Juice Yield of Hawaiian Sugarcane (Kō) Varieties

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Introduction

Sugarcane has been, and continues to be, very important in Hawai'i. Introduced by Polynesians, the crop was important for generations as food, medicine, and for religious and other purposes (Lincoln, 2017; Krauss, 1993). With the rise of plantation agriculture in the 1800's, sugarcane was a driving force in the Hawaiian economy for a little over a century (Schenck et al., 20014). Although sugar is no longer "King" in Hawaii, it has undergone resurgence as a high value horticultural crop that is being increasingly produced by small growers. These growers are producing cane in an attempt to add value to their farm operation by marketing whole cane, processed pieces for chewing, or pressed juice. Many of these growers are choosing traditional Hawaiian or other heirloom varieties and producing them organically to increase the value of their products. However, information on such heirloom varieties is not readily available since they have not commonly been grown for over 100 years. To address gaps in our knowledge regarding juice yield and quality from organically grown, native Hawaiian varieties of sugarcane, we initiated small, replicated variety trials at two locations on O'ahu in 2015 and 2016.

Methodology

Sugarcane plantings were established at the certified organic plots at the Waimānalo Research Station (2/7/2015) and the Poamoho Research Station (3/10/2016). Varieties selected are listed in Tables 1 & 2. They were selected to represent those commonly used for their eating quality, medicine and other purposes as described in Lincoln (2017). Plantings were arranged in a randomized complete block design with 3 plants per variety. Well rooted plants in 1-gallon pots were spaced at 2.5

meters within rows and 3 meters between rows and fertilized with 500g of Sustane® 8-2-4 per plant at planting and side dressed with the same every six months. The basal 0.60m portion of 3 canes from each plant was harvested on 1/6/16 in Waimānalo and on 5/24/17 in Poamoho. Canes were harvested again in Poamoho on 4/17/18. At this harvest 1.8m canes were harvested and separated into "top" "middle" and "bottom" sections of 0.6m each. Juice was extracted with a commercial sugarcane juicer (Juicernet®) and total soluble solids (brix) determined using a digital refractometer (Hanna Instruments®). Data was analyzed using Statistix®.

Results

Average Juice yield was about 450 ml per kg of cane, but varied slightly by variety in each location (Table 1). The only consistent difference at each harvest was that 'Honua'ula' was the lowest yielder (~400 ml/kg), averaging about 10% less than the overall average. This was attributed to the smaller cane diameters characteristic of this variety. Preliminary measures made from the Poamoho 2018 data suggest that a marketable cane yield of ~40kg per plant per year is reasonable (data not shown). This results in a tentative potential annual yield estimate of about 18 liters of juice per plant.

Brix values ranged 12-21%, and were lowest in Waimānalo (Table 2). The low brix values in Waimānalo (12-16%) may be attributed in part to lower solar radiation at that location relative to Poamoho. Brix values at Poamoho in 2018 tended to be higher than in 2017 at the same location for all varieties. This may be due to the increased age of the plants. It is also worth noting that a negative relationship was observed between brix and juice yield across years and locations. In other words, as the amount of juice increased the concentration of sugar decreased. This may be due to a simple dilution effect resulting from larger yields having a higher water content.

Table 1. Juice yield (ml/kg) of sugarcane grown at the Waimānalo and Poamoho Research Stations on O'ahu. Values within columns with the same letter indicate that means are not significantly different from each other. – indicates that data is not available for that variety.

Variety	Waimānalo 2016	Poamoho 2017	Poamoho 2018
Halali'i	—	504.4a	446.0a
Honua'ula	427.6c	393.3b	377.4b
Ko'ula	519.0a	477.8ab	427.5a
Lahi	460.0bc	455.6ab	410.7ab
Laukona	482.0ab	494.7ab	431.7a
Mahai'ula	—	414.4ab	411.6ab
Manulele (Tolo Mauga)	—	516.7a	424.8a
Pakaweli	477.3ab	483.0ab	423.0ab
Pua'ole	—	498.0ab	406.7ab
Uahiapele	525.4a	475.6ab	400.9ab

Table 2. Brix of juice from sugarcane grown at the Waimānalo and Poamoho Research Stations on O'ahu. Values within columns with the same letter indicate that means are not significantly different from each other. – indicates that data is not available for that variety.

Variety	Waimānalo 2016	Poamoho 2017	Poamoho 2018
Halali'i	—	16.0c	20.5bc
Honua'ula	15.4ab	19.1ab	20.2c
Ko'ula	15.0ab	19.0ab	20.7bc
Lahi	14.1ab	19.4ab	20.5bc
Laukona	16.2a	19.8a	20.8abc
Mahai'ula	—	19.6ab	19.2d
Manulele (Tolo Mauga)	—	18.8ab	20.2c
Pakaweli	12.3b	19.3ab	21.7a
Pua'ole	—	17.7bc	21.4ab
Uahiapele	14.6ab	18.9ab	20.3c

References

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