THE EFFECT OF PHYTOTECHNIC TREATMENT ON ESTABLISHMENT AND SURVIVAL OF DIFFERENT GRASS SPECIES AND CULTIVARS AT A LIMESTONE QUARRY

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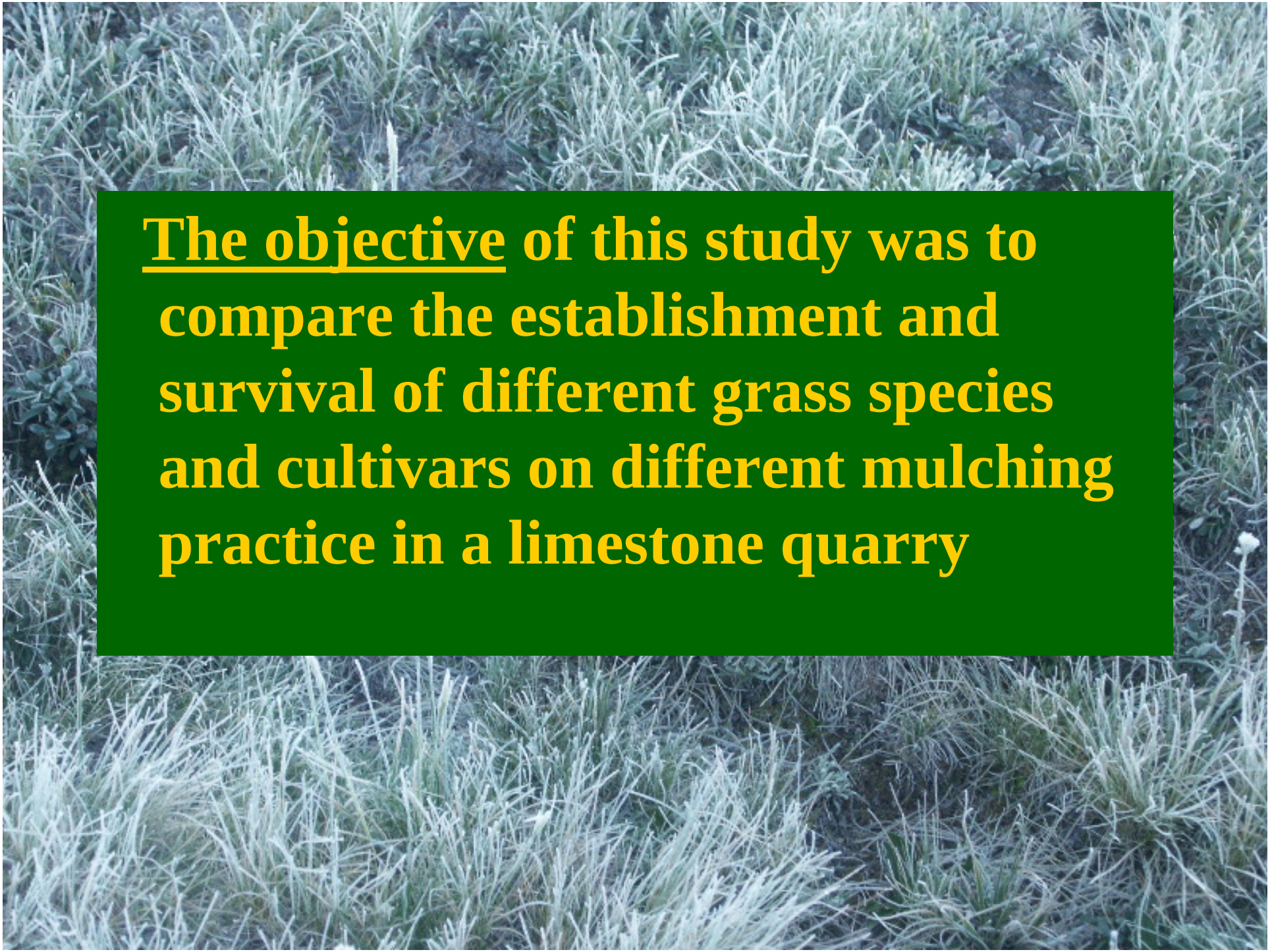
The main problems of revegetation in limestone quarries

- Natural colonization is slow especially in Mediterranean area.
- Seeding is a difficult process because of the poor physical and chemical quality and the low biological activity of the soil.
- Mulching practice is necessary in order to create a proper seedbed for seed germination.

The advantages of grass species

- Protect the soil from erosion and reduce the high temperatures that developed in such sites.
- Survive in highly stressfull environments because of their ability to develop physiological and morphological adaptation mechanisms to environmental factors.


The objective of this study was to compare the establishment and survival of different grass species and cultivars on different mulching practice in a limestone quarry

Study area

- **Location: The quarry of cement factory "TITAN", Thessaloniki, North Greece.**
- **Climate: Mediterranean semiarid with cold winters.**
- **Natural vegetation: Shrubs of *Quercus coccifera* and herbacious species of Poaceae.**

The experiment

- Approximately 10 cm local topsoil was applied
- 30 g seed for each plant species was sown in a plot area of 1 m^2
- The experimental plots were arranged in a completely randomized design with three replications

The phytotechnic treatments

- **Bare soil, without any additive (BS)**
- **Powder of bentonite 20 g/m^2 (BE)**
- **Powder of bentonite and lay of straw (BE-S)**
- **Lay of straw saturated with water-soluble asphalt emulsion (AS-S)**


The grass species:
Agropyron cristatum
Agropyron desertorum
Lolium perenne


Festuca arundinacea
Phalaris aquatica

Dactylis glomerata

1. Palestina
2. Perouvia
3. Chrysopigi

Measurements

- Germination rate (%).
- Plant density (number of plants per square meter) from March to July.
- Vegetation cover (%) at the end of the growing season.
- The percentage of survival = (1-b/c)X100

  b=the number of plant that establish at the beginning of the growing season.

  c= the number of plant that survived at the end of the growing season.

Germination rate (%)

Species	Treatments				Mean
	BS	BE	BE-S	AS-S	
Agropyron cristatum	12.7	15.5	25.7	25.1	**19.7**
Agropyron desertorum	2.7	2.5	6.9	5.6	**4.4**
Lolium perenne	24.6	27.6	42.3	22.1	**29.2**
Festuca arundinacea	2.8	4	9.4	4.7	**5.2**
Phalaris aquatica	9.2	13.1	32.0	20.1	**18.6**
Dactylis glomerata var. palestina	11.1	6.9	25.7	17.3	**15.2**
Dactylis glomerata var. perouvia		6.9	17.3	36	**20.1**
Dactylis glomerata var. chrysopigi	7.1	8.3	17.1	16.4	**12.2**
Mean	**10.0**	**10.6**	**18.4**	**22.0**	

Density (number of plants/m^2)

Species	Treatments				Mean
	BS	BE	BE-S	AS-S	
Agropyron cristatum	3437	3477	5292	4466	**4168**
Agropyron desertorum	602	766	1446	1163	**994**
Lolium perenne	10234	15506	12447	12026	**12553**
Festuca arundinacea	1679	1277	4501	4252	**2927**
Phalaris aquatica	7026	9883	12197	11860	**10242**
Dactylis glomerata var. palestina	9182	8452	13087	12767	**10872**
Dactylis glomerata var. perouvia		3690	12418	13455	**9854**
Dactylis glomerata var. chrysopigi	5616	5914	10764	10962	**8314**
Mean	**5396**	**6121**	**9019**	**8869**	

Vegetation cover (%) at the end of the growing season

Species	Treatments				Mean
	BS	BE	BE-S	AS-S	
Agropyron cristatum	10	15	4	28	**14**
Agropyron desertorum	17	0	30	43	**23**
Lolium perenne	20	25	30	25	**25**
Festuca arundinacea	15	20	20	19	**19**
Phalaris aquatica	0	10	6	6	**6**
Dactylis glomerata var. palestina	30	40	40	42	**38**
Dactylis glomerata var. perouvia		30	27	27	**21**
Dactylis glomerata var. chrysopigi	20	44	23	42	**32**
Mean	**14**	**23**	**23**	**29**	

Survival (%) at the end of the growing season

Species	Treatments				Mean
	BS	BE	BE-S	AS-S	
Agropyron cristatum	1.7	2.5	2.5	2.0	**2.2**
Agropyron desertorum	1.5	5.1	4.0	4.3	**3.7**
Lolium perenne	1.3	2.1	1.5	2.1	**1.7**
Festuca arundinacea	1.7	1.4	2.8	3.4	**2.3**
Phalaris aquatica	0,5	1.9	0.6	1.2	**1.0**
Dactylis glomerata var. palestina	1.7	3.8	2.0	1.9	**2.4**
Dactylis glomerata var. perouvia		0.9	0.5	0.4	**0.6**
Dactylis glomerata var. chrysopigi	1.6	4.3	2.5	2.4	**2.7**
Mean	**1.4**	**2.7**	**2.1**	**2.2**	

Conclusions

- **Mulching with AS-S and BE-S enhanced the seed germination and the growth of the seedlings. However, the plants survived better on BE than the other treatments.**

- **Despite their poor germination rate and first growth A.de and the cultivars Palestina and Chrysopigi of D.gl had high survival rate at the end of growing season.**

- **The high germination rate and plant density at the beginning of growing season did not favor the plant survival at the end of the growing season, probably because of high competition among them for water and nutrients.**

- **Moreover, the selection of the proper cultivars it seems that is equally or more important than the species selection.**

- **Generally, grass species adaptation in the specific edaphoclimatic conditions of a quarry is positively related with the drought resistance of the species. Thus, the selection of drought resistance species and among them the most drought resistant cultivars it could be an effective practice for the revegetation of such areas.**


THANKYOU