Preliminary Maple Sap Data For Boxelder and Norway Maples

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Introduction

- Consumers demand locally-sourced agricultural products and are willing to pay premium prices for novel and products.
- Maple syrup is an important agricultural commodity in the United States valued at $131.73 million in 2020.
- Annual maple syrup production timing and yields vary widely between years and regions, depending on climatic conditions.
- Expanding production to western states could help supply the ever-increasing demand for syrup and provide additional income for landowners where maple resources have not been utilized traditionally.
- Bigtooth maple (*Acer grandidentatum*) and boxelder (*Acer negundo*) are native to the Intermountain West. Norway maple (*Acer platanoides*) and other introduced maples are common in urban and suburban areas of the region.
- Very little research has assessed the potential to tap these species for syrup production which is greatly needed to assess the viability of this emerging industry.

Objective

- Determine sap yield, sugar content, and mineral compositions of boxelder and Norway maple trees in urban landscapes in Utah.

Materials and Methods

- On 16 Feb. 2022, tapping buckets (11.4 L) were installed for tapping 10 boxelder trees and 10 Norway maple trees in each of three municipal parks in Logan, Providence, and Smithfield, Utah (Fig. 1).
- Diameter at breast height (DBH) was measured.
- Sap was collected daily to determine the yield for each tree from 19 February to 27 March 2022.
- Sap was sampled on 8, 14, 19, or 25 March 2022 for determining sugar content (Brix) using a digital refractometer (0-85% Brix range, HI 96801; Hanna Instruments, Smithfield, RI).
- Sap samples were collected on 14 or 15 Mar. 2022 for mineral content analysis at Utah State University Analytical Laboratory.
- Soil type information was collected from SoilWeb California Soil Resource Lab, University of California, Davis, CA. (https://casoilresource.lawr.ucdavis.edu/gmap/).
- Temperature data was downloaded from the Utah AgWeather System (Utah Climate Center, Logan, UT).

Results

- When temperatures fluctuated above and below freezing, sap flow was plentiful, and when the temperatures stayed above or below freezing the sap flow ceased (Fig. 1).
- From 19 Feb. to 27 Mar., boxelder (134.5 cm CBH) and Norway maple (133.8 cm CBH) yielded 27.5- and 12.9-liter sap for each tree with a Brix value of 2.3% and 2.5%, respectively (Table 1).
- Maple sap has rich mineral nutrients with K, Mg, P, and S concentrations varying with the type of soils and Ca, Mg, Mn, P, and S concentrations differing within plant species (Table 2).

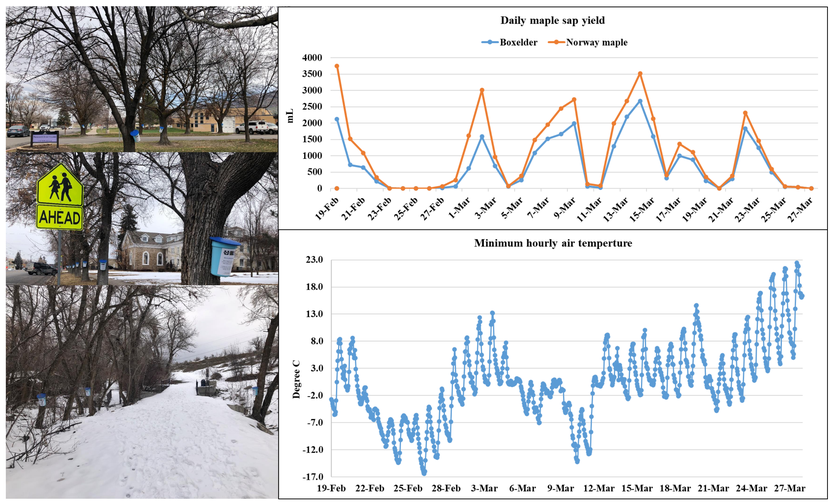

Fig. 1. Tapping buckets in Logan, Providence, and Smithfield, Utah (top to bottom), daily maple sap yield for boxelder and Norway maples and minimum hourly air temperature in Logan, UT.

Table 1. Soil type, circumference at breast height, sap yield (L), and sugar content (Brix) of boxelder and Norway maples.

Species	Location	Soil Type	Circumference (cm)	Sap yield (L)	Brix (%)
Boxelder	Logan	Timpanogos silt loam	131.9 ± 14.8	27.3 ± 3.7	2.6 ± 0.1
	Providence	Rough broken land	114.9 ± 10.4	24.5 ± 4.8	2.1 ± 0.1
	Smithfield	Sterling gravelly loam	156.7 ± 12.2	30.6 ± 7.2	2.2 ± 0.1
Norway maple	Logan	Nibley silty clay loam	135.8 ± 8.5	14.6 ± 2.1	2.5 ± 0.2
	Providence	Steed gravelly loam	147.7 ± 7.6	10.4 ± 3.1	2.3 ± 0.2
	Smithfield	Sterling gravelly loam	111.2 ± 9.9	13.6 ± 6.0	2.2 ± 0.1
Species (S)		-	ns	***	ns
Location (L)		-	ns	ns	ns
S*L		-	**	ns	ns

ns, *, **, ***: nonsignificant or significant at $P < 0.01$, or 0.001, respectively.

Table 2. Mineral composition in boxelder and Norway maple sap.

Species	Location	pH	Ca	Fe	K	Mg	Mn	P	S	Zn
			mg/Kg							
Boxelder	Logan	6.7 a	85.9 a	0.79 a	243.8 a	16.7 a	0.3 a	28.3 a	2.9 a	-
	Providence	6.6 a	105.8 a	1.15 a	137.8 b	13.0 a	0.2 a	15.5 a	1.5 a	-
	Smithfield	6.7 a	141.0 a	0.86 a	194.4 ab	16.0 a	0.2 a	17.8 a	2.2 a	-
Norway maple	Logan	6.5 a	219.0 a	0.55 a	188.0 a	33.2 a	0.8 a	8.8 a	2.1 a	0.3 a
	Providence	6.5 a	165.0 b	1.36 a	148.6 a	19.5 b	1.3 a	4.2 a	0.9 a	0.3 a
	Smithfield	6.5 a	165.8 b	0.56 a	175.8 a	18.5 b	0.8 a	5.8 a	0.7 a	0.3 a
Species (S)		ns	****	ns	ns	**	****	****	*	-
Location (L)		ns	ns	ns	***	*	ns	*	*	ns
S*L		ns	**	ns	ns	ns	ns	ns	ns	-

ns, *, **, ***, ****: nonsignificant or significant at $P < 0.05$, 0.01, 0.001, or 0.0001, respectively. For species, means with same letters within column are not different among locations by Tukey HSD.

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