

Geochemical characteristics of soil selenium in the typical soil profiles of carbonate rocks in Wuming county of Guangxi, China

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Selenium is one of trace elements that are essential for human and animal organisms. The results of the multi-target regional geochemical survey with the scale of 1:250 000 in Guangxi Zhuang Autonomous Region showed that the selenium-rich soil area is the largest contiguous area delineated currently in China, which is relatively rare. Among the surveyed selenium-rich area in Guangxi, the area in Nanning city accounts for 37.5%. The carbonate rocks are widely distributed and account for 40.72% of the total area of Guangxi. This study confirmed that the available selenium in soil, especially the water soluble selenium, is the key to determine the selenium level in food chain. The water soluble selenium also has a significant correlation with the amount of selenium intake of plants. However, water soluble selenium, under normal conditions, only accounts for 1%~5% of the total selenium in soil.

The study of two typical soil profiles of carbonate rock in Wuming county of Guangxi, whose profile numbers were GXP01 and GXP05, suggested that the average arithmetic pH value in soil was 4.8 of GXP01 and 7.1 of GXP05. The content of soil selenium was be inversely proportional to the depth of soil profiles and it was increased respectively from 0.20 mg/kg and 0.21mg/kg in the deep layer of 850~1000 cm to about 0.84 mg/kg and 1.06 mg/kg of the surface (0~20 cm) soils. The total amount of water soluble selenium content in the topsoil of the GXP01 profile was 2.40 $\mu\text{g}/\text{kg}$ accounting for 0.3% in soil selenium content, simultaneously, 1.12 $\mu\text{g}/\text{kg}$ for 0.1% in GXP05 profile. They were both given priority to with selenate, followed by selenite and humic acid combined with selenium. The correlation analysis between soil selenium content and pH values, total organic carbon (TOC) contents showed that there was no significant correlation between selenium content and pH value. On the contrary, selenium content was significantly positively correlated with TOC, and its correlation coefficient r was 0.549 and 0.8003 ($P < 0.01$) respectively. This coefficient may indicate that soil selenium contents are mainly influenced by TOC contents in the soil formation process.