

CONTRIBUTIONS TO THE ECOLOGICAL RECONSTRUCTION OF THE SKI SLOPES IN THE PREDEAL – POIANA BRAȘOV AREA (BRAȘOV COUNTY)

CONTRIBUȚII LA RECONSTRUCȚIA ECOLOGICĂ A PÂRȚIILOR DE SCHI DIN ZONA PREDEAL – POIANA BRAȘOV (JUDEȚUL BRAȘOV)

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Abstract: The problem of sowing of ski slope in Romanian Carpathians is more recent compared to the countries from the Alps, where exists a long tradition of one century. In this paper is presented the experience of the author over thirty years referring to sowing of ski slopes. For reseeding of ski slopes in this area the best results during the last five years have been obtained with the mixture consisted by 100-150 kg grass and legumes perennial seeds, 50-100 kg grains and 500 kg/ha chemical fertilizers of NPK(15-15-15).

Rezumat: Problematika înierbării pârtiilor de schi din Carpații românești este de dată recentă în comparație cu țările din zona Alpilor, unde există o lungă tradiție de mai bine de un secol. În această lucrare este prezentată experiența autorului pe o perioadă de trei decenii privind înierbarea pârtiilor de schi. Pentru refacerea pârtiilor de schi rezultatele cele mai eficiente din ultimii cinci ani au fost obținute prin aplicarea unui amestec de 100-150 kg de semințe de graminee și leguminoase perene, 50-100 kg cereale și 500 kg/ha de îngrășăminte chimice complexe NPK(15-15-15).

Key words: ski slopes, sowing, chemical fertilizers, botanical composition

Cuvinte cheie: pârtii de schi, înierbare, fertilizare chimică, compoziție botanică

INTRODUCTION

Ski slopes sowing represents a major action for avoiding soil erosion and slopes consolidation, after all the necessary specific construction for the ski slope are finished, with respect to terrain modulation, establishment of a fertile soil strata, elimination of high humidity levels by drainage, culverts for conducting slope flows, consolidation work for dykes etc.

Sowing working in these conditions is very difficult especially if the substrata where the grass cover is inert without any “ natural fertilization “, can become acid or alkaline, is situated to high altitudes with draughts , where the rainfalls can wash and erode the fertile substrata (the germinal bad) , conditions very difficult to establish in isolated areas and in other unforeseeable situations. This is the reason why sowing activities can be done only after a minimum strata is already deposited, 5-15 (20) cm, extracted from areas outside the ski slope, and arranged due different type materials: geogrilles, geotexture, cereals straws or others having the aim to fix the fertile strata with respect to not being undertaken along with the weeds seeds by surface waters, extremely active.

The first guiding studies concerning the sowing activities with special destination as the setting up and entertainment of turf , were described for the first time in the scientific paper of the specialist in grass breeding, E. KELLNER (1974).

In our country, also the first questions concerning the ski slopes sowing were born in 1970 to Poiana Brașov area, with this occasion the author of this article beginning the first experiments

on vegetal recipients and plots on different altitudes ski slopes.

In the last 5 years, as a result of continual development of ski activities from the Predeal - Poiana Braşov area, these actions have been intensified, the RENATUROPA Association having at present its own practical experience in slopes sowing that we would like to present further.

MATERIALS AND METHODS

The first experiments were done in different vegetation associations in 1970 with remained material after modulation with bulldozer raise and fertile strata for the future slopes Kanzel, Sulinar, Ruia, Drumul Roşu, Bradu, Sub Teleferic from Poiana Braşov, around 10 ha on an altitude range about 800 m (1000-1800 m) in Postăvarul Mountains. There were tried different species sets of perennial graminaceae and legumes and fertilizers concentration.

After obtaining the first results in vegetation we have moved to the next experimental field level, when were installed plots in five places Sub Teleferic and on Kanzel slope respecting the following variants:

- a – with or without fertile soil substrata (10 cm)
- b – with or without straws fixed with hot bitumen
- c – 100 kg/ ha and 200 kg/ha mixture of perennial graminaceae and legumes (*Festuca rubra* 35%, *Festuca pratensis* 20%, *Lolium perenne* 15%, *Phleum pratense* 10%, *Poa pratensis* 10% and *Trifolium repens* 10%)

Regarding these variants elaboration, we were helped by Jean CATTELIN, technical director of Couchevel-Albertville research station from the Alps, who started the fitting out and entertainment of ski slopes from France , from 1955, meaning with 15 years before us ; also, we were helped by the regretted Gelu GOLOGAN, architect and designer, a pioneer in ski slopes constructions from our country.

The following experiments were set up to Predeal city, on the “ Cock “ slope around 1300 m altitude with three repetitions with the further variants :

- A. Fertilized level NPK
 - 1. Without (control)
 - 2. N₇₅P₇₅K₇₅
 - 3. N₁₅₀P₁₅₀K₁₅₀
- B. Seeds norm
 - 1. Without (control)
 - 2. 125 kg/ha (75 herbs + 50 cereals)
 - 3. 250 kg/ha (150 herbs + 100 cereals)

It was utilized the following perennial herbs mixture: *Festuca pratensis* 10%, *Phleum pratense* 10%, *Lolium perenne* 10%, *Lolium multiflorum* 10%, *Festuca rubra* 10%, *Festuca gigantea* 10%, *Phalaris arundinacea* 10%, *Agrostis stolonifera* 10%, *Lotus corniculatus* 5%, *Trifolium pratense* 5%, *Trifolium repens* 5% and *Melilotus albus* 5%.

The cereals introduction was made aiming a more rapidly fixation of soil particles, until herbs installation, process realized much slower.

RESULTS AND DISCUSSIONS

From the first experiments realized on vegetation associations and ski slopes on Poiana Braşov were revealed the necessity of utilization of a fertile strata, of a perennial herbs mixture in

quantities of 100-200 kg/ha and fixation of a straws strata with hot bitumen to protect the terrain until is stabilized.

On a much more crumbly substrata reach in limestone with a material reaction (conglomerates , sandstone, marls) close to neutrality, sowing is realized good enough and without fixation of a supplementary grass cover with the condition of utilization of bigger concentrations of chemical fertilizers, at least 120-150 kg/ ha nitrate and medium concentration of PK.

This sowing method was utilized successfully on the ski slopes from Poiana Braşov area.

A recently experience on Clăbucet-Predeal area revealed the fact that herbs mixture was influenced by fertilization applied concentrations and seeds norm (Table 1).

Table 1

Floristic composition of herbs mixture correlated with agriculture environment and seeds norm in the sowing second year (%) Predeal, Braşov County, 2002

Fertilisation	N ₀ P ₀ K ₀			N ₇₅ P ₇₅ K ₇₅			N ₁₅₀ P ₁₅₀ K ₁₅₀		
	0	125	250	0	125	250	0	125	250
Seeds(kg)									
Land cover	30	100	100	50	100	100	65	100	100
Poaceae	22	43	33	41	55	60	45	43	62
<i>Festuca pratensis</i>	5	10	8	6	10	15	13	7	12
<i>Phleum pratense</i>	12	8	5	22	15	18	7	10	8
<i>Lolium perenne</i>	+	5	+	5	+	1	2	1	5
<i>Lolium multiflorum</i>	1	10	8	2	13	15	8	15	22
<i>Festuca rubra</i>	-	+	+	+	+	+	+	+	+
<i>Festuca gigantea</i>	-	+	+	1	+	1	+	2	+
<i>Phalaris arundinacea</i>	2	10	12	4	17	10	15	8	15
<i>Agrostis stolonifera</i>	2	+	+	1	-	+	+	+	+
Fabaceae	6	57	67	9	44	40	18	57	38
<i>Lotus corniculatus</i>	2	17	23	2	12	32	8	18	13
<i>Trifolium pratense</i>	1	10	32	+	22	17	2	20	25
<i>Trifolium repens</i>	3	17	15	7	5	10	8	17	10
<i>Melilotus albus</i>	-	3	7	-	5	1	+	1	+
Other families	2	+	+	+	1	+	2	+	+

The “not-sowed” variants due superficial washing of seeds from the neighbour sowed terrain were partially covered by vegetation in a proportion of 30-65%.

In rest, all the sowed variants and chemical fertilized in the second year were completely covered by vegetation.

It is important to underline the participation above the average of the species *Phleum pratense*, *Festuca pratensis*, *Lolium multiflorum* and *Phalaris arundinacea* from the perennial graminaceae and from perennial legumes: *Lotus corniculatus*, *Trifolium pratense* and *Trifolium repens*, the substrata being rich in limestone, with a water pH of 7.4 characteristic to the Sinaia marls.

Due the chemical fertilizers use on the ski slopes soil substrata, after a period of four years, appeared some modifications on a depth in a range between 0-15 cm (Table 2).

Table 2

Agrochemical modifications of soil on a depth range between 0-15 cm in ski slope substrata correlated with the chemical fertilizer use Predeal, 2005

Specification	MU	N ₀ P ₀ K ₀	N ₇₅ P ₇₅ K ₇₅	N ₁₅₀ P ₁₅₀ K ₁₅₀
Water pH	ind	7.4	7.3	7.2
Ca CO ₃	%	2.5	2.2	2.1
Humus	%	2.68	2.74	3.13
P-Al	ppm	2.5	5.0	9.1
K-Al	ppm	86	94	106

The soil suffers a slight decrease on the pH, from 7.4 to 7.2 due higher doses of chemical fertilizers NPK, about 150 kg/ ha active substances for each one. Obviously, by increasing chemical fertilizers doses, it has increased also the soil content of fertilizing elements in substrata. But, after a period of four years, the content of fertilizing elements is found to bellow level, being necessary the long-term continuity in fertilizing until the grass carpet is completely installed and the soil substrata is formed. The results of these experiments were applied on a surface of 10 ha ski slopes from Poiana Braşov and 25 ha in Predeal-Braşov, with extend possibilities in other mountain resorts such are: Azuga, Buşteni, and Sinaia (Prahova), Baia Sprie, Cavnic, and Borşa (Maramureş), Negreşti-Oaş (Satu Mare), Vatra Dorne (Suceava), Arieşeni (Alba), Deda (Mureş), Văliug (Caraş-Severin) and in many other areas.

PRELIMINARY CONCLUSIONS

1. Ski slope sowing is a special problem that needs applicable suitable techniques and methods for extreme substrata conditions and high altitude climate.
2. Utilization of complex mixture formed by 100-150 kg perennial herbs, 50-100 kg cereals and 500 kg chemical fertilizers complexes (15-15-15) NPK is assuring the success of sowing on cracky substrata, reach in limestone, as those from Predeal and Poiana Braşov area.
3. The continuity of experiments is necessary especially for seeds quantities reductions that are more expensive and of mechanical methods of sowing like those of water sowing.

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