



Manoa Leopard

Field Screening of Various Lettuce Cultivars for Tip Burn Tolerance in Hawaii

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According to the 2017 Census of Agriculture, lettuce acreage and farms have decreased statewide since 2012. However, production in 2017 for leaf lettuce was estimated at \$4.39 million. Lettuce (all types) sales was estimated at \$8.7 million based on the Hawaii Vegetable and Melon Crops Report (USDA, 2018) (Figure 1). This increase is close to the 2012 lettuce farm gate value of \$10.7 million (USDA, 2013). Extreme and unforeseen changes in our environment can affect the productivity of sensitive field crops such as lettuce.

Lettuce grows well in cool climates across the state and/or are often targeted for cool season planting. New lettuce varieties with tolerance to high temperatures have allowed growers to grow lettuce in lowland areas, year-round. The combination of tip burn tolerant varieties with new and innovative approaches such as hydroponic and aquaponic systems can help increase lettuce production in our island state.



Photo 1. A variety of lettuce from the 2019 field trials

The objective of field trials conducted by Cooperative Extension is to help farmers manage and reduce their risk by identifying cultivars with optimal horticultural characteristics that pair well with farmers' respective farming conditions and microclimates.

New lettuce cultivars were evaluated at the Waimanalo Research Station and compared against varieties screened in the past. Two field trials were conducted in early 2019 using the Nutrient Film Technology (NFT) hydroponic system paired with our Conley screenhouse.

The primary purpose of this field trial was largely to show field day participants, which included GoFarm Hawaii participants, suitability of different types of lettuce cultivars to Waimanalo's growing conditions. The Waimanalo Research Station is one of many sites around the state which host the GoFarm Hawaii Program. The GoFarm Hawaii Program is a new and beginning farmer program managed by the University of Hawaii at Mānoa, College of Tropical Agriculture and Human Resources (CTAHR).

Due to space limitations, we installed 4 seedlings per each lettuce cultivar. Averages were based on 3 heads per cultivar. There were no replications as part of this field trial.

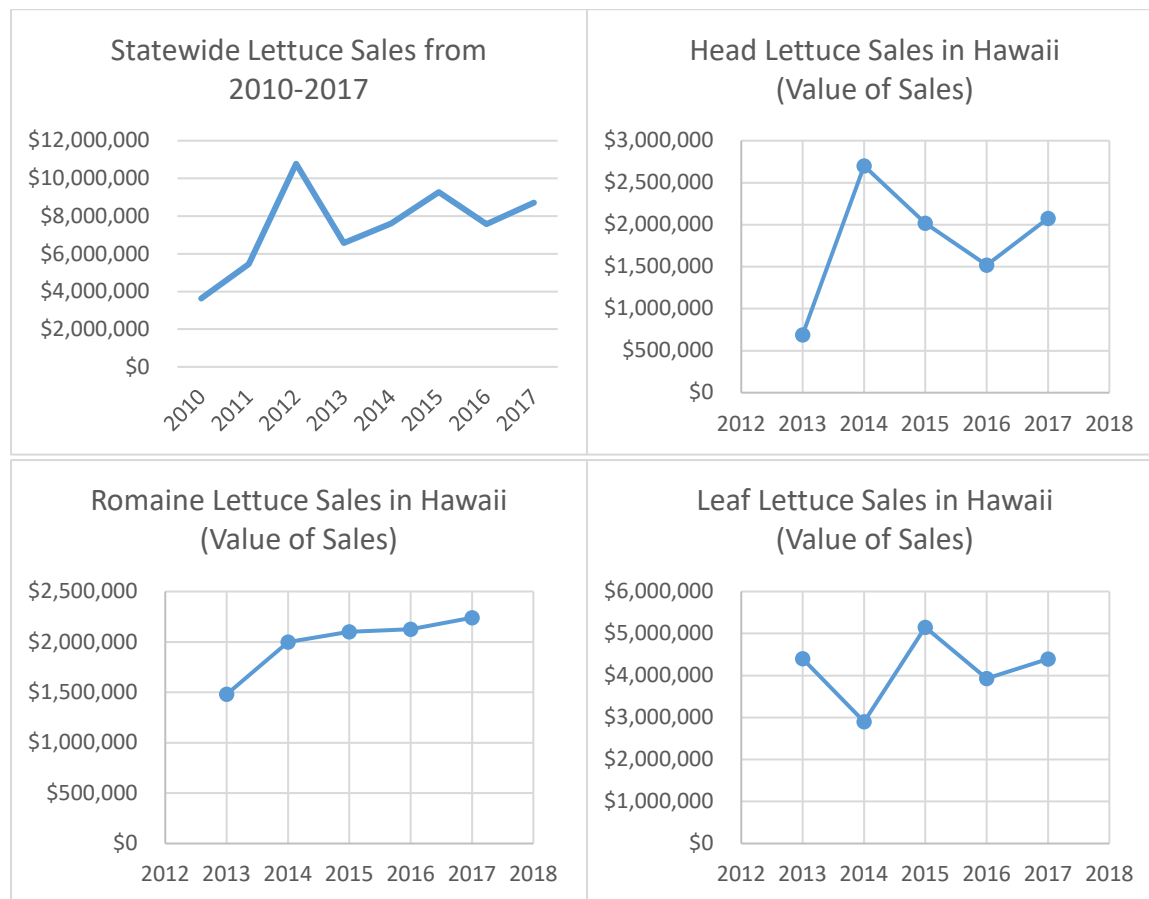


Figure 1. Value of sales of different lettuce types in Hawaii, USDA 2010-2018.

Lettuce varieties evaluated in the trial were obtained from Osborne Seed Company, Johnny’s Select Seeds, Eden Brothers, Wild Garden Seed and from Glenn Teves (Molokai Extension Agent).

Manoa lettuce is a highly sought-after lettuce cultivar in local markets due to its flavor and texture, but it is highly sensitive to tip burn.

Manoa Leopard hybrids used in these trials were developed and screened by Frank Morton (Wild Garden Seed) and Glenn Teves. The Manoa lettuce cultivar was crosses with “Leopard” a three-way cross of Merlot, a dark red leaf; Dark Green Romaine; and Forellenchluss or Speckled Troutback, a spotted leaf lettuce. The Manoa Leopard (MxL) hybrids were originally screened on Oahu in 2018 in an open field setting. Sugano and Spinelli made selections in 2018 and germinated selected lines of Manoa Leopard for the 2019 hydroponic lettuce variety trial (Photo 2).



Photo 2. Dr. Spinelli harvesting Manoa Leopard seeds at the Waimanalo Research Station

Lettuce was grown hydroponically following Hydrogarden’s manufacturers recommendations. Solution pH and EC were monitored twice a week. In both trials, we were able to grow lettuce without pesticides, bird and rodent damage and threats from slugs or snails which can harbor the rat lung worm disease (*Angiostrongyliasis*) by integrating this project with our protected agriculture system. The trials were an observational tip burn tolerance study and was not replicated.

We used a 4-point scale (none, low, moderate and excessive) to assess the different degrees of tip burn damage.





	No observable tip burn
	Low observable tip burn
	Moderate observable tip burn
	Excessive observable tip burn



Photo 3. A field day was held for growers and the public in February 2019 to showcase the horticultural characteristics of the various lettuce cultivars.



Photo 4. Two students from CTAHR's Natural Resource & Environmental Management executed the field trials which included transplanting, nutrient solution management, pH, EC, harvest, etc.

Figure 2: Field Trial #1-Seeded December 21, 2019, Harvested February 9, 2019 (50 days).
Lost data due to heavy rains and pump issues. Extreme weather during this time.

Harvest February 2019 Variety	Tip Burn				Av. Weight / Head	Seed Source
	None	Low	Moderate	Excessive		
Sparx					1.34	Johnny Select Seed
Fusion					1.23	Johnny Select Seed
Dragoon					0.94	Osborne Seed Company
Jadeite					0.84	Wild Garden Seed
Rhapsody					0.83	Osborne Seed Company
Dark Green Romaine					0.82	Wild Garden Seed
Newham					0.79	Osborne Seed Company
Starhawk					0.73	Osborne Seed Company
Concept					0.69	Osborne Seed Company
Spretnak					0.66	Osborne Seed Company
Pomegranate Crunch					0.61	Osborne Seed Company
Jericho					0.59	Wild Garden Seed
Sucrine					0.59	Wild Garden Seed
MXLCA-9A17					0.54	Wild Garden Seed
Alkindus					0.51	Osborne Seed Company
MXLCA-9B17					0.48	Wild Garden Seed
MXLCA-GA17					0.44	Wild Garden Seed
Truchas					0.44	Osborne Seed Company
Bloodstone					0.40	Wild Garden Seed
Salanova® Green Butter					0.39	Johnny Select Seed
MXLCA-C417					0.35	Wild Garden Seed
Pirat					0.32	Wild Garden Seed
Skyphos					0.32	Osborne Seed Company
Outredgeous					0.32	Johnny & Wild Garden Seed
Dubya Red Density					0.31	Wild Garden Seed
Red Butter Romaine					0.24	Wild Garden Seed
Thurinus					0.23	Osborne and Johnny Seeds
Ezburke					0.23	Wild Garden Seed
Better Devil					no data	Wild Garden Seed
Big Island					no data	Wild Garden Seed
Glossy Bronze Cos					no data	Wild Garden Seed
Hearts Aflame					no data	Wild Garden Seed
Holon					no data	Johnny Select Seed
Parris Island					no data	Johnny Select Seed
Red Rosie					no data	Johnny Select Seed
Red to Heart					no data	Wild Garden Seed
Rouge D'Hiver					no data	Johnny Select Seed

Figure 3: Field trial #2-Seeded February 11, 2019. Harvested April 2-4, 2019 (50-53 days)

Harvest: April 2019	Tip Burn				Av. Weight /	Seed Source
Variety	None	Low	Moderate	Excessive	Head	
Rhapsody		Low			1.37	Osborne Seed Company
Starhawk		Low			1.32	Osborne Seed Company
Sparx	None				1.29	Johnny Select Seed
Ridgeline			Moderate		1.27	Johnny Select Seed
Holon			Moderate		1.21	Johnny Select Seed
Jericho			Moderate		1.19	Johnny Select Seed
Green Forest	None				1.13	Johnny Select Seed
Better Devil		Low			1.11	Wild Garden Seed
Newham		Low			1.01	Osborne Seed Company
Dragoon	None				1.01	Osborne Seed Company
Spretnak		Low			0.99	Osborne Seed Company
Fusion	None				0.98	Johnny Select Seed
Parris Island		Low			0.90	Johnny Select Seed
MXLCA9B17	None				0.88	Wild Garden Seed
Red to the Heart				Excessive	0.84	Wild Garden Seed
Outredgeous			Moderate		0.82	Johnny & Wild Garden Seed
Alkindus			Moderate		0.78	Osborne Seed Company
Skyphos	None				0.78	Osborne Seed Company
Pomegranate Crunch	None				0.77	Osborne Seed Company
Lava Lamp	None				0.76	Wild Garden Seed
Sucrine			Moderate		0.74	Wild Garden Seed
Red Rosie	None				0.70	Wild Garden Seed
Red Sails	None				0.69	Johnny & Wild Garden Seed
Adriana	None				0.65	Johnny Select Seed
Thurinus	None				0.64	Osborne and Johnny Seeds
Salanova®	None				0.64	Johnny Select Seed
Tropicana	None				0.63	Johnny Select Seed
Little Gem	None				0.59	Osborne Seed Company
Breen	None				0.57	Osborne Seed Company
Bronze Mignonette	None				0.57	Eden Brothers
MXLCCX717	None				0.47	Wild Garden Seed
Cherokee	None				0.46	Johnny Select Seed
Truchas		Low			0.46	Osborne Seed Company
Concept	None				0.45	Johnny Select Seed
MXLCCZ17	None				0.44	Wild Garden Seed
Bloodstone			Moderate		0.38	Wild Garden Seed
Nancy	None				0.35	Johnny Select Seed
Theodore	None				0.30	Johnny Select Seed
Rex	None				0.28	Johnny & Wild Garden Seed
Salanova® Red Sweet Crisp	None				0.26	Johnny & Wild Garden Seed
Bambi			Moderate		0.26	Johnny Select Seed
Salanova® Green Butter	None				0.25	Johnny Select Seed
Antonet Lollo	None				0.25	Johnny Select Seed
Salanova® Red Butter	None				0.23	Johnny Select Seed
Rosaine	None				0.21	Johnny Select Seed
Rouxai	None				0.20	Johnny Select Seed
Salanova® Red Oak	None				0.18	Johnny & Wild Garden Seed

Adaption of farming practices is important for long term farm sustainability. Location, replication and seasonality affects the outcome of many field trials. Therefore, replicated field evaluations should be conducted on farm to assess the cultivars suitability to growers' respective growing conditions.

Variety photos:

<https://www.flickr.com/photos/suganoj/sets/72157707739372405>

Field day photos:

<https://www.flickr.com/photos/suganoj/albums/72157678535994998>

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