THE EFFECTS OF PHYSICAL INJURY ON COTTON GROWTH, MATURITY, AND YIELD

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Abstract

Cotton (*Gossypium hirsutum* L.) grown in the Southeastern U.S. often encounters adverse weather conditions including occasional hail events during periods of early season growth. The resulting injury can range from minimal to severe and common symptoms include leaf or cotyledon removal, terminal bud damage, stem bruising or breakage, and seedling death, often necessitating replanting. Provided that seedling death or stand loss is minimal, surviving seedlings can occasionally recover and achieve acceptable yields, depending upon the severity of a particular hail event and its resulting injury. However, it has been observed that leaf removal or terminal damage can delay maturity and reduce yields of surviving plants, even if the remaining plant stand is adequate. The objectives of this research were to quantify the effects of various leaf/cotyledon removal treatments on seedling cotton growth, maturity and yield, to determine the minimal amount of leaf/cotyledon material required to sustain unaffected growth and yield, and to determine if terminal/true leaf removal –or- cotyledon removal has more effect on cotton growth, maturity, and yield. PHY 499 WRF® was planted at a rate of 3 seed per foot of row, on June 8, 2011in a dryland strip-tillage environment. Leaf removal treatments consisted of a factorial arrangement of two true leaf removal treatments {no true leaf removal versus true leaves and cotyledons removed} and five cotyledon removal treatments {no cotyledons removed, one cotyledon removed, two half-cotyledons removed, one and one half cotyledons removed, and two cotyledons removed}. All treatments were applied to two to three-leaf cotton. Plant heights and nodes above white flower (NAWF) were monitored weekly until physiological cutout, and plant mapping for boll distribution characteristics was conducted at the end of the season. Seedcotton yield, lint percentage, and lint yield were collected at harvest and subsequent ginning. All data were subjected to analysis of variance and means were separated using Fisher's Protected LSD at $p \leq 0.05$. Plant heights at four weeks after planting were unaffected by cotyledon removal when the terminal bud and true leaves remained intact. However, when the terminal/true leaves were removed, all cotyledon removal treatments resulted in shorter plants compared to their corresponding cotyledon removal treatment when the terminal/true leaves remained intact. Additionally, removal of terminal/true leaves plus one and one half cotyledons, and removal of terminal/true leaves plus two cotyledons, resulted in plant height reductions of 15 % and 29 % respectively compared to removal of terminal/true leaf removal with no cotyledon removal. At 55 days after planting, removal of terminal/true leaves plus one cotyledon, removal of terminal/true leaves plus one and one half cotyledons, and removal of terminal/true leaves plus two cotyledons, resulted in plant height reductions of 8%, 13%, and 18% when compared to their corresponding treatments when the terminal leaves remained intact. Interestingly, plant height was unaffected by removal of terminal/true leaves plus two half-cotyledons compared to the terminal remaining intact, whereas removal of terminal/true leaves plus one cotyledon did result in a plant height reduction compared to the corresponding treatment with the terminal remaining intact. This suggests that half the normal cotyledon material remaining on both sides of the mainstem may sustain growth better than removal of one entire cotyledon, when the terminal/true leaves are removed. Lastly, the removal of terminal/true leaves plus two cotyledons resulted in shorter plants than all other treatments at 55 days after planting. There was no effect of leaf removal treatment on plant heights at physiological cutout, indicating that the effect of leaf removal on plant growth may be transient in some environments. Nodes above white flower was unaffected by leaf removal treatment at all times during the bloom period, although removal of terminal/true leaves plus two cotyledons delayed the initiation of blooming by one week for most plants within this treatment. Leaf removal also had no effect on boll distribution characteristics, node of first sympodia, sympodial nodes, total nodes, and boll retention. Seedcotton yields were unaffected by leaf removal, however lint percentage was affected, resulting in the removal of terminal/true leaves plus two cotyledons yielding significantly less than all other treatments, with reduction ranging from 22 to 35 %. These data suggest that the removal of terminal/true leaves alone, or the removal of terminal/true leaves plus cotyledons can have adverse effects on plant growth during the early part of the season, however only the removal of terminal/true leaves plus substantial cotyledon material adversely affected plant growth by midseason in this environment. As suggested by final plant height data, the effects of leaf removal on plant growth may be transient in some environments. Although boll distribution was unaffected, this data suggest that severe leaf removal (removal of terminal/true leaves plus two

cotyledons) can significantly reduce lint yields. Similar research in more stressful environments should be conducted to confirm these results. The effects of mainstem bruising, herbicides, or thrips in addition to that of leaf removal should also be evaluated, in addition to leaf removal at various growth stages. The authors extend a special thanks to the Georgia Cotton Commission for funding this and other research.