

## A study of the inorganic element contents for the ginsengs of Keumsan, Chungnam

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This study is for geochemical relationships between ginsengs and soils from three representative soil types from Keumsan, shale, phyllite and granite. For these study, ginsengs, with the field and weathered soils were collected from the three regions, and are analysed for the major and trace elements.

In the weathered soils(avg.), the granite and phyllite areas are high in the most of elements while the shale area is low. In the correlation coefficients, negative correlations are shown in the  $Al_2O_3$ -MgO pair while positive correlations, are shown in the Ba-Sr, Zr, Sr-Zr and Cs-Ge pairs.

In the field soils(avg.), the granite and phyllite areas are, generally, high in the most of elements while the shale area is low. In the shale area, the major elements are high in the 4 year soils, but low in the 2 year soils. The LFS(Ba, Sr, Cs) and transitional elements are high in the 2 year soils, but low in the 4 year soils. The HFS(Y, Zr) is high in the 4 year soils. In the correlation coefficients, most of the elements from the 4 year show positive relationships. Positive correlations are shown in the  $Al_2O_3$ -CaO, MnO-MgO, V-Tl, and Ba-Sr pairs in all localities.

In the ginseng contents, clear chemical differences with the ages are shown in the shale and granite areas, but not clear in the phyllite area. In the shale area Mn, Mg, Ba, Sr, and Y contents, increase with ages but decrease in Al, Cs, Be and Cd. In the correlation coefficients, degrees of the correlations for the major elements become low with the ages. Positive correlations are shown in the Al-Mn, Ti, Mn-Ti, Mg-Ca, Ca-K, Ba-Cs, Y and Cs-Y pairs.

Comparisons with ginsengs of the same ages from the different areas suggest that generally, the 2 years in the shale and 3 and 4 years in the granite area are distinctive. Relative ratios(granite/ shale area) of the ginsengs are below 1 in the major elements except Mn in the 2 year ginsengs and above 1 in the other elements except Mg and Na in the 4 year. Relative ratios(granite/ phyllite area) of the ginsengs are high in the 3 year from the phyllite area.

In the relative ratios(weathered/field soils) of the soils, numbers of the elements showing the ratios of above 1 increase from the shale, to phyllite and granite in the case of the major elements, but decrease in the case of the trace elements. These results suggest that major elements are high in the granite while trace elements are high in the shale area.

In the relative ratios between field soils and ginsengs(field soils/ginseng), the shale area, regardless of the ages, show differences of several hundred times in the  $Al_2O_3$ ,  $TiO_2$ , Y and Tl, of several ten times in the MnO, MgO and Ba and of several times in the CaO contents. These results suggest that ginseng

contents are significantly different from the field soils in the  $Al_2O_3$ ,  $TiO_2$ , Y and Tl, but similar in the CaO contents.

The phyllite area, regardless of the ages, show differences of several hundred times in the  $Al_2O_3$ ,  $TiO_2$ , Y, Tl and Be, of several ten times in the MnO, MgO,  $Na_2O$  and Ba, and of several times to ten times in the CaO,  $K_2O$  and Sr contents. These results suggest that ginseng contents are significantly different from those of the field soils in the  $Al_2O_3$ ,  $TiO_2$ , Y, Tl and Be, but similar in the CaO,  $K_2O$  and Sr contents.

The granite area, regardless of the ages, show differences of several hundred times in the  $Al_2O_3$ ,  $TiO_2$ , Tl and Be, of several ten times in the Ba, and of several times to ten times in the MgO and CaO contents. Of the other elements, differences of several times to ten times are shown in the MnO,  $K_2O$  and Sr contents. These results suggest that ginseng contents are significantly different from those of the field soils in the  $Al_2O_3$ ,  $TiO_2$ , Tl and Be, but similar in the  $K_2O$  and Sr contents.

Comparisons among the different ages from the same area suggest that, in the case of shale area, differences of several hundred times in the  $Al_2O_3$  and  $TiO_2$ , of the several ten times in the MnO, MgO and Ba and several times in the CaO and  $K_2O$  are shown in the 2 year ginsengs. Differences of several hundred times in the  $Al_2O_3$ ,  $TiO_2$ , Cs, Y, Tl and Be, of above several ten times in the MnO, MgO,  $K_2O$  and Ba, and of several times in the CaO and Sr are shown in the 3 year ginsengs.

Differences of several hundred to thousand times in the  $Al_2O_3$ , of above several hundred times in the  $TiO_2$ , Cs and Y, and of several ten times in the MnO, MgO,  $K_2O$  and Ba, and of several times in the  $Na_2O$  are shown in the 4 year ginsengs. These relationships suggest that, regardless of the localities in the shale area,  $Al_2O_3$  contents of the soils show big differences from those of the ginsengs.

Regardless of the ages of ginsengs, comparisons with the overall average contents of each area show differences of several hundred times in the  $Al_2O_3$ ,  $TiO_2$ , Cs and Tl and of several ten times in the MnO. These overall relationships suggest that the  $Al_2O_3$ ,  $TiO_2$ , Cs and Tl contents of the soils are higher than those of the ginsengs, show big differences between two and low different contents are found in the MnO.

In detail, differences of several hundred times in the Y, and ten times in the MgO and Sr, and of several times in the CaO,  $Na_2O$ ,  $K_2O$  in the case of shale area, are shown. These results suggest that the soils are higher than the ginsengs in the Y and significantly differences in Y, and moderately differences in the MgO and Sr, and low differences in the CaO,  $Na_2O$  and  $K_2O$  are shown between soils and ginsengs.

Key words : Keumsan, Granite, Phyllite, Shale, Ginseng, Major and Trace elements