Final Report

Detection and Management Strategies for the Control of *Prosapia bicincta* (Twolined Spittlebug) in Hawaii

PO No. C30930

For the Period of
October 1, 2022 – March 31, 2024

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Report

This report covers the project period from October 1, 2022, through March 31, 2024. The work describe herein was completed through multiple funding sources including a USDA-ARS grant (Agreement 58-2040-9-010: November 12, 2020 – October 31, 2025; $267,468) USDA-ARS grant (Agreement; HISC grant (PO No. C20556: October 1, 2021 – March 31, 2023, $184,788); this HISC grant (PO No. C30930: October 1, 2022 – March 31, 2024); and HISC grant (PO No.C41542, October 1, 2023 – March 31, 2025, $200,000).

Summary of Activities

The Twolined Spittlebug (TLSB) entered diapause in late October 2022 and there was very little activity from the pest until May 2023. Over that time the project team focused on maintaining the forage trial blocks on the cooperating ranches, maintaining and propagating forage grasses in the greenhouse in preparation for the summer trials, entering and evaluating field data, and working on reports, meeting presentations, and publications.

Diapause was completed by May 2023 and TLSAB nymph activity increased. Adults TLSB began emerging late May early June. This was later than in past years, possibly due to the fall 2022/winter 2023 drought conditions that persisted into the spring and/or the cooler than normal spring conditions. Spittlebug activity remained low, relative to previous years, probably due to persistent dry conditions throughout the summer. As a consequence, there was no observed expansion of the pest out of the infestation zone as currently mapped. Field surveys were limited to monthly evaluation of nymph and adult activity in the forage trial blocks on the three cooperating ranches. Greenhouse, trials conducted over the TLSB season of 2023 (May – October) included egg diapause trials investigating conditions that trigger diapause and egg hatch using environmental chambers in cooperation with the Agricultural Research Service Center in Hilo, Hawaii, egg oviposition and survival on fountain grass, and host plant resistance trials.

Twolined Spittlebug diapause began in October 2023. Over the diapause period between late October and the end of this reporting period. Project work focused on maintenance of the forage Trial blocks and green house egg diapause and survival trials, the egg diapause trials underway at the ARS laboratory, and maintain the grass plantings.

Over the project period. TLSB team members have provided five oral/poster presentations, two tours and facilitated discussions with state legislators on TLSB. We released the Twolined Spittlebug Management Tool smartphone/computer application (November 2022) and published one peer reviewed paper (Wilson, S., M.S. Thorne, M.G. Wright, D.C. Peck, J. Mack, G.K. Fukumoto, and R.T. Curtiss. 2023. The twolined spittlebug (Hemiptera: Cercopidae) invades Hawaii: establishment, biology, and management of a destructive forage grass pest. J. Integrated Pest Management, 14:1-13). The project team held a two-day workshop and field day program for livestock producers May 19-20, 2023.

Deliverables

1. **Monthly tracking and quantification of TLSB populations**. Ongoing. TLSB began emerging from diapause in May, later than usual, likely due to drought conditions that persisted through the winter followed by a cooler than normal spring. Monthly spittlebug activity was recorded from field sites on cooperating ranches. Twolined Spittlebug activity remained lower than in previous years and there was no observed expansion of its range.

2. **Monthly and annual maps of TLSB range/density, distribution, and acres surveyed**. The annual map was not updated in October of 2023 as there was no observed expansion of the Twolined Spittlebug out of the current mapped range.

3. **Species trend in existing range and number of new infestations and/or increase in acreage**. No change in range and/or acreage impacted was observed over the TLSB season in 2023.

4. **Evaluation and refinement of IPM protocols**. Data collected on TLSB biology and ecology over the past 5 years has been incorporated into new/refined strategies for management/control of TLSB and are available through the TLSB smartphone application.

5. **Additional host-plant resistance trials and list of resistant/non-resistant grasses.** Host-plant resistance trails were delayed due to the late release from diapause that limited the availability of adult TLSB for the trials. A limited number of trials were conducted in August 2023. Adult TLSB activity remained low presenting difficulties in acquiring enough to provide adequate plant exposure for the trials.

6. **Test hypothesis on Si uptake, assimilation, and potential for increased resistance in Kikuyu grass to TLSB attack.** Trials on Si fertilization have been delayed due to the late release from diapause that limited the availability of adult TLSB for the trials. The trials are planned for the summer of 2024.

7. **Evaluation of the potential for remote sensing and other tools to be used to enhance detection, management, and biosecurity of TLSB.** No progress was made on this objective due to funding limitations and difficulties in finding graduate students/field technicians.

8. **Outreach materials and workshops.** Outreach and education activities for the project period include:
   - Oral Presentation – Thorne, M.S., 2022. Twolined Spittlebug (*Prosapia bicincta*): A pasture pest in paradise. California-Pacific Section, Society for Range Management, Kamuela, Hawaii, October 6, 2022.

   - Tour of Kona Experiment Station Greenhouse and discussion on TLSB in Hawaii with state legislators, November 10, 2022.

- Oral presentation – Wilson, S., M.S. Thorne, M. Wright, and D. Peck. 2022. Establishment, pest status, and management of the twolined spittlebug, *Prosapia bicincta*, in Hawaii, Entomological Society of America Joint Annual Meeting, November 14, 2022.

- Booth and poster display on TLSB, Hawaii Cattlemen's Council Annual meeting, November 18-19, 2022.

- Poster Presentation – Thorne, M.S., M. Wright, S. Wilson, D. Peck, and M. Oshiro. 2023. Development of a decision support tool to assist rangeland managers with control of Twolined Spittlebug in Hawaii. Society for Range Management Annual Meeting, Boise, Idaho, February 11-17, 2023.

- Meeting, tour, and discussion on TLSB in Hawaii with state legislators at the Kona Research Station (II), February 24, 2023.

- Oral presentation – Wilson, S., M.S. Thorne, M. Wright, and D. Peck. 2023 Establishment, pest status, and management of the twolined spittlebug, *Prosapia bicincta*, in Kona, CTAHR Showcase & Research Symposium, March 27, 2023.

- Twolined Spittlebug Management Workshop and Field Day, May 19-20, 2023.

- Twolined Spittlebug display and demonstration at the Hawaii Cattlemen's Council Annual meeting, October 6-7, 2023.

- Published paper: Wilson, S., M.S. Thorne, M.G. Wright, D.C. Peck, J. Mack, G.K. Fukumoto, and R.T. Curtiss. 2023. The twolined spittlebug (Hemiptera: Cercopidae) invades Hawaii: establishment, biology, and management of a destructive forage grass pest. J. Int. Pest Manag. 14:1-13. https://doi.org/10.1093/jipm/pmad023

- Oral Presentation, Wilson, S., M.S. Thorne, M.G. Wright, D.C. Peck. 2024. Pest status, seasonal abundance, and management of the Twolined Spittlebug, *Prosapia bicinta*, on Hawaii Rangelands. Society for Range Management Annual Meeting, Reno Nevada, January 28 – February 1, 2024.

- In cooperation with BIISC, developed Twolined Spittlebug Smartphone Application information card.

- Updated Twolined Spittlebug Page on Hawaii Rangelands Website: https://rangelandsgateway.org/twolined-spittlebug

- Developed and released (November 2022) the Twolined Spittlebug Management Tool smartphone/computer application.

- Hawaii Cattlemen's Council TLSB committee – ongoing participation and consultation to committee formed in response to threat TLSB poses to the livestock industry.

Challenges

The project lost two full-time field technicians, and a part-time research support position between July and September 2022. Recruitment of suitable research support, field technicians, and graduate students was difficult. In February 2023, we were able to fill one of the two field technician positions, but have not been able to fill the other two positions. As a result, progress on some aspects of the project has been slower than anticipated. Spring was colder and wetter than normal and seemingly resulted in a delay in the TLSB egg hatch (release from diapause) and this delayed the emergence of the first adults to near the end of June of 2023. Consequently, this delayed some of our trials that rely on the capture of adequate adults. Maintenance of the forage trial blocks was challenging because of lack of field technicians.