COOPERATIVE EXTENSION
UNIVERSITY OF HAWAI'I AT MĀNOA
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES

Tipburn-Tolerant Butterhead Lettuce Substitutes for 'UH Mānoa' Lettuce: On-Farm Field Trial, September 2019

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Introduction

'UH Mānoa' lettuce is a semi-head varietal selection of the 'Green Mignonette' variety and has been a popular lettuce variety planted among commercial and home growers for its compact size and crisp texture (Sakuoka et al. 2000). Although initially promoted for its heat tolerance, some commercial farmers growing Mānoa lettuce experienced significant tipburn damage up to 70% of their fields during the summers of 2018 and 2019. Practices such as calcium nutrition or 30% shade cloth were trialed but did not reduce tipburn damage on Mānoa lettuce for these farms (unpublished).

Although another management strategy, tipburn-tolerant or resistant varieties of semi-head lettuce that resembled Mānoa lettuce could not be found through commercial companies. However, butterhead varieties with those traits are available and have been trialed previously but either were in hydroponic settings, presented limited data, or did not evaluate more recent varieties (Sugano et al. 2019, 2013). An on-farm field trial was conducted to evaluate the substitute potential, tipburn tolerance, and yield of four green, butterhead lettuce varieties with known tipburn tolerance as well as visual similarity to Mānoa lettuce.

Varieties Evaluated

Lettuce varieties were selected for their resistance or tolerance to tipburn and physical resemblance to Mānoa lettuce, which was qualitatively conducted by assessing photos of these varieties from online sources.

NAME	TYPE	RESISTANCES	SUPPLIER
Adriana	Butterhead (dark green)	Downy mildew; Mosaic virus (intermediate); Tipburn, bolting, (tolerance)	Johnny's Seed
Mirlo	Butterhead (bright green)	Downy mildew, *Nasonovia ribisnigri* aphid, tomato busy stunt virus; Mosaic virus (intermediate)	Johnny's Seed, High Mowing
Okayama	Butterhead (dark green)	Heat, bolting	Kitazawa Seed
Rhapsody	Butterhead (dark green)	Tipburn (Sugano et al. 2019)	Osborne Seed, Renee's Garden
UH Mānoa	Semi-head	Heat (tolerance)	UH Seed Lab, Kitazawa Seed, Wild Garden Seed

Methods

This variety trial was conducted at a cooperating farmer's field in Wai`anae, O`ahu (mean annual precipitation and temperature= 24 inches, 75°F; Giambelluca at al. 2014). Varieties were seeded on August 9 and transplanted August 30 (21 days), and harvested September 19 (41 days). During the field trial period, a local weather station measured total rainfall as 0.56 inches and mean daily temperature as 83°F.

Varieties were transplanted in plots following a completely randomized block design across the length of a field. Each varietal plot included nine plants (3x3), with 8in spacing between plants in a row and 1ft spacing between rows. Varieties were replicated three times.

Soil tests indicated adequate nutrient supplies for phosphorus and base cations. As a result of this and previous cover cropping practices, only nitrogen was applied as ammonium sulfate at the farmer's rate of 60 lbs N/acre. Per the farmer's rate, irrigation occurred three times per day for 5 minutes using overhead sprinklers.

At harvest, data collection included the following:

- Total marketable weight (all plants, removed damaged leaves)
- Head diameter (average 2 plants per replicate)
- Tipburn and other damage percentage (number of damaged plants per total)

Results

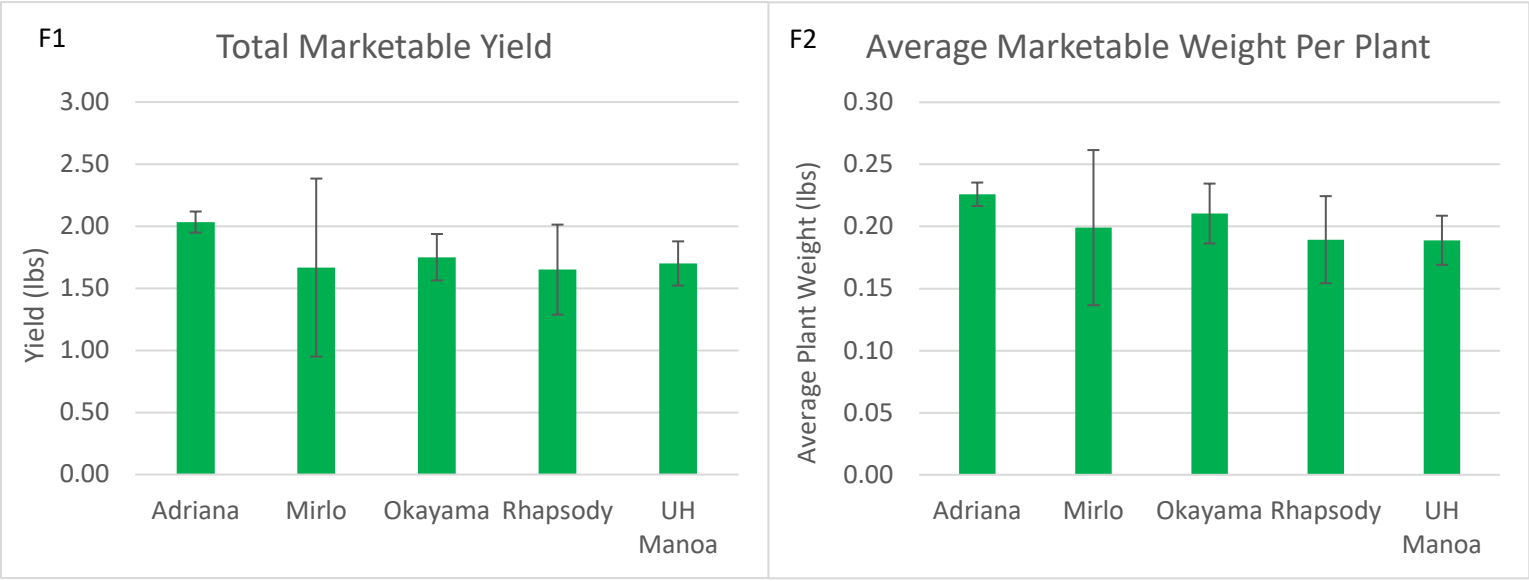

Fig 1-2. Total marketable yield and average marketable plant weight for five lettuce varieties. No statistical differences were observed among varieties (One-Way ANOVA, P=0.05)

- **Yield**: No differences were measured in marketable yield and average plant weight among the five lettuce varieties (Fig 1,2).
- **Head Diameter**: Adriana and Rhapsody butterhead varieties were 1-2" larger than the UH Mānoa lettuce variety (Fig 3).
- **Tipburn Damage**: All butterhead varieties evaluated exhibited better tipburn tolerance or resistance than the UH Mānoa variety, which experienced an average 77% tipburn damage among replicates. Only one plant in an Okayama replicate exhibited tipburn damage.
- **Lettuce Drop Damage**: In some replicate plots, suspected lettuce drop damage occurred in the Mirlo, Okayama, Rhapsody, and UH Mānoa varieties. The Adriana did not have any lettuce drop damage.

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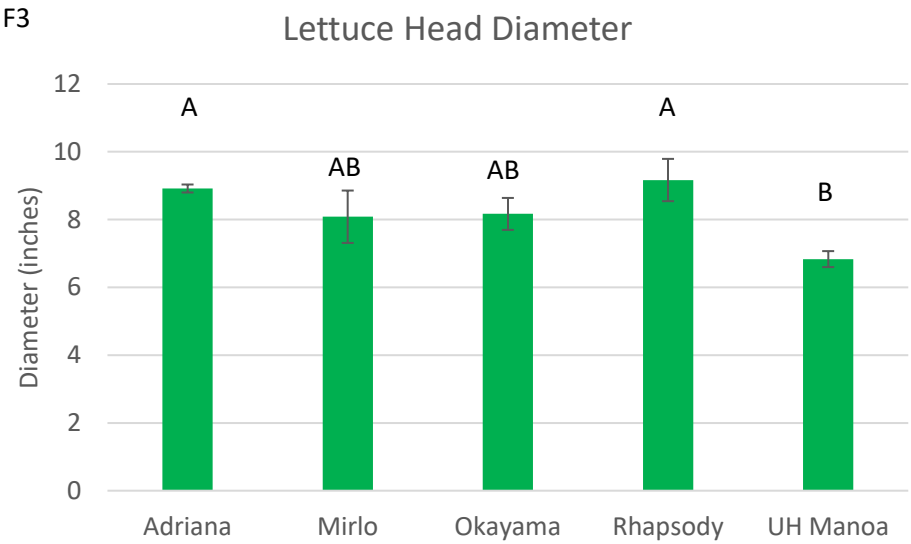

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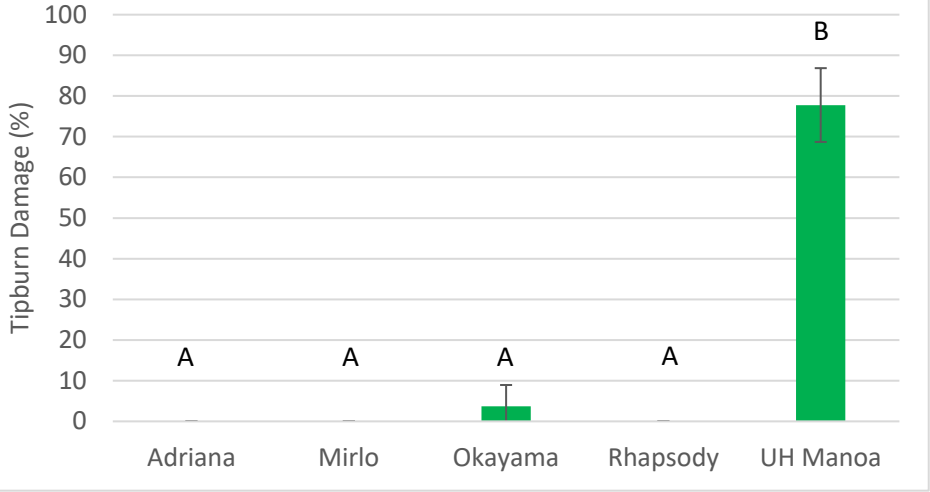

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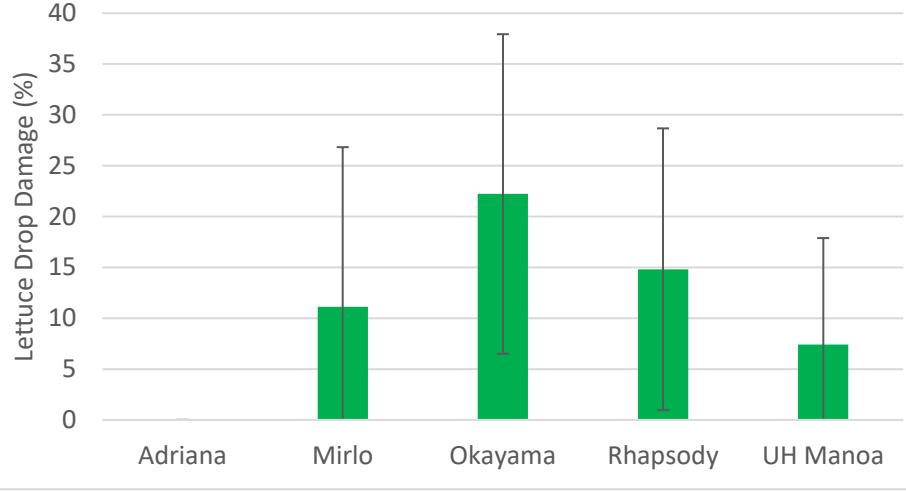


Fig 3-5: Head diameter and damage for five lettuce varieties. Varieties that do not share a letter are significantly different (ANOVA, P=0.05).
*Due to zero damage observed in multiple replicates for each variety, ANOVA and nonparametric analyses could not be conducted for lettuce drop.

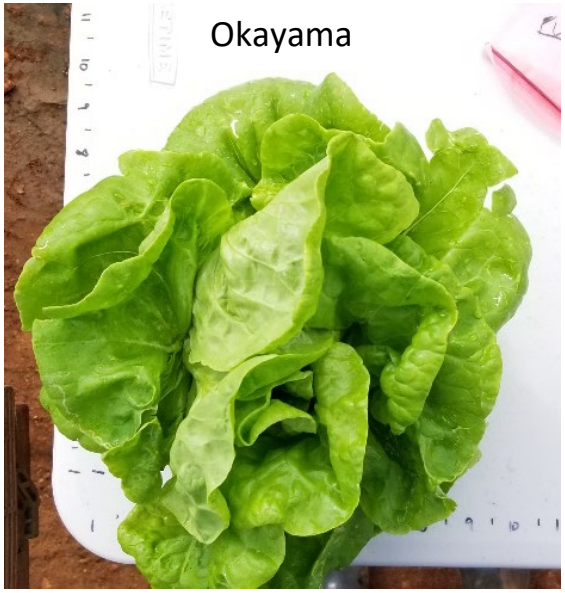


Fig. 6-10. Examples of lettuce heads for each variety

Conclusion:

Although yield and plant weight did not significantly differ among the varieties, all green butterhead lettuce varieties exhibited high tipburn tolerance. Based on appearance, Adriana, Okayama, and Rhapsody varieties have potential as substitutes for Mānoa lettuce, although Adriana and Rhapsody were slightly larger than Mānoa. The cooperating grower shared similar views, favoring Adriana and Okayama for their tipburn tolerance, appearance, and size.

However, Okayama, as well as Rhapsody, were susceptible to suspected lettuce drop, especially Okayama, which had damaged plants in each replicate. In this regard, the Adriana variety outperformed all varieties and has high substitute potential given its other traits. If diseases are managed, then Okayama and Rhapsody may also perform well.

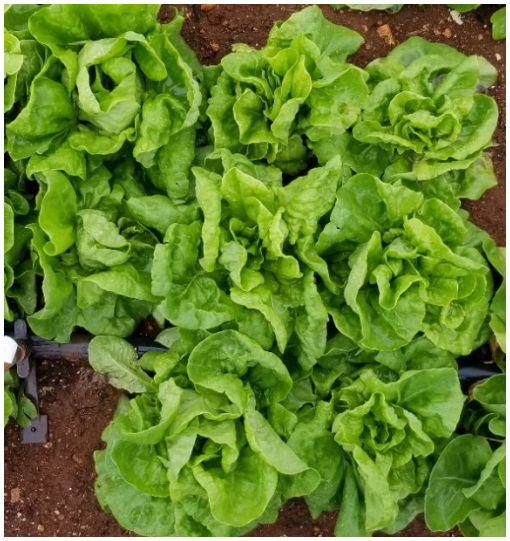
Flavor, texture, and storage potential still need to be assessed.

UH Mānoa

Adriana

Mirlo

Rhapsody



Okayama

Okayama (Lettuce Drop?)

References

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