedcare & Biologicals, and Jader Caricati, Global Product Management Lead – Seedcare, both from Syngenta, discuss the development and

performance of VICTRATO® and SALTRO®, including their performance across diverse Midwest environments and interactions with broader soilborne disease complexes. Willem-Jan Meulemeesters, General Manager of Gowan Netherlands, represents the biological seed treatment perspective, specifically addressing CeraMax and natamycin-based approaches.

The interviews reveal several consistent themes. First, accurate diagnosis remains challenging, as RCR symptoms closely resemble Sudden Death Syndrome and other soilborne diseases, requiring hands-on scouting and laboratory confirmation. Second, seed treatments remain the most reliable near-term control, with products such as VICTRATO® and SALTRO® demonstrating strong performance in field trials, though efficacy varies by location and growing conditions. Third, integrated management—combining chemistry, genetics, cultural practices, and proper field monitoring—offers the most durable path forward.

FACTS & FIGURES

Pathogen: *Calonectria ilicicola*

Disease Type: Soilborne fungal disease

Plant Part Affected: Roots and lower stems; foliar symptoms secondary

Symptom Appearance: R3–R4 growth stages (early reproductive)

Diagnostic Sign: Red/maroon discoloration and red perithecia at stem base

Yield Loss Range: 15–80% (field-dependent; 20–50% typical in Midwest)

Pathogen Persistence: Microsclerotia survive 5–7 years in soil

Favorable Conditions: Wet soils, poor drainage, compaction, plant stress

Geographic Distribution: Southeastern U.S. (endemic); Midwest (emerging; 7+ states as of 2026)

Current Best Practice: Match seed treatment selection with field history and disease pressure

Available Solutions: VICTRATO®, SALTRO®, ILEVO®, CeraMax®



Stephanie Porter

Illinois Soybean Association Outreach
Agronomist

? As Red Crown Rot (RCR) expands its footprint from the South into the Midwest, how would you characterize the current threat level to soybean production? In your view, what makes this pathogen uniquely difficult to manage compared to other established soilborne diseases like Sudden Death Syndrome (SDS)?

In Illinois, this red crown rot (RCR) is high threat based on the answers from hundreds of farmers that have participated in the Illinois Soybean Association (ISA) Growing Concerns Survey. Once this disease becomes established, it can cause between 20% to 50% yield loss in certain areas of the field, but this depends on the year. It is difficult to manage

because we are still learning about the RCR “disease triangle” or the pathogen, host range, as well as favorable conditions in which it occurs. I believe an



- Imagery from Illinois soybean field known to have red crown rot pressure. (Credit: Dr. Boris Camiletti, University of Illinois)

often-overlooked fact is the pathogen of RCR, *Calonectria ilicicola*, is that several recognized (such as alfalfa, clovers, peanuts, and some woody plants) as well as some unidentified plant species within Illinois could potentially serve as alternate hosts for the RCR pathogen.

? How can farmers better differentiate between early-season RCR symptoms and other common root rots, and how does this diagnostic challenge complicate your outreach and management advice?

Differentiating RCR from other soybean diseases is difficult because aboveground symptoms such as

interveinal chlorosis and necrosis closely resemble SDS, brown stem rot, and stem canker. As a result, accurate diagnosis requires in-field scouting around the soybean growth stages of R3 to R4, when plants can be dug up and examined at the crown.

Producers should look for characteristic reddish discoloration and small red fungal structures (perithecia) on the stem base, though these signs may not always be visible without adequate moisture or at certain growth stages. Scouting can be particularly tricky from mid-July through mid-August, as symptoms are often subtle and scattered, appearing as isolated chlorotic, necrotic, or



- Soybean stems with red crown rot at their base. (Photo: Stephanie Porter)

wilting plants rather than widespread field patterns visible from the road. From late August into September, plants infected with RCR are often dead and too degraded for clear diagnosis, frequently resembling a generalized black rot.

This complexity is compounded by the fact that multiple diseases often coexist in affected plants, while the pathogen’s microsclerotia can spread easily by wind, water, birds, and equipment. Together, these factors make timely and accurate diagnosis difficult, complicating outreach efforts and requiring agronomists to emphasize hands-on scouting and accurate diagnosis when advising farmers on management strategies.

? You have identified seed treatments as the most effective current defense, yet we see varying levels of performance in the field. From an agronomic perspective, what specific characteristics should a grower look for in a seed treatment package to ensure optimal RCR suppression? Furthermore, in cases where early-season pressure is extremely high, how are you guiding farmers to prioritize seed treatment selection alongside other risk-management tools?

Field trials conducted by the University of Illinois and supported by the Illinois Soybean Association check-off demonstrate that fungicide seed treatment performance against RCR can vary widely depending on the product and growing

conditions. Among currently registered seed treatments, however, Saltro® consistently delivered the most effective disease suppression and the strongest yield protection in RCR-infested fields. ILEVO® and CeraMax® also provided measurable benefits, though their performance was more variable across locations.

These findings underscore the importance of early-season protection. Infections that occur shortly after planting tend to result in the greatest yield losses, although disease development through the R1 growth stage can still significantly impact productivity. For fields with a known history of RCR, growers are encouraged to select proven fungicide seed treatments, with Saltro® standing out as the most reliable option for both disease control and yield preservation.

However, Victrato® (Tymirium), the newest option, is emerging as the most effective overall seed treatment in recent University trials, sometimes outperforming Saltro.

? What specific cultural or management practices are showing the most promise in your recent ISA-led discussions, in addition to seed treatment?

- Avoid rotations with other host crops such as clover or alfalfa, which can increase inoculum levels. Rotation with corn helps to reduce, but does not eliminate this pathogen, which can survive years in the soil.
- University of Illinois check-off funded satellite and drone

imagery has shown that RCR often appears in low lying areas or in patches. Over time, the spread of the disease across the field can be limited by no-till management practices.

- This disease appears to thrive in wet soils, so the improvement of field drainage is suggested.
- This pathogen could be spread by birds, deer, machinery, or water. It is encouraged to attempt to clean equipment to limit disease spread.
- When conditions are favorable, disease severity appears to be increased when soybeans are stressed by other factors such as compaction; therefore, the prevention of additional plant stress is advised.
- University of Illinois check-off funded research on interaction with soybean cyst nematode (SCN) is currently ongoing and we look forward to year two results from the field.

? Beyond current chemical seed treatments, where do you see the next breakthrough in RCR management coming from? Are we looking toward new biologicals, precision detection technologies, or perhaps gene-editing for true varietal resistance in the next 3–5 years?

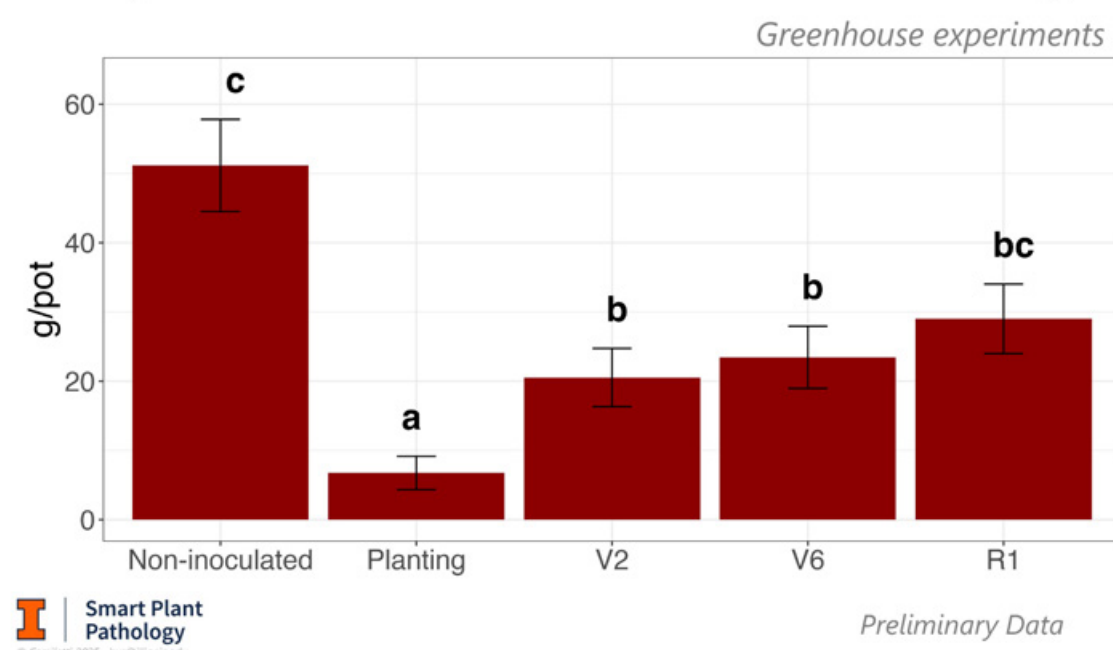
University of Illinois research funded by the Illinois Soybean Association collected satellite and drone imagery

from Illinois soybean fields with known RCR pressure and paired it with field disease measurements to train a machine learning model to detect canopy-level disease patterns. The model was then applied to commercial fields to identify disease hotspots and guide ground checks and field trial placement.

University of Illinois biological testing in growth chamber and greenhouse experiments, sponsored by the Illinois Soybean Association Check-off, indicate biological products alone cannot reliably control RCR or replace proven chemical seed treatments. While some products showed limited activity, none consistently provided meaningful protection beyond standard fungicide seed treatments. For fields with a history of RCR, farmers should prioritize chemical seed treatments and consider biologicals only as supplements if future products demonstrate clear added value.

The future RCR research should be focused on gene-editing for true varietal resistance because there currently are no highly resistant soybean varieties, but tolerance differences do exist. In addition, attempts should be made to screen soybean germplasm collections to find rare resistant alleles by way of improved methods. Lastly, more research is needed to learn more about disease epidemiology as well as alternative disease hosts.

Early Infections Resulted in the Lowest Seed Weight



- Graph showing early infections of red crown rot result in lower seed weight or greater yield loss. (Credit: Dr. Boris Camilletti, University of Illinois)



Martin Chilvers

Professor of Plant Pathology and Extension Specialist, Department of Plant, Soil and Microbial Sciences, Michigan State University

? You've noted that Red Crown Rot (RCR) is often mistaken for Sudden Death Syndrome (SDS). What is the single most important 'red flag' for farmers to look for, and why is laboratory confirmation critical before deciding on a management program?

Symptoms of red crown rot closely resemble those of SDS and brown stem rot, with foliar interveinal chlorosis (yellowing) and necrosis (death). These symptoms typically start during early to mid-reproductive stages. Red flags may include more dead plants than usual or disease in new areas of a field. Some of the indicators

include reddening of the lower stem, small red fungal fruiting bodies (perithecia), and pencil like root symptoms. However, confirmation in a laboratory is essential as visual identification alone is not sufficient.



■ Symptoms of red crown rot. (Photo: Martin Chilvers; Sunao Ochi)

? Since RCR is a soilborne pathogen that persists for years, what should be the foundation of a farmer's long-term management plan once the disease is identified on their farm?

The first step in managing any disease is correct identification. Once RCR is identified, work with your seed dealer to ask about variety resistance. It's early days, but there do seem to be differences in variety responses. It will take some time to breed varieties with resistance to RCR. And we still have a lot to learn about this disease. There are a number of seed treatments that

are labelled for use including Victrato, ILEVO, Saltro and Ceramax. We are still assessing the efficacy of these treatments, but some of these look promising.

? Beyond chemical tools, what is the most effective 'non-chemical' practice farmers can adopt today to slow the spread of RCR between fields and across county lines?

Where possible avoid spreading RCR from field to field, try to prevent soil movement

where feasible. This is perhaps more important when moving equipment between farms, or when buying used equipment that may be carrying contaminated soil.

? What is the biggest missing piece of data or the next major hurdle we need to clear to provide growers with a more reliable, sustainable solution for RCR?

We are in the very early stages of working with and understanding this disease that is new to the Midwest.

We are leveraging resources and working across the region with colleagues on improved diagnostic tools, understanding factors that increase risk of RCR, planting date effects, variety resistance, seed treatments, fungicide resistance, host range and cultural practices. Ultimately, varieties with improved resistance will be one of the key components to management, but with all diseases an integrated disease management approach will be critical.



■ Soybean field impacted by red crown rot. (Photo: Martin Chilvers; Sunao Ochi)



Carl Bradley

Professor of Plant Pathology and Extension Specialist at University of Kentucky

? Building on your extensive experience with field trials, how would you rate the current efficacy of commercial seed treatments in the field compared to what we see in controlled lab environments?

We are finding that there is certainly some variability among the seed treatment products that include red crown rot on their label. Efficacy ratings of products, based on multi-environment field research trials can be found on the Crop Protection Network publication "CPN-1020 – 2026 Soybean Seedling Disease Fungicide Efficacy" (www.doi.org/10.31274/cpn-20190620-015).

Although some products are able to provide fair to very good efficacy against RCR, there is always room for some improvement, and it is important to identify new active ingredients from different chemistry classes that are effective, which can help implement a fungicide resistance management plan.

? For a farmer operating in a known RCR-infested field, what criteria should they prioritize today when selecting varieties?

Although the industry is still at a somewhat early stage in identifying resistant soybean varieties and characterizing existing varieties, many seed

companies have active research in this area, and some companies may have internal information about which varieties should be avoided in high-risk fields, and which varieties might perform the best in high-



■ Red crown rot perithecia on the stem base of infected soybean plant. (Photo: Carl Bradley)

risk fields. It is important that farmers are aware of RCR in their fields, and if they know it is a problem in their fields, then they should work closely with their seed company representatives to help them identify the varieties that have the best chance to perform in fields known to have RCR. In addition, utilizing the most effective fungicide seed treatments in combination with these varieties will also be important.

? Since RCR is a soilborne pathogen that persists for years, what should be the foundation of a farmer's long-term management plan once the disease is identified on their farm?

The first step is for a farmer to be aware of the history of disease in each field. If they don't know they have RCR (or any other disease problems), then management becomes much more difficult. With some of the newer seed treatment products having very good efficacy against RCR, growing productive soybeans in fields with a history of RCR is still



■ Symptoms of red crown rot on soybean leaves. (Photo: Carl Bradley)

possible. Matching the best seed treatment products with varieties that have some level of resistance to RCR will be the best way to move forward currently.

I am also confident that seed companies will continue to better understand which varieties perform best against RCR, while continuing to breed new varieties with improved resistance. Although RCR is new to many farmers in the Midwest, we can look back at the history of other similar diseases, such as sudden death syndrome (SDS),

which was a disease that started to emerge in the Midwest in the 1980s and 1990s (and even 2000s in some states). Continued breeding efforts for SDS-resistant varieties and registration of effective fungicide seed treatments has allowed soybean farmers to continue to produce high-yielding soybeans regardless of SDS. So, I'm confident that tools to manage RCR will continue to improve as long as research on this disease continues to be supported at the academic, federal, and industry levels.



? The balance between aggressive disease suppression and early-season crop safety is a common concern for growers. How are you designing seed treatments to ensure that RCR control doesn't come at the expense of root development or plant emergence?

The first point is that we should be precise with the language: seed treatments do not eradicate RCR. The goal is to reduce infection impact, protect the young plant during the critical establishment window and help growers preserve yield potential under disease pressure.

That is an important distinction, because a seed treatment should not simply suppress a pathogen; it should help the crop establish a stronger foundation. With RCR, protection needs to be positioned close to where early infection pressure begins: around the seed, root and young plant. But crop safety and early vigor are equally important. A product that reduces disease pressure but compromises emergence, root development or stand establishment would not be a

good outcome for the grower.

That is where VICTRATO[®], powered by TYMIRIUM[®] technology, is differentiated. It is designed to provide targeted protection against key below-ground threats while supporting healthy early plant development. Across U.S. development work, VICTRATO[®] has shown no negative plant response on germinating seed or seedlings, and under disease pressure we often see larger, more robust plants because the root system is better protected.

In soybeans, growers rarely manage RCR in isolation. They are often dealing with a broader complex that may include SDS, Soybean Cyst Nematode (SCN) and other early-season root stresses. The goal is therefore not only disease suppression, but stronger young-plant establishment.

? To better understand the leap in performance, how does the TYMIRIUM[®] technology fundamentally shift the ceiling for RCR suppression compared to the standard fungicide packages growers have relied on in the past?

TYMIRIUM[®] technology raises the performance ceiling because it brings a

new level of targeted activity against difficult soilborne threats affecting root health and early crop development.

RCR is challenging because the pathogen is soilborne, infection can begin before symptoms are visible, and disease expression is strongly influenced by field history, soil moisture, compaction, variety and other stresses. Traditional seed treatment packages have been important for broad early-season protection, but RCR requires more specific attention because of where and how the disease develops.

In Syngenta U.S. trials across nine locations in 2024–2025 under moderate to heavy RCR pressure, VICTRATO[®] delivered a +16.1 bu/A yield advantage over the fungicide/insecticide base treatment and a +11.9 bu/A advantage over ILEVO[®] at its RCR

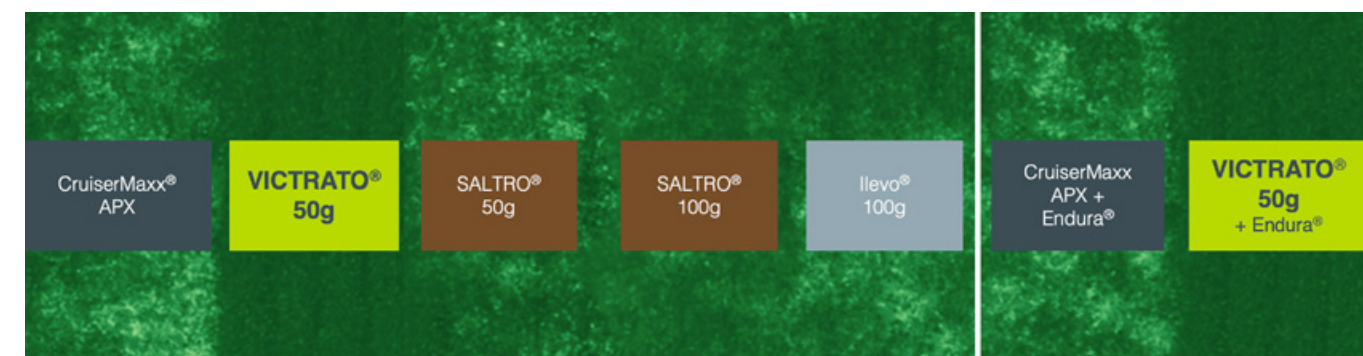
rate. Under very heavy RCR pressure at Hamel, Illinois in 2025, VICTRATO[®] delivered a +39.4 bu/A advantage over the base treatment and a +32.8 bu/A advantage over ILEVO[®] at its RCR rate.

Those results support the view that TYMIRIUM[®] technology is not just another incremental addition to the seed treatment package; it materially strengthens the chemical contribution to RCR management.

That said, “suppression” remains the right word. RCR is not a disease that should be discussed in terms of eradication. High inoculum pressure, poor drainage, compaction or very favorable disease conditions can exceed what any seed treatment can deliver alone. VICTRATO[®] raises the ceiling, but the strongest programs will still combine chemistry, genetics and agronomy.



■ Red Crown Rot trial (Illinois, 2023). Base treatment: CruiserMaxx[®] APX. Photo taken 111 DAP.



■ Same photo, converted into RGB image.

? As RCR expands into new northern territories with varying soil profiles and stressors, how does Syngenta ensure consistent product performance?

The Midwest should not be treated as one environment. Soil texture, organic matter, drainage, planting date, temperature, rainfall, SCN pressure and field history all influence disease pressure and product performance.

Seed treatments help because they place protection directly on the seed and in the early root zone, where the young plant is exposed during establishment. That placement matters for RCR because the risk begins below ground, often before the grower sees above-ground symptoms.

Consistency does not mean every field responds the same way. It means the product has been tested across many environments, so we understand its performance profile under different agronomic and disease conditions. Syngenta invests heavily in multi-year, multi-location field research before commercialization; 2026 will mark the eleventh year of U.S. field research invested into VICTRATO® commercial soybean development.

SALTRO® has been an important Syngenta tool for early-season soybean protection. VICTRATO® adds a new option for growers facing RCR, SDS and other below-ground threats, including multiple species of nematodes.

The best performance will come when product choice is matched with field diagnosis, local disease pressure, variety selection, SCN management and sound agronomy. This is why local channel

partners and Seedcare specialists are important in helping growers tailor the right recommendation field by field.

? Looking beyond, what are the primary targets for Syngenta's R&D in soilborne disease management?

Soilborne diseases are too complex for a single-input answer. The future is integrated management, but with stronger tools in each layer. Seed treatments will continue to become more targeted, more robust and better matched to field-level risk. Genetics will remain important. While the industry does not yet have highly resistant commercial lines for RCR, we know from other diseases, such as SDS, that genetic progress can become a major part of durable management over time.

From an R&D perspective, highly virulent Fusarium species in soybean and corn remain an increasing challenge. As the industry has strengthened control of pathogens such as Phytophthora and Pythium with multiple modes of action, Fusarium-related diseases are becoming a more prominent focus.

For Syngenta, the direction is clear: protect the young plant more effectively against the soilborne complex — diseases, nematodes and early root stress — while maintaining crop safety, compatibility with modern seed-applied systems and practical fit for growers. VICTRATO® is part of that broader direction, but it should be used alongside other tools: genetics, diagnostics, rotation, cultural practices and field-level agronomy.



Willem-Jan Meulemeesters

General Manager of Gowan Netherlands

? CeraMax is built on the unique mode of action of Natamycin. For growers accustomed to synthetic fungicides, what is the most important technical advantage of choosing a biological pathway for RCR suppression?

Natamycin in general and CeraMax in particular offers substantial advantages. To begin with, it is safe for both users and the crop, not having any of the phytotoxicity effects that can be seen with some chemistry. In our trials, we consistently see CeraMax performing the best in terms of germination, early stand and vigor. We understand from growers also that they see benefits in terms of soil health — a biological like CeraMax is simply put better for your current and future crops. CeraMax is available in the USA in conventional formulation and in an OMRI-compliant formulation.

? As an industry leader, how do you see the role of CeraMax within a modern, integrated seed treatment package?

CeraMax is fully compatible with a very wide range of other products, including all major synthetic active

ingredients, and is consistently applied in a broader seed treatment stack. We also recommend that CeraMax is used as part of an integrated program, be that with synthetic or biological active ingredients, as Natamycin does not have efficacy against certain important pests, such as insects.

CeraMax was tested for more than 3 years before its launch with a win rate of over 97%, in a wide variety of US states. It has now been in the market for more than 5 years, showing consistent and strong performance.

? How do you see the role of biological seed treatments evolving over the next five years?

We believe there is indeed a great opportunity for growers to strengthen their bottom line, reduce their risks and future-proof their operations by incorporating more biologicals into their programs. We do see that all major industry players are ramping up their biological investments and portfolio to enable such a shift. The key, however, is an integrated program, where there will remain a place for synthetic active ingredients for some time to come. AP