

ANALYZING Cs-137 AND Cs-134 CONCENTRATION IN MOSSES SAMPLES IN CAMPANIA REGION - ITALY AFTER THE CHERNOBYL ACCIDENT

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INTRODUCTION

The Chernobyl accident caused an exceptional relapse of radioactive material. The consequent fall-out in several European countries, including Italy (1).

Term and height of aeriform effluent radioactivity admitted into the atmosphere, the distance of place of origin and the variability of meteorologic qualifications existence (wind, rain, etc...), determined the level of contamination of radioactivity in the air with a consequent deposition of soil much variable depending on space and time.

Following the Chernobyl accident the situation of artificial deposition in Italy is considerably changed. In order to obtain arrange a new map of contamination of radioactivity in the soil. All over italian territory has been organized radioecological campaign to arrange a new zero point (2).

The Central Laboratory of Italian Red Cross (L.C. - CRI) is part of the National Network for the monitoring of the environmental radioactivity in Italy co-ordinated by National Environmental Agency (ANPA). The L.C. - CRI took part in the national campaign for the monitoring of the environmental radioactivity to evaluate the deposition of artificial radioactivity on Italian territory (3). Fig.1.

In Italy to obtain the radioecological map the gamma spectrometry technique is used. In fact this technique is more sensitive and is answering several kinds of information. The gamma radioactivity on the place is a more appropriate method, in reality isn't use due to the lenght of time.

In this work, in particular, living organism by *bioindicators* have been used as a mosses (bryophytes). The experience carried out at national and international level demonstrated that mosses can be used to map the radioactive fall-out (4). Studies were also performed on mosses which appeared to have some advantages with respect to lichens.

The mosses are organisms made up chlorophyll and therefore photosynthesis. Mosses generally live in environmental sub-air, they have not roots and do not have a vascular system to allow the transport of material from substratum for diffusion and to absorb atmospheric water.

The present work was orientated to use specific types of mosses which act as a passive trap to collect radioactive particules and mosses are distributed in all mountain ecosystems whether in Italy or in other countries.

The monitoring of gamma radioactivity for Campania region has been delegated to the Section of Environmental Radioactivity of the L.C. - CRI. To this task the cooperation with the Ministry of Agriculture and Forestry and together with the help of the Department of the State Forestry Corp of Campania.

This work presents the data of the surveys carried in 1993-1994. The mosses were picked up in four different locations of Campania region and measured by means of ray spectrometry, according to a national standard procedure, to evaluate the content of Cs-137 and C-134. The content of K-40 was also measured.

MATERIALS AND METHODS

In this paper the measures concern n.44 samples of mosses; this mosses have been collected in four States Forest Corp posts in the provinces of Salerno, Caserta, Napoli. In particular, the localities are: Laviano, Piaggine, S.Gregorio Matese and Boscotrecase.

The species of the mosses picked up are *Hypnum cupressiforme* and *Homalotecium lutescens*.

The samples were gathered in late autumn (November - December) only on the rock and show horizontal growth, with formation of carpets thickness between 2 - 4 centimetres.

The samples have not received any chemical treatment and after drying up in the air have been utilized.

The samples underwent analysis of gamma ray spectrometry: the measures have been carried out using high purity Germanium detector (Hp), relative efficiency 25 %, in to a well of the lead 10 centimetres thick. Radionuclide concentrations were determined by automatic peak fitting using a spectroscopy applications software package (PCA II - GDR). Detector was calibrated using a calibration standard (359 RLM-ENEA) in the liquid form (Marinelli 500 cc) through participation in national intercomparison. For the samples, the counting error, expressed with an accuracy of $\pm 1\%$. Consequently the samples placed in Marinelli Beakers in the volume of 500 cc. The count time was 72.000 sec (20 hours).

The concentration of mosses is reported on the 1st July 1993 and is expressed as Bq/m².

The counting time which is rather long allowed to obtain a standard deviation on peak of height intensity of Cs-134 of $\pm 10\%$.

Fig. 1

from : "Mapping of radioactive fallout using mosses as bioindicators"

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RESULTS

The table n.1 shows the average concentration of the Cs-137 and Cs-134 on relating to 44 samples of mosses examined in four places for cathering. The values of average concentration of mosses in the Campania region are: 374 Bq/m² of Cs-137 , 16 Bq/m² of Cs-134 and 151 Bq/m² of K-40. Tab.1

Tab. 1
Cs-137 - Cs-134 and K-40 activity in mosses

LOCALITIES	Cs-137 (Bq/m ²)	Cs-134 (Bq/m ²)	K-40 (Bq/m ²)
S.GREGORIO (TORNARE)	505	22	175
LAVIANO (CACARI)	375	16	134
PIAGGINE (COZZO)	312	13	1163
VESUVIO (TRECASE)	303	14	133
REGIONAL	374	16	151

Tab. 2
**Cs-137 and Cs-134 activity in mosses in
differeents regions of Italy (1992-93)**

REGION	Cs-137 (Bq/m ²)	Cs-134 (Bq/m ²)
ALTO ADIGE	750	50
CAMPANIA	530	30
EROMAGNA	940	70
FRIULI V.G.	5400	380
LAZIO	500	35
LOMBARDIA	6000	400
PIEMONTE	5800	400
TOSCANA	330	20
TRENTINO	3500	250
UMBRIA	350	25
VALDAOSTA	1300	90
VENETO	3000	210

CONCLUSIONS

In this paper the results of the concentrations of the Cs-137 and Cs-134 in the mosses confirm an uniform distribution of the radioactivity post Chernobyl in the regional territory. The reluts are in accord to the previous date (1992-1993). Tab.2

The concentration of K-40, in all samples examined, has a costant value.

Currently we are investigating the possibile correlation between the concentration of the Cs-137 and Cs-134 in the soil and in the mosses of the same spots (5-6).

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