Article title	Modal Analysis to Estimate the Composition of Single Superphosphates
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Keywords	Phosphate fertilizers
Abstract	Better knowledge of the composition of acidulated phosphorus (P) fertilizers will provide useful information to properly manage these P sources. Single superphosphate is one of the major P sources utilized by some countries to increase the amounts of bioavailable P to commercial crops. This study was conducted to estimate the composition of single superphosphates produced from gross, fine and refloatable Araxá phosphate rock (SSP 1, SSP 2, and SSP 3, respectively) and also one produced from Patos de Minas phosphate rock (SSP 4). The original fertilizer and its water-insoluble residue (WIR) were analyzed for P, silicon (Si), iron (Fe), aluminum (Al), calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), titanium (Ti), barium (Ba), strontium (Sr), zinc (Zn), fluorine (F), free water, water of hydration and citrate insoluble P. Modal analysis was used to estimate the composition of the SSP products. This analysis was based on 1) qualitative information on the type of compounds provided by x-ray diffraction, 2) quantitative chemical information on total elemental content, 3) solubility index of the compounds, and 4) chemical composition of the compounds or minerals. The modal analysis, proposed in this study, was adequate to estimate the composition of the four SSP fertilizers. The results indicated that Fe3(K,Na,H)H8(PO4)6·6H2O was the main water insoluble phosphate impurity in the three SSP from Araxá PR, with an increase of this compound in the order SSP 1<SSP 2<SSP 3 and a decrease of Ca(H2PO4)2·H2O in the order SSP 1>SSP 2>SSP 3. CaAlH(HPO4)2-F2·2H2O was present in the SSP 4 in a significant amount. Results of the modal analysis can help to further understand the agronomic effectiveness of SSP fertilizers in experiments conducted in different crop systems.
Publication date	2006-08-16
Citation	L. I. Prochnow liprochn@carpa.ciagri.usp.br , E. F. Dillard , E. R. Austin , S. H. Chien & C. G. Calvo (2003) Modal Analysis to Estimate the Composition of Single Superphosphates, Communications in Soil Science and Plant Analysis, 34:15-16, 2131-2147, DOI: 10.1081/CSS-120024053
Article link	https://doi.org/10.1081/CSS-120024053