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Injury and damage dynamics of *Diceraeus melacanthus* Dallas, 1851 (Hemiptera: Pentatomidae) in corn subjected to early defoliation

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ABSTRACT

The green-belly stink bug is an early pest in the second crop of corn, following soybean. The dynamics of infestations by this pest in systems where corn is defoliated in the early stages is still unknown. Therefore, the objective was to evaluate the feeding of the stink bug on corn subjected to early defoliation. In a greenhouse, used a 2 x 4 factorial design, with two cultivars: BRS3042 VTPRO2 and 1F640PRO2, and four treatments: Without stink bug and with plant cutting (WSB-C); With stink bug before cutting (SB-BC); With stink bug after cutting (SB-AC); With stink bug and without cutting (SB-WC), with ten repetitions. Cutting of the plants was performed at the V3 stage, at a height of five centimeters above the soil. Infestation with stink bugs was carried out five days after emergence and/or after cutting, with two stink bugs per pot. The following were evaluated: injury score, height, stem diameter, fresh and dry plant weight. The plants that were not cut (SB-WC) presented the highest values in height and diameter, resulting in injury scores around 1 compared to those that were infested after the cut (SB-AC), which had scores varying between 3 and 4 and had smaller height and diameter. It was concluded that removing the leaf surface impairs the establishment of the corn plant, and with the infestation of the green-belly stink bug, the severity of the damage increases.

Introduction

In intensive agricultural production systems, in which crops are cultivated successively, pests in one crop can cause injuries to subsequent crops, compromising plant development. In unfavorable weather conditions, the second crop's productivity loss in succession can increase even further. In the specific case of corn cultivation in Brazil, the largest cultivated area is concentrated after the soybean harvest in the summer (Souza et al., 2018). In many Brazilian regions, with this succession of crops, pests from the final reproductive stages of soybeans can infest and cause injuries to corn plants in the initial vegetative stages (Ferreira and Sosa-Gómez, 2017).

An example of this type of infestation occurs with the green-belly stink bug *Diceraeus melacanthus* Dallas, 1851 (Hemiptera: Pentatomidae). This species has caused significant economic damage in the early stages of corn, depending on the management method adopted, the cultivar, and the plant's development stage at the time of infestation (Silva, 2019). During feeding, stink bugs release toxins into the tissues of the corn plant, causing injuries to the leaf area. In more severe cases, this can lead to the death of the plant, starting with the wilting of leaves that have not yet expanded, a symptom known as slow growth, the wilting of the central leaves, which detach easily when pulled and deformed appearance (Ribeiro et al., 2016). The population density of the green belly stink bug in corn crops, which causes economic damage, can range from 0.3 to 2 stink bugs per linear meter, depending on the cultivar and the stage of injury onset. That is, a few insects are needed to cause losses equivalent to the cost of adopting control methods. The damage can result in almost total loss of the plantation, requiring replanting (Duarte et al., 2016; Silva et al., 2021).

Adjusting and synchronizing crops in intensive agricultural production systems is essential to reduce the risk of production loss due to biotic and abiotic factors (Borghi et al., 2023). As mentioned, the productive potential of late-sown corn due to the soybean harvest can be limited by adverse climatic conditions (Contini et al., 2019).

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To achieve profitable productivity levels, Karam et al. (2020) evaluated a new cultivation system for second-crop corn, which consists of mechanized interseeding of the cereal up to 20 days before the soybean harvest, known as Antecipe® Technology. In this intercropping system, during the soybean harvesting stage, due to the grain harvest, there is a reduction in the corn leaf area due to mechanical damage caused by the harvester. However, if this process is carried out up to the V4 corn development stage and the leaf area is not completely cut, the plant continues its development (Borghi et al., 2021). This is because, up to the V5 stage, the corn plant meristem is below the soil surface (Nielsen, 2019). This characteristic allows the plant to tolerate mechanical damage and cutting carried out during the soybean harvest. Even so, the plant presents satisfactory recovery compared to other phases of its growth cycle, depending on the vitality level in the apical meristem region (Magalhães and Durães, 2006).

Given the importance of the soybean-corn second-crop planting system for Brazil, there are still hypotheses to be evaluated, particularly concerning pest management. For instance, the insect-plant interaction in the crop rotation system, mainly in the second crop, which results in negative effects for the plants and positive effects for the herbivores (São João and Raga, 2016). This work hypothesizes that the green-belly stink bug causes different levels of damage depending on whether the infestation occurs before or after early defoliation of the crop. We expected greater damage when the stink bug population increases after early defoliation, because there will be less remaining leaf area to compensate for the combined stress of defoliation and the insect infestation.

The relevance and importance of this work, as well as testing such hypotheses arise from the fact that, at the end of the soybean crop cycle, there is a population increase in the stink bug pest complex (Ferreira and Sosa-Gómez, 2017). With the sowing of corn, in the second crop, this crop becomes susceptible to attack during its early development stages. In the case of corn intercropping in the soybean rows, in addition to initial development, there will be a reduction in leaf area (= cutting) due to the soybean harvest. In this scenario, the concern about green-belly stink bug infestation is even greater since, initially, insecticide applications will only be carried out after the soybean harvest.

Thus, the injuries and damage caused by the green-belly stink bug *D. melacanthus* in corn subjected before and after to early defoliation were evaluated.

Material and methods

The experiment was conducted in a greenhouse at Embrapa Maize and Sorghum, Sete Lagoas-MG, Brazil (latitude 19º28'S, longitude 44º15'W, and altitude of 732 m) (26.65± 4ºC; 57.2% RH). The maize cultivars used were BRS3042 VTPRO2 and 1F640 PRO2. The cultivars presented contrasting results, with significant variations in growth and initial development, in tests conducted at the Embrapa Research Institute, and were consequently chosen for this study. The BRS3042 cultivar exhibited higher values for plant height and stem diameter, while the 1F640 cultivar displayed lower values in these same parameters and they could represent an escape from injuries as the cultivar develops rapidly, progressing through susceptibility stages more quickly.

The experimental design was factorial (2x4), with two cultivars, 10 replications and four treatments, which represent the scenarios of stink bug appearance before or after early defoliation: without stink bugs and with plant cutting (WSB-C), with stink bugs before plant cutting (SB-BC), with stink bugs after plant cutting (SB-AC), and with stink bugs and without plant cutting (SB-WC).

Planting was done in nine-liter plastic pots, fertilized, and managed according to the recommendations for corn cultivation (Silva et al., 2020a). Two seeds were sown per pot, but only one plant was used after germination to continue the experiment.

Plant cutting and infestation of the stink bugs

Five days after plant emergence, at phenological stage V1, two adult bugs were placed per plant, regardless of sex. After infestation, colorless and transparent plastic containers with a volume of 2 liters were placed over the plant and manually fixed to the soil. The containers were perforated along the sides with approximately 4 mm diameter holes, allowing air to pass through but preventing the bug from escaping. Perforated cloths were attached to the top of the container with elastic tape to facilitate air circulation. The plants were cut, with the aid of scissors, at a height of five centimeters from the soil of the pot during phenological stage V3, corresponding to the third leaf with the ligule of the sheath visible, simulating a real field situation, where corn plants are cut at the time of soybean harvest by agricultural machinery (Magalhães et al., 2020), which was 15 days after emergence in the WSB-C, SB-BC and SB-AC.

The infestation with the green-belly stink bug was carried out in the morning. In the SB-BC and SB-WC treatments, the infestation occurred after corn emergence (5 days after planting). In the SB-BC, the insects were reared until the time of plant cutting (i.e. 15 days). After cutting, the stink bugs were collected and the plants were evaluated. In the SB-WC treatment, the stink bugs were removed on the same day as the SB-BC, however, without defoliation of the corn plants afterwards. For the SB-AC treatment, the infestation occurred immediately after defoliation, and the stink bugs were reared for 15 days and then removed (Figure 1).

The plants were inspected daily, assessing the need to replace the stink bugs due to escape or death. The corn plants were evaluated every five days, starting from plant emergence to 35 days after planting (DAP). This period encompasses the stages where the corn plant remains vulnerable to insect-related damage, up to the V5 stage (Silva, 2019). The variables evaluated in the corn were: injuries caused by the feeding of the green-belly stink bug, height, stem diameter, and fresh and dry plant weight.

Evaluations, visual damage classification and data analysis

At 5 DAP (at the phenological stage VE), the treatments SB-BC and SB-WC were infested with stink bugs. At 10 DAP (V1), the plant height and stem diameter were evaluated in the treatments WSB-C and SB-AC, and this evaluation continued at 15 DAP (V2) with the same treatments. At 20 DAP (V3), four stages were carried out: removal of stink bugs and injury rating (SB-BC and SB-WC), plant height and stem diameter (WSB-C, SB-AC, SB-BC, and SB-WC), plant cutting (SB-BC, WSB-C, and SB-AC), and stink bug infestation (SB-AC). At 25 DAP, after cutting (V1/V2) and 30 DAP (V2/V3), the treatments WSB-C, SB-BC, and SB-WC maintained the evaluation of plant height and stem diameter. Finally, at 35 DAP (V2/V7), in the SB-AC treatment, the stink bugs were removed and the injury rating was assessed. In addition to the evaluations of plant height and stem diameter in all treatments, the harvest was carried out manually at 35 days after planting (DAP) using a big pruning shear with a wooden handle. The plants were subsequently placed into ten kilograms (kg) paper bags to measure their fresh weight, followed by the drying process.

To recognize and identify the level of visual injury on corn plants caused by the green-belly stink bug, the damage classification scale proposed by Bianco (2004) was used. According to this scale, 0 corresponds to a plant without attack and free of damage, and 4 corresponds to a

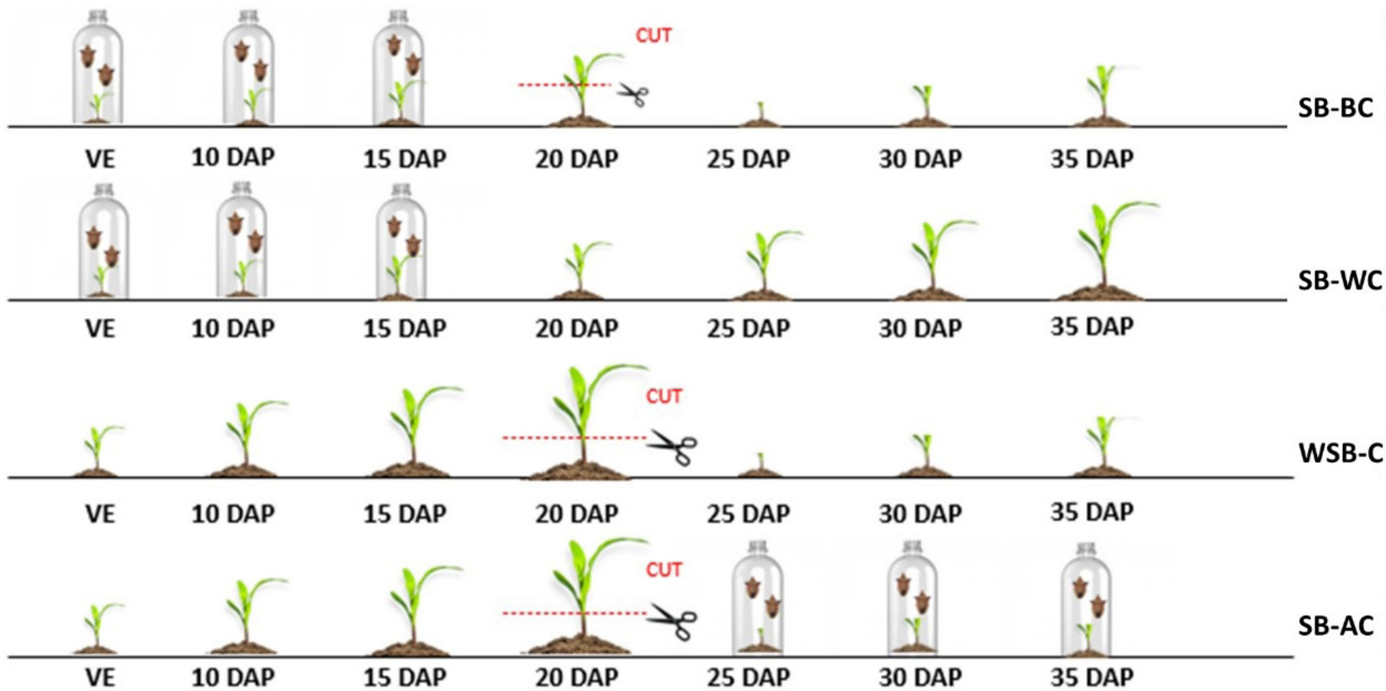

Figure 1 Scheme of infestation of the green-belly stink bug and cut in corn plants, during the days after planting (DAP). (SB-BC: With stink bug before cutting; SB-WC: With stink bug and without cutting; WSB-C: Without stink bug and with cutting; SB-AC: With stink bug after cutting). Sete Lagoas, MG, Brazil. 2024.

plant with the maximum manifestation of pest attack, such as reduced size, leaf rolling, and death of the main stem.

Plant height was measured using a ruler in centimeters from the soil surface to the height of the last fully expanded leaf (visible ligule). The stem diameter was recorded with a digital caliper Digimess 100.179A, 150mm/6", measuring from two centimeters above the soil's surface. At the end of the evaluation, at 35DAP, the aerial parts of the plants were collected (Figures 2 and 3) to assess the fresh weight. After drying at 65°C in a drying oven with circulation/air exchange for 72 hours, they were assessed again to obtain the dry weight.

For preliminary data analysis, the Shapiro-Wilk test was used to assess normality, and Levene's test was used to assess variance homogeneity, both at a 5% significance level. The presence of discrepancies (= outliers) was also evaluated through direct observation in box-plot graphs. Subsequently, the Analysis of Variance (ANOVA) was conducted, followed by the Scott-Knott test at a 5% significance level for comparing averages. Regarding the injury score caused by stink bug feeding, the non-parametric Kruskal-Wallis test was used, which evaluates median values. This was done because the score data (= scales) did not follow a defined frequency distribution. At a 5% significance level, the Dunn test was used as a non-parametric post hoc evaluation.

The R v.4.4.1 (R Development Core Team, 2024) statistical environment was used for preliminary data analysis, model fitting and graph generation. The 'MASS,' 'car,' and 'rstatix' packages were used for model fitting, and the 'ggplot2' package was used for graph generation. The numerical dataset and scripts for model fitting and graph generation will be stored in an open GitHub repository to enhance verification and reproducibility of results by other researchers (Gandrud, 2020).

Results

Whenever measurements were significant, in the interaction between cultivar, treatments and days after planting, the cultivars BRS3042 VTPRO2 obtained the highest averages for plant height,

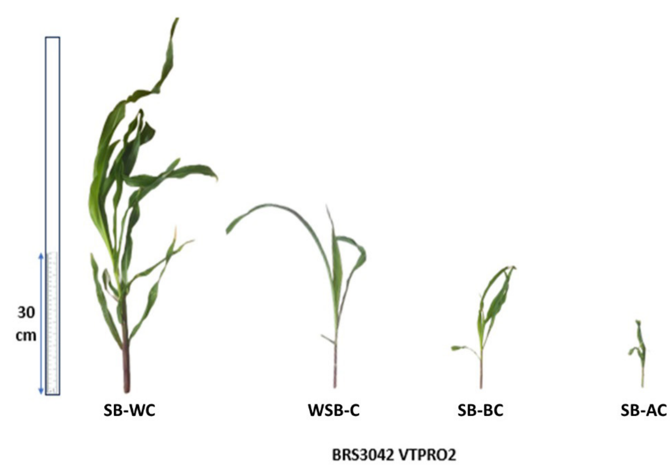

Figure 2 Injuries in corn plants caused by the green-belly stink bug D*iceraeus melacanthus* (Hemiptera: Pentatomidae) in the treatments (SB-WC: With stink bug and without cutting; WSB-C: Without stink bug and with cutting; SB-BC: With stink bug before cutting; SB-AC: With stink bug after cutting) for the BRS3042 VTPRO2 cultivar. Sete Lagoas, MG, Brazil, 2024.

green and dry weight. For injury notes, cultivar 1F640PRO2 had greater injuries. The difference in plant height in the interaction with the cultivars was significant at 25, 30 and 35DAP in the treatment where there was no defoliation (SB-WC). For stem diameter and the interaction with the cultivars (F=2.89, df=336, p=0.035), the SB-AC treatment was significant at 15 DAP (F=5.09, df=1, p=0.029) and 20 DAP (F=5.98, df=1, p=0.018). For the SB-WC treatment, the greatest variations in stem diameter occurred at 20 DAP (F=6.68, df=1, p=0.012), 30 DAP (F=12.22, df=1, p=0.001), and 35 DAP (F=7.59, df=1, p=0.007). For injury score, the cultivars had a significant difference in the treatment that did not have defoliation (SB-WC). For fresh weight (F=11.23, df=1, p=0.001) and dry weight (F=15.20, df=1, p<0.001), the treatment with stink bugs without cutting (SB-WC) was the only treatment that showed a difference between the cultivars.

Plant height differed in relation to the time after planting and the infestation by *D. melacanthus* and/or cutting of the plant, when removing the cultivar variable (Figure 4). Until 20 days after planting, plant heights were similar. However, differences emerged from the 25th day after planting, when the first evaluation after cutting was performed (Figure 4). On the 25th DAP (F=24.93, df=57, p<0.001) and on the 30th DAP (F=41.68, df=57, p<0.001). The treatment with stink bugs and without cutting (SB-WC) showed the highest average height compared to the other treatments: with stink bugs before cutting (SB-BC) and without stink bugs with cutting (WSB-C), which showed no significant differences between them. On the 35th DAP (F=88.09, df=76, p<0.001). The SB-WC treatment continued to show the greatest height, differing from SB-BC and WSB-C and the treatment with stink bugs after cutting (SB-AC), which had the lowest overall average.

In the treatment without stink bugs and with cutting (WSB-C), the plant showed a 35.3% reduction in height after cutting. However, it resumed growth during subsequent evaluations. The treatment with stink bugs before cutting (SB-BC) showed the same behavior as WSB-C: after cutting and removing the stink bugs, the plant initially showed a 36.10% reduction in height but resumed growth over the days following planting. In the treatment with stink bugs after cutting (SB-AC) and due to feeding by the stink bugs, there was only a reduction in height of around 29.27% at 35 DAP. While, in the treatment with stink bug and without cutting (SB-WC), the plants continued their gradual growth, since they were not cut.

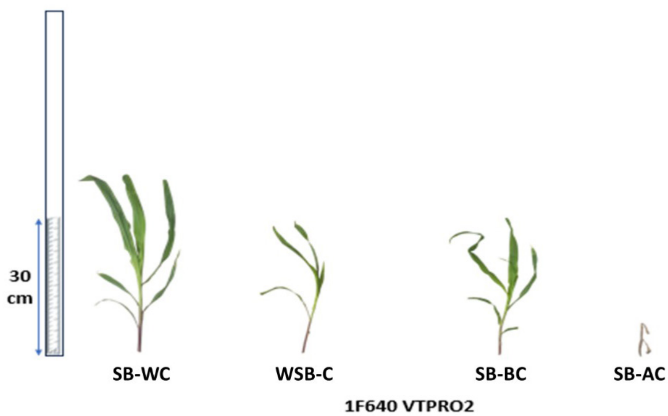

Figure 3 Injuries caused by the green-belly stink bug *Diceraeus melacanthus* (Hemiptera: Pentatomidae) in the treatments (SB-WC: With stink bug and without cutting; WSB-C: Without stink bug and with cutting; SB-BC: With stink bug before cutting; SB-AC: With stink bug after cutting) for the 1F640 VTPRO2 cultivar. Sete Lagoas, MG, Brazil, 2024.

For stem diameter, in the interaction time after planting and infestation by *D. melacanthus* and/or when cutting the plant, when removing the cultivar variable, there was no significant difference at 10 DAP (F=1.60, df=38, p=0.214) and 15 DAP (F=1.58, df=38, p=0.217). Differences between treatments were observed at 20 DAP (F=6.07, df=56, p=0.001), 25 DAP (F=12.76, df=57, p<0.001), 30 DAP (F=32.00, df=57, p<0.001), and 35 DAP (F=34.58, df=79, p<0.001). At 20 DAP, treatments with stink bugs before cutting (SB-BC) and with stink bugs after cutting (SB-AC) differed from treatments with stink bugs without cutting (SB-WC) and without stink bugs with cutting (WSB-C) (Figure 5). At 25 DAP, stink bugs without cutting (SB-WC) differed from those without stink bugs with cutting (WSB-C) and with stink bugs before cutting (SB-BC). At 30 DAP, the SB-WC treatment, with the greatest stem thickness, differed from SB-BC and WSB-C treatments. At 35 DAP, SB-WC maintained the highest average stem diameter, differing from SB-BC and WSB-C, as well as from SB-AC, which had the smallest diameter among them.

Stem diameter responded similarly to plant height throughout the evaluations compared to 20 DAP, the last evaluation before cutting: for SB-WC, expansion occurred only after insect removal, with increases of 55.88%, 100%, and 238.23%, respectively. For WSB-C, after cutting, stem development was slower, with successive values of 0%, 13.51%, and 86.49%. For SB-BC, after removing the stink bug, stem diameter reduced by approximately -15.22% at 25 DAP and -17.39% at 30 DAP, then resumed expansion at 35 DAP with an increase of 30.43%. For SB-AC, after cutting and insect removal, the diameter was reduced by -13.04% at 35 DAP.

For plant height and stem diameter, after insect attack and/or plant cutting, at 35 DAP, it was found that, in both cases, the treatment with stink bugs and without cutting (SB-WC) achieved the largest size: 23.49±0.71 cm for height and 1.15±0.05 cm for stem diameter, differing from with stink bugs before cutting (SB-BC) with 12.16±0.71 cm

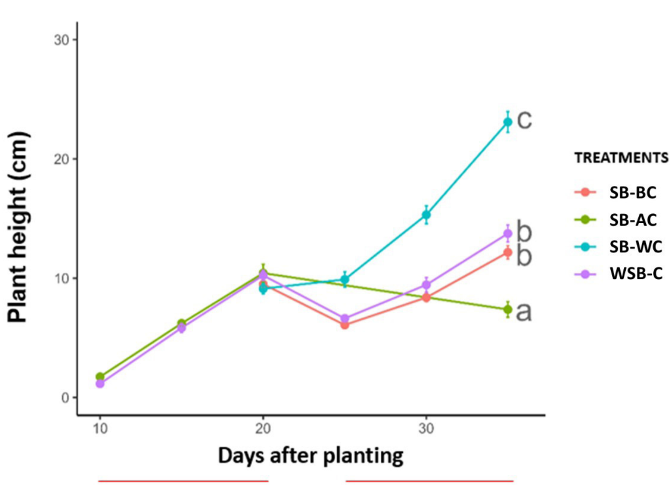

Figure 4 Height of corn plant (cm) under four conditions: (1) with stink bug before cutting (SB-BC), (2) with stink bug after cutting (SB-AC), (3) with stink bug without cutting (SB-WC), and (4) without stink bug with cutting (WSB-C). Lines followed by the same letter do not differ according to the Scott-Knott test for each period after planting (α = 5%). Sete Lagoas, MG, 2024.

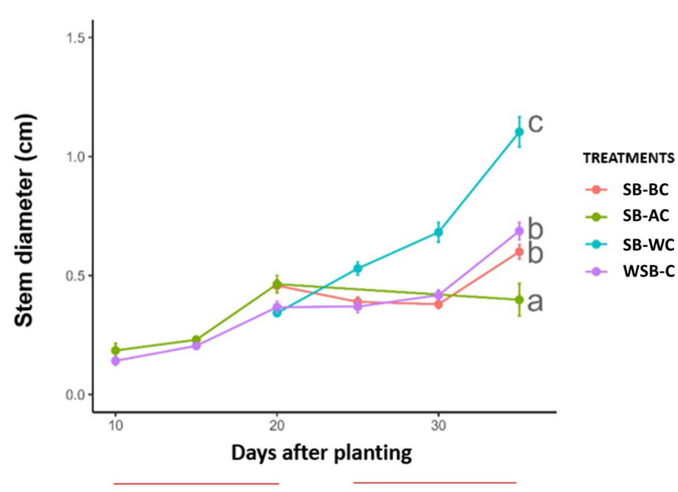

Figure 5 Stem diameter of corn plant (cm) under four conditions: (1) with stink bug before cutting (SB-BC), (2) with stink bug after cutting (SB-AC), (3) with stink bug without cutting (SB-WC), and (4) without stink bug with cutting (WSB-C). Lines followed by the same letter do not differ according to the Scott-Knott test for each period after planting (α = 5%). Sete Lagoas, MG, 2024.

and 0.599±0.05 cm, without stink bugs with cutting (WSB-C) with 13.74±0.71 cm and 0.687±0.05 cm, and with stink bugs after cutting (SB-AC), which had the smallest overall average: 7.37±0.71 cm and 0.389±0.05 cm.

For the injury score, the SB-AC treatment had the highest median injury score, with a score of three (χ^2 = 18.54; df = 2; p< 0.001), and it differed from the others, while SB-BC and SB-WC were not statistically different, with scores around one (Figure 6).

Significant differences were observed between treatments for fresh weight (F=42.83, df=76, p<0.001) and dry weight (F=45.2, df=76, p<0.001) (Figure 7). The SB-WC treatment had the highest average fresh and dry weight, differing from the other treatments. There were no significant differences between SB-BC, WSB-C, and SB-AC.

Discussion

This study examined the effect of green-belly stink bug infestation on intact and defoliated corn plants. For the SB-AC treatment, we observed the lowest plant heights, stem diameters, and the highest injury scores, indicating that early defoliation combined with the attack of stink bugs after the cut results in greater damage to the plants. Thus, it is crucial to monitor green-belly stink bugs throughout the entire development period of soybeans, up to harvest, to prevent attack on corn plants (Ferreira and Sosa-Gómez, 2017), particularly when they are planted in between soybean rows in an early intercrop system. Additionally, chemical seed treatment has no residual effect after defoliation, which further exacerbates the stink bug damage potential (Vazquez et al., 2014).

Through the results of the triple interaction of cultivars, days after planting and treatments, it was verified there was a difference between cultivars for plant height, only where there was no defoliation (SB-WC),SB-WC from 20DAP onwards. In diameter, from the perspective after cutting, there was a difference only where there was no cutting (SB-WC)SB-WC. And for the injury score and the green and dry weights, there was only significance in the treatment in which there was no cut. Therefore, it is possible to say that, until at least 15 days after cutting/defoliation, it is not possible to verify a difference in the speed of recovery between cultivars, as we generally see in the initial start-up after the emergence of corn plants (Costa et al., 2019).

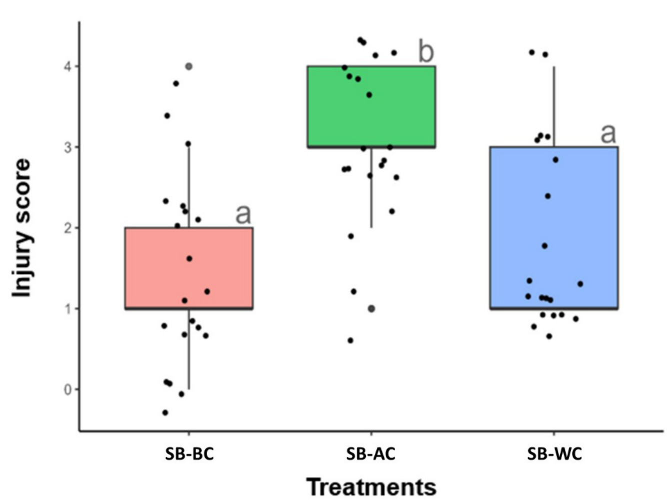

Figure 6 Injury rating (median) in treatments SB-BC = with stink bug before cutting, SB-AC = with stink bug after cutting, and SB-WC = with stink bug and without cutting of the corn plant. Bars followed by the same letter do not differ statistically according to the Dunn post-hoc non-parametric test (α = 5%). Sete Lagoas, MG, 2024.

Leaf area reduction in corn affects crop productivity depending on the phenological stage at which the damage occurs. Until to the V4 development stage, any reduction in leaf area has a low impact on productivity since the apical meristem is still located below the soil surface (Magalhães et al., 2020). In the case of intercrop cultivation of corn between soybean rows, even if it occurs 20 days before the soybean harvest, corn plants suffer mechanical damage from the harvester during soybean harvest (Karam et al., 2020). However, despite this damage, the plants continue their vegetative development as they are still in the early developmental stage. Therefore, understanding the dynamics of injuries and damage of pest infestations in this cropping system provides insights for pest management, about the need for insecticide application in pre-sowing corn and after soybean harvest, especially for the green-belly stink bug, as this insect there is an increase in population level predominantly at the physiological maturity of the soybean, which can lead to an increase in the pest insect population density in the succeeding crop, if not well controlled (Chiesa et al., 2016).

Stem diameter was reduced after defoliation, leading to decreased plant fresh and dry weights. It is known that the cutting height of the stem influences the percentage of dry matter, and cutting the plant leads to water loss and reduced stem development rate (Vasconcelos et al., 2005; Viecelli et al., 2011). Additionally, damage to the stem negatively affects its diameter due to the absence of leaves and reduced circulation of photoassimilates after damage (Karam et al., 2010; Taiz et al., 2015).

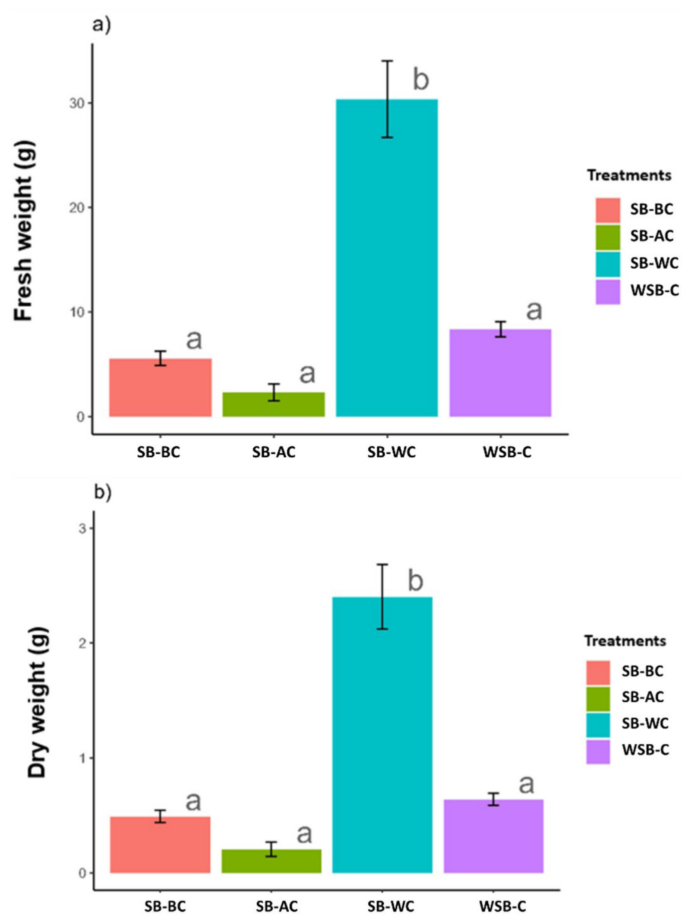

Figure 7 Fresh weight (a) and dry weight (b) of the corn plant (g) under four conditions: (1) with stink bug before cutting (SB-BC), (2) with stink bug after cutting (SB-AC), (3) with stink bug and without cutting (SB-WC), and (4) without stink bug with cutting (WSB-C). Bars followed by the same letter do not differ according to the Scott-Knott test (α = 5%). Sete Lagoas, MG, 2024.

As observed, early defoliation and stem cutting compromise the recovery and development of corn plants. Even in the WSB-C treatment, without stink bugs but with plant defoliation, there was a reduction in height and stem diameter. These results support the notion that height loss in corn plants results from defoliation (Khaliliaqdam et al., 2012). However, according to Karam et al. (2010), the delays in resuming initial growth after plant cutting is compensated over time, with no differences between treatments with and without cutting. A greater percentage of growth in plants subjected to cutting occurs from the 37th day after cutting. The same applies to forage plants, which show higher photosynthetic rates when defoliated compared to those not subjected to grazing (Moraes and Palhano, 2002). In this work, the thirty-five days after planting and fifteen days after cutting were not enough to verify this resumption of growth between treatments with and without cutting.

The stem diameter was smaller in the SB-AC treatment, implying that the use of resistant cultivars can reduce stink bug damage to final productivity. At 15 and 20 DAP, corn is in a stage in which it is susceptible to the insect, and a thicker stem interferes with the insect's feeding (Silva et al., 2020b). Fernandes et al. (2020) found that the green-belly stink bug feeding on corn plants between V1 and V3 stages reduces stem diameter, resulting in lower grain and dry matter productivity in field and greenhouse conditions.

The highest injury scores were observed when infestation occurred after plant cutting (SB-AC), while infestation before cutting (SB-BC) and without cutting (SB-WC) had lower injury. Thus, injury caused by stink bug feeding before cutting is less detrimental to the plant than infestation after cutting. Result that shows greater resistance of the plant, which suffered the injury before defoliation. Indirectly, stink bug feeding/injury causes lesions and deformations on the leaf area as the plant tries to develop (Zilli, 2021), and when defoliation is added, symptoms in the plant are intensified. In cases where cutting occurs after stink bug feeding (SB-BC), the injuries are mitigated since the plant will produce new leaves without the presence of the pest (WSB-C). A plant that is infested with the stink bug after defoliation (SB-AC) has to deal with the stress of the cut, its recovery in growth and development, as well as resisting the damage and toxins released by the insect during its feeding and is, therefore, a more complicated task for the plant and will consequently have higher damage scores.

As expected, complete defoliation of the plant hinders the accumulation of green and dry matter in corn plants. For fresh weight, in the SB-BC, SB-AC, and WSB-C treatments, there was a reduction of 81.7%, 92.4%, and 72.5% in weight over the evaluation period when compared to the SB-WC treatment, respectively. The same effect was observed for dry weight. These results show that up to 35 DAP, complete defoliation of the plant, combined with stink bug attack, hinders the accumulation of dry matter in corn plants.

Early defoliation causes changes in the morphology of the corn plant, reducing the development of the aerial part and resulting in narrower leaves (Ferreira et al., 2024). This explains the impact of defoliation in the treatments SB-BC, WSB-C and SB-AC, compared to the treatment without mechanical damage (SB-WC) and the compounded effect of the treatment with cutting and the infestation with stink bugs after cutting (SB-AC), which caused the most significant damage to the plants.

Thus, although further observations of the green-belly stink bug *D.melacanthus* under field conditions are necessary, the data from this study allow us to infer that infestation damages the initial development of the corn plant up to 35 DAP. In this context, the damage may even be reversed if the stink bug is present before plant cutting. On the contrary, if the pest attack occurs after the reduction of leaf area caused by mechanical damage, the plant's development becomes more compromised. This is the first report on the interaction of green-belly stink bug infestation in this intercropping system of corn preceding soybean harvest, a technology being employed in various regions of Brazil to improve productivity gains of the second-crop corn

Conclusion

With cutting of the corn plant, the infestation of the green-belly stink bug *D. melacanthus*, reduces plant height, stem diameter, and fresh and dry weight. The complete defoliation caused by cutting the corn plants increases susceptibility to injury caused by stink bug feeding, especially if the infestation occurs after cutting.

Furthermore, it is essential to conduct more in-depth studies focused on pest management in early defoliation before making any recommendations.

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Conflicts of interest

The authors declare no conflicts of interest.

Author contribution statement

NMS investigation (equal); methodology (equal) and manuscript writing (equal). MAMF data analysis and review (equal). EB review and writing (equal). DGS review and editing (equal). GSA methodology (equal).

RST methodology and resources (equal). NCRD methodology (equal). DK review (equal). SMM methodology, review, and editing (equal); funding acquisition (equal); project and laboratory management (equal); resources (equal); writing, review, and editing (equal).

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