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Corn Kernels

Impact of Flooding in Corn

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What is the Impact of Flooding on Corn?

Depending on the stage of development corn is fairly tolerant to excessive water or flooding as long as the water does not cover the entire plant. In fact from V5 to V10 corn can stand "wet feet" with little or no damage or yield loss. The following guidelines should be used when considering the impact of flooding on corn yield potential.

1. **Situations Where Flood Water Covers the Entire Plant:** As with most plants corn must be able to exchange gases - intake CO_2 at the leaves and O_2 at the roots. Therefore, corn cannot tolerate being underwater for a long time. Corn can be completely underwater for up to 72 hours before death of the plant occurs. Once this threshold has been passed the corn plant dies quickly. However, there is another key problem when corn is completely covered by water. Plants that have been covered by water for 24 to 48 hours can become infected with a disease known as Crazy Top. This disease is caused by a water-borne pathogen which infects the plant through the whorl when water covers the plant. This disease can cause the plant to grow in unusual ways often causing the tassel to have uncontrolled growth (Fig. 1). Due to either death or the potential for disease flood water that covers the entire corn plant is a serious problem that can have server yield impacts.

2. **Excess Water that does not cover the plant from V3 to V5:** This is a critical growth period in the establishment of root tissue. As such the plant is less tolerant to wet conditions. Excessive water during this period of growth can result in poor nutrient uptake (yellow plants from lack of N or a multitude of symptoms such as purpling due to lack of P) and can lead to root diseases such as pythium or crown rot. The combination of lack of nutrient uptake due to poor root development and disease results in stand loss and can severely impact yield potential. In general, plants cannot tolerate more than 4 to 5 days of excessive water at this stage.

3. **Excess Water that does not cover the plant from V6 to V10:** This is the stage at which corn is fairly tolerant to excess soil moisture or standing water. The root system is deeper and can recover from lack of oxygen in the soil. The key is how long the corn remains in standing water. At these growth stages corn can tolerate standing water for up to 7 to 10 days

Figure 1. Crazy top symptoms in corn.

depending on temperature. Since the corn plant will have difficulty moving water through the plant due to lack of root function the plant cannot tolerate very warm or hot temperatures. Therefore, temperatures above 86 ^{o}F will cause plant stress and will decrease the plants tolerance for standing water. Yield losses from standing water will depend on how long the flooding condition exists, temperature, and the nutrient status of the plant. Plants which went into this period with good nutrient levels can translocate nutrients to help keep growing points active; while plants that had low levels of nutrients in the leaves will not be able to maintain growth functions. In general, growers will need to assess the loss of yield potential on a case by case basis. In many cases there will be little or no yield loss while in some situations (extended time of flooding, high air temperatures, low tissue nutrient concentrations) there can be significant yield reductions.

4. **Excess Water that does not cover the plant – PreTassel through Silking:** These are the most critical stages of corn development and the stages at which the plant has its lowest tolerance for excessive soil moisture or standing water. The lack of nutrient uptake caused by excessive soil moisture or standing water during this time can lead to pollination failure and severely reduce yield potential. Excessive water and particularly standing water should be avoided at all costs during this critical period. In general the corn can tolerate no more than 2 to 4 days of standing water during this period before yield losses become severe.

What Can I do to Prevent or Reduce Yield Loss Due to Flooding?

1. **Remove Excess Water as Quickly as Possible:** Time is important. The longer the condition exists the more likely yield losses will occur.

2. **Corn from V3 to V5:** As soon as the soil starts to dry growers should assess the situation for the presence of diseased plants and determine how much stand loss has occurred. If more than 18,000 healthy plants remain per acre then the grower should plan on making sidedress applications of N and/or S as quickly as possible to help the plants recover. Depending on the situation growers may also need to consider adding K or nutrients such as Mg or B. If stand loss has resulted in less than 18,000 viable plants per acre then replanting another crop may be an alternative.

3. **Corn from V6 to V15:** The key issue with corn in these stages is to keep the plants actively growing. Depending on how quickly growers can return to the field there are several ways to help plants at these stages recover. One of these is the use of foliar nutrients. While foliar applications are not effective at providing a large quantity of nutrients they can be effective at improving short term improvement in tissue concentration. When corn has been in standing water for an extended period and temperatures are above 80 ^{o}F then a foliar fertilizer with N and perhaps K and B can improve plant recovery. Several companies have foliar products that can cover these nutrients. For the longer term some attention should be paid to providing N that may have been lost through denitrification. I recommend that growers add 30 to 50 lbs of N to fields that have seen standing water. This could be done using urea or with drop nozzles from a high-clearance sprayer. If growers are going over the field at this stage it would be useful to consider putting a fungicide and, where stinkbugs are an issue, perhaps an insecticide as well.

4. **Corn from early tassel through silking:** Corn in these stages should be monitored to determine how effective pollination was and to determine if yield losses. If pollination has not been effected then adding 30 to 50 lbs of N would be useful to replace losses due to denitrification.