

## SOME ASPECTS REGARDING REVEGETATION OF TAILING WITH PILLARED TUFF

Masu Smaranda. \*, Dragomir N.\*\*, Bogatu C.\*

\*National Research and Development Institute for Industrial Ecology-ECOIND,  
P-ta Victoriei 2, et.2, PO Box 254, Timisoara; phone/fax: +40 256 220369

\*\*Animal Sciences and Biotechnologies Faculty, Calea Aradului 119, Timisoara. phone: +40  
256 227206

### ABSTRACT

Waste dumps from cooper exploitations represent massive storages of fine sandy material with concentration between 200 and 2100 mg Cu/Kg d.m. and low content in nutrients. Installing a vegetative layer on the polluted terrain has the purpose to fix the sandy material against erosion and strong winds and to progressive discard the metals. The study point out the evolution of some selected species that present germination and development potential on waste dumps enveloped with layers of fertile soil and adding of amendmets based on indigenous volcanic tuff as is and pillared. From the competition of the sowing species *Festuca arundinacea*, *Lotus corniculatus*, *Medicago sativa* and *Trifolium arvense* with weeds result a vegetal layer with an dapted species that cover 70% of the surface sowed in the first year of culture.

### INTRODUCTION

The motivation for inception and development of some operations of turfing the waste dumps resulted from Cu mining exploitation in S-W of the country is represented by: spoiling of physical characteristic of soil that predisposes the area to dune forming through sterile deflation, cracks on dumps surface in dryness periods with predisposition to erosion, etc. spoiling the biochemical characteristics with lose and degradation of aggregates structures, lose of water, absence of humus and microorganisms and others inferior organisms activity, presence of metals with ecotoxic characteristics , diffusion of pollution in terrestrial limitrophe areas in call of surface and depth and in air/1-2/.

To initiate the phytoremediation is necessary to choose the seeds mixture that presents germination abilities and then, development of vegetation to cover the area. From the plants that can form the green cover, in Europe, are indicated the species: *Medicago sativa*, *Festuca arundinacea*; *Lolium perene*, *Lolium multiflorium* a.o. / 3/

Sowing depth indicated is of 5-15 mm to favor fast germination and growth in advance from the weed seed. Because waste dumps are formed from sterile under the form of fine flying sand, his fixing and adding of nutrients is made through layers of fertile soil /4/. Providing water necessity on dryness period can be done through adding of materials in type of zeolitical sites.

## MATERIALS and METHODS

Three experimental lots were cultivated, each lot composed of four parcels on waste dump of an abandoned Cu mining exploitation from S-W of Romania. Each one of the twelve parcels had 10 m<sup>2</sup>. Experimental lots were covered with 5 cm of fertile soil. The studied variants are:

- control parcel
- sterile amended with grinded indigenous volcanic tuff added in the superficial layer in quantity of 0.6 kg tuf/m<sup>2</sup> parcel

- sterile amended with Tuf Aln pillared volcanic tuff homogeneous added as aqueous suspension dosed in quantity of 0.6 kg/m<sup>2</sup>. parcel

Parcel were sowed with a 4 plant mixture: *Festuca arundinacea*, *Lotus corniculatus*, *Medicago sativa* and *Trifolium arvense*. Sowing was done in the spring of 2007.

Chemical analyzes regarding the quantity of metals in different parts of the plant were done according to the current standards. For metal analysis a Varian Spectra AAS atomic absorption spectrophotometer was used.

## RESULTS AND DISCUSSIONS

In table 1 is presented the situation of sprung and developed plants in a period of 2 month after sowing. Adding pillared volcanic tuff cause good germination and development of plants in the first vegetation period

Table 1. Situation of sowing plants culture on experimental parcels of sterile covered with 5 cm of soil.

Experimental parcel	Plant specie	Germination level	Drought resistance
Control	<i>Trifolium dubium</i>	Medium	Very low
	<i>Festuca arundinacea</i>	Very good	High
	<i>Lotus caniculatis</i>	Very good	High
	<i>Medicago sativa</i>	Very good	Very low
Sterile amended with grinded indigenous volcanic tuff 0,6 kg/m <sup>2</sup>	<i>Trifolium dubium</i>	Very good	Very high
	<i>Festuca arundinacea</i>	Good	Very high
	<i>Lotus caniculatis</i>	Very good	Very high
	<i>Medicago sativa</i>	Absence	Sear culture
Sterile amended with pillared indigenous aqueous suspension, volcanic tuff 0,6 kg/m <sup>2</sup>	<i>Trifolium dubium</i>	Very good	High
	<i>Festuca arundinacea</i>	Very good	high
	<i>Lotus caniculatis</i>	Very good	Very high
	<i>Medicago sativa</i>	Medium to good	High

In table 2 are presented plant species that cover the experimental parcels after a year from sowing.

Table.2. Biometric values of plants in the second year of culture on parcels covered with 5 cm fertile soil

Parcel	Cultivated plant species	Weed species	Covering level		
			Root cm	Aerial part	Aspect of root
Control	<i>Festuca sp.</i>	-	14	42	Very brushy
	<i>Lotus caniculatus</i>	-	15	10	Branched
		<i>Salvia sp.</i>	23	22	Brushy
		<i>Capsulla bursa-pastoris</i>	16	18	Less spread and branched
		<i>Filipendula Sp</i>	10	18	Branched and spread
		<i>Sinapis arvensis</i>	10	32	Branched and spread
Sterile amended with grinded indigenous volcanic tuff 0,6 kg/m <sup>2</sup>	<i>Festuca sp.</i>	-	18	38	Very brushy
	<i>Lotus corniculatus</i>	-	10	10	Very spread with thin wires
		<i>Medicago lupulina</i>	13	14	Brushy and branched
		<i>Salvia pratensis</i>	8	38	Brushy and branched
		<i>Filipendulas sp</i>	39	16	Very branched
		<i>Sinapis sp.</i>	7	32	Very thin
		<i>Valesiaca Sp</i>	12	25	Very dense
Sterile amended with pillared indigenous volcanic tuff aqueous suspension, 0,6 kg/m <sup>2</sup>	<i>Festuca sp.</i>	-	20-	45-	Very brushy
	<i>Lotus caniculatus</i>	-	21	17	Very spread with thin wires
		<i>Salvia pratensis</i>	14	35	Very brushy with thin wires
		<i>Filipendulas Sp</i>	9	9	Brushy with thin wires
		<i>Sinapsis arvensis</i>	10	39	Very branched with very thin wires
		<i>Rucoina Sp</i>	20	50	Branched, very brushy with thin wires

*Festuca sp.*, *Medicago sp.*, *Lotus sp.* and *Trifolium sp.* Present soil improvement capacities. *Festuca Sp.* Have a high potential of growing and regeneration and through his high capacity of maintaining green assure a high degree of enveloping of Cu, Zn, Fe, Mn polluted mining area. *Medicago sp.* through it strong radicular system fix the fertile layer that cover the waste dump and *Lotus sp.* and *Trifolium sp.* are species recognized through their well development on degraded soils.

It is noticed that some of the species introduces through sowing was replaced during a year by weeds. From the sowed species has resisted *Festuca sp.* and *Lotus sp.* *Festuca sp.* develop a terrestrial part till 38-45 cm and brushy roots, and *Lotus sp.* develop a lower terrestrial part of 10-21 cm and a root very spread with thin wires. Invading weed species remark through their well fixation, have roots that in some cases reach 20-39 cm and are well branched. Through root length the plants realized the fixation of soil layer on sandy sterile. The invading species have the best resemblance thru *Salvia pratensis* and *Sinapis avensis* followed by *Filipendulas Sp.* But, on all the lots appear sporadic species like *Capssulas Sp.*, *Valesiaca Sp.*, *Rucoina Sp.* terrestrial parts of plants was in domain of 14-42 cm high on blank lot and lot treated with volcanic tuff and higher to 40-45 cm on sterile treated with pillared tuff. The installed cultures get to assure land cover in proportion of 70%.

## CONCLUSIONS

- The plants sowed on lots of sterile form together with the indigenous invasive weeds, a vegetal layer with a coverage percentage of 70%.
- The species sowed that resist to harsh conditions are: *Festuca sp.* and *Lotus sp.* Adding pillared volcanic tuff determined better development conditions to sowed plants and also for the invading weeds. Invading plants are better developed then the one introduced by human. Tuf - Al<sub>n</sub> adding allowed the covering with a vegetal layer of well grown plants of over 35 cm high and with a well developed radicular system.

## LIST OF REFERENCES

- [1] E. Pilon – Smits, Phytoremediation, Annu. Rev. Plant. Biol., 2005, 56, p 15 – 39
- [2] M. M. Lasat, Phytoextraction of toxic Metals: A Review of Biological Mecanism, J. Environ. Qual. 31, 2002, p. 109 – 120.
- [3] xxx Environment Practice Specifications Construction : For Construction Site ,Infrastructure Upgrade and Maintenance Works,Integrated Environmental management Series, Ed3, 2005, Published by Department of Water Affairs and Forest, Pretoria, Republic of South Africa, p. 39-45
- [4] P.J.Leggo, B.Ledesert, G. Christie, The role of clinoptilolite in organo.zeolitic soil sxstems used for phytoremediation, Science total Environm.2006, 15, p. 1-10