**Czech University of Life Sciences Prague**

**2008**

# The Diploma Thesis

Theme:

# The Effect of grazing and cutting management on sward structure of abandoned broad-leaved dry grassland

**(A Comparative Ecology approach with overall inspired Ideas)**

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*Motto*
Darwin was not right. There is no struggle for the Existence; there is struggle for the Power. The end is that, always the strongest succumb by weaker, because they are the majority, the strongest in his end lost need to be strong and thus perish.

For all and none

# Contents (plot)

*rem tene, verba sequentur*

# Solicitation

I strongly urge you, be aware of the true that the whole is always more than total sum of its composed parts. Please first read to the last page and afterwards propound judgements.

# Abstract

The aim of the work was to observe changes in stand characterized as *Bromion erecti* in regard with applying rotational sheep grazing and one-cut management.

The discourse matter of diploma thesis has buttress in collation and analysis of data from still continuing experiment. Study area located in Mšec (Slánsko district) has origin as tree orchard in past and is exploiting by sheep. Trial running from 2005 has been organized as square cells with 5m side and on them randomly four times applied different management. Variants are extensive grazing (G), one per year cutting (C) and un-managements control (N). It was possible to recognize 63 species of angiosperm class and abundances of each species concerning particular square cell. Data contain *Relevés* from 2005, 2007 respective. The up-to-date results are e.g. statistical significant increased abundance of family *Fabaceae* on (C) sites and override abundance of species *Festuca rupicola* on whole study site. This reality correlated with their life strategy.

One of the purposes was to study ecological relationship. Review on comparative plant ecology, on competition and herbivore is given. The simple example could be our circumscription of established history on treatment *i.e.* the highest abundance of ruderals on grazed sites. Finely the site present species *Brachypodium pinnatum* was discussed.

Some formulated reasons afford applications in philosophy of science and what is of more importance; the originated Ideas penetrate into Life itself.

**Key words:** *Relevés*, Herbivore, Competition, *Brachipodium pinnatum*

# 1 Arrangement

The intellect projects relationship between components, as of them is the concept composed and proposes experiments, which proof, if the Nature with projected relationship "agrees", if is corresponding....

The goal of the work was to observe effect of grazing and cutting management on *Bromion erecti* grassland. The aim of the investigation will be to answer following question: Is there any effect of cutting and grazing on plant species composition of dry grassland?

The manipulative experiment was established in Mšec (Natural Park Džbán, Slánsko). The experiment was arranged in four complete randomized block design with three treatments: cutting management once per year (C), rotational grazing by sheep (G) and unmanaged control (N). Student collected data in each spring and analyse them by appropriate statistical methods.

# 2 Layout

I announce that all I write in this paper I complete by myself with the aid of literature named in the Reference.

I decided to write this in English for “the end” of Men evolution and for the liberty given by richness of this language.

The purpose of this Diploma thesis (DT) was to see the Study itself from different point of view and shed light mainly on plant ecology.

I would like to write about something which interests me as well as the possible another reader which I beg to be *lector benevole,* nevertheless do not treat me with indulgence.

The key bridge stone in my DT is the research site where have and had been collected data for the study the differences between managements applying to the communities. This was the first purpose, the development of this idea fundamentally overcome, however and I hope *faute de mieux*. And I want try to be driven in ongoing trail by *variorum notoe*. Every study so as our have to be ordered by Observe; collate; conjecture; analyse; hypothesise; test; validate; theorise. Repeat until complete.

And also when makes assumptions. The explanation requiring the fewest assumptions is most likely to be correct. So please be aware of appearing abbreviation. K.I.S. (Keep it simple!) And for our salvation, if you consider the short elapsed time used by as, we can just mentioned. Sod’s Law of Experiments: in a 3-year study, the important things are bound to happen in the fourth year. It is also important to find if we are inspecting the sophistic clock machine, or the rust can full of mess. But not dismay with intelligent design.

In sake of seriousness *(reductio ad absurdum)* I would like to throw my data into statistic flow and summarise if different common statements assumed to be true are also applicable to our diminutive site study. If there are some discrepancies shed light on them and discus.

What is not astonishing that there has been much more progress trough speculation, because measurements are always to costly. Pardon me for speculations.

# 3 Introduction

The goal is try to explain and elucidate by, among others, statistical significance hypotheses on this experiment.

The underling Ideas (studied literature) for applied hypothesis are given in 3 discourses: On competition, herbivore and *Brachipodium* in concise form. The hidden continuous reasoning pictured in the subtopic theories. To give little bit of taste I am compel to cite. Competition is considered in terms of its effect on population biomass not individual number. Plants may engage in interference competition (allelopathy) or in indirect way through exploitation competition. (PUTMAN, R.J., 1994). Species composition is determined by "availability" of any species for possible inclusion within a given community depends in the first instance – and perhaps trivially – on biogeography distribution, but thereafter on abiotic properties of the environment. There is study which is worth mentioning. See (CRAWLEY, M. J., BROWN, S. L., 1995) The pasture can be seen from (CRAWLEY, M. J., eds., 1997) point of view as inherently unstable structure which may in practice prove stable *inter alia* because energy flows through system are high enough. Herbivorous animals regulate the abundance of plant populations; may control the functioning of entire ecosystems; this not mean beneficial to plants. Grazing is considered to be depended primarily on above –ground net primary production and the evolutionary history of the grazing site (HUGGETT, R. J, 1995). Inter-relationships between species richness and productivity have been discussed by (WALKER, K.J., et al., 2004) who suggested that sward productivities of 4-6 tone/ha or less are required for high species coexistence. Despite the widespread popular notion that terrestrial food chains are predominantly of the form plant-herbivore-carnivore, an impression which is reinforced by the amount of scientific attention which has been devoted to herbivorous animals (especially grazing mammals), the base of most terrestrial food webs is not living plant tissue and the grazing down of this by herbivores. But is the decomposer food chain; Most energy flows through the detritus and litter –feeding animals. (BARNES, R. S. K., et al., 1991) Invasive or aggressive plant species can have a detrimental impact on the species richness and diversity of a plant community. An example is *Brachypodium pinnatum* P. Beauv., a potentially dominant rhizomatous grass which has long been recognized as a conservation problem, threatening the high species diversity of chalk grassland (BOBBINK, R., WILLEMS, J.H.,1987) What is clearly to date is that many of these species, which are becoming increasingly abundant in the landscape, lack obvious specialization for long-distance dispersal. (GRIME, J.P., HODGSON, J.G., HUNT, R., 1990)

The scientific guild of people demanded more studies which will describe environmental changes in terms of reality. There is sufficient source of data for experiments and observations. Current development shows tendency for uniting and synthesizing at least in still recognizable branches of organization. On the other hand scientific research is becoming specialized more in one particular phenomenon. My aim is to place this Thesis between two streams. However, there is reason to remain in proposed borders. Better to know nothing than many half things; to be fool on own account than be sage on others approval; this is to be scientific. First we focus on the Experiment, which is as repeatable as possible. It is copy of many such recent treatments. The particularity lays in environmental variables.

The results will give more understanding and thus in fact the possibility to have the Power to change observed development with known responsibility.

# 4 Material and methods

## 4. 1 Site description

### 4. 1. 1 Placement

Data collection was carried out near Mšec village (altitude 430 m, annual precipitation: 450 mm, average annual temperature: 7. 5°C), 11 km west of Slaný town. For recent view see Fig 4.1 and for better comprehended view see Fig. 4. 2.

The orchard is placed in dry site with relative little forage yield, on south exposition with relative sloping. The vegetation of the study area was classified as an abandoned dry broad-leafed sward *Bromion erecti.* (MORAVEC, J., et al., 1995, CHYTRÝ, M. 2007). Nomenclature of vascular plant species was taken from (KUBAT, K. et al, 2002). The dominant species were *Brachypodium pinnatum, Festuca rupicula, Arhenatherum elatius* and *Fragaria viridis.*

### 4. 1. 2 History

The first data collection was carried out by landlord M. Slavík in 2005.

For knowing what quality is the foraging plant cover and what is the species composition of this site gave rise to this study. On site parts of extensive sheep grazing field, cutting meadow and “unimproved” land have been established. The founder also introduces the importance long continuing trial for seeing the “Differences”.(SLAVIK, M., 2006)

## 4. 2 Experimental design

For Small scale arrangement of experiment see Fig. 4.3. Note that this was organized as the previous successful template carried e.g. (HEJCMAN M., AUF D., GAISLER J., 2005)

As been said, four complete randomized block design with three treatments have been organized. The site for placement has been chosen in regard of homogenized stand. The plot has downhill orientation with three treatments in horizontal row. Each cell is square with 5m side.

For next discourse the treatments will be called and their abbreviation will be used; Cutting management once per year (C), rotational grazing by sheep (G) and unmanaged control (N).

I collected *Relevés* (MORAVEC, J., et al., 2004) in 2007. Botanical observation collected in 2005 before management was used as baseline data.

First each plot was observed and questioned what we can recognize. Division *Bryophyta* was recognized as whole. The reveal angiosperm species were determined with sufficient aid of these two books (KUBÁT, K. et al*,* 2002, ROTHMALER, W., 2000)

The percentage canopy cover of all vascular species was also estimated each year.

In field we also measure Sward high with reputed tool; a rising plate meter used for example in (HONSOVA, D., et al., 2007)

### 4. 2. 1 Design of design

For comparison of data from my study and previous diploma thesis we should consider the difficulties connected with this purpose. I will reveal some of them in regard of study (CARLSSON, L., et al., 2005). We are trying to rid of the variation irrelevant when evaluating data (systematic inter-observer variation and variation due to phenological changes). In the Mšec it was applying the visual estimation percentage cover which is however more suitable for a one-time mapping of large area. I recommend making step towards sub-plot frequency analysis presence/absence, i.e. recording the frequency of species at various points or smaller sampling units (KENT, M., COKER, P, 1992). SF is more suitable for purposes demanding high accuracy and high precision, such as long-term biodiversity-monitoring when the identification of small changes has high priority. When evaluating time series data, accuracy is much less important than precision (GOTFRYD, A., HANSELL, R. I. C., 1985). Precision i.e. the repeatability of the method; Accuracy i.e. how well the method describes 'reality'.

I collected data in 5$^{th}$ and 16$^{th}$ May for plots number 1, 2 and the rest respectively. I do not find the exact date in 2005. However I am not so pedant and rely on exact date from 2005 for making comparable analyses. The reason for non-depend date observation might be that though June, July and August are all summer-months and the vegetation is growing substantially, the changes in species composition are relatively small.

The less unexplained variation there is – the better the method, since known sources of variation are more easily dealt with. For example, even if the systematic inter-observer differences would be unknown in a specific study, knowing the general magnitude of variation normally attributed to this source will assist when evaluating the data. Finally, it is important to consider the potential sources for the remaining unexplained variation. Residual variation should be attributed to interactions between these terms (all variable), and probably most important, to non-systematic differences between and within observers.

Beside the incorrect identification which happened in previous collecting data in 2005, we should see the problem in the estimation the cover concerned those species that were either small, had a high abundance or were winding plants. The species with high abundance are likely to contribute most to the variation simply by their large cover estimates, allowing for numerically larger discrepancies between observers. What we can hardly speak about is not finding the particular species in 2005 (if this species occur that time) e.g. *Pimpinella saxifraga*. And I am convinced about mistaken *Centaurea* for *Scabiosa* .

There were more difficulties.

### 4. 3 Data analysis

Redundancy analysis (RDA) in CANOCO package (BRAAK, C. J. F, ŠMILAUER, P., 1998) was used to analyse the data. The RDA was used because data sets were sufficiently homogenous and enviromental variables and co- variables, *e.g* treatments and blocks were in form of categorical predictors (LEPŠ, J.,ŠIMLAUMER, P., 2003). Further, a Monte Carlo permutation test with 999 permutations was used to reveal if the tested explanatory variables (environmental variables in CANOCO terminology) had a significant effect on the plant species composition. Results of the multivariate analysis were visualized in the form of bi – plot ordination diagram created with CanoDraw© software. The data form included repeated observations with the baseline (measurements performed before plotting management i.e. in 2005). Four hypotheses were proposed and tested. a1: Is there a succession trend in species composition? a2: Is there a difference in development between treatments? a3: Is there a difference between treatments in 2005? and a4: Is there a difference between treatments in 2007?

The sward high data from 2007 were analysed in ANOVA. To the Graminoids and particular plant families we paid attention and analyse their trend in abundance on site shown by contingency graphs.

# 5 Results

In 2005 and 2007 in Relevés 63 vascular plant species were identified within the study area.

## 5. 1 The results of RDA

The statistical multidimensional space "Zepelin"(Růžička in litt.) ; where each dimension is gradient of the variable; rotate and is cut into plate and topologically view on 2D where is the higher gradient (axis x). On graphs; the arrows show increasing positive correlation, where the interior angle between two examine phenomena is going more acute; in opposite direction more obtuse angle; more significant negative correlation.

The number from Tab. 5.1 of first axis says that we can see gradient which has direction on x axis and reveal particular percent of variability. The arrow of each species is the increasing abundance. The arrow of treatment is the increasing pureness of our treatment's site concept.

If we bear in mind these properties of CONOCO graphs we can easily read and propose statements, despite the probability is $P < 0.005$, it is always more important supervise the quality of input data.

The treatments explained 43.3 % variability of plant cover data (RDA; $F$-value = 4.3; $P$ = 0.001). For all four hypotheses results see Tab. 5. 1.

The ordination diagram (Fig. 5.1) displays the succession trend in species composition (a1 hypothesis). This is the only one analysis having proposed probability less than 0. 005. On this background we suppose that the year has the strongest influence on species composition. The grazing site does not reveal itself regarding changing abundance or composition change. Contrary to received opinion *Brachipodium pinnatum* appears to be in harmony with cutting management plus further not agrees with abandonment of site (N-management).

The graph (Fig. 5.2) lead as judging the difference in development between treatments, where the year influence is suppress, to very conclusion (probability value just 0.075). There is something worth mentioning i.e. the right angle (non influence) of N management with *Brachipodium pinnatum* and that site need to be further observer if changes in human controlled management are in true that *deus ex machina*.

On (Fig. 5. 3) difference between treatments in 2005 are supposed to be better result when less self apparent. However the statistical values Tab. (5. 1) speaks to us through clouds full of nebula. When was the treatment established, in that time there were already some differences which contribute to non-possibility statistical significant proving in 2007.

Depicted (Fig. 5. 4.) show as difference between treatments in 2007 the statistical values (Tab.5.1) of such further disputation is again not so convincing.

Arrow incarnating *Brachipodium pinnatum* on (Fig. 5.3) in 2005 is pointing middle between grazing (G) and control (N) (in 2005 is whole study site without any management), dialectically on

(Fig. 5. 4.) in 2007 is between control (N) and cutting (C); closer the later quoted management . We conclude zero statement i.e. the whole starting hypothesis is not right however we are coerce to some statement.

### 5. 2 The ANOVA results

The results of ANOVAs analysis concerning sward high are shown in graph (Fig. 5. 5). The treatments explained 43.64 % variability of sward high ( $F$-value = 8.946 ; $P$ = 0.007) Notwithstanding, the non-sufficient proposed probability. We can at least make distinction in sward high on grazed site. Also see Fig. 7. 11. and appropriate comment.
On graph Fig. 5. 6. the decline of the Graminoids due grazing and cutting plot is shown.
The graph Fig. 5. 7. show the results from examination of the Family Fabaceae, due the small overall cover there is no clear trend.

# 6 Discussions

## 6. 1 Overall view on competition (Fig. 6. 1.)

### 6. 1. 1 How we grasp and encounter this word in plant science? (Modelling)

Competition is considered in terms of its effect on population biomass not individual number. Plants may engage in interference competition (allelopathy) or in indirect way through exploitation competition. (PUTMAN, R.J., 1994)
For coexisting of potential competitors we consider those situations (i) resources are superabundant and thus actual competitive interaction absent (ii) conditions for both species are suboptimal and thus both are more strongly influenced by intraspecific competition than by interspecific interaction or more generally where (iii)the different species are competing simultaneously for a number of independent resources and differ in which particular resource most powerfully limits their population growth thus- intraspecific stronger than interspecific competition. (CRAWLEY, M. J., eds., 1997)
Another known model proposes that where the gaps needed for recruitment arise unpredictably through time and space and are filled on a “first come first served” basic from a pool of potential propagules of all species, the first colonist to locate the vacancy will able to hold the resource against later arrivals. Since it is genuine lottery as to which species arrives first in any “gap”, no one species consistently wins, and potential competitors may coexist within the community.
Evidence adduced in support of some major role of competition in influencing community structure is based on (i) observations of regularly repeated patterns of co-occurrence of particular species sets

of low average overlap in resource use or on (ii) observed differences in resource use patterns of a single species in different contexts (niche shift).
There is close alignment with competitive mutualism and diffuse competition - two are fighting third is smiling viz. recommended sowing *Rhinanthus* as parasite of grasses.
False interpretation called "apparent competition" – if an (unconsidered) shared predator not present the two species do not compete. In my study site we can find species which have significant higher abundance when not grazed but cut or with no treatment are supposed to fit this criterion. However for small number of data, there is not sufficient significant correlation.
However predation and competition is destabilizing and disrupting effect in combination stabilized community.(PUTMAN, R.J., 1994) More complex communities tend to be able to develop under conditions of greater environmental constancy which is a very difficult question for me what is more constancy.
In effect a single generalist becomes more efficient at exploiting the mixed resource than either specialist are so close that their independent resource use curves overlap within two standard deviations of their individual optima. This point, where a single generalist may then exploit the double niche more effectively than either specialist, might be considered the point beyond which niche overlap between adjacent species along any resource axis. I am asking which two specialist species are replacement for one generalist. I find *Brachipodium* as generalist.

Increased species number is accompanied by decreased niche overlap. Are species which added have just occurred only on one plot thus has narrower niche or is this species which increase species diversity? I have attempt to evaluate this but concluded to leave it, too complicate and without significant statistical proof.
Species composition is determined by "availability" of any species for possible inclusion within a given community depends in the first instance – and perhaps trivially – on biogeography distribution, but thereafter on abiotic properties of the environment. There is study which is worth mentioning. See (CRAWLEY, M. J., BROWN, S. L., 1995)
Some pairs of species never coexist, either by themselves or as part of large combination. However, some pairs of species that form an unstable combination by themselves may form part of a stable larger combination; conversely some combinations are themselves unstable. We can find combinations which are repeated through plots i.e. pairs of species and their abundance. Permissible combinations resist invaders that would transform them into forbidden combinations. If there is this particular species and has such abundance. Thus species never coexist. We can follow *Brachipodium* in study species richness.

Nevertheless, because we are unable to infer anything about competition past and its possible role in community assembly processes from present-day distributional data, we always ricochet to *fait accompli,* notwithstanding aid of CANOCO.
Observation suggest there may be some pattern of convergence , despite the influence of invasion history (two clear end-communities, despite the wide range of experimental treatments) and that indeed there may be unique end – community invulnerable to invasion and resistant to further change.(PUTMAN, R.J., 1994)
It was also showed that coexistence of strong competitors might be facilitated by periodic fluctuations in conditions, resulting in regular reversal of the community's dynamics, preventing such interaction from ever running its full course to extinction. Indeed it can be shown that intermediate levels of diversity within communities provided the perturbations are neither so severe nor so frequent that they actually destroy the community, the continual disruption of predatory or competitive interactions permits the coexistence within the community of powerful antagonists; Classic example from which we calculate the herbivory impact.
Many analyses of the changes in species composition and relative abundance suggested that the system was more powerfully affected by stochastic variation in abiotic factors affecting each species population in isolation – than by biotic interactions between guild members. Why so many non-significant correlations?

For next lines I want shed light on the difference in the level of primary production.
Species richness depends on form of the increase in productivity. Increase in diversity or species richness might be accompanied only by increase in the abundance of all resource. Increase in production within one small part only of total resource spectrum might lead to decrease in diversity because the community would then become dominated by those species superior at exploiting that particular range of resources-problem of *Brachipodium* again.
Encounter circular argument: An increase in species richness may itself produce an increase in structural complexity, as species provide habitats for others or (in plant community more likely) produce diversity in micro-environmental pattern.

In our *Bromion erecti* I expect for high diversity this statement.
Low-productivity sites may limit the abundances of all populations to levels at which they do not strongly interact.
What is repeated after asking more ourselves?
Are communities filled to capacity, or may the development of diversity be arrested before communities become saturated; Suggestion that such systems in general appear very rarely to be saturated. Again comes to my mind seed limitation.

More severe natural environment support lower diversity because they are usually relatively small in extent thus has lower chance of colonization.

If I comment any results I doubt these succeeding statements.
Pay attention to uncritical acceptance of a general axiom that diversity begets stability. Is stability the result of the observed diversity, or is the diversity a consequence of the inherent stability?
Note the tendency for model communities to become less dynamically stable with increase number rather than more stable; analyses suggested that increasing species number or connections within randomly assembled webs decreased the stability of constituent species population.(PUTMAN, R.J., 1994)

The author also proposes and I can only regard; we have to distinguished more clearly between the two separate components of complexity “species richness and diversity of interactions. Community resilience is in fact better regarded as a function of the diversity of energy exchange pathways within the community rather than simple species number; the two are not necessarily connected in any direct way, for the link between the diversity of energy exchange routes and species richness will depend on the types of organism involved and to what degree they are specialist or generalist.
After diving to studies which are closely connected e.g. (PAVLU, V., 2005); there emerged questions.
What is lying behind all study with grazing cessation? What is the riding power?
In the begging just refer to statements such; Increased complexity is not associated with any necessary decrease in stability.
This we can track in models with strongly donor controlled dynamics or where is strong self regulation of component populations or elements of spatial or temporal heterogeneity, i.e. any factor which admits an element of asynchrony in population dynamics.
Average return time to equilibrium after disturbance may be less in systems of higher interactions. (PUTMAN, R.J., 1994)
Subunits within the community matrix structuring competitive interactions have been clearly identified in recognized guilds. Although the question of whether they, too, reflect structural discontinuities in the distribution of resources or a more ‘active’ functional construct is equally debated. Are Relevés on one treatment Subunits?
Species abundance distributions strongly reflected the level of environmental disturbance, while species richness appears a direct function of the severity, constancy and predictability of the physical environment. (PUTMAN, R.J., 1994) For next collation in Msec when sufficient data will be obtained, it would be interesting to appraise this proposition.

### 6. 1. 2 From abstract reasoning to more empirical

As was wrought out in particular studies; we will be consequently cognizant of exact numbers and have thus firmament for further discussion.

Inter-relationships between species richness and productivity have been discussed by (WALKER, K.J., et al., 2004) who suggested that sward productivities of 4-6 tone/ha or less are required for high species coexistence. On formerly improved swards, the reduction of soil nutrients through the removal of hay is also likely to

take many years.(BERENDESE,F., 1992) estimated that only 1% of total P and exchangeable potassium (K) and 2.5%of total N in the nutrient pool were removed annually by this method, although even these low levels were considerably greater than overtake by grazing animals alone.

For example, it has been estimated that it would take 70 - 90 years for fertilized plots in the Park Grass Experiment at Rothamsted, England, to revert to *Cynosurus cristatus & Centaurea nigra* grassland (DODD, M. E. et al., 1998). A number of meadows which had been cultivated and reseeded, the development of a typical sward took over a century to develop despite high initial rates of colonization from adjacent species-rich pastures (GIBSON, C. W. D. & BROWN, V. K., 1991)

Cutting and removal of a hay-crop with aftermath (and sometimes spring) grazing has generally been more successful than either cutting or grazing alone. See (BOBBINK, R., WILLEMS, J.H., 1987). Such management has been shown to accelerate reductions in residual soil fertility as well as optimise conditions for the colonisation and establishment of target species. As been showed that, the disturbance caused by aftermath grazing, in particular, opens up the sward and creates germination gaps (viz. following discussion) which are colonised by

forb seed from the hay crop and from normal colonisation by seed brought by the wind or other dispersal agents such as sheep (SMITH, R. S. et al., 2000). In contrast, hay cutting without aftermath grazing has been shown to favour coarse grasses whereas grazing alone encourages the establishment of undesirable weed species. Evidently in Mšec site the development is leading to confirm it.

### 6. 1. 3 On behalf of physiognomy

## If a plant had a brain, said Darwin, it would lie in its roots.

Most of proceeding lines and where begging page number is given, it will be quoted from (CRAWLEY, M.J. eds., 1997). It will be not faux pas to baptise this book as the Bible of plant ecologist.

Why grasses are so successful? Also seen on my study site; grasses do not appear to show the decline. The big advantage seems to be their particular physiology.
The highest rates of photosynthetic capacity are attained prior to or near, the period of maximal leaf expansion, after which time fixation capacity begins to decline.
From studies on *Poa* and *Lolium* concluded that trampling tolerance is established from unusual structure of their leaf sheaths - coduplicate stem and folded leaf section. Grasses are considered with these advantageous properties - prostrate form, rapid tillering, grazing tolerant (not all grasses e.g. *Antherhanteum*)
Antipodes conclude that trampling tolerance of Australian grasses positively correlated with tiller production rate, and strongly depend upon stem flexibility rather than on leaf strength. (p.124)
Photosynthesis saturates in about 25 per cent of full light grasses does not have problems with self shading.
To see more clearly I give some another indices. Grass seedling establishment and growth studied species dependent more on biomass than on which species dominated the examine site.
There is simple equation which every grass count.
The most palatable + the least competitive = not persist
If you want to be released buy selective herbivore - necessary but not sufficient for species coexistence. See Chapter On herbivores
There is another evolutional adaption i.e. clonally growth - offspring smaller when conditions are good for individual growth. (p.78)
Recruitment of the potential dominant species is seed limited, but recruitment of the inferior competitor is not seed -limited. See *Brachypodium* limitation (Section 6. 3 )
There is wide range seed size trade-off between competitive ability + dispersal ability in spatially structured community. (p.90) for some concatenation see graphs seed size and agency of dispersal from Msec site (Fig. 7. 13. and Fig. 7. 7 respectively).

### 6. 1. 4 Nutrient milieu

For illustration and what is important.(N - nitrogen, etc.; means as commonly used in plant ecology)
All types of phosphate ions are extremely insoluble in combination with the dominant cations in soils. P availability based on soil chemistry, N on soil biology. K never forms organic compounds like P. Other nutrients are between those properties.
Begin with greenhouse experiment, concretely with the N economy observation
*Dactilis* fourfold growth rate when high amount N added, opposite *Briza media, Carex* doubled, *Brachypodium* tripled, PNUE - smallest reduction in *Dactilis*, because smallest increase in leaf content of N, PNUE - Photosynthetic nitrogen use efficiency i.e. Photosynthetic rate expressed per unit N (p. 57)

Quoted briefly: Slow growing plants - N not for growing- store, defence

Shading-reduced carbon supply - plant allocate more N in defence (e.g. alkaloids) (p.307)

Micorrhizas and N-fixing bacteria; Natural communities dominated by legumes are much less common. N fertilization quickly reduced the abundance of legumes. It is energy demanding process, not shade tolerant plants. Park grass Rothamsted and see also Rengen Grassland experiment (HEJCMAN, M., KLAUDISOVA, M., SCHELLBERG J., HONSOVA, D., 2007).

Patches nutrient-species root response, ignored when largest, fastest growing and most competitive. (p.71)

This corresponds with regular spacing because is found only in resource poor habitats.

Simply stated and I am asking e.g. serpentine ecotypes require serpentine or they are simply poor competitors on normal soils? Answer: Different greenhouses studies different conclusions.

Competition on productive sites, there is ruling power - nitrogen+ light, on unproductive sites- nitrogen. The results were drawn from comparison seedling biomass experiments. (p.242)

### 6. 1. 5 Question of seed

Seedling detect their neighbours by green light, when exposed to unfiltered light before drying – able germinate under light or dark, that germination neighbour identity- different spectrum of light (p.218); for some "zoologist" intriguing possibility.

Seedlings are observing and generally occur in gaps. We naively assume that is direct result of competitive, although the germination biology alone evolved to avoid intense competition. (p. 226)

Communities are seed limited on large one scale, disturbance limited in microsite scale.

Bear in mind the legendary study of doyen Crawley using Motorway and non-intend dispersed *Brasica* from lorries.

I am interest where is the border in scale. It is between site management? I.e. Species occur on all particular sites with management but every else no. How I can I tested? Species which were seed limited. You can not rid of different site disposition, so large scale not happened. Can I found seed limited plant? I come to conclusion that without labour demanded seed sowing I can not tested.

Seed limitation has been shown to constrain the development of chalk grassland on two former arable field (HUTCHINGS, M. J., BOOTH, K. D., 1996). At both sites, chalk grassland species,which were present in adjacent grasslands made little contribution to the seed bank or reverting vegetation community and were generally connected to the margins of both sites. The greatest diversity of chalk grassland species were found on plots that had either been grazed or cut.

### 6. 1. 6 Modes

From number of studies confirmed that, *Trifolium* presence is due reduced competition for light, rather than to trampling tolerance as much. In Mšec site we can easily come to wrong opposite conclusion.

This sentence deserving great attention; Plant distributions in filed environment are refuges from competitors or enemies, rather than present the plant with ideal environmental conditions.

Another derived equitation; Inferior competitor = superior colonist

From greenhouse experiments; When inequality size is low in monoculture – supposed weak intraspecific competition. When species alone perform higher inequality strong intraspecific competition is inferred. In mixture when second species appear to have opposite performance the strong intraspecific competition is alleviated by replacing individuals by second less competitive species, thus entire dry mass better result. (p.339)

Simple and easy observed indication of interspecicific competition. Count the numbers of individuals from point and from another species within equal area. You will see difference exceed 50 % (p. 555) I not comment if it is method with significant and confident results.

The plants can recognize their neighbourhoods; Longer roots for competition when different kinds of plant sown together. It was going from less respond when more related species to no respond when siblings from one family. This pattern shown in experiment with *Cakile edentula* (DUDLEY, S. A., FILE, A. L., 2007)

Density is dependent on intraspecific competition, seen for year to year variance and on account of weather. Within year there is neither cyclic nor chaotic dynamic in spatial density. (p. 384)

Experiment which aim to remove competition sometimes fall to interpret increase abundance. It is not due competition but reduction of abundance of shared herbivore.

Grawley states and weights relationship which influenced this way; Interspecific competition > herbivory > interspecific competition for microsites > seed limitation.

When pollination is low, widely spaced plants have seed production positively depend with density.

When we are detecting density depend processes e.g. seed predation and mature plants are small or widely spaced out. This however, does not mean density process does not operate. When demographic rates are averaged over several patches, in order to produce a single figure for each generation, it may by impossible to detect the regulating factors. (p.491)

Simple food chains, including longer ones are top-down controlled. Not always fit herbivore-plant.

### 6. 1. 7 Competition and pollution

Shift from pollution sensitive species is not clear e.g. can be carrying due allelopathic relation, composition change from *Trifolium* to *Festuca. Festuca* leached inhibitors to *Trifolium* nodulation only in high level of $O_3$ . (p.572)

Pure stands responses to elevated $CO_2$ are limited due intraspecific competition. A mixed stand with plants with „C4"cyclus overcome intraspecific c. through interspecific competition and has better gain. However, "C3 plants"are considered expanding. (p.591)

**6. 1. 8 DNA**

In cool regions amount of DNA coincidence in timing of shoot growth;
When small genome plants have inability to grow rapidly in early spring; low temperatures inhibit cell growth.
Higher DNA amount- process of expansion of large cells divided and stored in an unexpanded state during preceding warmer season.
Plants are more responsive in year-to year variation; Weather increase variance in shoot yield with decreasing DNA amount. See *Brachipodium* section 6. 3.

**6. 1. 9 Species response question; why some species disappear?**

Major case of death is actively growing neighbours, rather than from harsh weather condition (p. 371)
The responses are as always knotted in cobweb. A high Ca:K ratio seems to increase the freezing tolerance. Decline of *Fragaria* can be ascribed to leaching due to acid rains from top-soil without sufficient Ca supplying minerals. (AHOKAS, H., 2007)

In an elegant study (HUTLEY, B., 2007) published recently; they have demonstrated that a shift in flowering time of the naturalized annual plant *Brassica rapa* was an adaptive evolutionary response. To organize such study, they have to have ancestors collected before dry fifth season from wet and dry site and descendents from same sites. These populations have been disposed to different environment (dry and wet year). The dry site population exhibited no difference in survival rates between descendants and ancestors.
The contrasting responses of the *B. rapa* populations from the wet and dry sites strongly suggest that the latter population already lies close to the limit of the species' genetic variance with respect to growing season length.
*Ab unu disce omnes* this was show within one species and it is also possible to show this pattern on different species.
When we apply this to our site we can expect that species, which have e.g. already short flowering, time, they cannot expend their flowering in response to change environment. Another important statement predicted is that, in those species where such apparent adaptive responses have been observed, the extent of the morphological adaptation seen in the past falls within the range of morphological variation found in the species today across its geographical range.

*Re vera* an inevitable prediction is that a small number of species that happen to have the necessary genetic variance will come to dominate many plant communities.

...and one species had appeared (STRNAD, L. & EKRT, L., 2007)

## 6. 2 Dialectic thesis either-or herbivory-plant union (Fig. 6. 2.)

### 6. 2. 1 About the grazing treatment; mammalian description

Sheep like goat is characteristic selective browser. Within higher stand is sheep avoiding (unlike goat) blooming graminoids and is also capable to take more palatable morsel from lower layer. (JENSEN, P. eds., 2003) The selection increase when grasses and other forbs are scattered in clumps than within closed stand. (CLARK, D.A., HARRIS, P. S., 1985). For the maintenance forest-free area is enough to have just sheep kind of herd. In contrast to goats which search them all the year round sheep graze down trees and shrubs only in late summer, in autumn and in winter. Among horses, goats, cattle, grazing with suitable amount of sheep we can obtain stand without under grazed patches and with the lowest height of pasture. (RATCLIFFE, D. A., MCVEAN D.N. , 1962)

The pasture can be seen from my point of view as inherently unstable structure which may in practice prove stable *inter alia* because energy flows through system are high enough. See section 6. 1.

As on competition the next lines mainly undermine (CRAWLEY, M. J. eds., 1997)

So the answers of leaves (not whole plant) to herbivores are bringing about in two different ways; by reducing nitrogen content, or by increasing the content of resin.

There are direct and indirect cost i.e. losses of future carbon gain due the making resin compounds.

If the probability of herbivore is low during the early grow stages, the plant might increase its fitness by delaying the elaboration of the defence resin.

It has been recently shown that in at least one case adjacent plant individuals of the same species can react, by chemical mobilization, when a nearby individual is attacked by grazers, even though they themselves have not yet been

As our Press-grazing and pulse experiments indicate; Grazing as herbivory is widely implicated in such competitive release. By reducing the vigour of the taller – growing grasses and maintaining a short sward of close – cropped turf, grazes prevented the grasses from growing to such a height that they might exclude other lower-growing species from the community through shading (competition for light) and thus help and maintain an unusually high diversity of shade sensitive species within the community.

The experiments confirm that grazing reduced the size but not the survival, of seedling of perennial plant species (p.404)

From view of herbivory insect; no impact on proportional biomass allocation to leaves, stems or roots, nor the Net assimilation rate. There is reduction in leaf area per unit leaf mass, not alternation in plant physiology. (p. 408)

**6. 2. 2 Important for shepherd economy**

The sentences are given as in the shortest explanation meaning.

In general, midsummer biomass is lower on grazed than on ungrazed swards, but total annual productivity is higher.

Year to year stability of digestible forage yield may best achieved with light grazing rather than with heavy or no grazing.

Despite the preference of browsers for large plants there was still a clear net growth advantage for plants of large initial size when the effects of competition, browsing and net growth were combined.

Next neat study revel some important assumptions; why not make quickly allegation. Removal cinnabar moth caterpillars from fenced plots lead to extinct of ragwort within 3 year; because there were no rabbits this means dense canopy and any seedling. With moth plant produce no flowers and thus survival on plots.

Slow-growing plant less compensate growth after grazing. Higher-growth rate in herbivore free environment has positive correlation with palatability and competitive ability.

Where herbivore is independent of ecosystem primary production, there are important fast growing communities (p. 434)

Levels of tolerance are different in species and stage but not on species herbivore free growth rates.

Example: plant galling taxa have larger population size in xeric environment then in mesic (suppress by fungi, parasites).

There is negative correlation effect; above herbivore to root feeder, however from root to above there are mediated benefit; because in some case increase above food quality offset quantity. (p. 438)

Herbivore optimization hypothesis i.e. herbivores are striving to optimize plant productivity (they are prudents predators). The example is overcompensation by grasses in the soil environment where each species was naturally most abundant.

There is replacement of lost leaf area with higher nitrogen concentration thus increase forage quality, but more grazing limits root growth i.e. uptake capability.

Sometimes the species which is much more adapted to grazing fall in the end to produce expected results; because the same species is much more preferred by grazer. E.g. decline *Agrostis capillaris* versus *Nardus stricta* (p. 440)

When plant are browsed they reduce growth in high and medium density (still is in power intraspecific competition). When plant is topped there is enhanced growth in low density.
Common assumption; higher soil fertility = better compensate damage.
Be aware; total seed production is reduced only at high level of soil fertility (p. 441)

We have to expel Misled belief; Grazing can increase the Darwinian fitness.
Increase only the dry shoot mass. (p.443)

You cannot infer the mechanism by observing the dynamics. Ratio-dependent functional response e.g. death ratio of herbivore is indistinguishable in its effect on plant abundance from direct density dependence acting on the herbivore death rate.

It is clear that it is interactions between its component populations which may influence community stability. This depends heavily on the nature of the interaction and whether such relationships are donor- controlled or more powerfully influenced by population changes among the "recipient". Top- down interaction as a rule are far more likely to be destabilizing for populations of both interactions, while where the predator's population merely tracks that of its prey will in general be far less disruptive. (PUTMAN, R.J., 1994)

When herbivores eat and not kill small plants there is more size diversity, but not when eats big size plants.

From conservation and contravention point of view; too little grazing is responsible for more species decline than too much grazing.

Some people and I can see connection with this observe phenomena; fertilizer application is apparently a greater menace than herbicide spraying.

Herbivorous animals regulate the abundance of plant populations; may control the functioning of entire ecosystems; this not mean beneficial to plants.
Grazing is considered to be depended primarily on above –ground net primary production and the evolutionary history of the grazing site (HUGGETT, R. J, 1995).

I hope there is no reason why not to quote here next lines.
Effects are complex, what help to understand problems are graphs. See Fig. 6. 3
I come to conclusion of very-difficultly to state what is the recent demand in population; I.e. current evolution in agricultural politics; sustainability on one hand with separated increasing efficiency. See Appendix.

(a) Increasing the intrinsic growth rate of plants (in the absence of herbivores) = Increase herbivore steady–state (s-s) density and system stability. There is no effect on plant abundance.

(b) Increasing herbivore searching efficiency (depression of the plant population per encounter with an herbivore) = REDUCED herbivore s-s density. There is no effect on system stability or steady–state plant abundance.

(c) Increasing herbivore growth efficiency = reduced s-s plant abundance and so reduced system stability, but increasing s-s herbivore numbers.

(d) Increasing carrying capacity of the environment for plants = increasing herbivore s-s density, reduced system stability, but PARADOXICALY, has no effect on s-s plant abundance.

### 6. 2. 3 Final generalizations

I conclude this chapter with aid of (BARNES, R. S. K., et al., 1991)
Only one category of plant consumers efficiently utilizes plant materials without the aid of symbiotic bacteria and protests.
Despite the widespread popular notion that terrestrial food chains are predominantly of the form plant-herbivore-carnivore, an impression which is reinforced by the amount of scientific attention which has been devoted to herbivorous animals (especially grazing mammals), the base of most terrestrial food webs is not living plant tissue and the grazing down of this by herbivores.

But is the decomposer food chain; Most energy flows through the detritus and litter –feeding animals.
Terrestrial animals have therefore not escaped from the consequences of their marine ancestry in terms of what they can efficiently process, and even today less than 3 % of forest productivity is consumed, whilst it is still alive, by herbivores.

## 6. 3 Discourse mainly about Brachypodium pinnatum (Fig. 6. 4. )

I would like to discuss plant which is currently occurring in high cover in our study site and it is considered as species which dispose peculiar ability to expand similar type of grassland.

Invasive or aggressive plant species can have a detrimental impact on the species richness and diversity of a plant community. An example is *Brachypodium pinnatum* P. Beauv., a potentially dominant rhizomatous grass which has long been recognized as a conservation problem, threatening the high species diversity of chalk grassland (BOBBINK, R., WILLEMS, J.H.,1987)
I read published data describing the impact of *B. pinnatum* on the chalk grassland community which are mostly from Dutch sites where both species richness and diversity were reduced, and forbs lost more rapidly than graminoids, as *B. pinnatum* increased in a community. During *B. pinnatum*'s competitive ability was enhanced when nitrogen levels were increased and other soil nutrients were not (BOBBINK, R., BIK, L. WILLEMS, J.H., 1998). It has been suggested that the increase in *B. pinnatum* on Dutch chalk grasslands is primarily due to eutrophication through atmospheric inputs of nitrogen ( BOBBINK, R., den DUBBELDEN, K., WILLEMS, J.H.,1989) in the UK such inputs are generally lower and their role in the increase in *B. pinnatum* is disputed (BOBBINK, R, 1991). In Czech Republic there is currently also such debate about nitrogen inputs for introduction see (CÍLEK, V.,2007). See also www.initrogen.org
Increases in *B. pinnatum* are thought to be primarily due to reductions in grazing pressure (WILSON, E.J., WELLS, T.C.E., SPARKS, T.H., 1995) whilst site management also contributes to the increase of *B. pinnatum* in The Netherlands (BOBBINK, R., WILLEMS, J.H.,1987).
In another study viz. (HURST, A., JOHN, E., 1999) which observe effects of *B. pinnatum* on the community a negative correlation existed between *B. pinnatum* cover and both species richness and diversity. However, total vegetation cover was not significantly correlated with diversity or species

richness at any site, and total per cent cover of graminoid species (other than *B. pinnatum*) and forbs species were positively correlated, in all sites, with total vegetation cover.

Effects of *B. pinnatum* on individual species where negative correlations were not significant, this was often a result of a species achieving variable cover values in low *B. pinnatum* cover, rather than because of the presence of high cover values in dense *B. pinnatum*. The cover of low growing and rosette species (e.g. in our study *Thymus praecox, Fragaria viridis, Taraxacum* spp.) showed the most consistent negative correlations with *B. pinnatum* cover. But we have to confirm that as frequency was low for most this type of plants, significant correlations were unlikely.

The authors also focus on above-ground biomass. The strong negative correlation of diversity with *B. pinnatum* cover, rather than with total vegetation cover, implies that it is *B. pinnatum* itself that is having an impact on the community and not a direct effect of increased productivity and biomass.

The production of a dense litter layer and the canopy shading properties of leaves (see also discuss on competition) mean that *B. pinnatum* is a more effective

competitor for light than may be predicted by its increase in biomass alone. (HURST, A., JOHN, E., 1999) The litter produced by *B. pinnatum* has a high C: N ratio, due to the redistribution of nutrients from leaves to rhizomes prior to leaf senescence ( BOBBINK, R., den DUBBELDEN, K., WILLEMS, J.H.,1989).

Grassland canopies have been shown to capture atmospheric ammonium in the same way that forest canopies do and even better (FIALA, K., 2007, i.e. non impact factor discussion) and the taller *B. pinnatum* may intercept and capture deposition to a far greater extent than the surrounding grazed grassland. Reduction of *B. pinnatum* dominance alone may therefore fail to lead to the return of a typical chalk community unless the manipulation of soil nutrient levels forms part of a management regime.

To obtain and examining information focusing on properties of species I considered *B. pinnatum* to have the transient type of the bank. The evidence is given in (CZARNECKA, J., 2004).

Going deeper for knowing where the power of *B. pinnatum* has its roots I have to mention another study. (SCHLAEPFER, F., FISCHER, M., 1998) The results were that the mean ratio of sexual versus vegetative recruitment was about 1:32000. Despite this low ratio, clonal diversity within the population of *B. pinnatum* was higher than reported for other clonal plant populations, possibly because of its high ramet densities. Mean clone area was 5.73 $m^2$. Mean vegetative dispersal distance was 5.5 mm per year. Mean clone radius was 245 times larger than the mean distance of yearly vegetative dispersal which suggests old ages and low turnover rates of clones. How long is peculiar clone in our plot? (See fig. 4. 2. )

The time scale of the inert response of clonal diversity of *B. pinnatum* to changes in land use appears to largely exceed the experimental period of 16 yr.

Why *B. pinnatum* invades such grasslands?

In study (RYSER, P., LAMBERS, H., 1995) to observe they first compare and their report that the low density of the biomass of *D. glomerata* is the pivotal trait responsible for its faster growth at all nutrient levels. It enables simultaneously a good nutrient acquisition capacity by the roots as well as a superior carbon acquisition by the leaves. The high biomass density of *B. pinnatum* will then result in a lower nutrient requirement due to a slower turnover, which in the long term is advantageous under nutrient-poor conditions.
There is also elegant study (KROON, H., HARA, T., KWANT, R., 1992) contributing to our picture of *B. pinnatum* Focusing on growing pattern. Planted at three densities, the shoot (ramet) and at the end of both the first and the second year of the experiment there were measure and obtain no significant differences in Gini coefficients (size inequalities) of shoot height or weight between treatments. In the second year, when the number of shoots and the biomass per plot were extremely high and similar for all treatments, size hierarchies (based on height) of shoots born in spring decreased in the course of the summer and height increment was unrelated to shoot height at the beginning of the growth period. This reminded us why *B. pinnatum* has such turnover discus in prior study.
The leading author organized as well as this study (KROON, H., KNOPS, J., 1990). Shoots of species increased in height in response to shading, but only shoots of *Brachypodium* responded to fertilization. Automatically for uniting see nitrogen input discussion. Mean rhizome length in *Brachypodium* was significantly smaller under high nutrient availability, but only when unshaded. Again, to compare, sedge Carex flacca produced longer rhizomes under high light conditions, but showed no effects of nutrients. We propose boundary of this topic *Brachipodium*, however *Carex* cannot be threat for our site.
Three times for the best of (KROON, H., KWANT, R., 1991) show first as firmament that shoot natality (i.e. the number of shoots born per plot) and shoot mortality (i.e. the number of shoots that died per plot) were usually unrelated to clone density. Study confirms that clonal herbaceous species can effectively prevent an overproduction of shoots, but they found no evidence that physiological integration (i.e. the exchange of resources and growth substances between shoots of a single clone) may be the responsible mechanism. What is the joining cause? It is uniting milieu?
How is *Brachypodium* topologically behaving in community? (HOEVEN, E.C., KROON, H., DURING, H.J., 1990) reveal some configuration of *Brachypodium* In dense stands the positions of leaf clumps were not correlated to those of shoot clumps. This is a result of the tall growth form of this species and its high shoot densities, and it is suggested that this will be a characteristic of any species that dominates a dense stand. From such statement we suppose the maximum light economy in grassland where is light drawing power.
As many studies contain logo DNA as well the gurus (GRIME, J.P., HODGSON, J.G., HUNT, R., 1990) predicted from low nuclear DNA amount, that *B. p.* has a summer peak in growth. This is

marked contrast to *Bromus eretectus.* Also for them, the geographical restrictions appear to arise from problems in initial establishment. They consider *B.p.* resistant to trampling, eaten by sheep and cattle only as young leaves and tolerant of burning with rhizomes down to 200 mm below the soil surface.

Skip into chalk grassland where is *B. pinnatum* considered as unpalatable to grazing stock and, therefore, traditional chalk grassland management often fails to control it. (BOBBINK, R., WILLEMS, J.H.,1987). There is such demand in UK that *B. pinnatum* stands are currently treated with glyphosate by some site managers, to restore the species-rich chalk grassland community. However, the recommendation is as always much broader. The effectiveness of glyphosate will improve where it is used in an integrated *B. pinnatum* control program, with post-treatment grazing and techniques to reduce soil fertility. The last advice can be fulfilling with aid of this study (DAVIES, D. M., 1997) and their recommendations of *Rhinathus* spp.

In conclusion the forbs diversity is affected less, and coarse grasses reaching higher cover values under *B. pinnatum* at a previously under-grazed site. (HURST, A., JOHN, E., 1999). When site is less intensively grazed, and more mesotrophic, the consequence would be that *B. pinnatum* is invading a taller sward and this may also give certain tall forb species a competitive advantage.

Focus on *Brachipodium pinnatum* does not necessary exclude importance of other subjects and make impossible completely substitution.

# 7 Subtopic Theories

## 7. 1 Prefix

Concomitantly with statistical and conventionally proper examination I tested hypotheses applying on collected data which I am aware of their low value.

They have to only elucidate further interest in next student statistical examination. (Theory-originally from word for theatre; to view)

To introduce the aim to interest; man is always surprise when he comes to discover properties associated more with the animal kingdom. Last time it was sound hearing, the ability of a particular tone to switch on the expression of some gene in rice. And the man will use it in the economic point of view. They are keen to make GMO crop which will make insecticides only during the swarming. (NIILER, E., 1999)

During discussions there appeared phantom of logic; argument which rest merely upon consequences *argumentum ad consequentiam*; we are never in greater hazard. E.g. *Brachipodium pinnatum* in experimental site has statistically significant low occurrence on grazing plot.

I also fear to discover in most of studies *ad hoc* hypotheses i.e. such hypotheses that exclude data that would otherwise be evidence against the principal hypotheses.

### 7. 2 Ecological attributes

One possible way of description particular plant community which we want discern is functional approach. Different management is supposed to have effect on plant ecology. I take advantage of comparative plant ecology and I would like to show the advance of such useful view. Supposed that species are characterized by their properties sourced in known literature, we can, bear in mind *q.v.* statement; observe and analyse reactions of plant's guilds with regard on different managements. The ecological attributes has been mainly obtained from (GRIME, J.P., HODGSON, J.G., HUNT, R., 1990). When the species was not discussed there the data are were sourced from the book collection of Czech Flora. Or the attributes were compared in field observation in similar species. From research I complete contingency table (Table 7. 1) where each species obtain 16th attributes. For explanation number see Table 7. 2 and for species abbreviation Fig. 7. 1.

Finely each treatment is pictured in graphs (Fig.7. 2 - Fig. 7. 13) where the particular ecological character of plant has its abundance. Only the mean for 2007 data is given and further analyses does not been statistically valued. It is on author responsibility, how he comment the results.

There are some issue which we clearly perceive and also suppose e.g. the abundance of ruderals is the highest on grazed site. (Fig. 7. 2 ) On the other there are some graphs which are hardly pointing somewhere clearly. On the seed dispersal graph (Fig. 7. 7 ) we have to cited (GRIME, J.P., HODGSON, J.G., HUNT, R., 1990). What is clearly to date is that many of these species, which are becoming increasingly abundant in the landscape, lack obvious specialization for long-distance dispersal. For more, to each graph there is attached some briefly quoted idea. ( *ad hoc* hypothesis )

Which variation of properties among species and treatment sites is it the most easily explained e.g. the duration of flowering time has smallest variance and is the shortest on cutting sites, thus has connections with management. (Fig. 7. 13).

The aim of my laborious work was to demarcate the differences and rise interest in plant ecology. From data contains ecological attributes of each species further analysis were meant to produce.

### 7. 3 Producing cause either effect

I coin testing the evolutionary hypothesis i.e. when you have food (in limited environment) the rare kind of individual adaptation is more successful between the remained mass. This we can proof by comparing species e.g. their life strategy and the proportion in abundance. The most abundant is the most common strategy or we can say that if we found the property, which is most common, there will be small abundances for this kind of species. There will be the strongest competition. So what is the successful strategy? It is the most common? You win, same time you lose. I would like make statistical comparisons with more data.

Simultaneously we view the pattern of development; more abundant on all sites or only on one site with peculiar management; see CONOCO figures if you can see the pattern (Fig.5.1. - Fig. 5. 4.).

Increased species number is accompanied by decreased niche overlap. Are species which added have just occurred only on one plot and thus has narrower niche or is this species which increase species diversity occurring on more sites. Leave it, too complicate! Or make species composition which occurs on all sites i.e. the back bone of the Mšec site in both collocations; next observe where species are "added" and what is their property. See Fig. 7. 14. This is the sketch for further study.

Some pairs of species never coexist, either by themselves or as part of large combination. However, some pairs of species that form an unstable combination by themselves may form part of a stable larger combination; conversely some combinations are themselves unstable (PUTMAN, R.J., 1994). Hypothetically find combinations, which are repeated through, plots species and their abundance. Permissible combinations resist invaders that would transform them into forbidden combinations. If there is this species in this abundance this species never coexist. Tracing *Brachipodium* in study of species richness. See section 6. 3

**7. 4 Evaluation index**

As in many recent studies I want to try to apply comparative index, concretely index of atmospheric purity synthesised by quantitative and binary approach.

Fig. 7. 15. Equitations of Atmospheric purity (IAP).

$$Q = \frac{\sum_{j=1}^{m}\sum_{i=1}^{n} S_{ij}}{m} \qquad IAP = \sum_{1}^{n} \frac{(Q \times f)}{10}$$

n = number of species; Q = ecological index (number of species found in the vicinity of the species at all stations/ m) ; f = cover and frequency of each species; m = number of stations where the species of interest is present; $S_{ij}$ = equals 1 if species i is present at station j. (NASH III, T. H. eds., 1996)

Specially for the conduct of the index from mathematical expression was created the computer program by D. Zahradnik in the Borland Developer Studio 2006. The example of source code is given on Fig. 7. 17.

I found this index interesting for finding out how big value has particular site from conservation point of view, notwithstanding the usefulness of other indexes of species diversity e.g. Shannon index.

The ecological index has lowest value for species which occur on all sites with smallest number of accompanied species. The highest ecological value has species which occur only on one site accompanied there with high number of species. The whole index of purity is highest for site when species with high Ecological index appear to be there most abundant in highest number.

The ecological index (Q) of species *Brachypodium pinnatum* equals 4.5 in both years which is not so predicable. The results from IAP analysis are shown on Fig. 7. 18. There are differences in the range of values i.e. higher values in 2005. In conclusion we cannot precisely appreciate the impact on biodiversity, however we would like to show that there is not necessary positive effect connected with management (the high value of control site (N)).

### 7. 5 Felicity sires Stability?

One possible way if the community is in stable environment to compare species-abundance curves. For communities of stable environments being lognormal (the statistical expression of an ideally uniform pattern of distributions), vice versa for communities of unstable environments being logarithmic (reflecting some uneven division of resources as would result, for example, from competition) (STENSETH, N. C., 1979)

I am aware of too much incorect statistical data handling, thus this is only inttention. Everithing is in flux, thus cannot be statistic. However G treatment impresses comparable less logaritmic and thus the plant community is considered in more stable environment, which is as usual discutable. See Fig. 7.16

### 7. 6 Synthesised judgements

From posteriori reasoning inspired by (LIM,M., METZLER, R., BAR-YAM,Y., 2007).

They identified a process of global pattern formation that causes regions to differentiate by culture. Violence arises at boundaries between regions that are not sufficiently well defined. They model cultural differentiation as a separation of groups whose members prefer similar neighbours, with a characteristic group size at which violence occurs. They agree that application of this model to the area of the former Yugoslavia and to India accurately predicts the locations of reported conflict. This model also points to imposed mixing or boundary clarification as mechanisms for promoting peace. To create India from grazing treatment and show separation; different species different engage. If they have different properties they don’t engage, where is the starting point of separation, correlation of mutual abundance.

When plant fluctuate more in abundance does it mean more specialized i.e. more uncommon properties on site? When plant have high frequencies and low fluctuated small abundance does it mean unspecialised properties?

# 8 Appendix

*ravenous a' nos moutons*

For the approaching conclusion I would like to mentioned the Theory which strikes me and I hope it will be useful to repeat (HARDIN, G., 1968) It is also, I think, not the mere coincidence simplification that "The tragedy of common" is describe by aid of sheep and grazing as symbolizing matter.

Pasture as playing the Earth is open to all. As rational being, each herdsman tries maximize his gain. He will get every time negative and positive responses for adding one more sheep to the herd. The utility is nearly close plus 1, mathematically formulated, from sale one more sheep. From the fact that pasture is overgrazed, he by himself will be deprive only with portion of 1 as forage yield lost is divided within the whole herdsman community. Assuming the common willing of all being to increase their success. Ruin is the final destination for the Earth. Believing in freedom in a commons brings this unfortunate end.

I have to add as tutor, if you will agree, that the game theory is as many only theory. He who is a thorough teacher takes things seriously (and even himself) only (here is the tragedy) in relation to his pupils.

# 9 Conclusion

It have to be said of many Works, that they would had been much shorter, if we consider the time required to be master of them. I am impel to conclude and strive not to produce such feelings.

From our research the clear effect has been obtained. The statistical significance of results reveal succession in plant composition in abandoned dry broad-leafed sward *Bromion erecti* in relation on management. There is also pointing evidence, marked by species ecological attribute, of possible discrimination between managed sites. The additional analysis consider further characterisation of plant community condition such is sward hight correlation and the proportional abundance of emphasised plant family. The species *Brachipodium pinnatum* carefully understanding does not appear as strong as on other sites, notwithstanding obvious problem of continuous nitrogen enrichment.

The nurture of site meticulously view does not play part in opposite to nature. The management cannot be fully ascribed or is a truth-resembling (*podobnost pravdě*). There is union unfortunately-seen only after competent scrutinising. The conduct of our treatment demand more study in regard of data producing time-lapse picture.

Near the place where our knowledge lay there is also our biggest crass.

Finely, the Necessity of action coerce us not to leave the question of future on freedom of our will.

## Acknowledge

Here I am grateful to everybody whom does not *ad valorem* things on themselves. I also want not to praise all whom are disapointed, becouse they want more than praise. Man, please Take my thanks.

[Seid umschlungen, Millionen. Diesen Kuß der ganzen Welt! (F. S.)]

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## Tables and Figures
## (cannot stand *eo ipso*!)

Fig. 4.1. Aerial photography view (PLANstudio, [online] 2005)


Fig. 4.2. III$^{nd}$ Military Survey 1877-1880 (DUSEK, J.,[online] 2005)

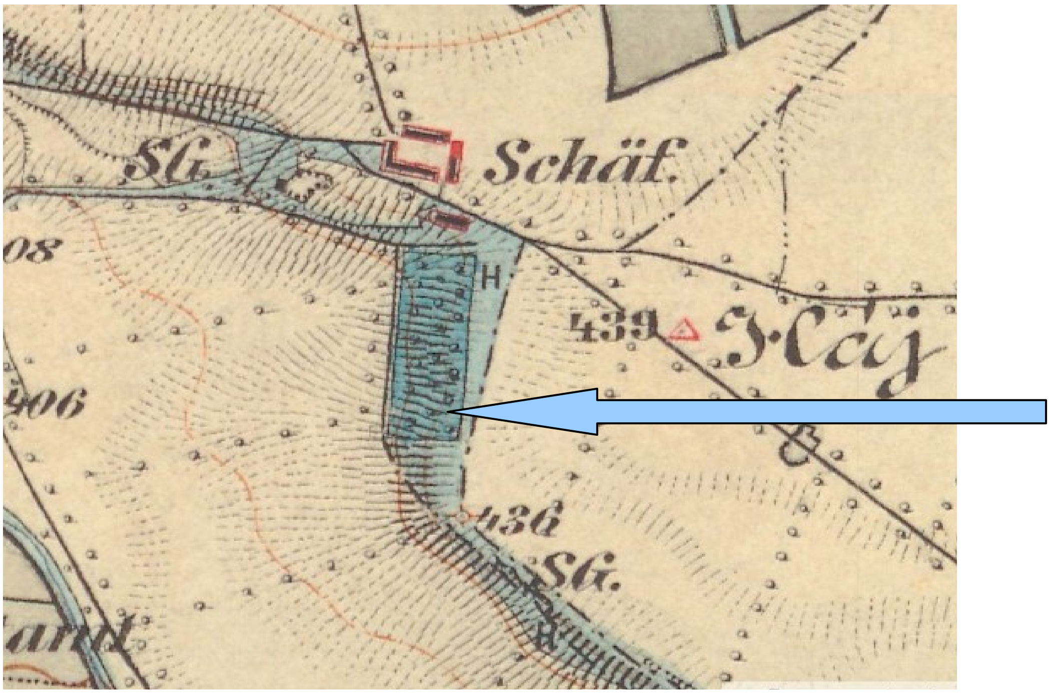
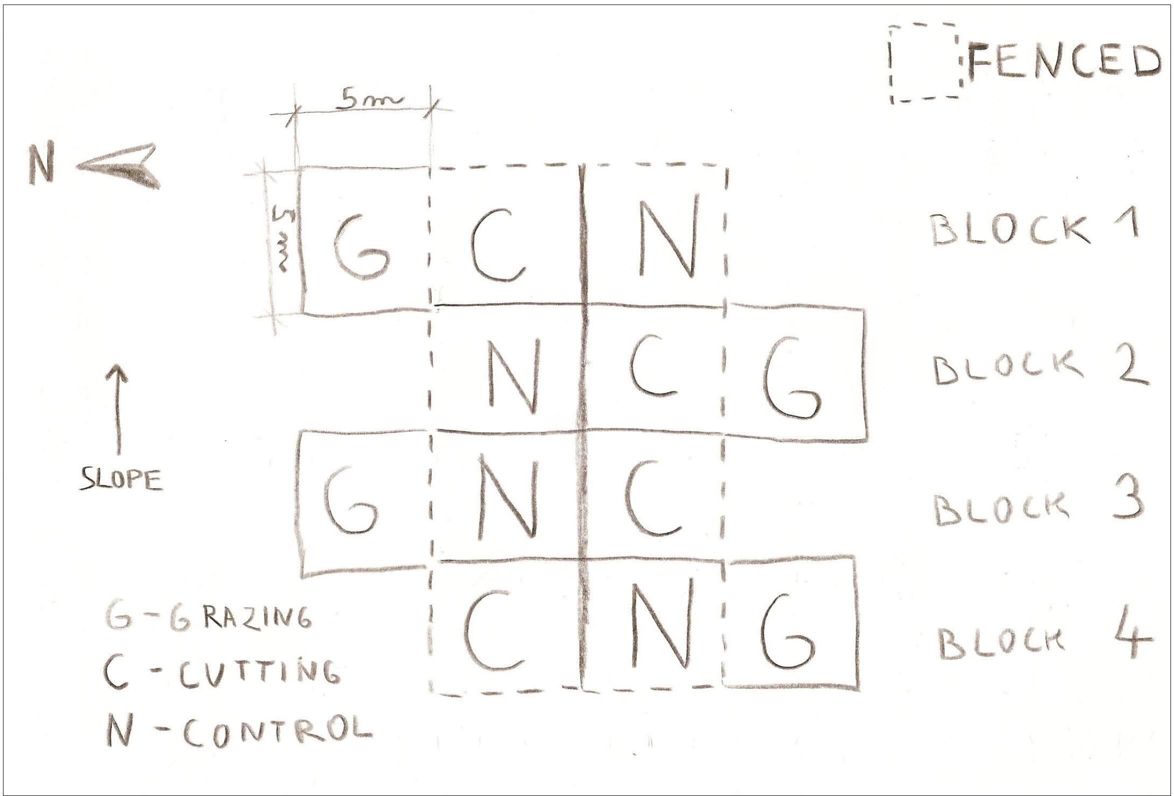


Fig. 4. 3. Spatial arrangement of monitoring plots in four completely randomized blocks.




Tab. 5. 1. Results of RDA analyses of plant species composition data. an.- number of analyses, expl. var. – explanatory (environmental in Canoco terminology) variables, % ax 1 (all) – species variability explained by canonical axis 1 or by all axes (measure of explanatory power of the environmental variables), F 1 (all) – F statistics for the test of the particular analysis, P 1 (all) – corresponding probability value obtained by the Monte Carlo permutation test. a1 and a2 – repeated measures RDA, data from 2005 (baseline data collected before the first experimental manipulation) and from 2007 a3 and a4 – RDA, analyses from individual years 2005 and 2007 respectively.

| an. | expl. var. | covariables | % ax 1 (all) | F 1 (all) | P 1 (all) |
|---|---|---|---|---|---|
| a1 | Y, Y*N, Y*C, Y*G | block | 27.3 (43.3) | 6.4 (4.3) | 0.001 (0.001) |
| a2 | Y*N, Y*C, Y*G | block, Y | 17.3 (22.3) | 3.6 (2.4) | 0.114 (0.075) |
| a3 | N, C, G | block | 11.1 (18.7) | 0.7 (0.7) | 0.842 (0.749) |
| a4 | N, C, G | block | 41.6 (51.2) | 4.3 (3.1) | 0.028 (0.020) |

Fig. 5.1. Bi – plot ordination diagram created with CanoDraw© software showing the result of (RDA) of plant species composition data concerns (a1) hypothesis (Tab.5.1) For treatments abbreviations see section 4.2. and for species abbreviations see Fig. 7.1.

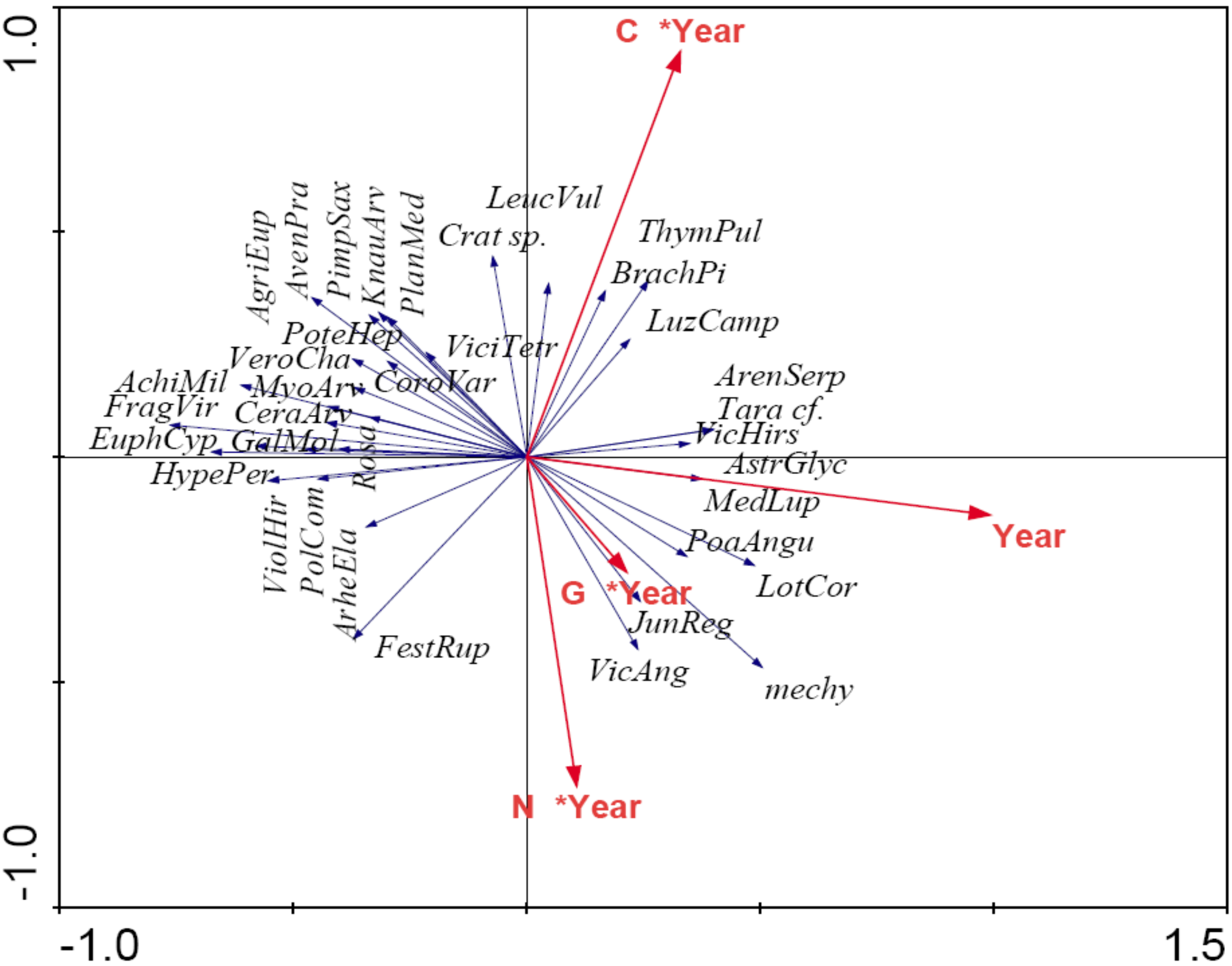


Fig. 5.2. Bi – plot Ordination diagram created with CanoDraw© software showing the result of (RDA) of plant species composition data concerns (a2) hypothesis (Tab.5.1) For treatments abbreviations see section 4. 2. and for species abbreviations see Fig. 7.1.

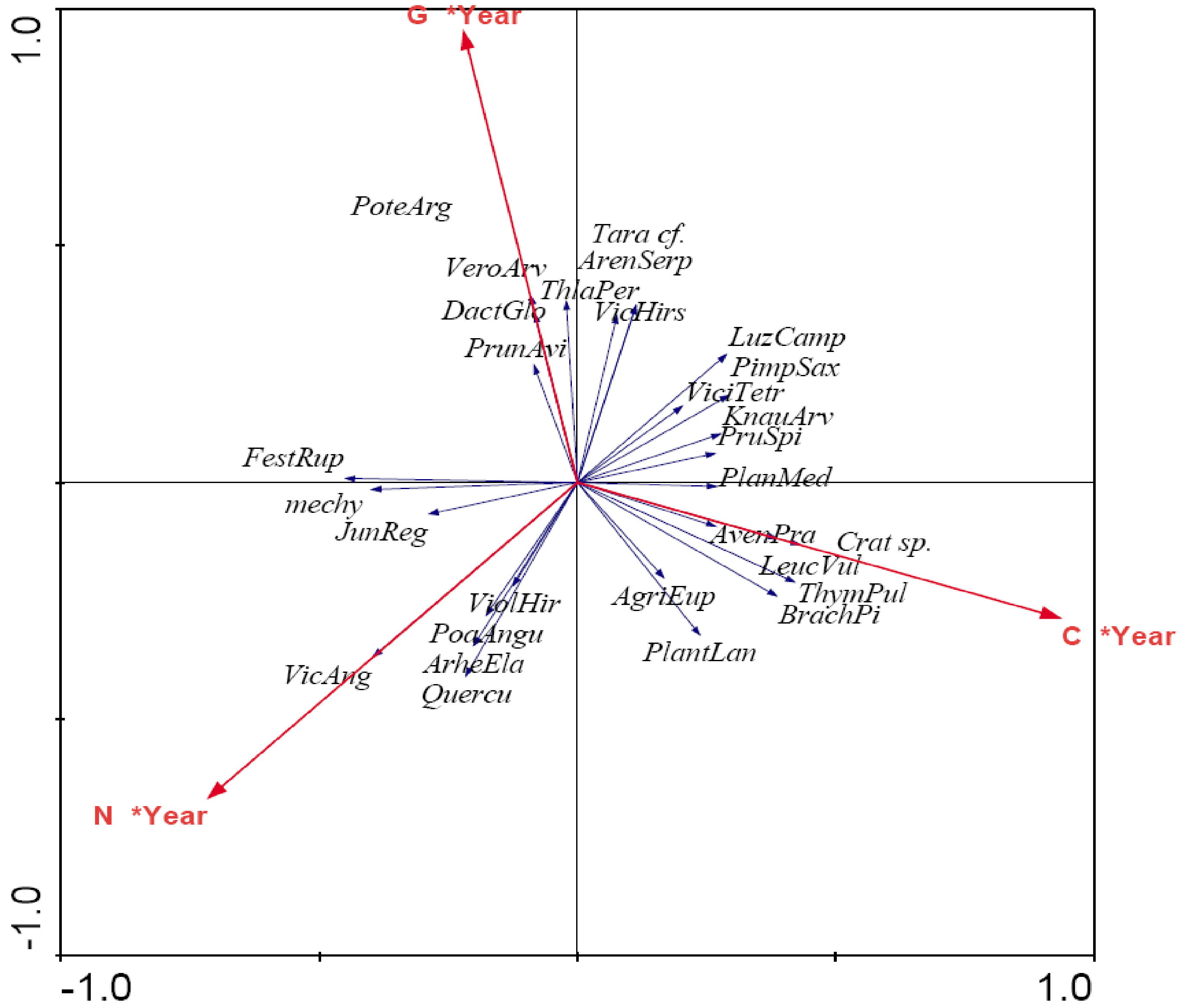


Fig 5. 3. Bi – plot Ordination diagram created with CanoDraw© software showing the result of (RDA) of plant species composition data concerns (a3) hypothesis (Tab.5.1) For treatments abbreviations see section 4. 2. and for species abbreviations see Fig. 7.1.

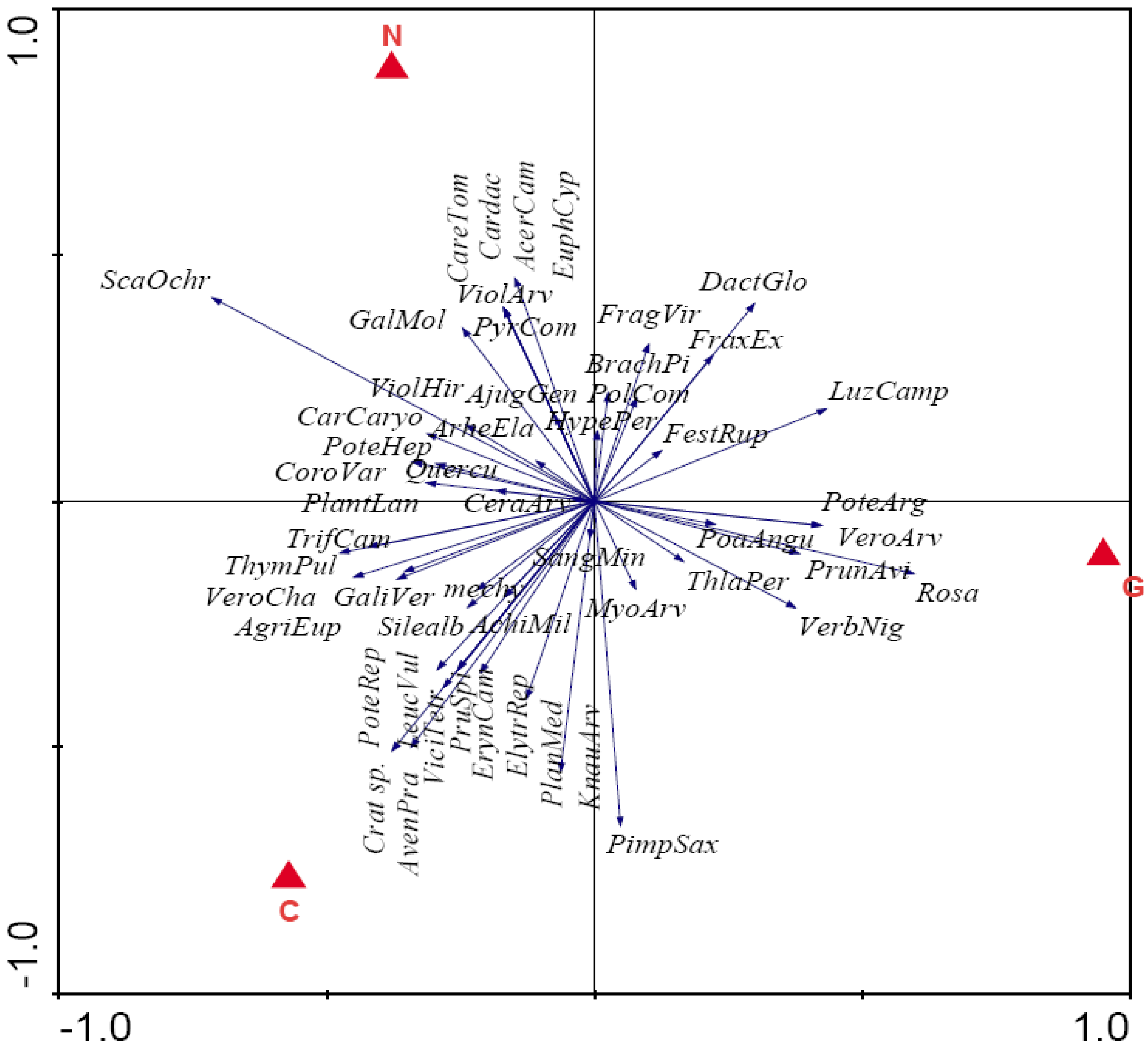


Fig. 5. 4. Bi – plot Ordination diagram created with CanoDraw© software showing the result of (RDA) of plant species composition data concerns (a4) hypothesis (Tab.5.1) For treatments abbreviations see section 4. 2. and for species abbreviations see Fig. 7.1.

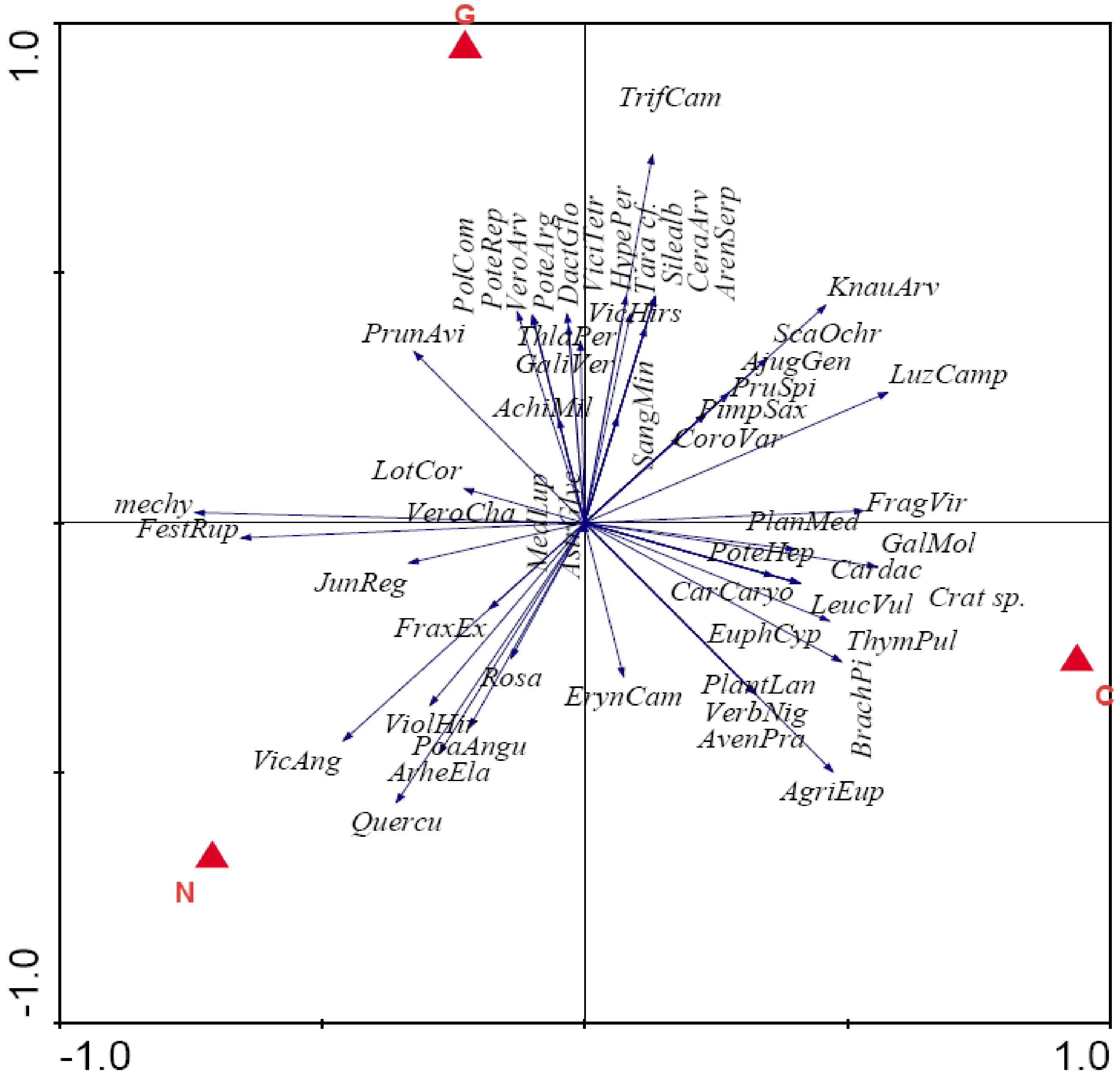


Fig. 5. 5. Graph of Sward height measured by rising plate meter. Treatment abbreviation see section 4. 2. Statistic numeric see section 5. 2.. sh-sward height in (mm), Treat-treatment

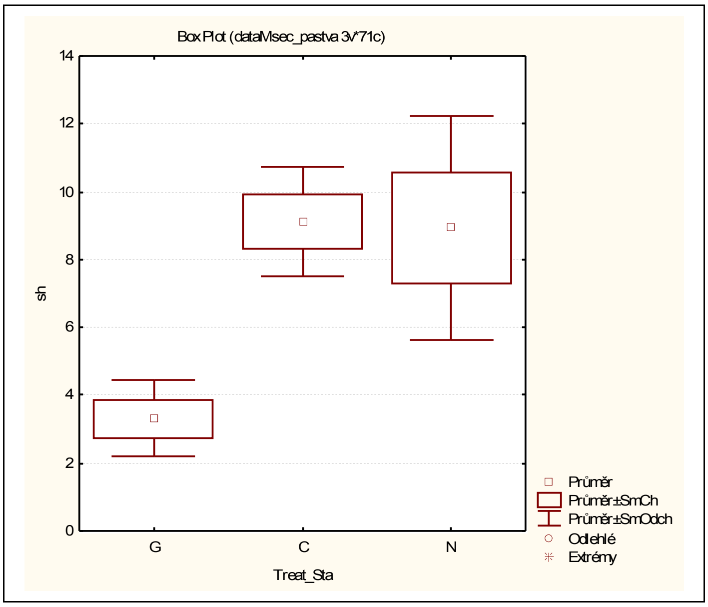



Fig. 5. 6. Graph of abundances mean and standard deviation (axis-Y) of Graminoids group on site. (G, C, N- treatment abbreviation, axis-X) The highest probability of non-hitting false has statement of distinction on grazed site. I may comment that the Graminoids are the most easily recognizable on grazed site on account of their “ordered” appearance.

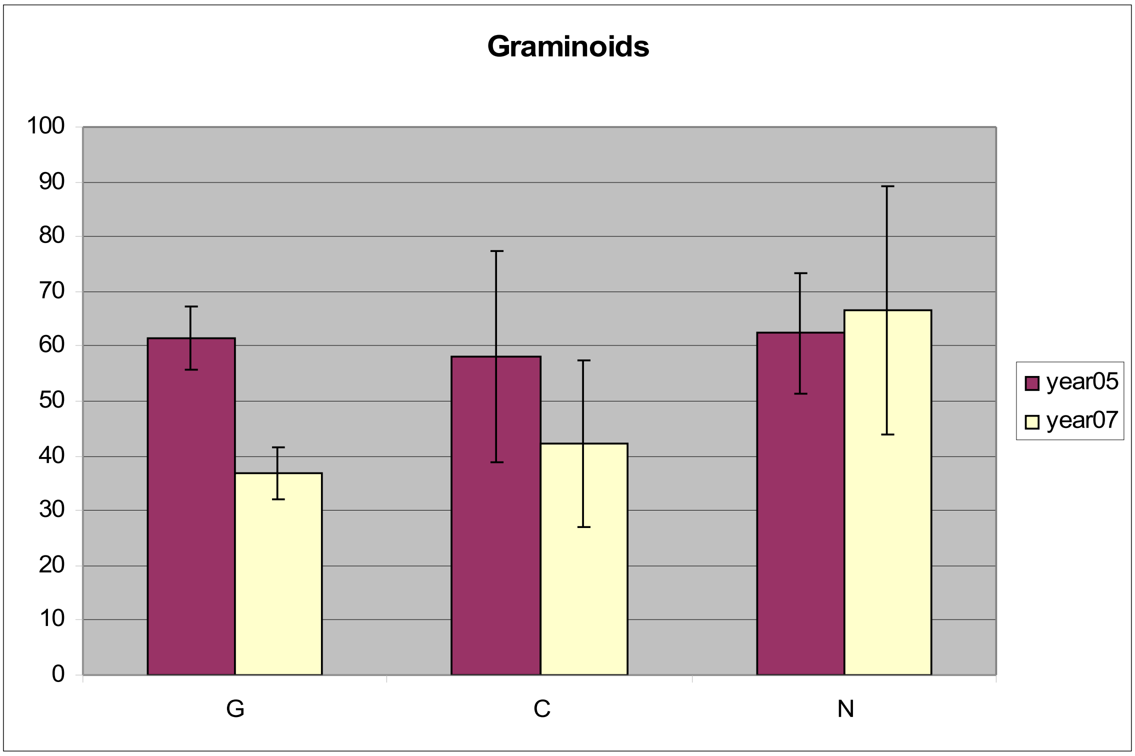
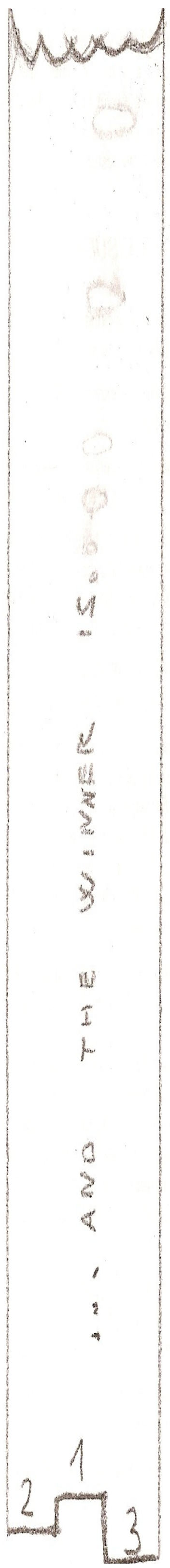


Fig. 5. 7. Graph of abundances in percent of family Fabaceae on site. (G, C, N- treatment abbreviation) Example *pour rire*. We can hardly judge the site, due small number of examples and high standard deviation.

Fig. 6. 1. Between devil and blue deep sea



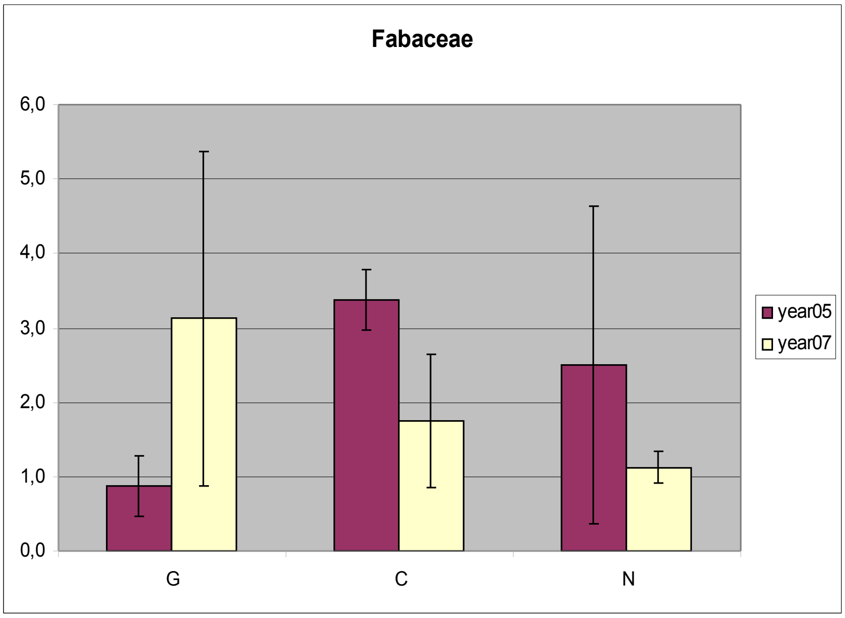




Fig. 6. 2. The Herbivore

Fig. 6. 3. Dynamics of plant-herbivore system with resource-limited plants. after (CRAWLEY, M. J., 1983)

(a) growth rate of plants (b) herbivore searching efficiency (c) herbivore growth efficiency (K) carrying capacity of the environment for plants

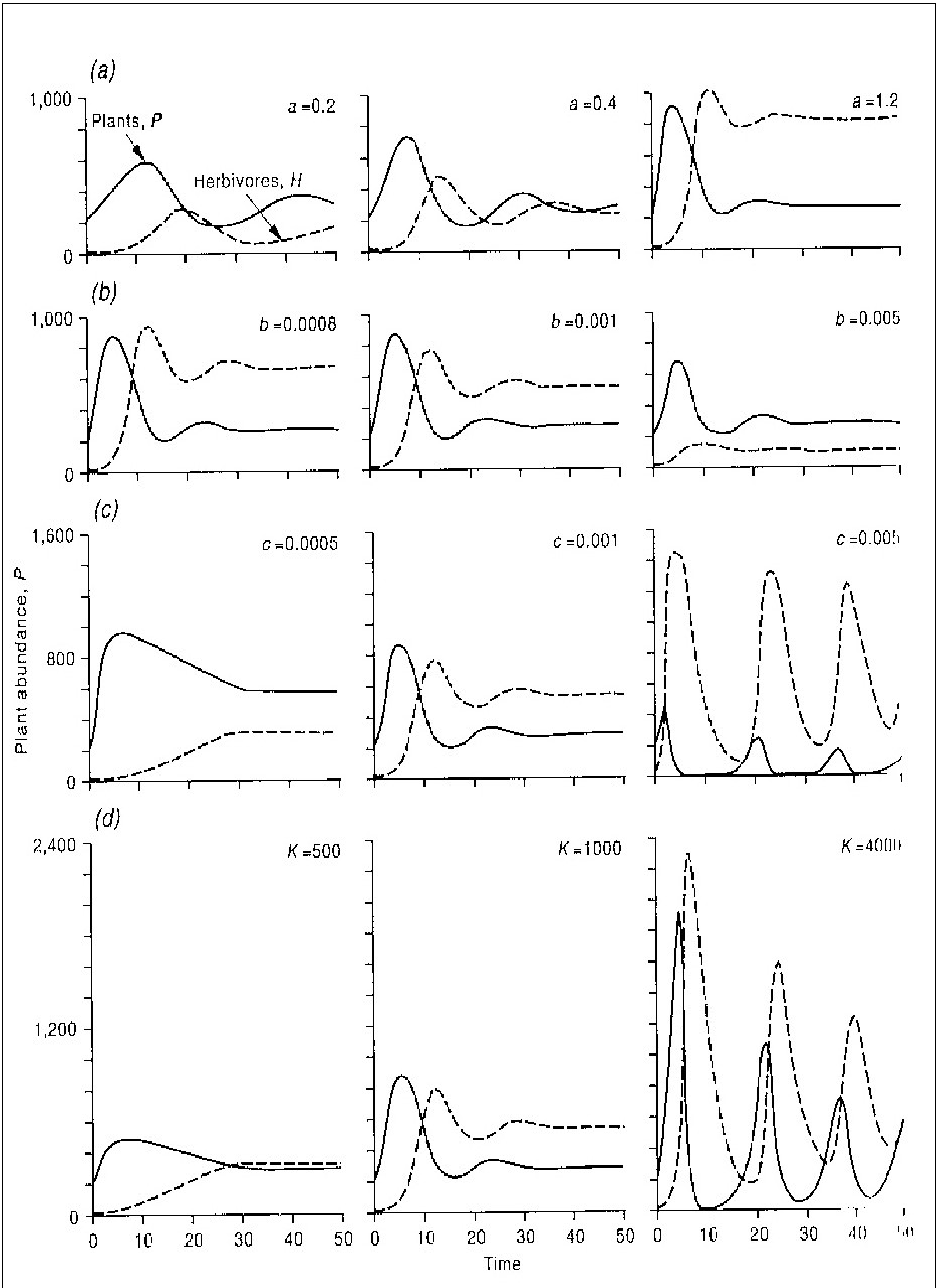


Fig. 6. 4. The Plant (after Rothmaler, W.)

Table 7. 1 Comparative plant ecology contingency table. Abbreviations of species are given in Fig. 7. 1.

| | Life his. | Est.history | Life form | Canopy str | Can. height | Lat. spread | Leaf phen. | Start Flow. | Flow. durat | Reg. strat. | Seed bank | Agen.of dis | Disp./gem. | Dispersule | Disp. Shap | Family |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AcerCam | 5 | 5 | 1 | 3 | 6 | 5 | 1 | 5 | 2 | 4 | 1 | 9 | 1 | 6 | 1 | 23 |
| AgriEup | 5 | 7 | 3 | 3 | 3 | 2 | 1 | 6 | 3 | 1 | 2 | 4 | 1 | 5 | 2 | 5 |
| AchiMil | 5 | 4 | 2 | 2 | 2 | 5 | 4 | 6 | 3 | 3 | 1 | 9 | 1 | 1 | 2 | 2 |
| AjugGen | 5 | 7 | 3 | 2 | 2 | 4 | 4 | 5 | 3 | 3 | 2 | 3,12 | 1 | 4 | 2 | 14 |
| ArenSerp | 1 | 6 | 5 | 3 | 2 | 1 | 2 | 5 | 4 | 15 | 3 | 8 | 2 | 1 | 1 | 15 |
| ArheEla | 5 | 1 | 3 | 3 | 5 | 4 | 5 | 6 | 2 | 31 | 1 | 5 | 1 | 5 | 2 | 1 |
| AstrGlyc | 5 | 6 | 3 | 2 | 1 | 2 | 4 | 6 | 2 | 35 | 3 | 10 | 2 | 6 | 1 | 3 |
| AvenPra | 5 | 3 | 3 | 2 | 2 | 3 | 4 | 6 | 1 | 1 | 1 | 5 | 1 | 5 | 3 | 1 |
| AvenPub | 5 | 3 | 3 | 3 | 2 | 2 | 4 | 6 | 2 | 31 | 1 | 5 | 1 | 4 | 3 | 1 |
| BrachPi | 5 | 5 | 3 | 2 | 2 | 5 | 4 | 7 | 1 | 3 | 1 | 10 | 1 | 5 | 3 | 1 |
| CarCaryo | 5 | 3 | 3 | 2 | 1 | 3 | 4 | 4 | 2 | 3 | 1 | 10 | 1 | 4 | 2 | 12 |
| Cardac | 4 | 4 | 3 | 2 | 5 | 1 | 4 | 6 | 3 | 4 | 1 | 7 | 1 | 5 | 2 | 2 |
| CareTom | 5 | 3 | 3 | 2 | 1 | 3 | 4 | 5 | 1 | 3 | 1 | 10 | 1 | 4 | 2 | 12 |
| CeraArv | 5 | 7 | 2 | 3 | 2 | 4 | 4 | 6 | 4 | 3 | | 8,12 | 2 | 2 | 1 | 15 |
| CoroVar | 5 | 7 | 3 | 3 | 4 | 4 | 1 | 6 | 3 | 5 | 1 | 10 | 2 | 6 | 1 | 3 |
| Crat sp. | 5 | 5 | 1 | 3 | 6 | 5 | 1 | 5 | 2 | 1 | 1 | 1 | 1 | 6 | 2 | 5 |
| DactGlo | 5 | 1 | 3 | 2 | 3 | 3 | 4 | 5 | 3 | 1 | 1 | 11 | 1 | 3 | 2 | 1 |
| ElytrRep | 5 | 4 | 3 | 3 | 3 | 5 | 4 | 6 | 4 | 3 | 2 | 12 | 1 | 5 | 3 | 1 |
| ErynCam | 5 | 6 | 3 | 2 | 4 | 2 | 4 | 7 | 3 | 1 | 1 | 5,7 | 1 | 5 | 2 | 4 |
| EuphCyp | 5 | 6 | 3 | 3 | 3 | 4 | 5 | 4 | 3 | 35 | 3 | 3 | 2 | 4 | 2 | 17 |
| FestRup | 5 | 7 | 3 | 2 | 2 | 4 | 4 | 5 | 3 | 31 | 1 | 5 | 1 | 3 | 3 | 1 |
| FragVir | 5 | 7 | 3 | 1 | 2 | 4 | 4 | 4 | 3 | 35 | 3 | 1 | 1 | 2 | 1 | 5 |
| FraxEx | 5 | 1 | 3 | 3 | 6 | 5 | 1 | 4 | 2 | 1 | 1 | 9 | 1 | 6 | 3 | 18 |
| GaliVer | 5 | 5 | 3 | 3 | 2 | 4 | 4 | 6 | 3 | 3 | 1 | 10 | 1 | 2 | 1 | 6 |
| GalMol | 5 | 5 | 3 | 3 | 2 | 4 | 4 | 5 | 4 | 3 | 1 | 10 | 1 | 2 | 1 | 6 |
| HypePer | 5 | 4 | 3 | 3 | 3 | 4 | 5 | 6 | 4 | 35 | 3 | 8 | 2 | 1 | 2 | 10 |
| JunReg | 5 | 1 | 3 | 3 | 6 | 5 | 1 | 5 | 2 | 31 | 1 | 2 | 1 | 6 | 1 | 19 |
| KnauArv | 5 | 7 | 3 | 2 | 3 | 2 | 5 | 7 | 3 | 1 | 1 | 5 | 1 | 5 | 2 | 20 |
| KoePyr | 5 | 3 | 3 | 3 | 4 | 3 | 4 | 6 | 2 | 1 | 1 | 5 | 1 | 5 | 2 | 1 |
| LeucVul | 5 | 1 | 3 | 3 | 3 | 2 | 4 | 7 | 3 | 315 | 3 | 11 | 1 | 2 | 3 | 2 |
| LotCor | 5 | 3 | 3 | 3 | 2 | 2 | 1 | 6 | 4 | 5 | 3 | 10 | 2 | 4 | 1 | 3 |
| LuzCamp | 5 | 3 | 3 | 2 | 1 | 3 | 4 | 3 | 4 | 35 | 3 | 3 | 2 | 3 | 2 | 16 |
| MedLup | 6 | 2 | 5 | 3 | 2 | 1 | 4 | 4 | 4 | 5 | 3 | 10 | 4 | 5 | 1 | 3 |
| MyoArv | 2 | 2 | 5 | 2 | 2 | 1 | 2 | 4 | 6 | 15 | 3 | 5 | 1 | 2 | 2 | 22 |
| PimpSax | 5 | 3 | 3 | 2 | 1 | 2 | 4 | 7 | 2 | 1 | 1 | 10 | 1 | 4 | 2 | 4 |
| PlanMed | 5 | 6 | 3 | 1 | 2 | 2 | 4 | 6 | 4 | 35 | 3 | 6 | 2 | 4 | 2 | 7 |
| PlantLanc | 5 | 7 | 3 | 1 | 2 | 2 | 4 | 5 | 5 | 35 | 3 | 6 | 2 | 4 | 2 | 7 |
| PoaAngu | 5 | 7 | 3 | 2 | 2 | 3 | 4 | 5 | 3 | 35 | 3 | 11 | 1 | 2 | 3 | 1 |
| PolCom | 5 | 3 | 2 | 3 | 1 | 2 | 4 | 5 | 3 | 1 | 1 | 3 | 2 | 4 | 2 | 13 |
| PoteArg | 5 | 5 | 3 | 3 | 2 | 2 | 4 | 6 | 5 | 35 | 3 | 10 | 1 | 2 | 1 | 5 |
| PoteHep | 5 | 5 | 3 | 3 | 2 | 2 | 4 | 4 | 3 | 35 | 3 | 10 | 1 | 2 | 1 | 5 |
| PoteRep | 5 | 4 | 3 | 3 | 2 | 5 | 5 | 6 | 4 | 35 | 3 | 10,12 | 1 | 2 | 1 | 5 |
| PrunAvi | 5 | 5 | 1 | 3 | 6 | 5 | 1 | 4 | 2 | 31 | 1 | 1 | 1 | 6 | 1 | 5 |
| PruSpi | 5 | 5 | 1 | 3 | 6 | 5 | 1 | 3 | 3 | 31 | 1 | 1 | 1 | 6 | 1 | 5 |
| PyrCom | 5 | 5 | 1 | 3 | 6 | 5 | 1 | 5 | 1 | 1 | 1 | 1 | 1 | 6 | 1 | 5 |
| Quercu | 5 | 5 | 1 | 3 | 6 | 5 | 1 | 4 | 2 | 1 | 1 | 2 | 1 | 6 | 2 | 21 |
| Rosa | 5 | 5 | 1 | 3 | 6 | 5 | 1 | 5 | 3 | 31 | 1 | 1 | 1 | 6 | 2 | 5 |
| SangMin | 5 | 3 | 3 | 2 | 2 | 2 | 4 | 6 | 2 | 5 | 3 | 10 | 1 | 4 | 2 | 5 |
| ScaOchr | 5 | 7 | 3 | 2 | 3 | 2 | 5 | 7 | 2 | 1 | 1 | 5 | 1 | 5 | 2 | 20 |
| Silealb | 6 | 2 | 3 | 3 | 4 | 2 | 4 | 5 | 5 | 5 | 3 | 8 | 2 | 3 | 1 | 15 |
| Tara cf. | 5 | 2 | 3 | 1 | 3 | 2 | 4 | 3 | 8 | 4 | 2 | 7,12 | 1 | 3 | 3 | 2 |
| ThlaPer | 2 | 2 | 5 | 3 | 2 | 1 | 3 | 3 | 3 | 5 | 3 | 9 | 2 | 2 | 1 | 8 |
| ThymPul | 5 | 3 | 2 | 3 | 1 | 4 | 4 | 7 | 4 | 35 | 3 | 10 | 1 | 1 | 1 | 14 |
| TrifCam | 2 | 6 | 5 | 3 | 2 | 1 | 2 | 6 | 4 | 15 | 3 | 5 | 4 | 2 | 2 | 3 |
| VerbNig | 4 | 2 | 3 | 2 | 5 | 1 | 4 | 6 | 4 | 5 | 3 | 8 | 2 | 1 | 2 | 11 |
| VeroArv | 1 | 6 | 5 | 2 | 1 | 1 | 2 | 4 | 3 | 5 | 3 | 10 | 2 | 1 | 1 | 11 |
| VeroCha | 5 | 7 | 2 | 3 | 1 | 3 | 4 | 4 | 3 | 35 | 3 | 10 | 2 | 1 | 1 | 11 |
| VicAng | 2 | 2 | 5 | 3 | 3 | 1 | 2 | 6 | 4 | 5 | 3 | 10 | 2 | 5 | 1 | 3 |
| VicHirs | 2 | 2 | 5 | 3 | 2 | 1 | 2 | 6 | 3 | 5 | 3 | 10 | 2 | 5 | 1 | 3 |
| ViciTetr | 2 | 2 | 5 | 3 | 2 | 1 | 2 | 5 | 5 | 5 | 3 | 10 | 2 | 5 | 1 | 3 |
| ViolArv | 1 | 2 | 5 | 2 | 3 | 1 | 5 | 4 | 4 | 5 | 3 | 11 | 2 | 2 | 2 | 9 |
| ViolHir | 5 | 3 | 3 | 1 | 3 | 2 | 4 | 4 | 2 | 3 | 2 | 3 | 2 | 5 | 3 | 9 |

Table 7. 2. The legend for properties explanation. after (GRIME, J.P., HODGSON, J.G., HUNT, R., 1990)

| |
|---|
| Life history: 1 – As, summer annual; 2- Aw, winter annual; 3- B, usually biennial; 4- M, monocarpic perennial; 5- P, polycarpic perennial; 6 –species typically monocarpic, but it is also capable of being either a winer annual or a polycarpic perenial |
| |
| Established history: 1- C, competitor; 2- R, ruderal; 3- S, stress-tolerant ; 4-CR, competitive ruderal; 5- SC, stress-tolerant competitor; 6- SR, stress-tolerant ruderal; 7- CSR strategist |
| |
| Life form: 1- Ph, phanerophyte; 2- Ch, chamaephyte; 3- H, hemicrryptophyte; 4- G, geophyte; 5- Th, therophyte |
| |
| Canopy structure: 1- R, rosette; 2- S, semi-rosette; 3- L, leafy; 4- -, leaves small, reduced to scales or spines |
| |
| Canopy height: 1- less than 100 mm in height; 2- 101-299 mm; 3- 300-599 mm; 4- 600-999 mm; 5- 1,0-3,0 m; 6- greater than 3,0 m |
| |
| Lateral spread: 1- therophytes; 2- perennials forming small tussocks or compact unbranched rhizomes ( less than 100 mm in diameter); 3- 100-250 mm; 4- 251-1000 mm; 5- more than 1000 mm |
| |
| Leaf phenology: 1- Sa, aestival (duration of canopy spring to autumn); 2- Sh, hibernal (mainly autumn to early summer); 3-Sv, vernal (winter to spring); 4- Ea, always evergreen; 5- Ep, partially evergreen ( species evergreen in some habitats and not in others, or leaves slowly but incompletely senescing over winter, or evergreen in mild winters, or overwintering with small leafy shoots, formed in autumn) |
| |
| Start of Flowering: 3- March; 4- April; 5- May; 6- June; 7- July; 8- August as the month of first flowering; |
| Flowering duration time: x- as flowering lasting x month |
| |
| Regenerative strategies: 1- S, seasonal regeneration by seed; 2- Sv, seasonal regeneration by vegetative means (offsets soon independent of parent); 3- V, lateral vegetative spread; 4- W, regeneration involving numerous widely-dispersed seeds or spores; 5- Bs, a persistent bank of buried seeds or spores |
| |

| |
|---|
| |
| Seed bank: 1- transient, seed rarely persisting for more than one year; 2- short-term persistent, seed persisting for more than one year but unusually less than five; 3- long- term persistent, seeds persisting for at least five years, and often much longer; 4- -, no seed produced |
| |
| Dispersule and germinule formule: 1- germinule a seed, dispersed either within a fruit or as a seed; 2 - dispersule a and germinule a seed; 4 - dispersule and germinule a fruit (or part of fruit, e.g. nutlet or mericarp) |
| |
| Dispersule weight: 1- weight less than or equal to 0.20 mg; 2- 0,21-0,50 mg; 3- 0,51-1,00 mg; 4- 1,01-2,00 mg; 5- 2,01-10,mg; 6- greater than 10 mg; 7- no seeds produced |
| |
| Dispersule shape: 1- length/breath ratio less than 1,5; 2- 1,5-2,5; 3- greater than 2,5; 4- seed normally absent |
| |
| Family: *1-Poaceae; 2- Asteraceae; 3- Fabaceae; 4- Apiaceae; 5- Rosaceae; 6- Rubiaceae; 7- Plantaginaceae; 8- Brassicaceae; 9- Violaceae; 10- Hypericaceae; 11- Scrophulariaceae; 12- Cyperaceae; 13- Polygalaceae; 14- Lamiaceae; 15- Caryophyllaceae; 16- Juncaceae; 17- Euphorbiaceae; 18- Oleaceae; 19-Juglandaceae; 20- Dipsacaceae; 21- Fagaceae; 22- Boraginaceae; 23- Aceraceae* |

Fig. 7. 1. Species abbreviations

AcerCam - *Acer Campestre,* AgriEup - *Agrimonia eupatoria,* AchiMil - *Achillea millefolium*, AjugGen – *Ajuga reptans*, ArenSerp - *Arenaria serpyllifolia*, ArheEla - *Arhenatherum elatius*, AstrGlyc – *Astralagus glycyphyllos*, AvenPra - *Avenula pratense,* AvenPub - *Avenula pubescens,* BrachPi – *Brachypodium pinnatum,* CarCaryo - *Carex caryophyllea,* Cardac - *Carduus acanthoides,* CareTom - *Carex tomentosa,* CeraArv- *Cerastium arvense,* CoroVar - *Coronilla varia,* Crat spp. - *Crataegus,* DactGlo - *Dactylis glomerata,* ElytrRep - Elytrigia repens, ErynCam - *Eryngium campestre,* EuphCyp - *Euphorbia cyparissias,* FestRup - *Festuca rupicola*, FragVir - *Fragaria viridis,* FraxEx - *Fraxinus excelsior*, GaliVer - *Galium verum,* GalMol - *Galium mollugo*, HypePer - *Hypericum perforatum,* JunReg - *Juglans regia*, KnauArv - *Knautia arvensis,* KoePyr - *Koeleria pyramidata,* LeucVul - *Leaucantheum vulgare,* LotCor - *Lotus corniculatus*, LuzCamp - *Luzula campestris*, mechy - *Bryophyta*, MedLup - *Medicago lupulina,* MyoArv - *Myosotis arvensis,* PimpSax – *Pimpinella saxifraga,* PlanMed - *Plantago media*, PlantLanc - *Plantago lanceolata,* PoaAngu - *Poa angustifolia,* Polcom - *Polygala comosa*, PoteArg - *Potentilla argentea*, PoteHep - *Potentilla heptaphylla* PoteRep – *Potentilla reptans,* PrunAvi - *Prunus avium,* PruSpi - *Prunus spinosa,* PyrCom - *Pyrus comunis,* Quercu - *Quercus robur,* Rosa - *Rosa spp*. SangMin -

*Sanguisorba minor,* ScaOchr - *Scabiosa ochroleuca,* Silealb – *Silene album,* Tara - *Taraxacum spp.,* ThlaPer - *Thlaspi perfoliatum,* ThymPul - *Thymus praecox,* TrifCam – *Triforium campestre,* VerbNig - *Verbascum nigrum,* VeroArv - *Veronica arvensis,* VeroCha - *Veronica chamaedrys,* VicAng - *Vicia angustifolia*, VicHirs - *Vicia hirsuta,* ViciTetr - *Vicia tetrasperma*, ViolArv - *Viola arvensis,* ViolHir - *Viola hirta*

Fig. 7. 2. Graph of plant abundance (y-axis), comparative ecology in established history. Note how the plants strategies fit our predicted supposition on their economy. (G, C, N- treatment abbreviation)

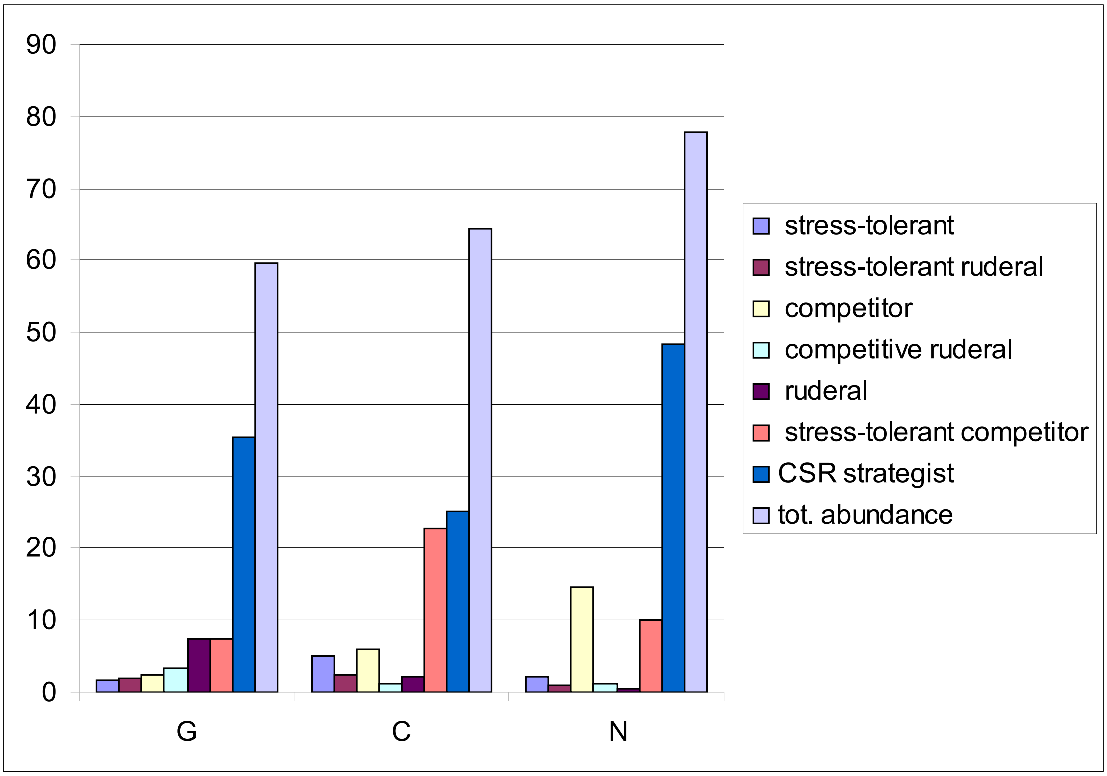



Fig. 7. 3. Graph of plant abundance, comparative ecology in life history. Winter annuals benefit soil surface disturbance. (G, C, N- treatment abbreviation)

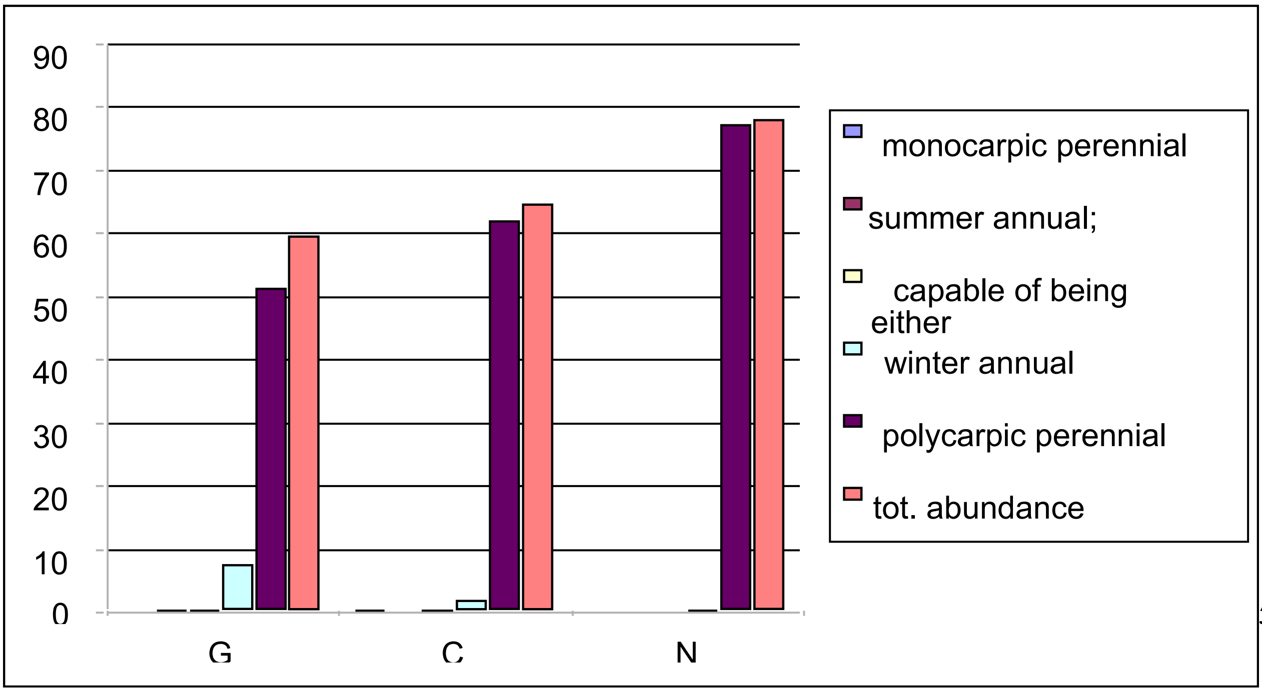


Fig. 7. 4. Graph of plant abundance, comparative ecology in canopy structure. The highest abundance on cut site of rosette species is supposed. (G, C, N- treatment abbreviation)

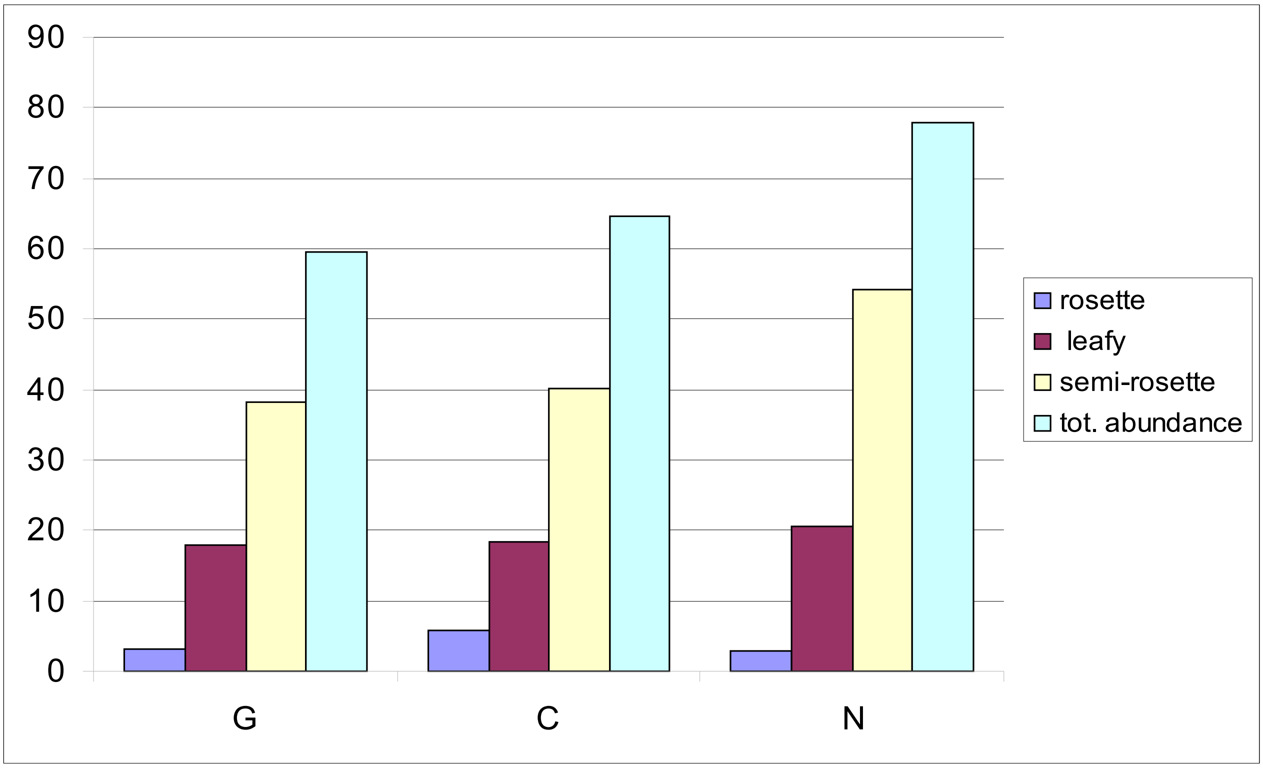



Fig. 7. 4. Graph of plant abundance, comparative ecology in lateral spread. On cut site the species tend to spread mainly by means of long rhizomes. (G, C, N- treatment abbreviation)

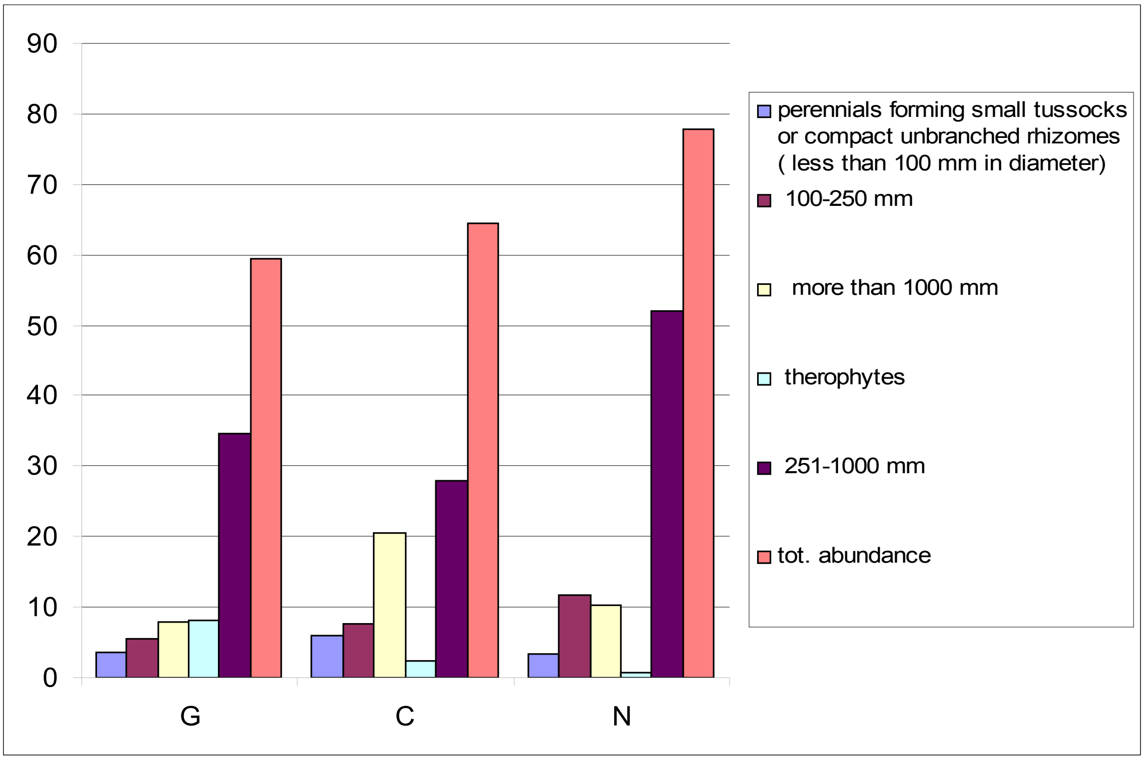


Fig. 7. 5. Graph of plant abundance, comparative ecology in life form. Therophyte is category which include *q.v.* winter annuals. (G, C, N- treatment abbreviation)

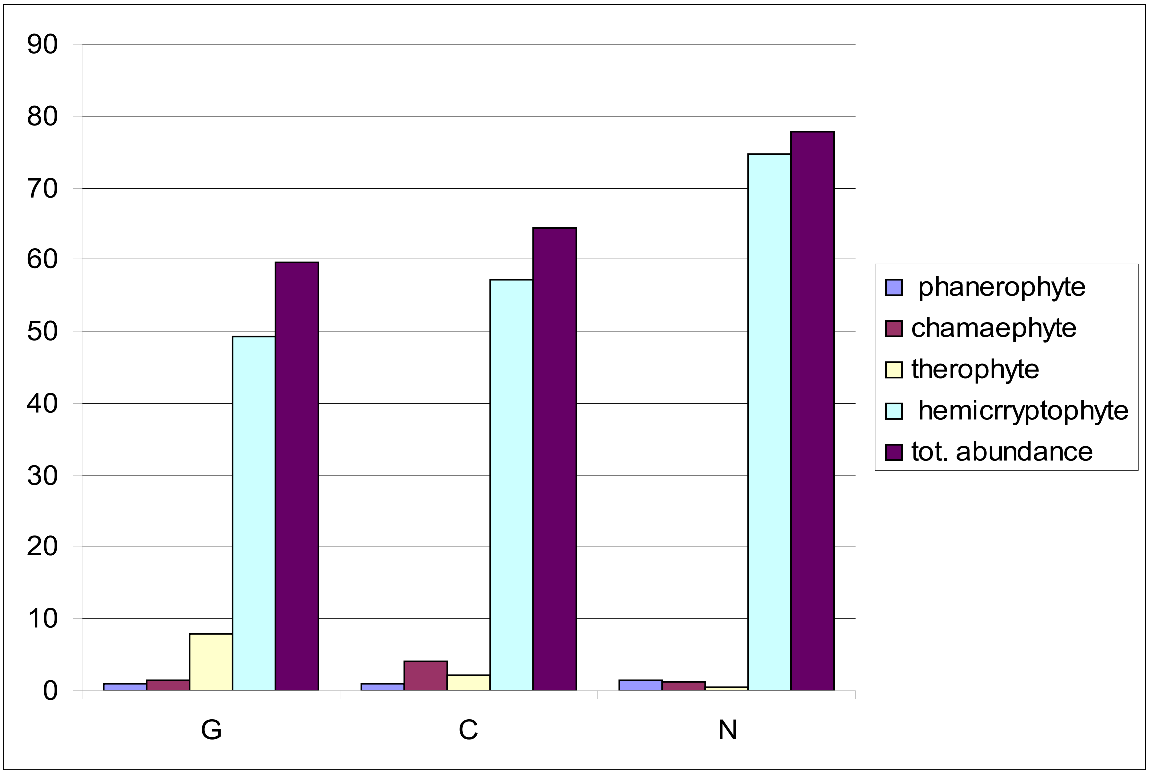



Fig. 7. 6. Graph of plant abundance, comparative ecology in regenerative strategies. The persistent bank reveal itself only on grazed site, however this does not mean non-occurrence on other sites.(G, C, N- treatment abbreviation)

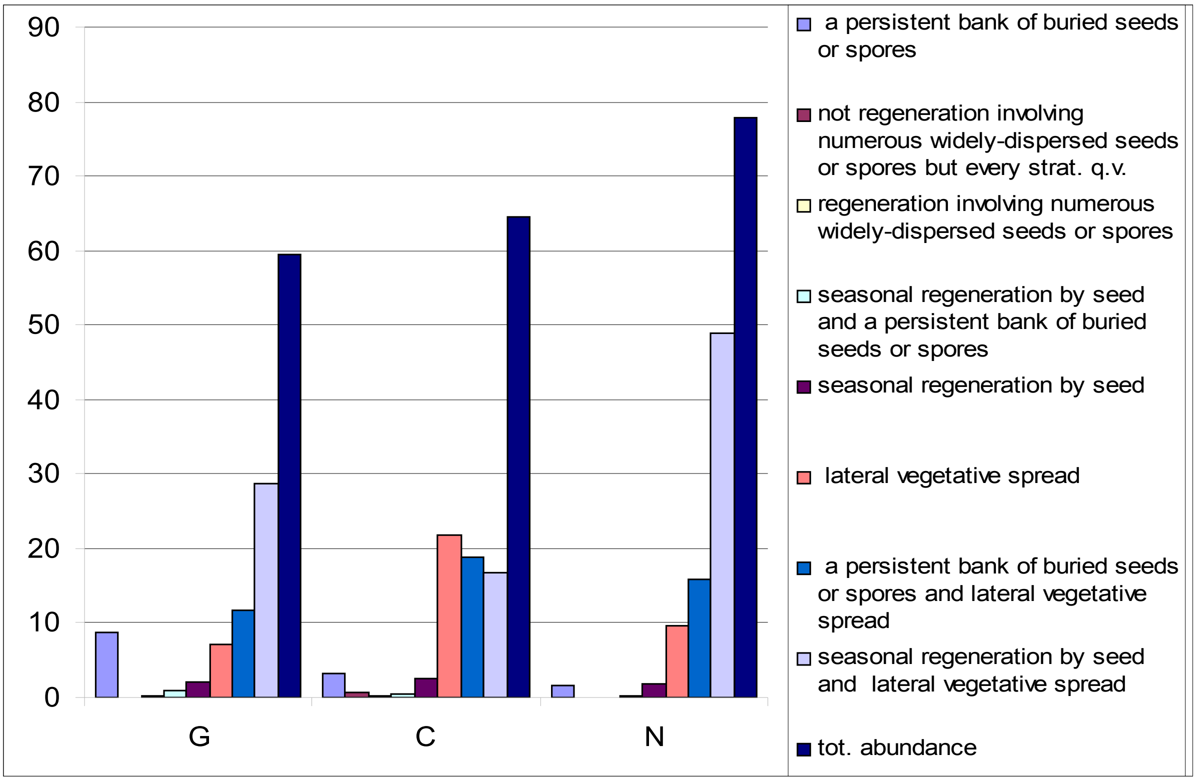


Fig. 7. 7. Graph of plant abundance, comparative ecology in agency of dispersal (G, C, N- treatment abbreviation)

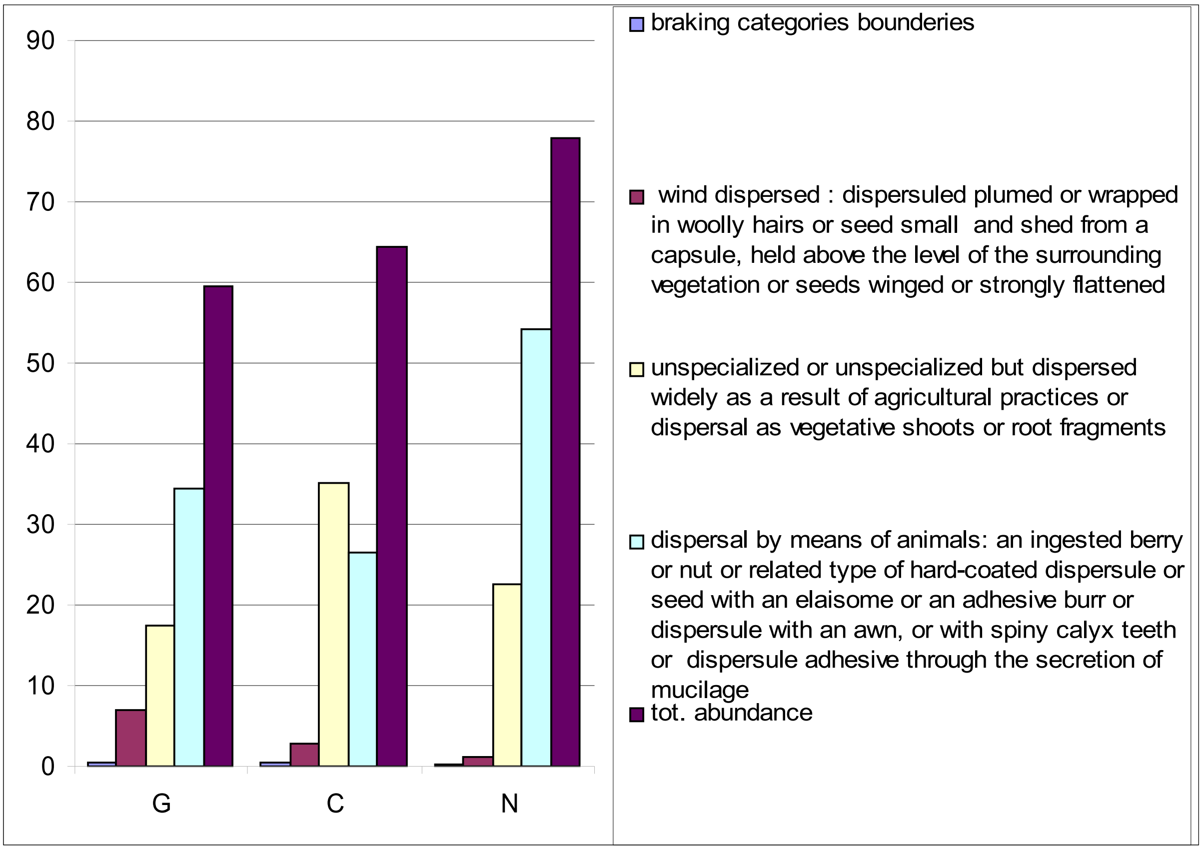



Fig. 7. 8. Graph of plant abundance, comparative ecology in dispersule form. There is clear decrement in seed dispersule and geminule going G,C, N. In seed ecology there is question. Does the species, where occurred, occurred there because dispersal strategy? (G, C, N- treatment abbreviation)

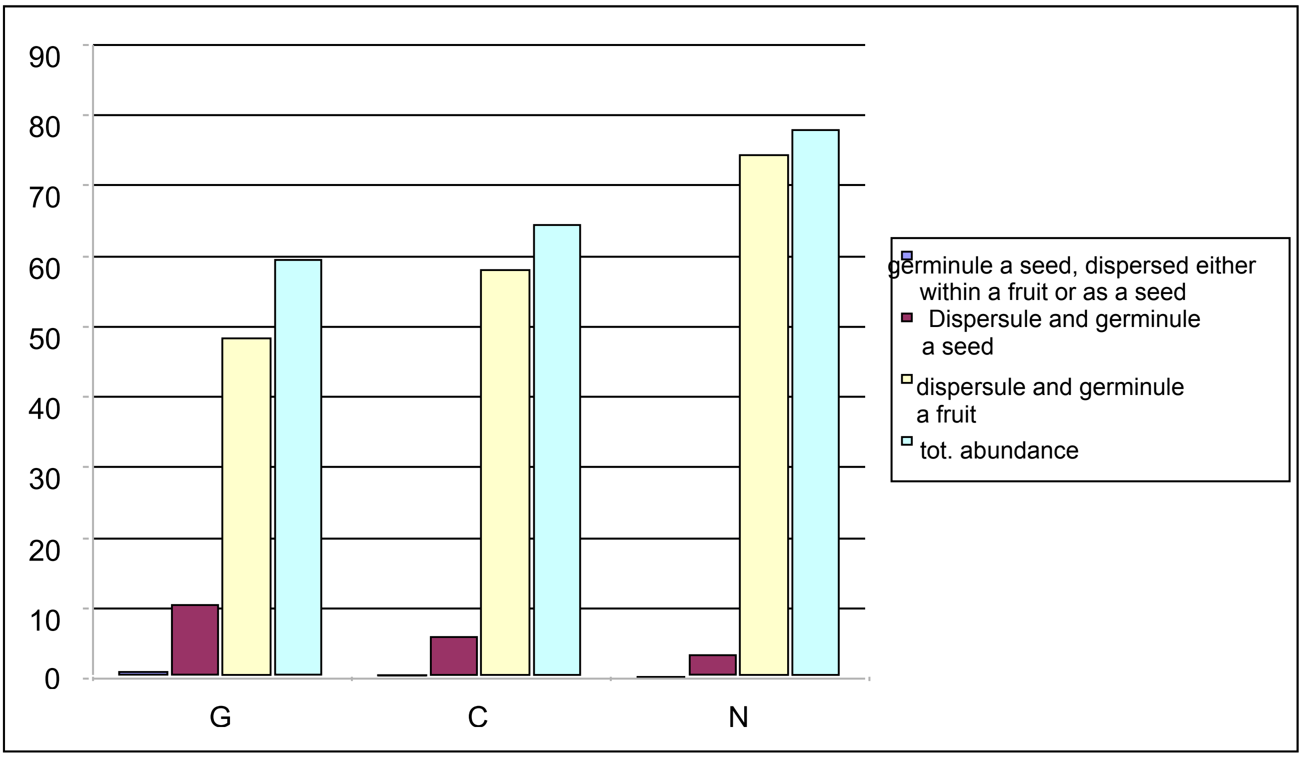


Fig. 7. 9. Graph of plant abundance, comparative ecology in seed bank. Is it still long-term seed bank on control (N) site? (G, C, N- treatment abbreviation)

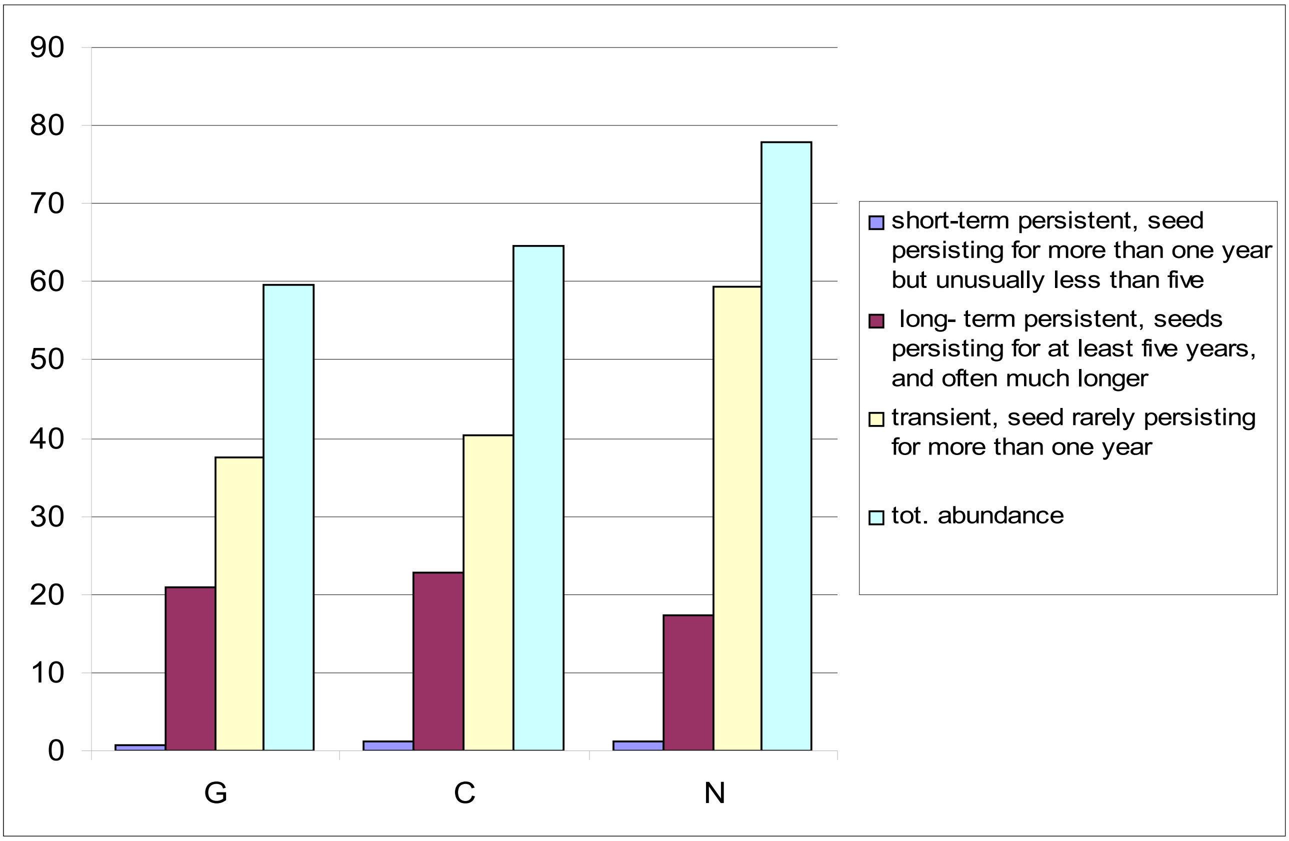



Fig. 7. 10. Graph of plant abundance, comparative ecology in leaf phenology. The grazed sites appear to be the most diversified one. (G, C, N- treatment abbreviation)

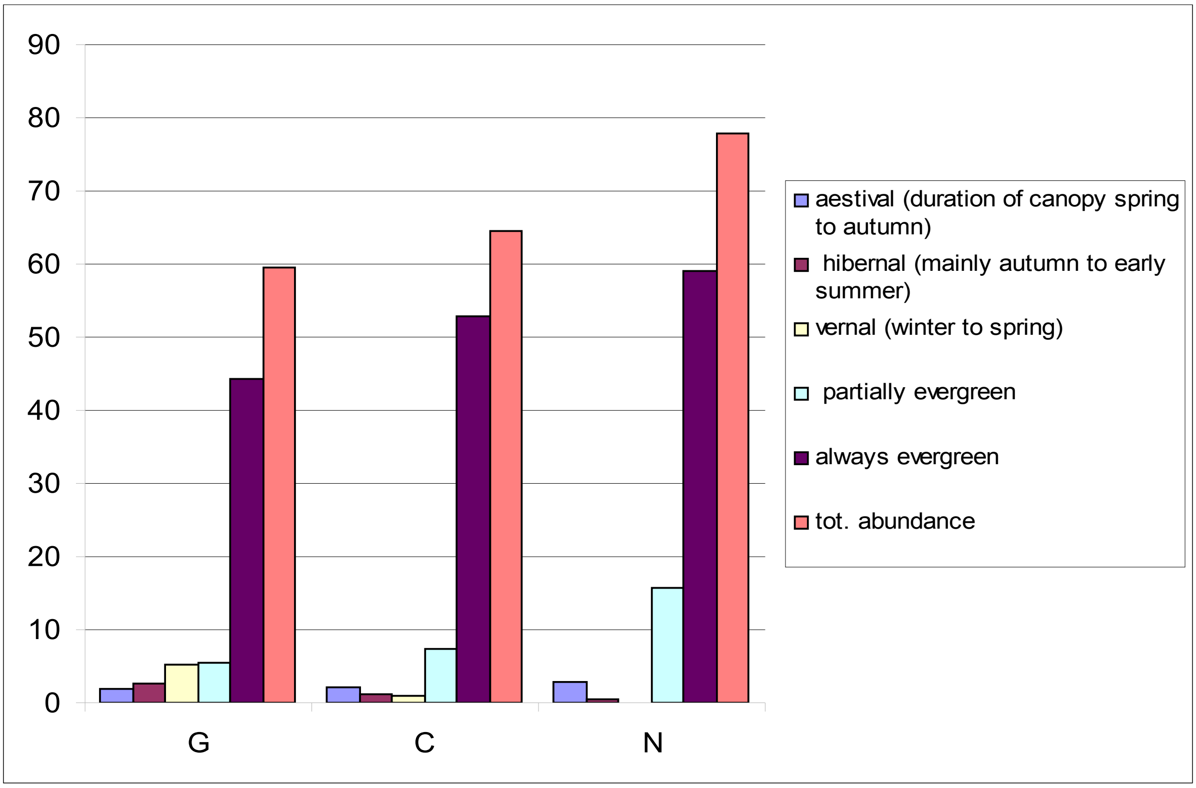


Fig. 7. 11. Graph of plant abundance given by occurred mean number of canopy height of each species from literal source. For explanatory number see Tab. 7. 2. It is worth compare the results from real observed high of stand see Fig. 5. 5. (G, C, N- treatment abbreviation) The standard deviation is also given.

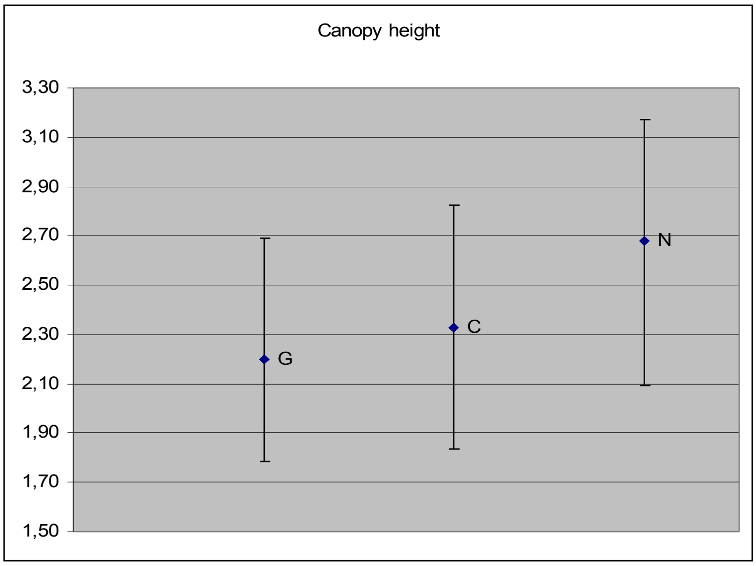
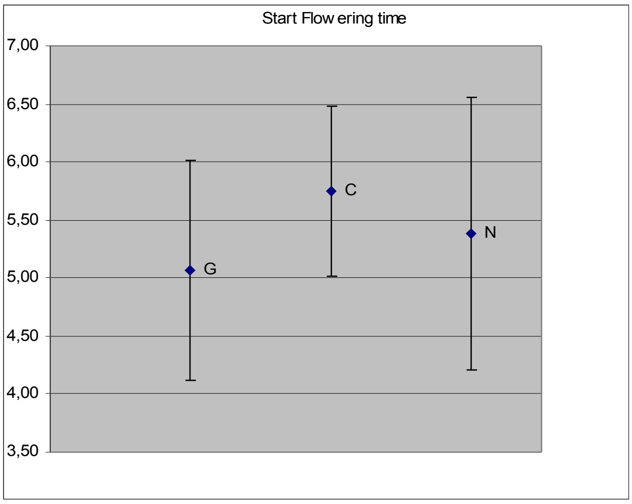



Fig. 7. 12. Graphs showing the Starting month of flowering and the Duration of flowering. The mean and standard deviation is given for each treatment in 2007. The most obvious feature is the adaptation of plant guild to cutting.; starting early and not to linger.(G, C, N- treatment abbreviation; y-axis Tab. 7. 2)



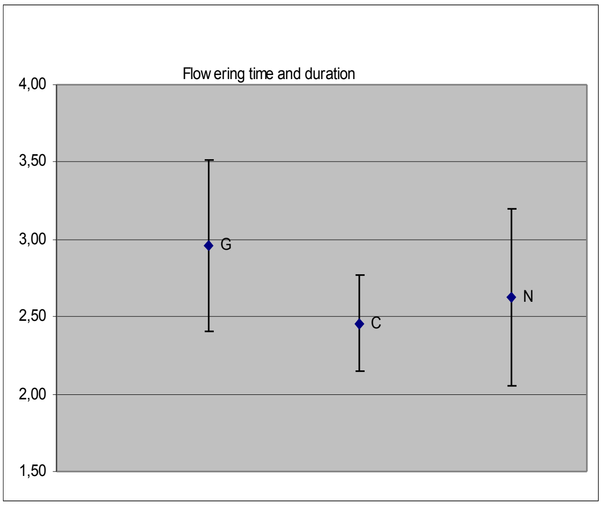
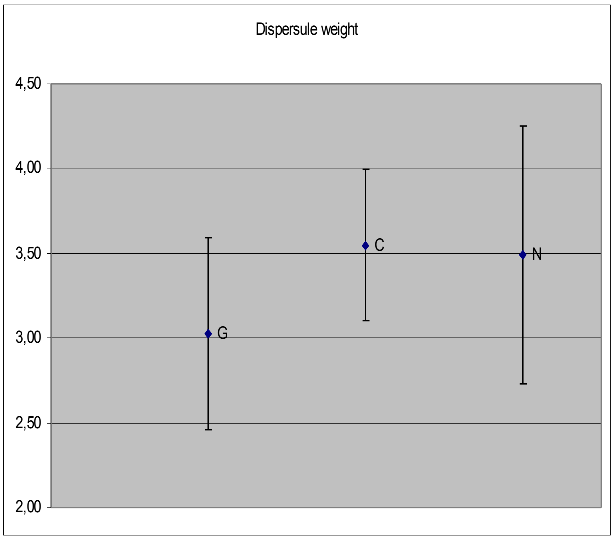



Fig. 7. 13. Graphs concerning the dispersule properties on each treatment site. The common assumptions which we associated with ecology of each site are obvious, notwithstanding the deviations of our Data.(G, C, N- treatment abbreviation; y-axis Tab. 7. 2)



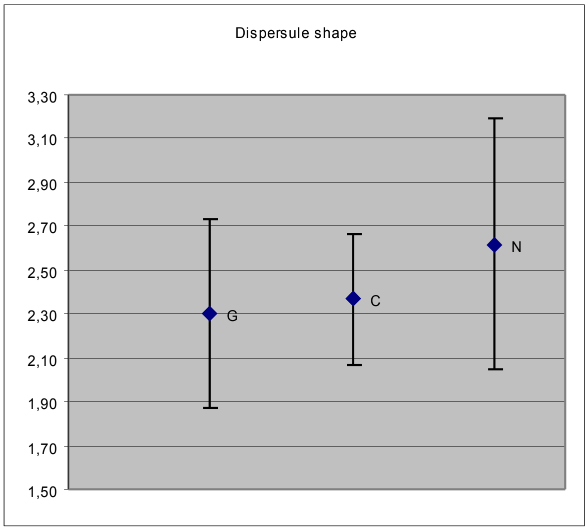




Fig. 7. 14. The back bone, plant species and its mean abundance.

| | |
|---|---|
| ArheEla | 9,6 |
| BrachPi | 9,0 |
| EuphCyp | 2,1 |
| FestRup | 28,3 |
| FragVir | 11,1 |
| GalMol | 4,3 |
| mechy | 25,8 |
| PoaAngu | 5,4 |

Fig. 7. 16 The species abundances curves on treatment (G, C, N) sites

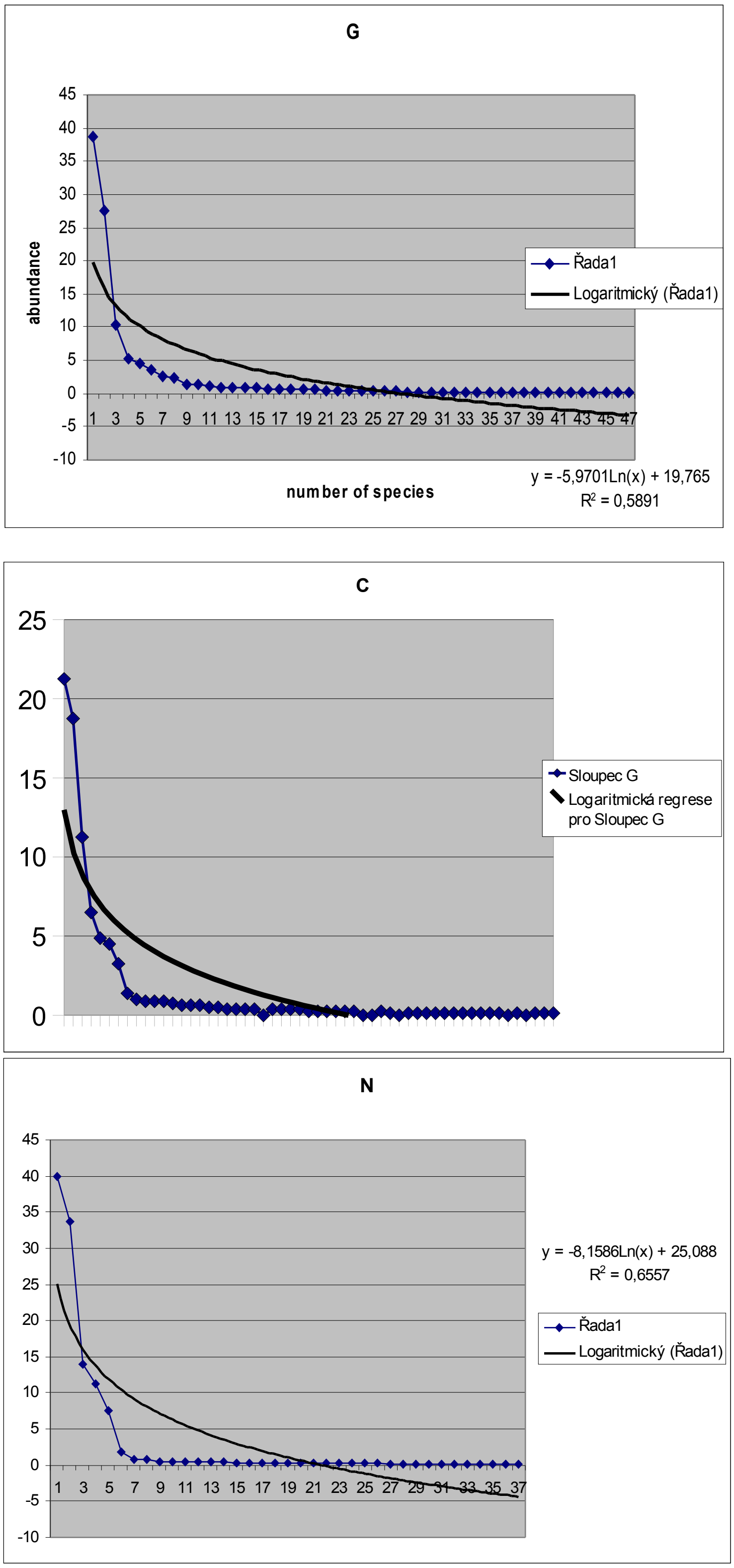


Fig. 7. 17. The example, part of source text of program compute Index of Atmospheric Purity

```
procedure TForm1.Button3Click(Sender: TObject);
var
  i,j,k,m,s: integer;
  sousedi: set of 0..100;
  Q: array of real;
  r: real;
begin
//Computation of index Q for each species
  Memo1.Lines.Add('');
  Memo1.Lines.Add('Index Q:');
  SetLength(Q, length(a));
  for i:= 0 to high(a) do begin
    m:= 0;
    s:= 0;
    sousedi:= [0..high(a)] - [i];
    for j:= 0 to high(a[i]) do
      if sign(a[i,j]) = 1 then begin
        inc(m);
        for k:= 0 to high(a) do
          if (k in sousedi) and (sign(a[k,j]) = 1) then begin
            sousedi:= sousedi - [k];
            inc(s)
          end;
      end;
    Q[i]:= s/m;
    Memo1.Lines.Add(FloatToStr(Q[i]));
  end;
```

Fig. 7. 18. The results of index evaluations for treatment site (Section 7. 4.).

| Mean 05 | standard dev. | treatment |
|---|---|---|
| 69,3 | 8,68 | G |
| 85,4 | 11,3 | C |
| 76,21 | 19,76 | N |

| Mean 07 | standard dev. | treatment |
|---|---|---|
| 52,72 | 24,82 | G |
| 47,66 | 7,58 | C |
| 56,87 | 13,57 | N |

## Postscript

The Sense can poses no Reason. Apodeictic statement going backward is impossible. The Science objectified more and more; thus losing inner Sense; is becoming the Nihilism of the Nature. The outer Sense is shaken by recently coined subjectivist Relativism; which does not fully grasp the Responsibility. The antinomy of the Being and Sense reveal the true being problematic, which again and again is seeking the absolute sense. The Being is merely enigmatic. Above intentions, by reflection I know will be open to much criticism. I shall be grateful to all those who will be kind enough to show me the Reason where and how I have gone wrong. However I have not given to these notes (as they are printed) by any means its Final form. But why so soft, are we not next of kin?

Anyway, there are still many letters that I hope are not printed only for the (posthumous) Fame e.g. It is peculiar, that the most endangered biome is not the Tropical rain forest, but the Temperate grassland community. (Ecology Letters 2005, 8: 23-29)

The absence of evidence is not evidence of absence.

# Announcement

I announce that all I write in this paper I complete by myself with the aid of literature named in the Reference.

Lukáš Strnad 27 April 2008

| species | 1G5 | 1G7 | 2C5 | 2C7 | 3N5 | 3N7 | 4N5 | 4N7 | 5C5 | 5C7 | 6G5 | 6G7 | 7G5 | 7G7 | 8N5 | 8N7 | 9C5 | 9C7 | 10C5 | 10C7 | 11N5 | 11N7 | 12G5 | 12G7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AcerCam | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AgriEup | 0 | 0 | 0 | 0,5 | 0 | 0 | 0,5 | 0,5 | 6 | 1 | 0 | 0,5 | 0,5 | 0 | 7 | 0,5 | 5 | 0,5 | 2 | 0,5 | 0,5 | 0,5 | 1 | 0 |
| AchiMil | 1 | 0,5 | 3 | 0 | 1 | 0 | 5 | 0,5 | 3 | 1 | 10 | 0,5 | 0,5 | 0,5 | 5 | 0,5 | 8 | 0,5 | 5 | 0 | 2 | 0,5 | 1 | 0,5 |
| AjugGen | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 1 | 0 | 0,5 | 1 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ArenSerp | 0 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ArheEla | 20 | 3 | 20 | 3 | 30 | 35 | 10 | 15 | 15 | 15 | 15 | 1 | 5 | 1 | 10 | 5 | 10 | 1 | 5 | 0,5 | 5 | 1 | 5 | 0,5 |
| AstrGlyc | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 |
| AvenPra | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 8 | 0,5 | 3 | 0,5 | 0,5 | 0 | 1 | 0 |
| AvenPub | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| BrachPi | 15 | 10 | 10 | 40 | 10 | 2 | 5 | 10 | 3 | 5 | 5 | 2 | 5 | 3 | 10 | 3 | 5 | 5 | 10 | 25 | 10 | 15 | 8 | 1 |
| CarCaryo | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 |
| Cardac | 0 | 0 | 0 | 0,5 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CareTom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 |
| celkova | 80 | 55 | 80 | 70 | 85 | 80 | 65 | 75 | 70 | 60 | 80 | 60 | 80 | 60 | 55 | 70 | 55 | 50 | 60 | 60 | 70 | 75 | 70 | 60 |
| CeraArv | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0,5 | 0,5 | 3 | 0,5 | 2 | 0 | 4 | 0,5 | 1 | 0 | 3 | 0,5 | 1 | 0,5 |
| CoroVar | 1 | 0,5 | 0 | 0,5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0,5 | 0,5 | 2 | 0,5 | 3 | 0,5 | 4 | 0,5 | 0,5 | 0,5 |
| Crat sp. | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DactGlo | 0,5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0,5 | 0,5 | 0 | 0 | 0 |
| ElytrRep | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ErynCam | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0,5 | 0 | 0,5 | 0 | 0 |
| EuphCyp | 2 | 0,5 | 3 | 2 | 3 | 0,5 | 10 | 0,5 | 5 | 0,5 | 5 | 0,5 | 1 | 0,5 | 5 | 0,5 | 2 | 0,5 | 1 | 0,5 | 3 | 0,5 | 4 | 0,5 |
| FestRup | 20 | 20 | 50 | 15 | 20 | 25 | 40 | 50 | 15 | 5 | 30 | 30 | 50 | 25 | 50 | 50 | 40 | 20 | 15 | 5 | 25 | 10 | 40 | 30 |
| FragVir | 40 | 7 | 15 | 5 | 30 | 3 | 30 | 0,5 | 20 | 5 | 20 | 0,5 | 15 | 3 | 15 | 3 | 10 | 5 | 15 | 3 | 15 | 1 | 5 | 0,5 |
| FraxEx | 0,5 | 0 | 0 | 0 | 0,5 | 0,5 | 0,5 | 0 | 0,5 | 0,5 | 1 | 0,5 | 0 | 0 | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GaliVer | 0 | 0,5 | 0 | 0,5 | 5 | 0,5 | 0,5 | 0,5 | 10 | 1 | 2 | 5 | 0 | 0 | 1 | 0 | 1 | 0,5 | 2 | 0 | 1 | 0 | 0 | 0 |
| GalMol | 10 | 0,5 | 8 | 1 | 8 | 0,5 | 30 | 0,5 | 5 | 3 | 4 | 0,5 | 4 | 1 | 5 | 0,5 | 5 | 0,5 | 8 | 1 | 5 | 0,5 | 2 | 0,5 |
| HypePer | 4 | 0,5 | 4 | 0,5 | 3 | 0,5 | 8 | 0,5 | 3 | 0,5 | 5 | 0,5 | 0 | 0,5 | 0 | 0 | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 |
| JunReg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KnauArv | 0,5 | 0,5 | 1 | 0,5 | 0 | 0 | 0 | 0 | 1 | 0,5 | 2 | 0,5 | 1 | 0,5 | 1 | 0,5 | 1 | 0,5 | 5 | 0,5 | 0 | 0,5 | 1 | 0,5 |
| KoePyr | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| LeucVul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| LotCor | 0 | 0,5 | 0 | 0,5 | 0 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LuzCamp | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0,5 | 0,5 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0,5 |
| MedLup | 0 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 |
| mechy | 10 | 50 | 40 | 30 | 15 | 40 | 20 | 45 | 20 | 20 | 15 | 35 | 20 | 30 | 25 | 45 | 15 | 20 | 15 | 15 | 15 | 30 | 25 | 25 |
| MyoArv | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PimpSax | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0,5 | 0 | 0,5 | 0,5 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0,5 | 0,5 |
| PlanMed | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0,5 | 0,5 | 0 | 8 | 3 | 5 | 0,5 | 2 | 0,5 | 1 | 0,5 |
| PlantLanc | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 |
| PoaAngu | 10 | 3 | 5 | 10 | 3 | 25 | 5 | 10 | 5 | 10 | 1 | 10 | 3 | 3 | 2 | 5 | 2 | 5 | 0,5 | 1 | 2 | 5 | 3 | 1 |
| PolCom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0,5 |
| PoteArg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0,5 |
| PoteHep | 2 | 0,5 | 1 | 0,5 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 1 | 0,5 | 4 | 0,5 | 2 | 0,5 | 3 | 3 | 2 | 1 | 0 | 0,5 |
| PoteRep | 0 | 7 | 0 | 0,5 | 0 | 0 | 1 | 2 | 6 | 1 | 0,5 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PrunAvi | 3 | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PruSpi | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 |
| PyrCom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quercu | 0,5 | 0 | 0 | 0 | 0 | 0,5 | 0 | 1 | 1 | 0,5 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0,5 | 0 | 0 |
| Rosa | 3 | 0,5 | 8 | 0,5 | 3 | 2 | 1 | 0 | 1 | 1 | 30 | 1 | 7 | 0,5 | 1 | 1 | 1 | 0,5 | 2 | 0,5 | 1 | 0,5 | 10 | 0 |
| SangMin | 0,5 | 0 | 1 | 0,5 | 0 | 0,5 | 0 | 0,5 | 0,5 | 0,5 | 0 | 0,5 | 0 | 0,5 | 1 | 0,5 | 0,5 | 0,5 | 3 | 1 | 3 | 0,5 | 4 | 2 |
| ScaOchr | 0 | 0 | 0,5 | 0,5 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0,5 | 0,5 | 0 | 0,5 | 0,5 | 0,5 | 0,5 | 1 | 0,5 | 0 | 0,5 |
| Silealb | 0 | 0,5 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 0,5 | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tara cf. | 0 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ThlaPer | 3 | 20 | 1 | 0 | 0,5 | 0 | 3 | 0 | 2 | 3 | 1 | 0,5 | 1 | 0,5 | 0,5 | 0 | 2 | 0,5 | 0 | 0 | 0 | 0 | 1 | 0 |
| ThymPul | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 3 | 2 | 10 | 1 | 1 | 0 | 0 |
| TrifCam | 0 | 0,5 | 2 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 1 | 0 | 1 | 0,5 | 0,5 | 1 | 0,5 | 0,5 | 0 | 2 | 0 | 0,5 | 0,5 |
| VerbNig | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0,5 | 1 | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| VeroArv | 0,5 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VeroCha | 0,5 | 0 | 5 | 0,5 | 0 | 0 | 8 | 0,5 | 10 | 0,5 | 1 | 0,5 | 1 | 0,5 | 1 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VicAng | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VicHirs | 0 | 3 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 |
| ViciTetr | 0 | 2 | 2 | 0,5 | 0,5 | 0 | 0,5 | 0 | 3 | 0,5 | 0,5 | 0,5 | 0,5 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,5 | 0 |
| ViolArv | 0 | 0 | 0 | 0 | 0,5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ViolHir | 0 | 0 | 0 | 0 | 0 | 0,5 | 2 | 0 | 1 | 0,5 | 0,5 | 0 | 2 | 0 | 5 | 0 | 3 | 0 | 4 | 0 | 3 | 3 | 3 | 0 |
| mean SH | | 2 | | 7,75 | | 10,75 | | 7,25 | | 10,75 | | 4,25 | | 4,25 | | 5,25 | | 7,75 | | 10,25 | | 12,5 | | 2,75 |
| SwardHeight | | 2;2;1;3 | | 7;10;8;6 | | 13;14;16;10 | | 6;8;10;5 | | 11;10;9;13 | | 5;4;6;2 | | 4;3;6;4 | | 5;2;4;10 | | 7;9;5;10 | | 9;11;14;7 | | 12;14;15;9 | | 3;5;2;1 |