Preliminary DRIS Diagnostic Norms for Pecan

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The Diagnosis and Recommendation Integrated System (DRIS) uses nutrient relationships, such as concentration ratios in tissue, to assess nutrient balance and diagnose the nutrient most likely to limit growth and yield (Beverly, 1991; Walworth and Sumner, 1987). Based on field fertility research with pecan [*Carya illinoensis* (Wangenh.) K. Koch] (R.E.W., unpublished data), we compiled more than 3000 observations, including yield and leaf concentrations of 11 essential nutrients and Al (Table 1). The sampling and analytical techniques have been published (Worley, 1974). The means and cvs of element concentrations (Table 1) and ratios (Table 2) corresponding to yields ≥ 58 kg/tree (the 75th percentile by yield) can be used to calculate DRIS index values (Beverly, 1991; Walworth and Sumner, 1987). Since alternative forms of expression (e.g., N : P vs. P : N) should not affect diagnostic accuracy, the ratios presented are based on the arbitrary order of concentrations in Table 1. We were unable to identify a suitable independent population from the literature with which to

test the diagnostic accuracy of the norms; thus, we consider the norms preliminary.

Literature Cited

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Worley, R.E. 1974. Effect of N, P, K, and lime on yield, nut quality, tree growth, and leaf analysis of pecan (*Carya illinoensis* W.). J. Amer. Soc. Hort. Sci. 99:49-57.

Table 1. Leaf element concentrations in pecan trees with yield ≥ 58 kg/tree (75th yield percentile).

Element ^a	n	Mean	CV
N	585	27.2	9.4
P	641	1.40	18.1
K	641	10.2	20.9
Ca	641	14.5	33.4
Mg	641	3.82	29.9
Fe	487	89.4	40.9
Mn	596	324	54.5
Zn	641	126	60.0
Cu	401	9.69	32.4
Mo	134	6.30	28.1
B	274	40.1	34.7
Al	273	1380	34.3

^aNitrogen, P, K, Ca, and Mg expressed in g·kg⁻¹; other elements in mg·kg⁻¹.

Table 2. Leaf element concentration ratios in pecan trees with yield ≥ 58 kg/tree (75th yield percentile).

Ratio ^a	Mean	CV
N : P	19.8	18.2
N : K	2.74	20.9
N : Ca	2.44	130
N : Mg	7.74	36.7
N : Fe	0.349	36.4
N : Mn	0.107	47.4
N : Zn	0.306	76.5
N : Cu	3.13	41.0
N : Mo	4.56	28.0
N : B	0.746	40.2
N : Al	0.0257	138
P : K	0.143	25.4
P : Ca	0.123	117
P : Mg	0.414	46.5
P : Fe	0.0175	32.0
P : Mn	0.00535	41.3
P : Zn	0.0164	76.4
P : Cu	0.163	38.9
P : Mo	0.301	25.6
P : B	0.0412	40.0
P : Al	0.00143	154
K : Ca	0.948	151
K : Mg	2.97	46.3
K : Fe	0.134	35.9
K : Mn	0.0409	50.7
K : Zn	0.121	77.3
K : Cu	1.23	41.7
K : Mo	1.86	32.4
K : B	0.319	53.6
K : Al	0.0104	137
Ca : Mg	4.13	42.0
Ca : Fe	0.193	54.2
Ca : Mn	0.0583	58.5
Ca : Zn	0.168	75.4
Ca : Cu	1.62	47.8
Ca : Mo	2.27	29.2
Ca : B	0.325	41.6
Ca : Al	0.0109	135
Mg : Fe	0.0518	45.2
Mg : Mn	0.0158	58.3
Mg : Zn	0.0438	71.9
Mg : Cu	0.470	49.4
Mg : Mo	0.565	42.9
Mg : B	0.111	45.0
Mg : Al	0.00389	155
Fe : Mn	0.354	46.0
Fe : Zn	1.04	91.7
Fe : Cu	9.98	42.9
Fe : Mo	18.6	45.8
Fe : B	2.77	46.5
Fe : Al	0.0958	149
Mn : Zn	3.23	83.6
Mn : Cu	35.4	56.6
Mn : Mo	70.7	45.3
Mn : B	10.2	65.0
Mn : Al	0.328	171
Zn : Cu	14.8	57.6
Zn : Mo	21.5	54.7
Zn : B	3.69	66.5
Zn : Al	0.125	183
Cu : Mo	1.70	41.1
Cu : B	0.276	43.8
Cu : Al	0.00954	148
Mo : B	0.183	71.5
Mo : Al	0.00586	159
B : Al	0.0384	170

^aNitrogen, P, K, Ca, and Mg expressed in g·kg⁻¹; other elements in mg·kg⁻¹.

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