# VARIETAL RESISTANCE TO THE SUGARCANE BORER IN PLANT CANE, 2022

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The sugarcane borer (SCB), *Diatraea saccharalis*, is the most destructive insect attacking the Louisiana sugarcane crop. Varietal resistance to the SCB is a key pest management strategy, and resistant varieties have reduced insecticide usage by approximately 50%. Continued assessment of SCB resistance among commercial and experimental sugarcane varieties is critical to maintaining the success of this strategy in IPM programs. Resistance is assessed annually in small-plot field trials conducted at the Sugar Research Station in St. Gabriel, LA. Resistance was assessed in the plant cane trial and in the first ratoon of the 2020-planted trial.

In the 2021-planted trial, four advanced experimental sugarcane varieties of the L- and Ho-2015 and 2016 series of the variety development program were included, in addition to commercial varieties. Commercial varieties known to be resistant included HoCP 85-845, L 01-299, and HoCP 04-838. Additional resistant varieties that are not produced commercially, included Ho 08-9003 and N-21. Susceptible commercial varieties included HoCP 00-950 and L 12-201. Additional commercial varieties evaluated included those with intermediate or unknown levels of SCB susceptibility (HoCP 09-804, L 01-283, L 11-183, Ho 12-615, Ho 13-739, L 14-267, and HoCP 14-885). In the 2022 plant cane trial, varieties included the 15- and 17- series experimental varieties as well as HoCP 85-845, and L01-299 as resistant standards and HoCP 00-950 and L 12-201 as susceptible standards.

In both trials, varieties were planted in one-row 7-m plots using randomized block design with five replications. To increase the SCB population in the experimental plots, rows of corn were planted in between two-row plots and inoculated with laboratory-reared SCB larvae early in the season. A 12-stalk sample was cut from each plot at harvest, and the numbers of bored internodes and total internodes were recorded. Data was analyzed with generalized linear mixed models (SAS, Proc Glimmix). The Kenward–Roger method was used to estimate denominator degrees of freedom, and Tukey's HSD ($\alpha$=0.05) was used for mean separations. Models included variety as a fixed effect and replication as a random effect.

Differences in the percentage of bored internodes were detected among varieties ($P$ <0.001) in both trials. Injury in the first ratoon trial was greatest in HoCP 00-950 followed by several advanced experimental varieties (Figure 1). Interestingly, susceptible standard L 12-201 showed intermediate levels of injury and did not differ from resistant standard L 01-299. Conversely, SCB injury in the plant cane trial in L 12-201 was approximately 4-fold greater than that of L 01-299. Varieties in the 17- series not previously evaluated demonstrated a range of resistance levels. Ho 17-776 had the lowest injury level among the varieties evaluated, while L 17-428 was comparable to susceptible standards. Collectively, results suggest a range of SCB resistance remains present in the variety development program.

Figure 1. *Diatraea saccharalis* injury among commercial and experimental sugarcane varieties in plant cane, St. Gabriel, LA, 2022.

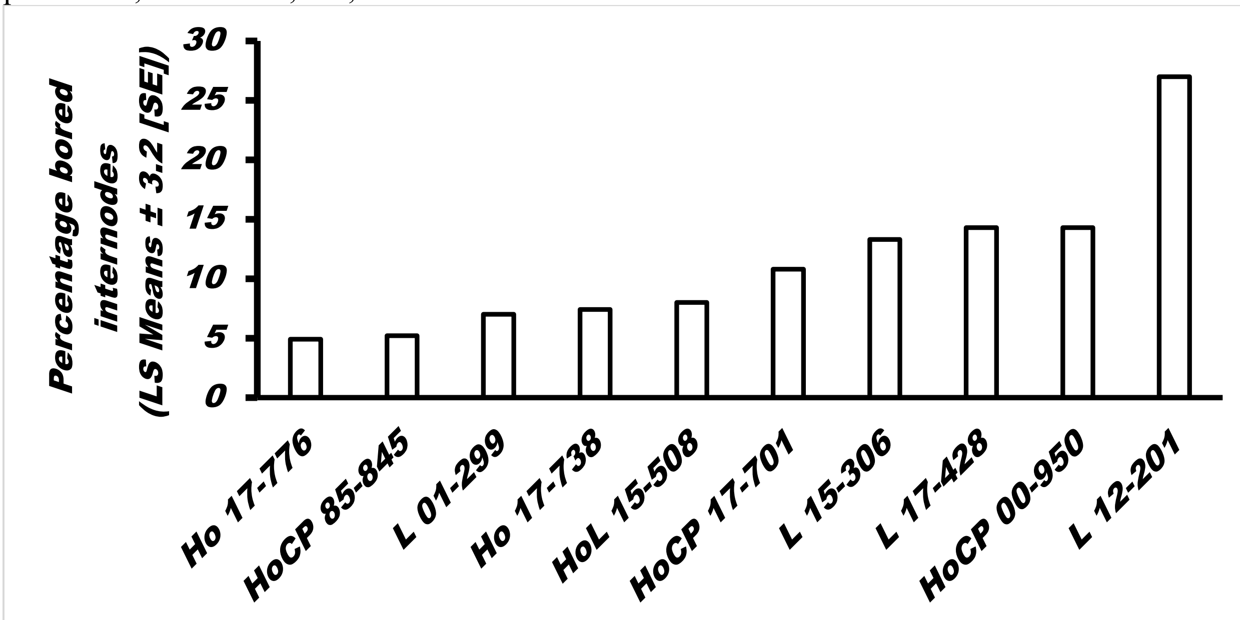
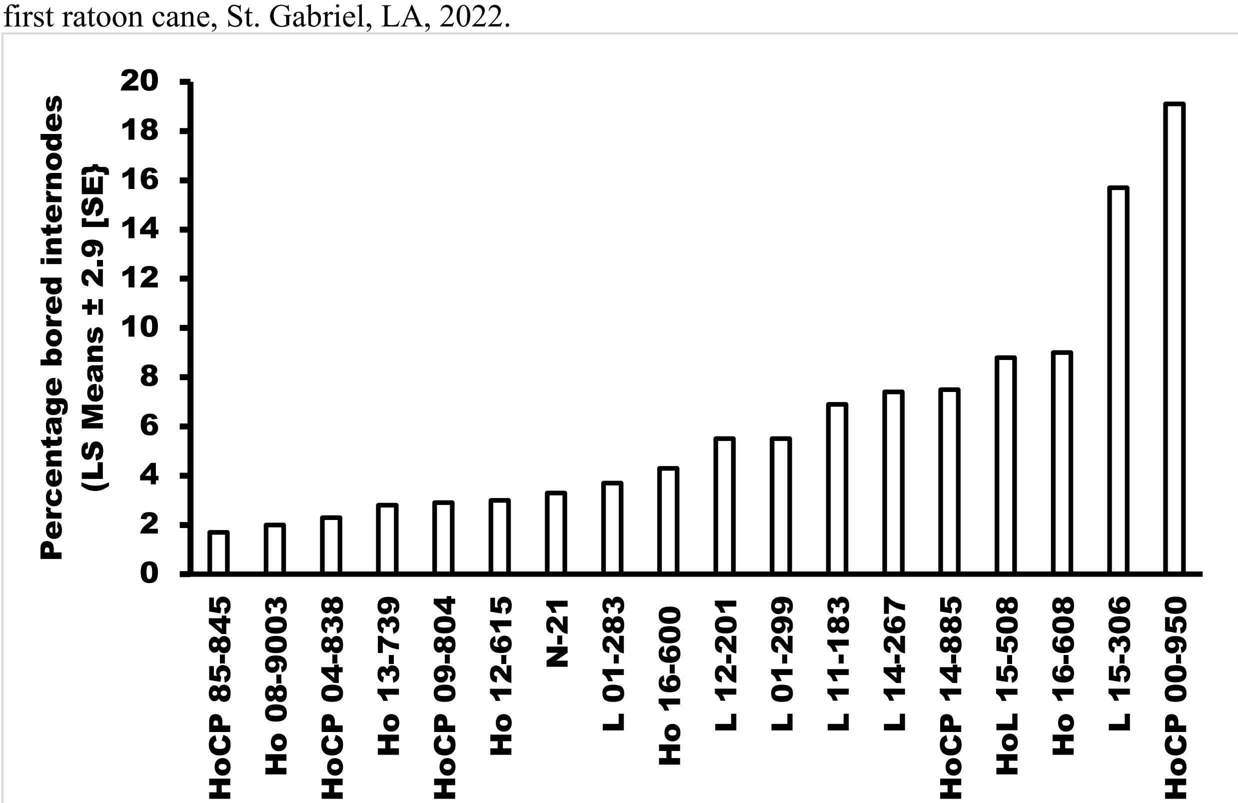



Figure 2. *Diatraea saccharalis* injury among commercial and experimental sugarcane varieties in first ratoon cane, St. Gabriel, LA, 2022.




*Means which share a letter are not significantly different (Tukey's HSD, α = 0.05).

**MEXICAN RICE BORER EXPANSION IN LOUISIANA**

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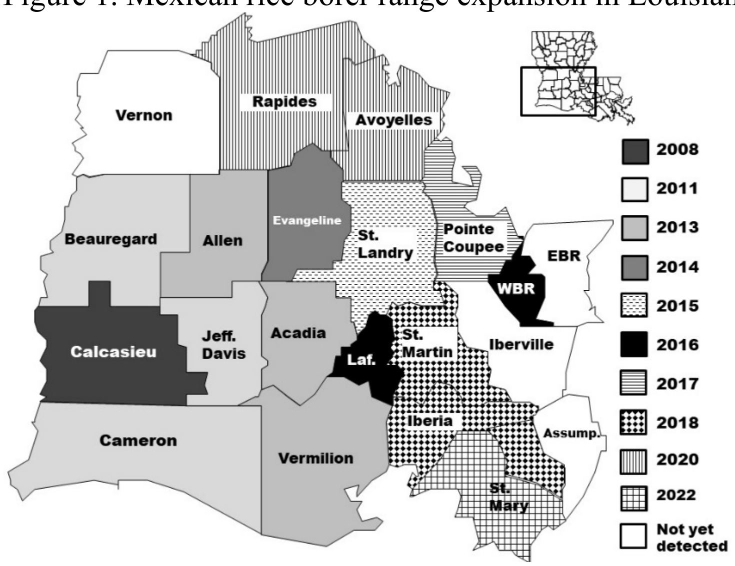
The Mexican rice borer (MRB) (*Eoreuma loftini*) is an invasive insect which is a damaging pest of sugarcane and other grass crops. The MRB has been the dominant pest of sugarcane in Texas since the 1980s and was first detected in Louisiana in 2008. MRB populations can be monitored with pheromone traps. These bucket traps are baited with a female sex pheromone which can detect adult male moths even at low population densities. Eastward spread through Texas and into Louisiana has been monitored with pheromone traps since 2000.

As of December of 2022, the MRB has been detected in 17 Louisiana Parishes: Acadia, Allen, Avoyelles, Beauregard, Calcasieu, Cameron, Evangeline, Iberia, Jefferson Davis, Lafayette, Pointe Coupee, Rapides, St. Landry, St. Martin, St. Mary, Vermilion, and West Baton Rouge (Figure 1). High populations are present in rice producing areas of Acadia, Calcasieu, Cameron, and Jefferson Davis Parishes. MRB populations have increased recently in sugarcane production regions of Pointe Coupee, Vermillion, and West Baton Rouge with many fields requiring insecticidal protection. The current range now includes approximately 70% of the state's sugarcane acreage.

Continued eastward expansion into sugarcane production regions along the Mississippi River and Bayou Lafourche in future years is anticipated. This spread is unlikely to be mitigated through management, but care should be taken to avoid increasing the rate of spread. Movement of sugarcane, particularly seed cane, to uninfested areas should be avoided. Transportation of sugarcane to the mill is thought to have minimal impact on MRB spread due to the rapidity of processing cane upon arrival. Still, cane should be taken to the closest mill wherever possible. Movement of alternative hosts including rice, hay, and other grasses should also be avoided. Detection of MRB in new areas should be reported to LSU AgCenter extension agents.

Figure 1. Mexican rice borer range expansion in Louisiana, 2008–2022.



# EFFICACY OF SOIL-APPLIED INSECTICIDES FOR CONTROL OF WIREWORMS

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Wireworms (Coleoptera: Elateridae) are sporadic pests of sugarcane which feed on seed cane at planting and have potential to reduce plant populations. One of two currently labeled organophosphate insecticides is applied at planting to approximately 25% of plant cane acres. This product is hazardous to the applicator and detrimental to beneficial insects, thus alternative insecticides are needed. Further, a new neonicotinoid insecticide, thiamethoxam (Platinum®, Syngenta) is anticipated to receive EPA registration for use in sugarcane in coming years, but the product has scarcely been tested for efficacy against wireworms. Additional interest in broflanilide and other experimental insecticides for wireworm control has led to a need for product efficacy evaluation. Assessing insecticidal control of wireworms in sugarcane has historically been challenging due to the unpredictable nature of infestations. This study investigated the influence of insecticides on plant cane emergence in two field trials conducted in plots with artificial pest pressure.

Trials were conducted at the USDA Sugar Research Unit North Farm in Schriever, LA, and the LSU AgCenter Sugar Research Station in St. Gabriel, LA. Prior to planting, wireworm larvae were hand collected from commercial sugarcane fields on multiple dates during the summer. In each experiment, one larvae per row-foot was placed in each plot and lightly covered with earth. Seed cane was planted in each plot at a rate of 3.5 mature internodes per row-foot. Treatments were applied over the top of the seed cane with a back-pack sprayer calculated to deliver 15 gallons per acre. The Schriever trial included Platinum (thiamethoxam) along with three rates of an experimental insecticide (A22466). The St. Gabriel trial included 4 rates of Broflanilide applied to the seed cane in addition to one rate applied to the soil after covering. The industry standard, Thimet (phorate), was also included. Both trials included an infested control and an uninfested control. The seed cane was covered with soil immediately following the application. Sugarcane emerged naturally, and stand counts were taken at approximately 4 and 10 weeks after planting (Schriever trial) and 6 weeks after planting (St. Gabriel). Tiller counts were converted to tiller per acre prior to analysis. Data were analyzed with generalized linear mixed models (SAS, Proc Glimmix) with treatment as a fixed effect and replication (n=5) as a random effect.

Differences were among treatments detected at both fall 2021 sampling dates in the Schriever Trial with the greatest plant populations observed in plots treated with Platinum and the highest rate of A22466 (Table 1). Differences were not detected among treatments in 2022 plant stands, stalk weights, or cane tonnage. Differences in fall 2021 plant populations were not detected ($P > 0.05$) among treatments in the St. Gabriel Trial. Differences were detected among treatments at both 2022 sampling dates as well as in stalk weights and tonnage estimates. Results suggest new chemistries show promise in protecting plant cane stands from wireworm damage. Further, results demonstrated the utility of inoculated plots in assessing product efficacy in wireworm control. On-going research will assess treatment effects on spring plant populations and sugarcane yields. Estimated cane yield was greatest in plots treated with the middle rate of Broflanilide. Results suggest Platinum, Broflanilide, and the experimental insecticide may offer effective alternatives to Thimet for control of wireworms.

Table 1. Sugarcane stand as affected by insecticide treatments (LS Means), Schriever, LA, 2021–2022.

| Treatment | Rate per acre | Stand per acre | | | | Weight (lbs)/ stalk | Tons/ acre |
|---|---|---|---|---|---|---|---|
| | | 26 Oct 2021 | 13 Dec 2021 | 25 Apr 2022 | 13 Sept 2022 | | |
| Infested control | NA | 15,636 d | 33,636 c | 48,000 | 56,364 | 2.9 | 83.0 |
| Uninfested control | NA | 24,545 bc | 42,727 abc | 58,546 | 57,455 | 3.2 | 91.7 |
| A22466 | 2.74 fl oz | 22,545 c | 45,273 abc | 54,727 | 61,091 | 3.3 | 100.1 |
| A22466 | 4.56 fl oz | 22,364 c | 41,090 bc | 54,000 | 52,727 | 3.0 | 77.5 |
| A22466 | 6.84 fl oz | 29,627 ab | 48,909 ab | 51,454 | 55,818 | 3.1 | 87.2 |
| Platinum | 5.67 oz | 33,455 a | 54,727 a | 58,909 | 52,727 | 2.8 | 81.9 |
| | *F* = | 8.40 | 6.31 | 0.67 | 0.83 | 1.55 | 2.55 |
| | df = | 5, 20 | 5, 20 | 5, 20 | 5, 20 | 5, 20 | 5, 20 |
| | *P* = | <0.001 | 0.001 | 0.650 | 0.546 | 0.220 | 0.061 |
| | SE = | 4,711 | 5,184 | 7,215, | 3,087 | 0.1 | |

*Means which share a letter are not significantly different (Tukey's HSD, α = 0.05).

Table 2. Sugarcane stand as affected by insecticide treatments (LS Means), St. Gabriel, LA, 2021–2022.

| Treatment | Rate/acre | Stand per acre | | | Weight (lbs)/stalk | Tons of cane per acre |
|---|---|---|---|---|---|---|
| | | 12 Dec 2021 | 11 May 2022 | 1 Sept 2022 | | |
| Uninfested control | | 15,240 | 73,569 ab | 57,329 ab | 2.7 ab | 77.0 ab |
| Infested control | | 11,974 | 45,993 b | 43,904 b | 2.6 b | 56.9 b |
| Broflanilide | 4.56 fl oz* | 14,514 | 71,853 ab | 58,418 ab | 2.9 ab | 86.6 a |
| Broflanilide | 2.28 fl oz | 17,779 | 86,7202 a | 67,126 a | 2.8 ab | 93.2 a |
| Broflanilide | 1.14 fl oz/a | 17,779 | 83,454 ab | 45,718 b | 2.6 b | 58.7 b |
| Broflanilide | 0.57 fl oz/a | 14,151 | 64,969 ab | 54,427 ab | 2.5 b | 67.7 ab |
| Broflanilide | 1.14 fl oz/a** | 8,708 | 60,958 ab | 50,073 b | 2.8 ab | 69.0 ab |
| Thimet | 3 lbs/a | 11,611 | 67,852 ab | 55,152 ab | 3.2 a | 87.1 a |
| | *F* = | 0.69 | 2.49 | 5.72 | 4.36 | 5.71 |
| | Df = | 7, 21 | 7, 21 | 7, 21 | 7, 21 | 7, 21 |
| | *P* = | 0.676 | 0.050 | <0.001 | 0.004 | <0.001 |
| | SE = | 5,297 | 8,369 | 2,133 | 0.1 | 8.0 |

*Uninfested
**Applied to soil surface

## EFFECTS OF FALL AND SPRING DEFOLIATION ON PLANT CANE GROWTH

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Lepidopterans pests including the fall armyworm (*Spodoptera frugiperda*) and true armyworm (*Mythimna unipuncta*) can cause substantial defoliation of young cane following planting in the fall or during early growth periods in the spring. While this defoliation can appear severe, the armyworms infestations do not persist long allowing for regrowth of the cane. The effects of defoliation are not clear as sporadic and unpredictable armyworm infestations have impeded research efforts. Thus, the objective of this study was to determine the effects of simulated armyworm damage at varying levels and timings on sugarcane regrowth throughout the growing season.

The trial was conducted at the LSU AgCenter Sugarcane Research Station in St. Gabriel, LA. It was conducted in plant cane of Ho 12-615 using a randomized block design with four replications and 2-row, 0.01-acre plots. Treatments included 50% and 100% defoliation in the fall, 50% and 100% defoliation in the Spring, 100% defoliation in the spring and fall, and uninjured sugarcane. The defoliation was done manually with a weed eater on 15 Oct 2021 (fall) and 21 April 2022 (spring). Regrowth was quantified by measuring 10 plants per plot approximately biweekly from 6 Oct 2021 to 14 Jan 2022 prior to a freeze event which killed growth. Biweekly sampling was reinitiated on 27 April 2023 followed regrowth in the spring and continued until 2 September 2023. Plant height data were analyzed with a generalized linear mixed model that included defoliation treatment, sampling date and the interaction as fixed effects and replication and replication × treatment as random effects. The slice function was used for separation of means among defoliation treatments within sampling dates.

Plant height was affected by defoliation treatment ($F_{5, 20.4} = 40.14$, $P < 0.001$), sampling date ($F_{12, 3382} = 7{,}290.31$, $P < 0.001$), and the interaction ($F_{60, 3387} = 6.44$, $P < 0.001$). Across sampling dates plant height was greatest in uninjured plants (65.0 cm ± 2.3 [SE]) and 50% fall defoliation (63.8 cm) and least in 100% Spring (57.4 cm) and 100% spring and fall defoliation (54.9 cm). Plant heights progressed in all treatments through the course of the spring and summer with minimal differences among treatments (Figure 1). Plant heights in fall defoliated plots did not differ from uninjured plots at any sampling dates in the spring. Plant height was reduced by approximately 20% in spring defoliated plots relative to uninjured plots during early summer, but this difference had declined to just 4% by September (Table 1). Results suggest defoliation of young plant cane in the fall likely has minimal to no impact on yield. Sugarcane can largely recover from severe spring defoliation during the growing season, though differences in plant growth were observable into fall. If the 4% reduction in plant heights present in September is reflected in sugarcane tonnage, control of armyworm infestations in the spring may be warranted in some cases.

Figure 1. Sugarcane plant growth as affected by defoliation treatments throughout the 2021/2022 growing season, St. Gabriel, LA.

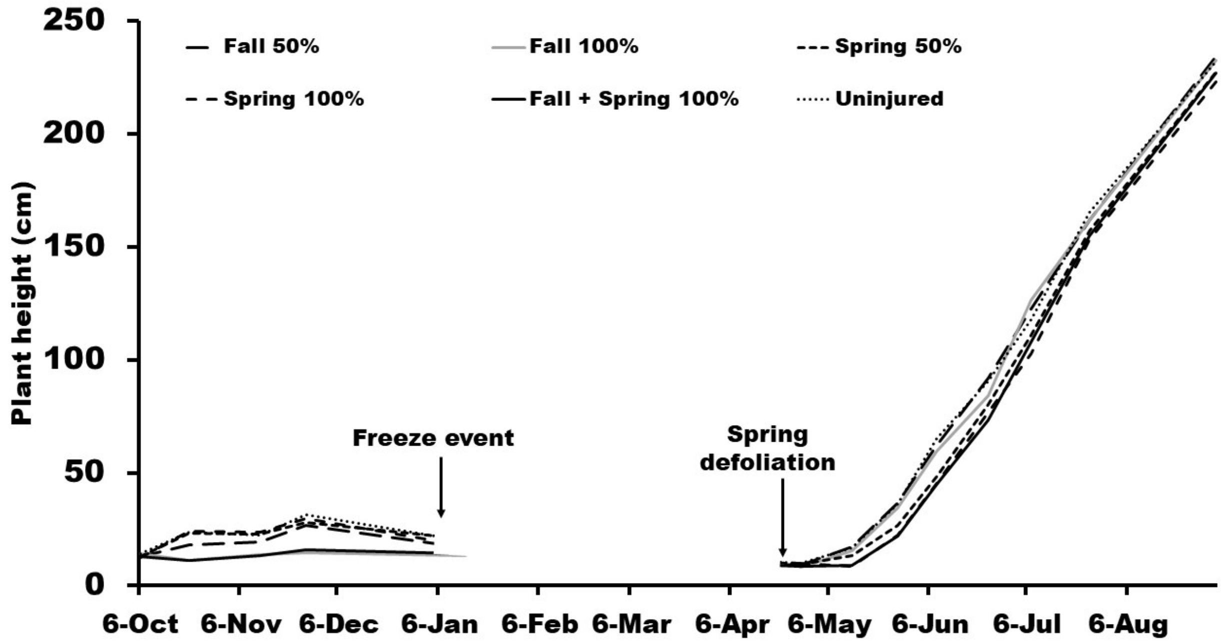


Table 1. Influence of defoliations treatments on plant heights at four sampling dates during the summer 2022

| Treatment | Plant height (cm) | | | |
|---|---|---|---|---|
| | Jun 24 | Jul 7 | Jul 25 | Sept 2 |
| Uninjured | 90.8 a | 117.9 ab | 165.2 a | 232.2 a |
| Fall 50% | 92.0 a | 122.6 a | 161.7 ab | 234.4 a |
| Fall 100% | 84.3 ab | 126.6 a | 161.9 ab | 232.7 a |
| Spring 50% | 80.3 bc | 111.1 b | 156.9 bc | 227.3 ab |
| Spring 100% | 76.7 c | 102.5 c | 153.0 c | 223.3 b |
| Fall + spring 100% | 73.5 c | 107.7 bc | 155.0 bb | 226.9 ab |