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Chromium in citrus orchards in São Paulo State, Brazil.

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Soils naturally can contain Cr, depending on the rock material from they are originated. Cr content in agricultural soils can be increased by anthropogenic actions, as the use of fertilizers, limestone, pesticides. Plants can uptake and transport Cr to the food parts and then enters the food chain. Chromium is not essential for plant nutrition and important for animal metabolism, but in high concentrations may be toxic. Citrus cultivation in the State of São Paulo, Brazil, is practiced with intensive use of agrochemicals so that the soil content of Cr may be higher than the uncropped soils. The objective of this work was to estimate the content of Cr in citrus orchards in that state, the forms in which it occurs in the soil and its concentration in the different parts of the plants.

Soil and plant samples were taken in 20 orchards previously selected according to soil type and crop management. Each selected area was split in 3 plots, each one representing a replication. In each plot, 20 soil samples were collected (10 on the dip line and 10 between plant lines) in the depths 0-0.10, 0.10-0.20 and 0.20-0.40 m. The simple samples were mixed in order to constitute the composite sample of the plot. It was also sampled soil from an uncropped area located in the vicinity of the orchard to function as control. In the same plants the soil samples were obtained, samples of fruits. Soil samples were air dried, sieved to 2 mm and analyzed for total Cr and in the extracts obtained by the extractors Mehlich 3 (Mehlich, 1984) and DTPA. The fruits were washed and split in bark, bagasse, seeds and juice, which were analyzed for total Cr. The metal quantification was made in the different extracts by atomic absorption spectrometry.

In some areas it were observed a total Cr in levels considered phytotoxic (60-125 mg kg^{-1}), concentrations that were more related to the rock material than to anthropogenic action. The intensive use of agrochemicals and organic manure as filter cake during a period of 38 years caused little increase in the content of total Cr in the studied soils. The extractors Mehlich 3 and DTPA were not efficient in evaluating the availability of Cr to citrus plants. Total soil Cr was higher in the samples obtained in the place where the fertilizers were applied, suggesting that this is the best place for soil sampling in order to evaluate the soil contamination by that metal. This higher concentration of Cr under the shoot of the citrus plants is something expected, once citrus is a perennial plant and the pesticides that are applied on the plant drains to the dip line, the same place where limestone, mineral and organic fertilizers are spread. The data suggested a special attention to Cr since in some cases its content in soil was very high and the bagasse, and seed content higher than the recommended by the international laws.

The data obtained in this work let the following conclusions: 1. the rock material contribute for a high level of Cr in some soils. 2. Agrochemicals contributed for a little elevation in the soil content of Cr. 3. The best place for soil sampling to evaluate Cr contamination is under the shoot, the place where agrochemicals are normally applied. 4. The use of the soil for 38 years with citrus plantation increased only slightly the soil Cr content. 5. Cr was the most dangerous of the heavy metals analyzed, getting levels higher than the permitted in bagasse and seeds. 6. The extractors Mehlich 3 and DTPA were not able to estimate the availability of Cr to citrus plants.

Reference

Mehlich, A. Mehlich n^o 3 soil test extractant. A modification of Mehlich n^o 2. Commun. Soil Sci. Plant Anal, 15:1409-1416, 1984.

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