Effects of Calcium Feitilizer on Enzyme Activities and Fertility of Barren Upland Red Soil Planted with Different Grain-type Peanut

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Peanut (*Arachis hypogaea* L.) is an important oil crop and cash crop in China. Red soil is the main zonal soil in southern China. Upland red soil is widely distributed. Due to the long-term influence of high temperature and alternating rainy, dry and wet seasons caused by subtropical monsoon climate, the loss of calcium and other nutrients in red soil upland is particularly serious through leaching and runoff, which results in poor soil and is not conducive to the growth and development of crops. Peanut is an calcium addicted crop, and lack of calcium causes a large number of empty pods.

In order to optimize fertilization of peanut in this area, in this experiment three typical peanut varieties (large-grain variety Xianghua 2008, medium-grain variety Xianghua 55, small-grain variety Lanshan Xiaozi) and barren upland red soil in Changsha (N 28°10’58”, E 113°4’46”) which was deficient in calcium (exchangeable Ca 148mg/kg) were selected, and two treatments (apply CaO 0,750kg/ha) were conducted by soil column method, then the soil enzyme activity and fertility were analyzed at main gwowth and development stages, to explore the differentiation effect of Ca application on enzyme activity and fertility of soil planted with the three varieties, the relationship among physical and chemical properties. The results were as follows: （1）The soil enzyme activity of large-seeded and medium-seeded peanut was opposite to that of small-seeded peanut in response to calcium. For large and medium-sized peanut varieties, calcium application increased soil catalase and phosphatase activities, but decreased soil invertase, phosphatase and protease activities. Secondly, the activity of rhizosphere soil enzymes was higher than that of surface soil (0-20 cm). From the whole growth period of peanut, the highest activity of soil enzymes occurred at flowering or podding stage. （2）Calcium application can effectively improve soil pH, alleviate soil acidity, and increase soil organic matter, alkali-soluble nitrogen and available potassium content, but inhibit the content of available phosphorus. （3）Calcium application, on the one hand, promoted the content of nutrients essential for peanut in soil, such as calcium, potassium, zinc, copper, on the other hand, inhibited content of the toxic elements in the soil, such as cadmium, lead, manganese, especially aluminum. （4）In contrast treatment, the soil invertase was positively correlated with soil organic matter and available potassium, phosphatase was positively correlated with soil available phosphorus, protease and urease were positively correlated with soil alkaline nitrogen, but urease was negatively correlated with soil organic matter,catalase was positively correlated with soil organic matter and alkaline nitrogen, and negatively correlated with pH, available phosphorus and available potassium. After calcium application, negative correlation decreased significantly or transformed to positive correlation.