

**DISTRIBUTION OF SELENIUM TOTAL CONTENT IN THE SOILS
SITUATED IN THE SOUTH-EASTERN PART OF ROMANIA, FROM
CENTRAL AND SOUTH DOBRUDJA**

**MIHAELA MONICA ALDEA, R. LĂCĂTUȘU, MIHAELA LUNGU, NINETA
RIZEA, VENERA MIHAELA STROE, RODICA DOINA LAZĂR**

National Research and Development Institute for Soil Science, Agrochemistry and
Environmental Protection of Bucharest

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Abstract

A number of 49 soil samples were collected from the South-Eastern part of Romanian territory, in Central and South Dobrudja, from the upper horizon (0-20 cm) of some soils with predominantly agricultural use, especially arable lands, consisting of wheat crops. These soils belong to the next types: Fluvisol¹ (FL), Chernozem (CH), Kastanozems (KZ).

Selenium total content was determined from the analysed samples through the optic method of analyse, the atomic absorption spectroflamephotometry coupled with hydrides generator. Grouping centre parameters (\bar{x} -arithmetic mean, Me-median, Mo-module) and spreading parameters (x_{min} -minimum value, x_{max} -maximum value, σ -standard deviation, and $cv\%$ -coefficient of variation) were computed for total selenium contents in the analysed samples to outline the distribution of these chemical elements in the soils of the studied area.

INTRODUCTION

Total content of selenium from the upper horizon (0-20 cm) of the soils in the South-Eastern part of Romanian territory, in Central and South Dobrudja, was studied. These soils have predominantly agricultural use, especially arable lands consisting of wheat crops. The studied soils belong to the following types: Fluvisol (FL), Chernozem (CZ) and Kastanozems (KZ) [1]. Selenium total contents differ from one soil type to another. The areas where wheat is cultivated must be carefully studied, because, as selenium transfers from soil to plant, its hyperaccumulation or deficiency in the edible parts of wheat plants would have negative effects on consumers health.

¹ WRB-SR-1998

MATERIAL AND METHODS

A number of 49 soil samples were collected from the South-Eastern part of the Romanian territory, in Central and South Dobrudja, from the upper horizon (0-20 cm) of some soils with predominantly agricultural use, especially arable lands consisting of wheat crops.

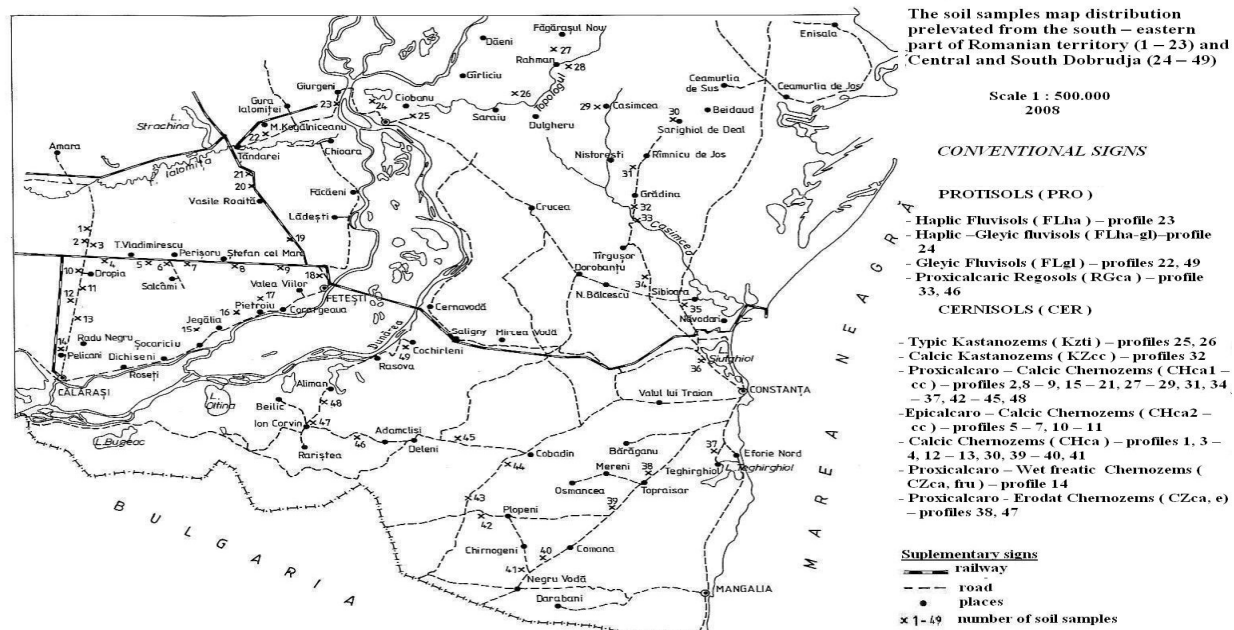
To establish the loading or pollution level with this kind of chemical element, the soil samples were analysed in the laboratory from the viewpoint of total content of selenium. Selenium total content was determined in hydrochloric solution obtained by soil digestion with a mixture of mineral acids, HCl-HNO₃, and H₂O₂, using atomic absorption spectrophotometry coupled with hydrides generation in alternative atomization with air-acetylene flame, for selenium dosage [2].

Grouping centre parameters (\bar{x} -arithmetic mean, Me-median, Mo-module) and spreading parameters (x_{\min} -minimum value, x_{\max} -maximum value, σ -standard deviation, and cv%-coefficient of variation) were computed for total selenium content to outline the distribution of this chemical element in the soils of the studied area.

RESULTS AND DISCUSSION

Figure 1 presents the localization of the sampling points together with the characteristic type of soil. Selenium total contents from the studied soil are situated in the 0.001-0.329 mg·kg⁻¹ interval, with a mean value of 0.189 mg·kg⁻¹ in Baragan, respectively of 0.143 mg·kg⁻¹ in Dobrudja, resulting that in Bărăgan soils selenium total content from the upper horizon is bigger, with an average of 0.046 mg·kg⁻¹, than in Dobrudja soils. The high value of the coefficient of variations shows a wide spreading of the selenium total content values. The soil distribution of selenium total contents from both areas is of bimodal type (figure 2). The obtained values are situated in the inferior third part of the variation interval of the world's soils, characterized by the following values: If we compare the value obtained by us with the values interval of selenium total content given by Pendias and Pendias (2001) [3] for soils from many countries (23) of world map, namely: $x_{\min}=0.005$ mg·kg⁻¹; $x_{\max}=4.0$ mg·kg⁻¹; $\bar{x}=0.383$ mg·kg⁻¹; $\sigma=0.225$ mg·kg⁻¹, consequently in a domain with small values of selenium total content. Within the framework of this domain, the values of selenium total content from the Dobrudja soil are on an average, inferior to those from the South-Eastern Baragan soils.

Table 1 shows the analytic data of selenium total content, together with localization and soil type. In table 2 the statistical parameters of these data are presented, grouped by region: the South-Eastern area of the Romanian territory (Baragan) and the Central and South Dobrudja.



Signed : M. Drăgoș

Fig. 1. Localization of sampling points and the characteristic types of soil

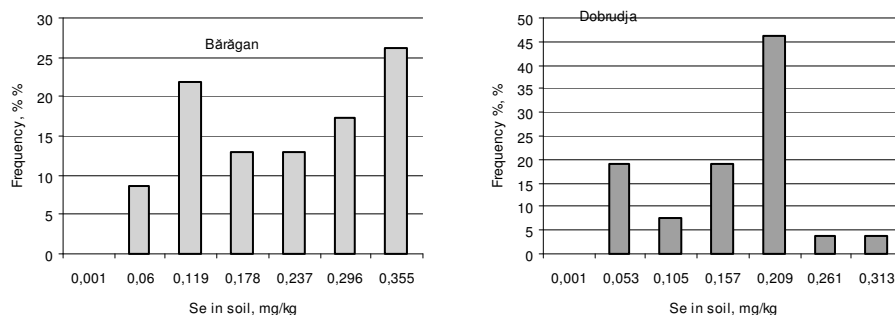


Fig. 2. Frequency histograms of selenium total content in soil (0-20 cm)

Table 1

Selenium total content from the upper horizon (0-20 cm) of soils where wheat was cultivated in the agricultural year 2007/2008

No.	Localization *	Latitude/Longitude	Soil type	Total Se (mg·kg ⁻¹)
Bărăgan				
1	S Slobozia	N 44°27.160' / EO 26°04.846'	CZ ti	0.094
2	S Slobozia	N 44°27.137' / EO 26°04.833'	CZ ka ₁ -kz	0.108
3	S Slobozia 1 km N Drajna	N 44°26.248' / EO 27°22.899'	CZ ti	0.298
4	E Drajna	N 44°25.465' / EO 27°25.058'	CZ ti	0.255
5	E Drajna	N 44°25.490' / EO 267°28.122'	CZ ka-kz	0.329
6	Perisoru – Marculesti	N 44°25.430' / EO 27°31.041'	CZ ka ₂ -kz	0.163
7	Jegălia	N 44°25.370' / EO 27°33.561'	CZ ka ₂ -kz	0.245
8	E Stefan cel Mare	N 44°25.226' / EO 27°40.176'	CZ ka ₂ -kz	0.303
9	7 km înainte de Fetesti	N 44°25.118' / EO 27°44.990'	CZ ₁ ka ₁ -kz	0.303
10	S Drajna spre Calarasi	N 44°23.866' / EO 27°22.282'	CZ ₁ ka ₂ -kz	0.272
11	S Drajna 2	N 44°22.941' / EO 27°22.139'	CZ ka ₂ -kz	0.125
12	S Drajna 3	N 44°21.137' / EO 27°21.813'	CZ ti	0.223
13	N Calarasi 15 km	N 44°18.729' / EO 27°21.391'	CZ ti	0.325
14	N Calarasi 7 km	N 44°15.226' / EO 27°20.786'	CZ ka ₁ , fru	0.001
15	NE Unirea	N 44°16.987' / EO 27°36.213'	CZ ₁ ka ₁ -kz	0.305
16	NE Unirea	N 44°19.147' / EO 27°41.027'	CZ ₁ ka ₁ -kz	0.252
17	NE Unirea	N 44°21.093' / EO 27°44.131'	CZ ₁ ka ₁ -kz	0.199
18	NE Unirea	N 44°26.093' / EO 27°48.196'	CZ ₁ ka ₁ -kz	0.067
19	NE Unirea	N 44°30.825' / EO 27°44.221'	CZ ₁ ka ₁ -kz	0.097
20	S Tandarei	N 44°34.947' / EO 27°41.886'	CZ ₁ ka ₁ -kz	0.120
21	S Tandarei	N 44°35.270' / EO 27°41.874'	CZ ₁ ka ₁ -kz	0.086
22	E Tandarei	N 44°39.097' / EO 27°42.192'	AS gc	0.185
23	V Giurgeni	N 44°42.522' / EO 27°50.935'	AS en	0.001

Dobrudja				
24	SE Vadu Oii	N 44°43.809' / EO 27°54.276'	AS en-gc	0.306
25	N Harşova	N 44°41.897' / EO 28°00.021'	KZ ti	0.127
26	N Saraiu	N 44°45.477' / EO 28°11.967'	KZ ti	0.019
27	Movilele Babei	N 44°49.434' / EO 28°16.100'	CZ ₁ ka ₁ -kz	0.052
28	SE Rahmanu	N 44°47.407' / EO 28°17.900'	CZ ₁ ka ₁ -kz	0.198
29	V Casimcea	N 44°43.413' / EO 28°21.617'	CZ ₁ ka ₁ -kz	0.067
30	V Sarighiol de Deal	N 44°42.148' / EO 28°29.084'	CZ ti	0.178
31	S Ramnicu de Jos	N 44°36.738' / EO 28°26.437'	CZ ₁ ka ₁ -kz	0.140
32	V Cheia	N 44°31.430' / EO 28°35.730'	KZ mr	0.129
33	E Cheia	N 44°30.472' / EO 28°25.871'	RS ka	0.168
34	N Mihail Kogalniceanu	N 44°23.815' / EO 28°27.685'	CZ ₁ ka ₁ -kz	0.178
35	V Sibioara	N 44°21.569' / EO 28°31.327'	CZ ₁ ka ₁ -kz	0.012
36	Ovidiu	N 44°14.406' / EO 28°34.548'	CZ ka ₁ -kz	0.087
37	Agigea V	N 44°04.663' / EO 28°36.055'	CZ ka ₁ -kz	0.140
38	Movilița	N 44°02.883' / EO 28°29.815'	CZ ka, e	0.012
39	N Amzacea	N 43°58.519' / EO 28°24.597'	CZ ti	0.209
40	SV Comana	N 43°52.759' / EO 28°17.332'	CZ ti	0.179
41	N Negru Voda	N 43°51.011' / EO 28°14.272'	CZ ti	0.203
42	SE Movila Verde	N 43°57.334' / EO 28°09.992'	CZ ka ₁ -kz	0.164
43	S Negresti	N 43°59.025' / EO 28°07.521'	CZ ka ₁ -kz	0.176
44	S Cobadin	N 44°03.054' / EO 28°11.141'	CZ ka ₁ -kz	0.209
45	E Pietreni	N 44°05.166' / EO 28°06.134'	CZ ka ₁ -kz	0.201
46	Adamclisi - vale	N 44°05.955' / EO 27°55.126'	RS ka	0.152
47	Ion Corvin - vale	N 44°06.906' / EO 27°49.044'	CZ ka ₂ , e	0.006
48	S Alimanu	N 44°09.451' / EO 27°50.034'	CZ ₁ ka ₁ -kz	0.181
49	S Cochirleni	N 44°16.685' / EO 27°58.953'	AS gc	0.219

*see figure 1

Table 2
Statistical parameters of selenium total content from the upper horizon (0-20 cm) of soils where wheat was cultivated in the agricultural year 2007/2008

Statistical parameters	Baragan	Dobrudja
n	23	26
x_{min}	0.001	0.006
x_{max}	0.329	0.306
\bar{X}	0.189	0.143
σ	0.104	0.076
x_g	0.119	0.104
cv (%)	55	53
Me	0.199	0.166
Mo	0.095; 0.311	0.177

n -total number of samples; x_{min} -minimum value; x_{max} -maximum value; x_{med} -mean value; σ -standard deviation; $c.v.$ %-coefficient of variation; Me -median; Mo -module; x_g -geometric mean,

\bar{X} -arithmetics mean

CONCLUSIONS

1. The average selenium total content from upper horizon of the South-Eastern Baragan soils is $0.189 \text{ mg}\cdot\text{kg}^{-1}$, and $0.143 \text{ mg}\cdot\text{kg}^{-1}$ in the Central and South Dobrudja soils.
2. In the soils from these two areas Baragan and Dobrudja, results a differentiation of selenium abundance, wich is greater in Bărăgan and smaller in Dobrudja.

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