Impact of a Biofertilizer on the Chemical Composition of Potato and Beans

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In modern agriculture, the intensive use of fertilizers and inadequate management of residues are agents of increased resistance and resurgence of pests and diseases. Sustainable agriculture is a productive system that does not imply the rejection of conventional practices, but rather, emphasized the incorporation of innovations originated by scientists and farmers. The present study is part of a large research project dealing with food quality and safety in the market economy for organic production and certification of agro-commodities. It is based on an intensive organic system using vermicompost biofertilizer locally produced from the decomposition of organic residues. Granja Shimura, a small producing farm located in Batatais, state of São Paulo, Brazil, was selected for implementing the biofertilizer project. The experimental field under organic cultivation received 10,000 kg/ha of vermicompost fertilizer, while in the conventional cultivation 400 kg/ha of synthetic fertilizer containing 4 % N, 14 % P_2O_5 and 8% K_2O were used. Potato tubers of the varieties Achat, Bintje, Monalisa, and Slaney and beans of the varieties Aporé, Diamante Negro, Jalo, and Pérola cultivated under conventional and organic systems were sampled. Tubers were washed with distilled water, pulp and peel separated, freeze-dried and reduced to particle sizes smaller than one mm. Beans were washed with distilled water, dried at 60 ºC and reduced to particle sizes smaller than 0.5 mm. For the instrumental neutron activation analysis, test portions between 250 mg - 500 mg were inserted into high purity polyethylene vials. Irradiation was carried out for eight hours at the nuclear research reactor IEA-R1 of Instituto de Pesquisas Energéticas e Nucleares, São Paulo. Induced radioactivity was measured by high-resolution gamma-ray spectrometry at the Laboratório de Radioisótopos, Piracicaba. Elements were determined by the k_0-standardization method using the software package Quantu to perform spectrum evaluation and calculate mass fractions and respective expanded uncertainties. Br, Co, Fe, K, Na, Rb, Sc, and Zn were

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determined in pulp and peel of potato tubers. Br, Ca, Co, Fe, K, Rb, and Zn were above the detection limits in all bean samples. In general, lower contents of Br, Na, and Zn and higher contents of Co and Rb were found for the organic potatoes that received the vermicompost biofertilizer. Similar behavior was noticed for pulp and peel compartments. Br, Co, and Rb showed the highest differences between organic and conventional beans. It is important to note that Br mass fractions had opposite trend for potatoes and beans regarding organic and conventional cultivation system. The application of vermicompost did not affect the mass fractions of the nutrients Ca, Fe, K, and Zn in beans. Therefore, the application of vermicompost biofertilizer may have influenced the chemical composition of potatoes and beans, as mass fractions varied for most of the elements. Rb and Co mass fractions were always higher in both organic products, indicating the potential to be used as tracers for the discrimination of organic potatoes and beans.