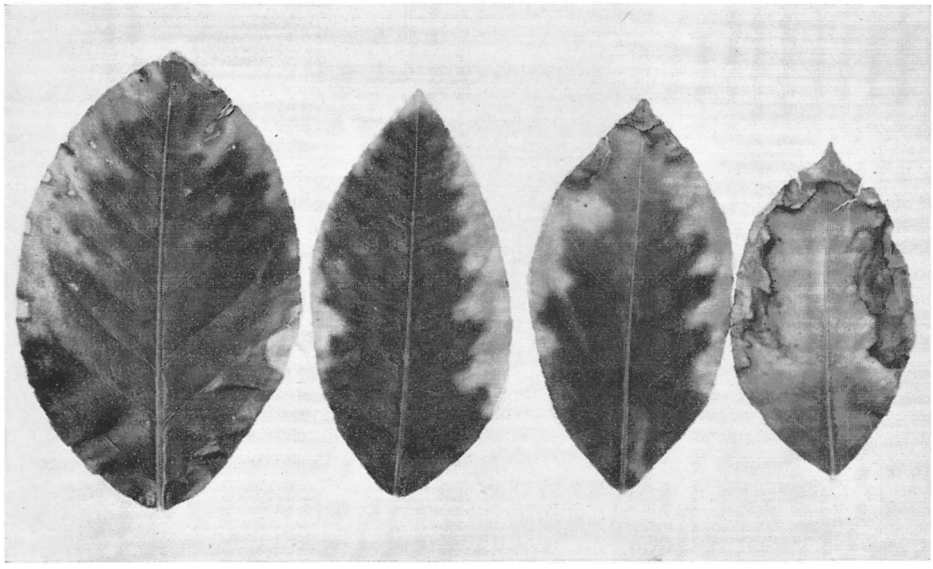

Characteristic mottling produced on sweet orange leaves resulting from lithium toxicity problem.

LITHIUM TOXICITY

in southern California citrus

G. R. BRADFORD

The occurrence of toxic levels of lithium in southern California citrus has been found to be more widespread than previously reported. Approximately 5 per cent of the total acreage shows symptoms of toxicity attributed at least in part to excess lithium. Some of the most severely affected acreages are on newly developed desert areas using locally developed well water with a high lithium content. A survey of the lithium content of irrigation waters of California is in progress.

Lithium, which is often associated in small amounts with sodium and potassium in the mica-type minerals, has been shown by earlier greenhouse studies to produce a characteristic mottling on citrus leaves when present in small amounts in the soil or irrigation water. Citrus leaves with typical lithium-toxicity symptoms, as shown in photo, received field recognition for the first time in a Santa Barbara County grove in 1950. Citrus varieties affected included lemons, grapefruit, and Valencia and navel oranges. Leaves containing more than 12 parts per million of lithium on a dry weight basis showed symptoms of lithium toxicity.

Spectrochemical analysis for the minor element content of citrus leaf samples taken since 1950 for miscellaneous purposes from southern California groves has provided data for the subject of this report. The table included summarizes results of the survey. Lithium was detected in variable toxic amounts in 62 leaf samples representing eight citrus growing areas of southern California. These samples were taken only from orchards where toxicity symptoms were observed and represent approximately 5 per cent of the citrus acreage of southern California.

Survey results

The results of a survey for minor elements in 43 high producing citrus orchards in southern California showed that lithium was present in amounts ranging from 5 to 22 parts per million in about 15 per cent of the samples. It was not detected in the other 85 per cent of the samples. Only slight symptoms of toxicity were observed on a few of the samples with the higher lithium content.

The degree of visual toxicity symptoms and the range of concentrations of lithium in the samples from each citrus area are shown in the table. In general, the higher the lithium content in the leaves the more severe the lithium toxicity symptoms. However, this association was often augmented or reduced, depending on a number of known or unknown factors. For example, the boron content of many of the samples was high enough to produce toxic symptoms which are similar in many respects to lithium toxicity. In the case of other samples, different citrus varieties and rootstocks were grown under highly variable conditions of salinity and climate, as well as variable cultural and management practices, which probably have some as yet undetermined effect on the assimilation and toxic effects of lithium.

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Lithium Content of Citrus Leaf Samples from Southern California

CITRUS GROWING AREA	NO. OF SAMPLES	LITHIUM CONTENT	CITRUS VARIETIES	DEGREE OF VISUAL TOXICITY SYMPTOMS
Coachella Valley	25	5–40*	Grapefruit, tangerine, lemons, Valencia and navel oranges	Moderate-severe
Santa Barbara County	10	2–15	Grapefruit, lemons, and Valencia and navel oranges	Moderate-severe
Ventura County	5	8–15	Valencia oranges and lemons	Moderate-severe
Riverside County (Hemet)	4	5–20	Grapefruit and navel oranges	Slight-moderate
Tulare County	3	5–15	Navel oranges	Slight
San Fernando Valley	3	5–25	Valencia oranges and lemons	Slight-moderate
Imperial Valley (Holtville)	4	25–35	Valencia oranges	Moderate-severe
Desert areas (Desert Center & Vidal)	8	30–40	Grapefruit, orange, lemon, and mandarin	Moderate-severe

* Concentration range (ppm in dry leaves).