

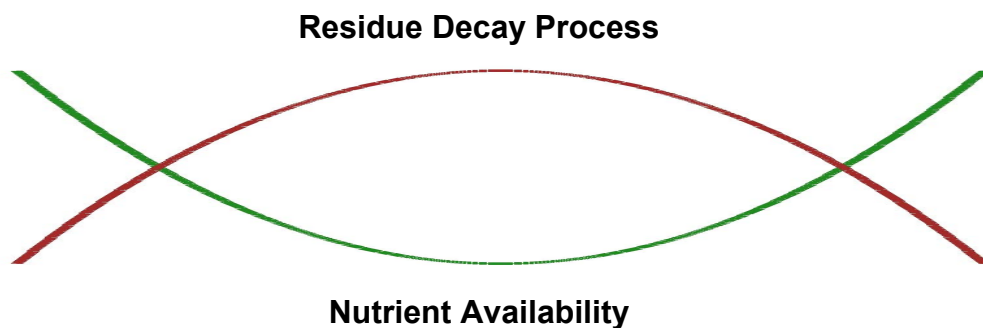
Managing Continuous Corn Residue with Chandler Biocat 1000

Corn Residue: Asset or Liability?

In recent years, farmers have had to deal with increasing amounts of corn residue, especially if they are using Bt corn hybrids with heavy stalks or if they have shifted to more continuous corn acres. Although we know that corn residue may be an asset in farming because it is an important source of humus and nutrients for the soil, we also know that excessive amounts of corn residue can tie up nutrients for the next crop. As well, large amounts of undecayed residue can hamper tillage and planting operations, reduce warming and drainage of the seedbed, contribute to chemical carryover problems, and harbor soil insects and disease. The purpose of this paper is to show how farmers can successfully manage the residue decay process when they are working with continuous corn, Bt corn hybrids, or other high residue situations.

Why Does Undecayed Residue Tie Up Nutrients?

Carbon in the corn residue is the key reason for this asset versus liability question. The soil microorganisms that break down the residue convert about one-third of the carbon to humus that helps to build up the soil organic matter and structure, and the rest of the carbon is released as carbon dioxide. However, these microorganisms use the nitrogen and other soil nutrients as a food source while they convert the carbon, so these nutrients are tied up and unavailable to the plants during the decay process. After the decay process ends, the nitrogen used by the microorganisms becomes available to the next crop. As shown in the figure below, the availability of all soil nutrients (green line) decreases as the residue decay process (brown line) begins. Crop nutrient availability is lowest at the peak of the decay process, and then soil nutrient availability increases as the residue decay process concludes. Thus, the residue decay process should be started and ended as soon after harvest as possible in order to reduce nutrient tie-up and make more soil nutrients available for production of the next crop.



Understanding the Carbon-Nitrogen Ratio

The time required to complete the residue decay process depends on the carbon-nitrogen ratio, which measures the amount of carbon present in the residue relative to the amount of nitrogen. The microorganisms driving the decay process work best if the carbon-nitrogen ratio of the residue is less than 30. As the ratio increases (more carbon relative to nitrogen), the decay process lasts longer and the nitrogen and other soil nutrients are tied up for a longer period of time. The carbon-nitrogen ratios for some common types of crop residue and yard waste are:

Type of residue	C-N Ratio	Type of residue	C-N Ratio
Grass clippings	10-25:1	Corn stalks	60-70:1
Red clover	20-30:1	Corn cobs	60-125:1
Tree leaves	40-80:1	Oat straw	50-100:1
Timothy hay	55-60:1	Wheat straw	100-150:1

Corn stalks and grain straw have high carbon-nitrogen ratios and require a longer time to decay. If the decay process is not completed before the next crop is planted, the undecayed residue may tie up valuable soil nutrients and hamper early growth of the next crop.

Can't We Simply Apply More Nitrogen to Solve the Problem?

Fertilizer companies typically recommend heavy fall nitrogen applications to help decay residue by balancing the carbon-nitrogen ratio, and this has been a common practice in continuous corn farming for several years. However, agronomy studies recently conducted at the University of Wisconsin at Madison found that fall nitrogen applications did not significantly affect corn residue decay. Further, agronomists tell us that heavy nitrogen applications can reduce potassium uptake into the plant. Potassium is required for the stalks and other critical plant structures, and a potassium deficiency can lead to poor stalk quality and lodging. Finally, we all know that excessive nitrogen applications can leach into the ground water or surface water (rivers and streams) and contribute to long-term environmental problems.

What if the Crop Residue is Removed from the Field?

Some farmers bale corn stalks or use other practices that remove the corn residue from the field, and there is evidence to show that this approach may help the next crop. For example, the old rule-of-thumb is that beans planted after corn silage may yield 5-10 bushels per acre more than beans planted after regular corn. The silage cutting operation removes the residue from the field, and the next bean crop can achieve higher yields because the soil nutrients are not tied up by undecayed residue. However, an acre of harvested corn may contain 8-10 tons of residue with up to 200 units of nitrogen, 74 units of phosphate, and 290 units of potash. Based on current fertilizer prices, these nutrients may be worth \$100 or more per acre. If the residue is removed from the field, these nutrients and the organic material (humus) are lost to the soil.

Use Chandler Biocat 1000 to Manage the Decay Process

In conclusion, farmers must deal with more heavy corn residue than ever before, and the increasing amount of carbon per acre in this residue can tie up soil nutrients and cause other problems. Although some short-term relief to the excess residue problem may be achieved by applying more nitrogen to balance the carbon-nitrogen ratio or by simply hauling away the residue, these methods are both expensive and wasteful. The key way to generate as much economic value from this residue while avoiding the liabilities is to stimulate the soil microorganisms and accelerate the decay process. Chandler Biocat 1000 is a liquid enzyme product that contains micronutrients and other compounds specifically designed to accomplish this task. Biocat 1000 should be applied to the residue as soon after harvest as possible in order to complete the decay process before the next crop is planted. The product may be applied with conventional spray equipment, and it is compatible for tank mix combinations with most commonly used liquid fertilizer and pesticides. Please refer to the Biocat 1000 product brochure and other information posted at our website (www.midwestbioman.com) for more details.