50 cultivars, and the total range of values was no greater than that found within 'Pioneer' on a given date. From a practical standpoint it would seem that the small differences in sugar content between cultivars (Table 2) would be of little consequence in microbial activities.

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Nutrient Element Status of Soils and Trees for Peach Orchards in Georgia and South Carolina[1]

J. Benton Jones, Jr.
Department of Horticulture, University of Georgia, Athens, GA 30602
R. A. Isaac
Extension Analytical Chemist, Georgia Cooperative Extension Service, Athens GA 30602
B. J. Skelton
Department of Horticulture, Clemson University, Clemson, S.C. 29631

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Abstract. **Soils, and leaf and fruit tissues were collected from 200 peach orchard sites during the 1970 growing season. Results obtained were not markedly different from those obtained in an earlier survey in 1962. Most of the soils were quite acid and the peach leaf N levels were below optimum. Most growers appeared to be overfertilizing with P but applying adequate K. Peach fruit were quite high in K, accounting for a sizeable removal of K from the soil.**

University of Georgia and Clemson University surveys have been used in the past to evaluate the nutrient status of soils and trees in the production of tree fruits. A number of surveys have been conducted in the past on peach orchards in California (8, 9), Maryland (10), Michigan (7), Ohio (2), Pennsylvania (11), and South Carolina (3). A very comprehensive review on peach tree nutrition is given by Ballinger, Bell and Childers (1). With the increasing severity of peach decline, particularly in Georgia (4), there has been a renewed interest in reevaluating those factors which may be contributing to the loss of peach trees. One important factor could be mineral nutrition.

We sampled 266 sites in 27 commercial peach orchards during the summer of 1970 in the Piedmont and Sand Hill areas of Georgia and South Carolina. The samples included surface (0–15 cm, 0–6 inch) and subsurface (15–30 cm, 6–12 inch) soils, tree leaves and fruit. Each site was sampled when the fruit were mature and ready for marketing. Since 6 cultivars, 'Coronet', 'Dixie Red', 'Keystone', 'Loring', 'Elberta', and 'Blake' were sampled, the time of sampling depended on shipping maturity, with sampling beginning in early June on through late August. Only 10-year old or older bearing trees were sampled. Ten to 12 trees were randomly selected at each sampled site and 40 leaves per tree near the base of the current year's growth were collected along with 8 fruit from each tree. A site soil sample, a composite of 1 core from under every leaf-sampled tree at its periphery, was also taken. The soil samples consisted of a surface sample taken at the 0–6 inch depth and another for subsurface, 6–12 inch depth. Therefore, each soil sample consisted of a composite of 10 to 12 cores. The leaf, soil and fruit samples were taken to the Georgia Soil Testing and Plant Analysis Laboratory for analysis. The fruit were depitted and freeze dried. The soils were air dried, crushed and sieved, and then analyzed for pH level of double acid extractable P, K, Ca, Mg, and Zn[2]. The leaf tissue was dried at 80°C for 12 hr and ground to pass a 20-mesh sieve. The leaf tissue and fruit were analyzed for N content by Kjeldahl digestion and for their P, K, Ca, Mg, Mn, Fe, B, Cu, Zn, Al, Mo, Sr, Ba and Na content by direct reading emission spectroscopy[2]. Each sampled site was evaluated based on established production records in relative terms as being good or medium. The analytical results obtained were compared based on these classifications.

Summaries of the soil, leaf and fruit analyses results are given in Tables 1, 2, and 3, respectively. Based on the soil tests, there were small differences between the 2 classes (good and medium) or orchards, except for soil Ca and Mg which were on the average higher in the good orchards. Since the soil pH's were similar, this would indicate that the more productive orchards were on the heavier textured Piedmont soils. In general, the subsoils were more acidic than the surface soils and had lower P, K and Ca soil test levels, the most striking difference being between surface and subsoil P. The majority of the surface soils had a pH less than 6.0, with 35% less than 5.5. There was some indication that the sites classified as medium occurred more frequently on the more acid soils. The vast majority of the sur-

Table 1. Average soil test level in peach orchards according to site classification.

Site classification	No. samples	pH	Nutrient level (kg/ha) P	K	Ca	Mg	Zn
			Surface, 0–15 cm				
Good	160	5.6±0.5[z]	101±88	209±100	891±375	152±126	17.5±17.5
Medium	106	5.5±0.5	97±60	148±69	623±265	91±70	13.0±10.8
Total	255	5.6±0.5	104±79	184±94	785±360	127±112	156±15.2
			Subsoil, 15–30 cm				
Good	160	5.3±0.4	20±28	153±90	701±351	172±119	7.5±7.9
Medium	106	5.3±0.4	27±38	129±68	388±219	97±86	3.9±2.5
Total	266	5.3±0.4	22±32	143±83	580±340	142±113	6.1±6.4

[z]± SD.

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[2]Jones, J. B., Jr., and R. A. Isaac. 1974. Laboratory Procedures for the Analysis of Soils, Feeds, Water and Plant Tissue. Ga. Coop. Ext. Serv. Memo.

[3]Jones, J. B., Jr. 1974. Lime and Fertilizer Recommendations Based on Soil Tests for All Crops Grown in Georgia. Ga. Coop. Ext. Serv. Memo.

Table 2. Average elemental analysis of peach leaf tissue according to site classification.

Element[z]	Site classification: Good (160)	Medium (106)	Total (266)[y]
N (%)	2.32±0.52	2.25±0.29	2.30±0.44
P (%)	0.15±0.02	0.15±0.02	0.15±0.02
K (%)	2.35±0.57	2.47±0.48	2.40±0.54
Ca (%)	1.99±0.48	2.01±0.47	2.00±0.48
Mg (%)	0.47±0.17	0.41±0.15	0.45±0.16
Mn (ppm)	140±91	137±72	139±84
Fe (ppm)	519±388	617±387	558±391
B (ppm)	33±5	33±5	33±5
Cu (ppm)	8±1	8±6	8±4
Zn (ppm)	83±69	126±86	100±79
Al (ppm)	760±591	473±497	646±573
Mo (ppm)	4.7±3.1	3.6±1.1	4.2±2.6
Sr (ppm)	60±28	63±23	61±26
Ba (ppm)	94±41	128±31	107±41

[z]Na was below the detection limit of 100 ppm in most samples. Fe, Al and possibly Zn are higher than normally expected due to soil and dust contamination.

[y]Number of samples in parenthese.

Table 3. Average elemental analysis of peach fruit according to site classification.

Element	Site classification: Good (154)	Medium (98)	Total (252)[z]
N (%)	0.83±0.29	0.78±0.27	0.81±0.29
P (%)	0.39±0.14	0.39±0.15	0.39±0.15
K (%)	5.57±1.24	5.76±1.25	5.65±1.25
Ca (%)	0.09±0.04	0.11±0.04	0.10±0.04
Mg (%)	0.18±0.07	0.18±0.06	0.18±0.07
Mn (ppm)	15±8	16±8	16±8
Fe (ppm)	73±34	64±23	70±31
B (ppm)	71±22	71±20	71±21
Cu (ppm)	13±6	13±5	13±6
Zn (ppm)	39±37	53±39	45±39
Al (ppm)	124±70	100±46	115±63
Mo (ppm)	2.0±0.4	2.0±0.4	2.0±0.4
Sr (ppm)	7±2	6±2	7±2
Ba (ppm)	3±3	5±4	4±4
Na (ppm)	364±220	410±273	383±243

[z]Number of samples in parentheses.

face soils tested very high in P, high in K and adequate in Ca and Mg by Georgia Soil Testing standards.[3]

The average N level in the peach leaves was considerably below the sufficiency range recommended by Jones (6), but equal to that found in peach leaves in an earlier South Carolina survey for trees growing on Piedmont soils (3). All the other elements were well within the recommended sufficiency range. There was a slight difference in the average elemental content between the 2 site classifications but they were not significant, except possibly for N which could indicate that low N could be limiting yield. The fruit elemental content followed fairly closely the leaf content (Tables 2 and 3). The N, Ca, Mg, Mn, Fe, Zn, Al, Mo, Sr and Ba in the fruit was less than that in the leaves, while the opposite was true for the elements P, K, B and Na. Since the leaves were not washed prior to drying and analysis, the Al, Fe and possibly Zn concnetrations may be due in part to soil and dust contamination (5).

There was a significant (0.01% level) positive correlation between the surface and subsurface soil pH with leaf Mg (r=0.37 and 0.33, respectively). The surface soil Ca and Mg levels were also correlated with leaf test Mg (r=0.43 and 0.33, respecitvely). The elemental content in the fruit was not significantly related to the soil test level, except for P which was correlated with fruit P (r=0.23).

Many of the soils tested high in Zn and there was a significant correlation between soil test Zn with leaf and fruit Zn (r=0.51 and 0.45, respectively). Many of the high soil Zn levels are probably the result of long use of Zn-containing pesticides by growers.

These results are not much different than those obtained by Boatwright et al. (3) 8 years earlier. The majority of peach orchard soils were low in soil pH (80% had pH less than 6.0). Most leaf N levels were below the recommended sufficiency range of 2.75% to 3.50% (6). It has been suggested that inadequate N fertilization may be a factor contributing to peach decline in Georgia and South Carolina (4). Evidently growers have been overfertilizing with P and applying sufficient K to maintain soil test K at a generally high level. Peach fruit are very high in K (5.50%) and sizeable quantities of K can be removed with a harvested crop.

It would be difficult to pinpoint nutrient element differences which would distinguish between the good and medium sites, although there may be some evidence which would single out soil pH and level of leaf N as possible important differences.

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