Response of Corn to Multiple Defoliation Events

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INTRODUCTION

Current National Crop Insurance Services (NCIS) Corn Loss Instructions provide a procedure for assessing yield losses to a corn field damaged by more than one hail storm on different dates and stages of development during the growing season. As hybrid genetics have improved and plant populations have increased over time, it is necessary to assess whether these changes influence corn response to defoliation differently than in the past. This study was undertaken to determine how much yield loss occurs in corn subjected to multiple defoliation events and compare these losses with those indicated by current NCIS Corn Loss Instructions.

OBJECTIVES

1. To determine effects of multiple defoliation events (“second losses”) on grain yield in corn.
2. To compare these “actual yield losses” with those estimated by the current NCIS Corn Loss Instructions.

METHODS

- Field experiments were conducted on research farms at the University of Illinois and University of Minnesota from 2012-2014 and at The Ohio State University from 2014-2016.
- 3 m x 3 m plots were planted in a randomized complete block design with four replications.
- Thirteen defoliation treatments were imposed at three stages of development (Table 1).
- Defoliation treatments consisted of either 100% (Fig. 1) or 50% leaf removal. 50% leaf removal involved cutting 60% off of every other leaf and stripping the leaf area from one side of the mid-rib on the remaining leaves. Subsequent leaf removal only treated leaves that were not previously damaged.
- Percent total light intercepted was measured using a Line Quantum Sensor (Li-Cor Biosciences, Omaha, NE) at tassel.
- The center 1.8 m of the two center rows were hand harvested for yield and kernel weights and kernels ear-1 were recorded.

RESULTS AND DISCUSSION

Actual yield losses for each state (Table 2), averaged across leaf removal treatments and years, were lower than the NCIS chart loss estimates but similar across states: 36% - chart loss vs 20% - IL, 24% - MN, and 21% - OH. Treatments limited to leaf loss at the 10-leaf and 15-leaf stages were generally similar to chart losses. Treatments which included a 50% leaf loss at tassel averaged a yield loss of 25% for IL, 28% for MN, and 26% for OH compared to 48% for the chart loss estimate. The multiple defoliation treatment that resulted in greatest yield loss (100% leaf removal at the 15-leaf stage followed by 50% leaf removal at tassel) also resulted in the greatest reduction of light interception (Fig. 2) and kernel weight (Fig. 3).

CONCLUSIONS

- Actual losses and NCIS chart loss estimates were generally similar for treatments involving leaf removal only at the vegetative stages.
- Treatments that involved leaf removal at tassel were consistently lower than estimated chart losses.
- Treatments with 50% leaf loss at tassel resulted in yield loss averaging only half of estimated chart loss.