
Carlina


Centaurea

Seedling recruitment of meadow dicots under different management regimes


Succisa


Tragopogon

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PROBLEM:

Management regime affects significantly the survival of the population of plants. The biggest influence on life-cycle is often assigned to stages of seeds and seedlings. In monocarpic and non-clonal perennial plants seedling recruitment is the only way of reproduction. Influence of this stage thus should lead to changes in whole population.

Work is a part of the **TRANSPLANT** project of EU. It is aimed to evaluate processes caused by habitat fragmentation and degradation on spatial scale across Europe and using methods differing from genetic markers and individuals measuring to metapopulation dynamics modelling.

QUESTIONS:

Does management affect recruitment and how this differs between localities and years?

How much is the growth of seedlings influenced by management?

Do these differences generate significant changes in population growth (survival)?

GOALS:

1) compare the natural recruitment between **management regimes** (mowing x no management), **years** and **localities**

2) compare **growth** using demographic parameters (number of leafs e.g..) between management regimes

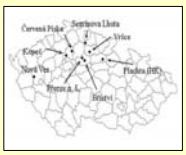
3) put recruitment values in population matrix and evaluate its importance in population 'fitness' (decrease or growth)


Kopeč


Červená Píska


Semínova Lhota


Nová Ves



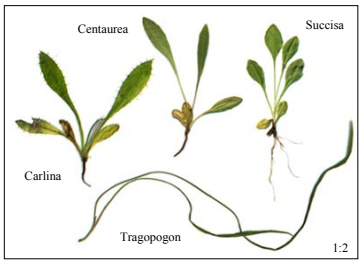

Vršce


Přerov nad Labem


Bříství


Plachta

METHODS:



species: four species of grassland dicots were chosen *Carlina vulgaris, Tragopogon pratensis, Centaurea scabiosa* and *Succisa pratensis*

localities: eight localities were found with 1-2 of selected species present, 2 or 3 per species

seeds: the seeds were collected on native plants and counted

sown cut	control cut
sown	control

sowing: in August seeds were sown in plots joined in blocks, 250 seeds were sown per plot (20 x 20 cm with 10 cm buffer), the grass was cut in height of 5 cm, plots were randomized within their blocks and there were 5 of them at each locality

data collecting:

1) seedlings were counted four times a year (April, May, June, August), in June all plots were thinned as to prevent density dependent mortality (to max. 4 x 7 per plot)

2) seedlings were marked (140 individuals per species and locality) and then measured two times a year (June, August) - these were the length of the longest leaf and the number of leafs (not the cotyledons)

additional data (this will be done in future):

1) the weight of cut biomass in summer and micro-relevés of plots (percentage of base cover of all species) to evaluate competition pressure and microsite limitation

2) the role of pre-dispersal seed predation will be estimated by counting of damaged seeds

demographic data for matrix modelling:

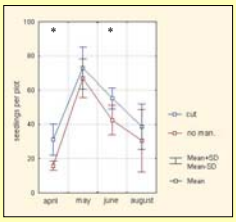
these data were collected in another part of TRANSPLANT project, 150 individuals were marked and they were measured (length of the longest leaf, number of leafs, number of flowering stems) and after merging with recruitment data they were divided in 3 stages

RESULTS:

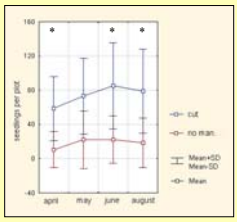
* significant at level α=0,05

management effect

is observable at almost all localities, although in some is not significant, the difference is sharp in fertile meadows and in places with no former management



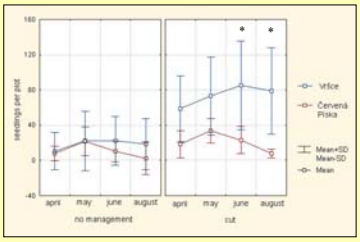
Time course variability of recruitment and survival in Centaurea - locality Kopeč



Time course variability of recruitment and survival in Carlina - locality Vršce

localities differences

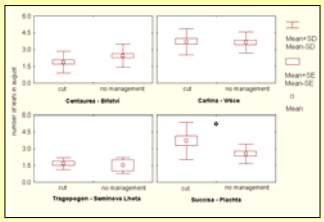
there are significant contrasts caused by many processes, which I'm not able to trace, still they seem to be connected mainly with ratio of grass canopy to moisture availability (the response is species specific), time course patterns for different species on one locality look similar



Differences in time course variation and management response between two localities of Carlina vulgaris

growth parameters

the differences in parameters between the two selected management regimes were small, because the period was too short, still in some species the data showed effects - in cut plots, the seedlings seem to have more leafs (but it's sometimes reversed by extreme drought)

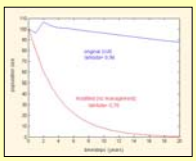


Contrast of number of leafs in cut and not managed plots among four localities

matrix modelling

with only few data available, I tried to compare decline (growth) of populations with seedlings stage from cut and non-managed plots

the output of the analysis didn't show any crucial changes, only in one case - more species should be taken in account



Theoretical model of population decrease (matrix had 3 stages with initial values 60,30 and 10 ind.)

cut
no man.

species	locality	original	modified
Tragopogon	Kopeč	**2.44**	**2.34**
Tragopogon	S. Lhota	**0.9668**	**0.78**
Carlina	Červená Píska	**3.31**	**5.31**
Carlina	Vršce	**4.769**	**9.61**

Lambda (λ) of modeled populations

I tried to write down all processes that affect recruitment and to visualise main observed interactions

locality	species	moisture	cultivation	fertility	recruitment	mortality	response to management
Semínova Lhota	Tragopogon	dry	grazed	medium	low	high	moderate
Přerov	Tragopogon	wet	mown (twice)	high	very high	very high	moderate first, then low
Kopeč	Tragopogon	medium dry	mown	medium	high	moderate	moderate
Kopeč	Centaurea	medium dry	mown	medium	moderate	moderate	moderate
Bříství	Centaurea	very dry	abandoned	low	low	low	low
Červená Píska	Carlina	dry to medium dry	fallow land	high	high	moderate	moderate
Vršce	Carlina	wet (sometimes dry)	abandoned	low	very high	low	high
Vršce	Succisa	wet (sometimes dry)	abandoned	low	high	low	high
Plachta	Succisa	very wet	mown	high	very high	moderate	high
Nová Ves	Succisa	boggy	abandoned	low	low	moderate	low

DISCUSSION:

The results show some significant differences, yet most of the data can't be compared by any means of statistic methods. More valuable would be a multifactorial analysis of all driving processes. But this would need some 20 or more localities and the same number of replications within a locality.

Second problem is connected with using simple counts of seedlings. These will never give you exact view of how high the natalities and mortalities are, because those processes overlap in time. Marking of all seedlings is impossible in this extent of experiment.

Year effect will be evaluated after second year's finished, however I don't believe it will show some consistent result, because too many driving forces change between two years. Still, this will give me a view of how reliable are the one year data.

SUMMARY:

Basically rates of recruitment and growth parameters do differ between years and management regimes but in almost all cases the cause of this contrast is highly speculative.

In almost all cases the cut plots had higher recruitment, what implies that return (or holding) to management would lead to conservation and progress in populations of meadow dicots.

Graphs were processed by Statistica © and Matlab ©, tests were performed using Statistica ©

Thanks to Tomáš Herben for leading my work, Petr Dostál for lot of help, encouragement and data and all others for valuable advice and help