

THE CHEMICAL ELEMENTS CONTENT IN THE PEAT OF TOMSK REGION THE SOUTHERN TAIGA SUBZONE

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SUMMARY

The paper dealt with defines patterns of chemical elements distribution and the accumulation of peat and peat soils in Western Siberia. The goal of the work to identify patterns of content and distribution of chemical elements in peat and peat soils of West Siberia the southern taiga subzone.

KEY WORDS: peat, chemical elements, West Siberia

INTRODUCTION

During the years of research a large amount of factual material on the content of chemical elements in peat and peat soils has accumulated. The most thorough analysis of peat on the content of chemical elements held in the European part of Russia. The elemental composition of the West Siberian peat studied less.

The paper deals with defining patterns of chemical elements distribution and the accumulation of peat and peat soils in Western Siberia. The goal of the work was to identify patterns of content and distribution of chemical elements in peat and peat soils of West Siberia the southern taiga subzone.

METHODS AND RESULTS

The content of chemical elements in upland peats

The peat analyses explored the following chemical elements: Ca, Sc, Cr, Fe, Co, Br, Sr, Cs, Ba, Hf, La, Ce, Sm, Eu, Yb, Lu, Th, U. There are two types of situations biogeochemical peat formation. The first corresponds to the conditions in which are bogs formed, and in which the main peat-forming plants are sphagnum mosses. The second are eutrophic biogeochemical conditions, when the process of formation peat educational fens. Occurring in bogs biogeochemical cycles are determined by the atmospheric mass exchange migration flows of chemical elements. For this reason, M.A. Glazovskaya (1988) refers to peat bogs eluvial, geochemical autonomous landscapes and content of elements in them is subject to a greater degree of climatic factors. Elemental composition of peat studies results are shown in Table 1.

Table 1. Contents of chemical elements in peat, mg / kg dw

| Chemical elements | M±md | Coefficient of variation, % |
|-------------------|-------------|-----------------------------|
| Ca | 2718±300 | 86 |
| Sc | 0,59±0,03 | 40 |
| Cr | 1,58±0,18 | 84 |
| Fe | 2400±400 | 139 |
| Co | 1,05±0,17 | 135 |
| Br | 9,00±0,83 | 77 |
| Sr | 60,00±6,00 | 78 |
| Cs | 0,17±0,02 | 84 |
| Ba | 74,00±5,00 | 54 |
| Hf | 0,17±0,007 | 45 |
| La | 0,65±0,05 | 59 |
| Ce | 2,78±0,18 | 51 |
| Sm | 0,11±0,02 | 109 |
| Eu | 0,03±0,005 | 52 |
| Yb | 0,040±0,001 | 46 |
| Lu | 0,001±0,00 | 81 |
| Th | 0,30±0,17 | 49 |
| U | 0,07±0,01 | 107 |

Note - M - arithmetic mean, ± md - error of the mean.

The results of studying the elemental composition of peat of different botanical composition showed that the distribution of chemical elements depend on a peat type (Figure 1). Thus, for example, the average content of Ca in cotton grass-sphagnum, complex are almost equally fuscum peats (2300-2400 mg / kg), slightly higher - in the sphagnum peat bogs, (3400 mg / kg). Cotton grass-sphagnum, peat fuscum complex and characterized by similar mean values of Sc (0,54-0,76 mg / kg), Cr (1,57-1,83 mg / kg), Hf (0,11-0,12 mg / kg), La (0,47-0,65 mg / kg). Slightly higher contents of Hf, and La (0,17 and 0,94 mg / kg, respectively) observed in sphagnum bogs, peat. Average content of Eu (0,06-0,07 mg / kg) are same in all studied peat types, under study except for cotton grass-sphagnum, in which the content of Eu are an average of 0.11 mg / kg. The average content of Br in cotton grass-sphagnum peat and complex are virtually identical (9.00 and 9.64 mg / kg, respectively), the higher Br contents found in sphagnum bogs peat (13.30 mg / kg), while the lowest are in fuscum (4.42 mg / kg). Cotton grass-sphagnum fuscum peats are characterized by similar values of the content of Sr (48.0 and 46.10 mg / kg, respectively).

According to the studies results on the shrub-grass upland bogs observed the greatest accumulation of Ba (131 mg / kg), Ce (6 mg / kg), Sc (1,6 mg / kg) and Th (1,2 mg / kg), as well as characterized by the lowest content of Sr (12,5 mg / kg) and Eu (0,03 mg / kg). In the pine-shrub-sphagnum bog complex are observed maximum content of Co (2,98 mg / kg), Sm (0,69 mg / kg), and the minimum content of Ba (38 mg / kg). In the pine-shrub-sphagnum bog in upland fuscum peat contains the least amount of Br (3,5 mg / kg), Co (0,1 mg / kg), La (0,07 mg / kg), Sm (0,001 mg / kg) and the highest Cr (3,4 mg / kg).

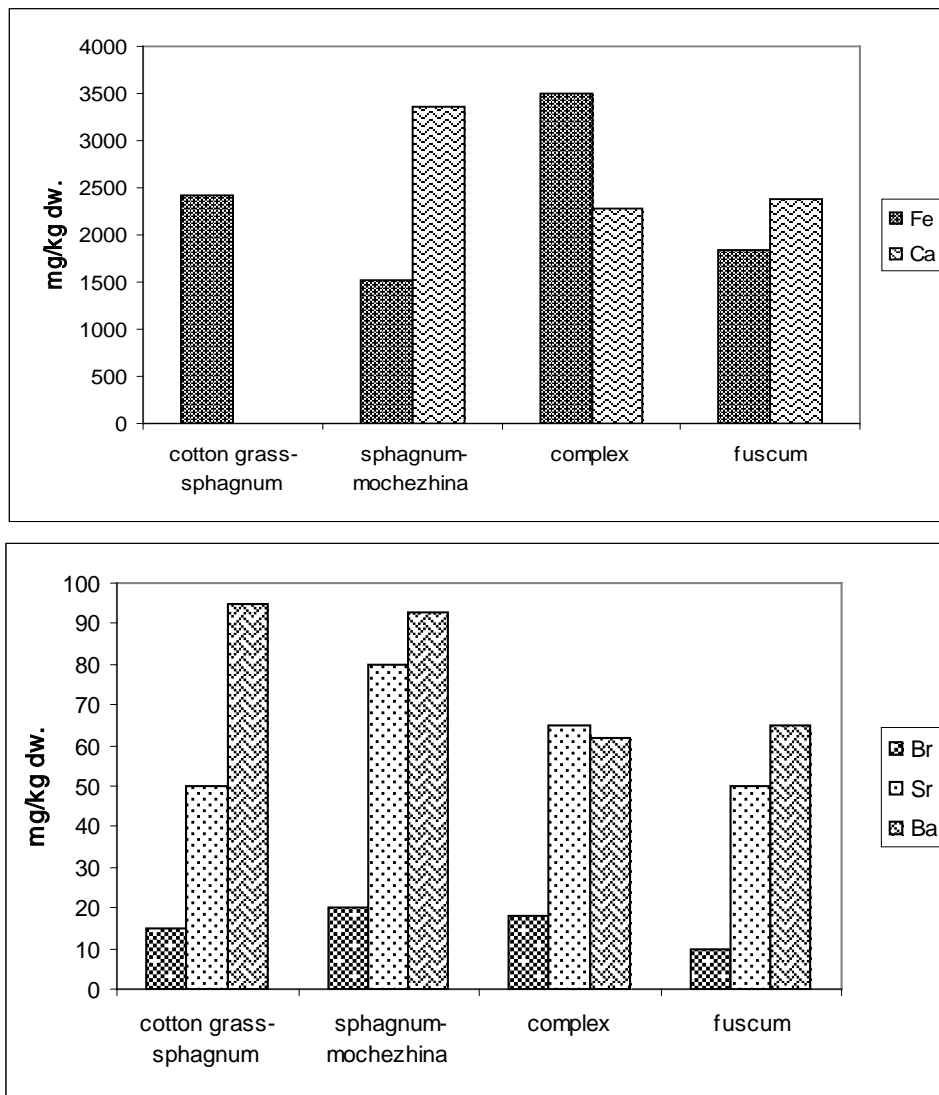


Figure 1 - Contents of chemical elements in Peat botanical composition of different types of mg / kg dw.

The content of chemical elements in peat fen type

The composition of peat soils is influenced by factors of peat formation and biogeochemical processes. Fens is accumulative geochemically subordinated landscapes (Glazovskaya, 1988). The average content of chemical elements in peat fen type is presented in Table 2.

The distribution of chemical elements in the peat of various botanical composition of the lowland has a more uniform character than upland(Figure 2). All peat under studied characterized by a uniform distribution of the content of Sc, Fe, Br, Sr, Ba, La, Eu. However, the average content of Ca, Cr, Co, Br, Hf, Ce, Sm, Th varies depending on the type of peat. It should be noted that some elements are not contained in one or another form of peat. For example, Yb, Lu, U is not found in the sedge peat, U is not in wood-sedge; Yb and Lu is not in the sedge-wort.

Table 2. Contents of chemical elements in peat fen, mg / kg dw

| Chemical elements | M±md | Coefficient of variation, % |
|-------------------|--------------|-----------------------------|
| Ca | 15200±1200 | 64 |
| Sc | 0,96±0,09 | 73 |
| Cr | 4,40±0,52 | 92 |
| Fe | 22500±600 | 26 |
| Co | 4,66±0,21 | 41 |
| Br | 34,00±1,30 | 34 |
| Sr | 250,00±14,00 | 47 |
| Cs | 0,18±0,05 | 182 |
| Ba | 121,00±11,00 | 75 |
| Hf | 0,17±0,02 | 102 |
| La | 1,53±0,11 | 62 |
| Ce | 3,29±0,32 | 85 |
| Sm | 0,44±0,03 | 71 |
| Eu | 0,10±0,01 | 82 |
| Yb | 0,07±0,02 | 218 |
| Lu | 0,01±0,002 | 173 |
| Th | 0,49±0,04 | 65 |
| U | 1,10±0,20 | 140 |

Note - *M* - arithmetic mean, $\pm md$ - error of the mean.

It should be noted that the vast majority of the studied chemicals accumulate in the wood-peat. Wood-sedge peat has the highest content of Sr, Ba, Ce, Sm, and U; but are - Ca, Sc, Cr, Fe, Co, La, Eu, Th, compared with wood peat. However, it should be noted that the wood-sedge peat is characterized by the low-Br and Hf compared with the rest considered peats. Sedge peat, as well as wood, contains high concentrations of Fe, and somewhat lower concentration of Ba. Sedge peat-wort contains more than the other peat Co, Br, and Hf; slightly lower Ca, Sc, Cr, Sr, Sm and Th discussed above in comparison with the peat.

Thus, the low-lying peat, by the can be constructed in the following series ability to accumulate the chemical elements: Wood - Wood-sedge - Carex-wort - sedge. According to the results of research on the herb-willow swamp low-lying peat found in the tree the highest content of Ca (22,340 mg / kg), Fe (25,430 mg / kg), Cr (6,8 mg / kg), La (2,7 mg / kg) , Sc (2,1mg / kg), Hf (0,48 mg / kg), Eu (0,23 mg / kg) and Th (0,89 mg / kg). On the birch-grass swamp low-lying reclaimed observed maximum concentration of Ba (186 mg / kg) and Sm (0,78 mg / kg). It depends on the herb-grass low-lying reclaimed swamp says the minimum concentration of Fe (4168 mg / kg), Br (27,4 mg / kg) and Eu (0,018mg / kg). On the grass in the low-lying marsh sedge peat contains the least amount of Ca (12,610 mg / kg), Sr (63 mg / kg), Cr (1,09 mg / kg), Co (0,28 mg / kg), Sc (0, 12 mg / kg), Sm (0,141 mg / kg) and Th (0,07mg / kg). Shrub-grass-hypnum lowland swamp is characterized by the highest content of Br (63 mg / kg), low-lying swamp grass is the lowest Ba (6,8 mg / kg).

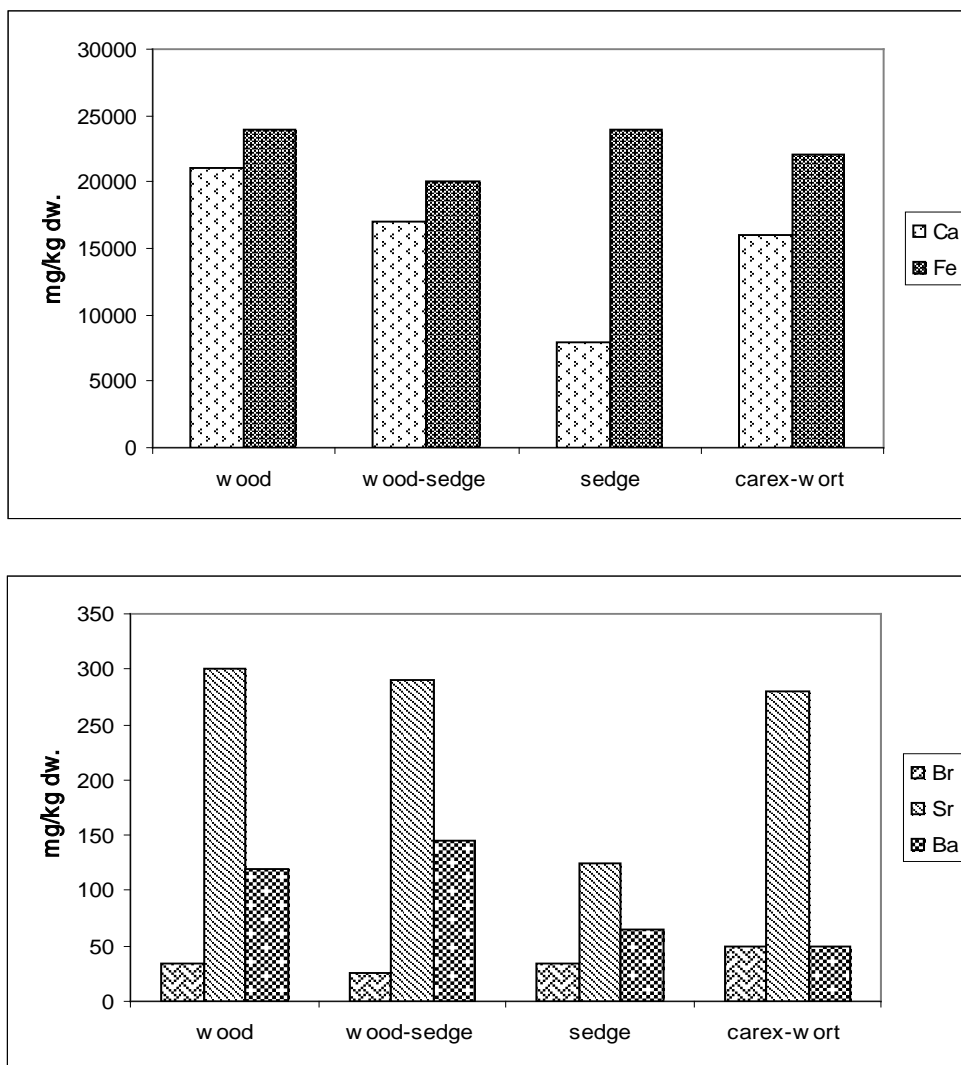


Fig. 2. The contents of chemical elements in peat lowland different botanical composition mg / kg dw.

CONCLUSIONS

As a result, the following conclusions can be made:

1. Botanical composition of peat influence on the content of chemical elements. The elements Ca, Sc, Cr, Hf, La, Eu, Th characterized by similar values of the contents in all investigated peat, content of the elements Fe, Co, Br, Sr, Ba, Ce, Sm depends on the type of peat. Some chemicals are accumulated selectively (Cs, Yb, Lu, U). Peat can be constructed in the following series in their ability to accumulate chemical elements: cotton grass-sphagnum - sphagnum-mochezhina - complex - fuscum. By their ability to accumulate chemical elements fen peat can be constructed in the following series: Wood - Wood-sedge - Carex-wort - wort.

2. The accumulation of chemical elements is determined by the hydrology and biogeochemical features of the functioning of wetland ecosystems of high-and low-lying types determine. The test items in larger quantities contained in the fen peat compared to riding.

3. Studies of the chemical elements in peat are belonged to the promising methods for assessing changes in geochemical composition of the biosphere. The ability to restore changes in the composition of dust aerosol deposition in the absence of long-term observations is important advantage.

4. Specific patterns of accumulation and dispersion of elements in the peat. In peat are observed it is determined by the origin of the main peat-forming plants and the characteristics of water and mineral nutrition of peat soils.