Freies Geobotanisches Kolloquium beider Zürcher Hochschulen

6. FREIES GEOBOTANISCHES KOLLOQUIUM BEIDER ZÜRCHER HOCHSCHULEN

a) Jeweils mittwochs von 13.00 bis 14.00 Uhr im grossen Hörsaal der Botanischen Institute der Universität, Zollikerstr. 107, 8008 Zürich

COOK Ch., Zürich. "Safe sites" - wie werden sie erreicht? - Gedanken. 8.1.1992

STÜTZEL Th., Ulm. Ökologie und funktionelle Morphologie der Eriocaulaceen. 15.1.1992.

BUZGO M., GROSS O. und TREMP M., Zürich. Eine Reise nach Kota (Indien). 22.1.1992.

DURING H., Utrecht. Population ecology of chalk grassland bryophytes. 29.1.1992.

ZOPFI H.-J., Zürich. Saisonale Ökotypen bei zwei *Rhinanthus*-Arten. 5.2.1992.

KRAMER K., Zürich. Quer durch Sibirien: Impressionen aus dem Express. 12.2.1992.

BOLLI R., Zürich. Wald- und Kulturlandschaft im nördlichen Alabama. 19.2.1992.

b) Jeweils freitags, von 12.30 bis 14.00 Uhr im Hörsaal D 1.2, Hauptgebäude der ETHZ

"Populationsbiologie und Populationsökologie der Pflanzen - wichtige Aspekte der Umweltforschung"

URBANSKA K.M., Zürich. Populationsbiologie und aktuelle Umweltfragen. 6.11.1992.

CALLAGHAN T.V., Cumbria, U.K. Clonal form and function - examples of resource capture and use in stressed environments. 13.11.1992.

HASLER A., Zürich. Experimentelle Untersuchungen an klonal wachsenden alpinen Leguminosen. 20.11.1992.

KÖCK U.-W., Halle, Deutschland. Populationsbiologische Grundlagen für den Artenschutz mitteleuropäischer Orchideen. 27.11.1992.

RAMSEIER D., Zürich. Wanderbrachen - Wunderbrachen? Ergebnisse von Einsaatversuchen auf Brachstreifen innerhalb von Fruchtfolgeflächen. 4.12.1992.

STÖCKLIN J., Basel. Keimlingsetablierung und unterschiedliche Wachstumsstrategien bei klonalen Pflanzen und ihre Konsequenzen für die Populationsstruktur. 11.12.1992.

FLÜELER R., Kloten. Experimentelle Untersuchungen über das Keimverhalten alpiner Leguminosen. 18.12.1992.

7. ENGLISCHE ZUSAMMENFASSUNGEN DER IM BERICHTSJAHR 1992 ABGESCHLOSSENEN DISSERTATIONEN

(Summaries of Ph. D. Theses)

FLÜELER Remo Peter. Experimentelle Untersuchungen über Keimung und Etablierung von alpinen Leguminosen. Veröff.Geobot.Inst.ETH, Stiftung Rübel, Zürich *110*, 149 S.

Experimental studies on the germinating behaviour and early developmental phases of alpine Leguminosae.

Germinating behaviour and early developmental phases were investigated in 14 alpine species of *Leguminosae* species from 65 populations. The study includes seed examinations, germinating trials under controlled conditions, observations in greenhouse and experimental garden, as well as experimental seedings and plantings in machine-graded ski runs within the alpine vegetation belt of Davos. The field plots were partially protected with Curlex® or jute blankets; in some plots substrate or fertilizer was added.

The behaviour of the plants studied was characterized by diversity and variability. Without pretreatment, seeds of most species germinated moderately; in a few taxa germination was good, in some others - exceedingly bad. Such patterns of behaviour are apparently influenced by different levels of innate dormancy caused by the impermeable seed coat.

Induced dormancy occurred in seeds stored under unfavourable conditions, and also towards the end of the growing season in seeds buried in the soil.

Enforced dormancy was observed in the field trials. This type of dormancy in the legumes seems to be mostly related to soil dryness and partly to low temperatures.

Innate dormancy was rather weak in large seeds but strong in small seeds. Since seed size decreased with increasing elevation a.s.l., seeds from higher elevations are characterized by a prolonged dormancy.

The diversity of germinating behaviour is apparently related to general ecological factors as well as genetical components. The variability in germinating behaviour and in the young plant development of the species studied was obviously influenced by various factors, e.g. by weather conditions during seed development, site conditions, duration of the growth period, fitness of the mother plant, and/or racial differentiation.

The study contributes to a better assessment of the biological erosion control within the alpine vegetation belt relative to the preparation of the seed material, timing of the seeding, the preparation of the soil prior to seeding and protection of the plots with biologically degradable materials. It is stressed, however, that no large areas above timberline should ever be machine-graded.

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GRIESSER Bernard. Mykosoziologie der Grauerlen- und Sanddorn-Auen (*Alnetum incanae, Hippophaëtum*) am Hinterrhein (Domleschg, Graubünden, Schweiz). Veröff. Geobot.Inst.ETH, Stiftung Rübel, Zürich, *109*, 236 S.

Mycosociology of riverine Alnus incana and Hippophaë stands in the Upper Rhine Valley (Domleschg, Grisons, Switzerland).

During 1986-1988, macromycetes were investigated on three plots of alder forest (*Alnetum incanae*: sites A-C, total area 2000 m^2) and for comparison on one plot with sallow thorn and willow (*Hippophao-Berberidetum*: site D, 1000 m^2, without alder). All four plots were situated in 600 m a.s.l. (submontane zone) on the eastern bank of the Rhine river near Rhäzüns (Domleschg, Grisons, Switzerland). The evaluation of the field data, recorded in weekly or fortnightly intervals, focuses on the following mycosociological and mycoecological aspects:

- comprehensive survey of the macromycetes associated with *Alnus incana* (enumeration of species, productivity, dynamics, fluctuation, phenology and spatial constancy of fruitbodies).
- graphic illustration of the spatial fruitbody distribution of several selected macromycetes based on fruitbody mapping at regular intervals in undisturbed permanent plots (sanctuaries).
- analysis of the influence of climatic (precipitation, air and soil temperatures) and edaphic parameters (chemical and physical properties of the soil, soil profiles) on fungal fructification.

Eighty-four collecting trips to the sites A-D yielded 3800 samples (with 1600 fully analysed collections) representing 303 fungal taxa (88% Basidiomycetes, 12% Ascomycetes; see Tab. 14). In the three alder habitats, 267 species were found (5% ectomycorrhizal fungi, 51% lignicolous fungi, 44% terricolous saprobic fungi). Comparing observations made by several authors in other Central and East European alluvial forests dominated by *Alnus incana*, the following typical mycoecological characteristics stand out:

- significant fungus aspect in spring represented by a set of typical vernal macromycetes.
- in general low density of fruitbodies with only occasional mass-occurrence of relatively few fungal species.
- dominance of lignicolous fungi (mostly belonging to *Coprinus, Crepidotus, Mycena, Psathyrella* and *Trametes*) due to the ample supply of standing and fallen wood.
- occurrence of many terricolous fungi, often representing nitro- and basiphilous saprobes (belonging e.g. to *Clitocybe, Conocybe, Cystolepiota, Marasmius* and *Pholiotina*) forming fragile and ephemeral fruitbodies.
- comparatively poor representation of ectomycorrhizal fungi, probably caused by the nutrient-rich fertile soils (resulting from periodical flooding and fixation of atmospheric nitrogen by the symbiontic *Frankia* in root nodules of alder). In general, *Paxillus filamentosus, Naucoria* spp. and *Inocybe* spp. occur regularly in alder and alluvial forests, whereas other ectomycorrhizal genera (especially *Amanita, Cortinarius, Hygrophorus, Lactarius, Russula* and *Tricholoma*) are only sporadically observed or seem to be absent all together.

The evaluation of pertinent literature concerning the mycoflora in Central European riverine *Alnetum incanae* demonstrated that this association is characterized by 137 frequently and 379 more or less casually alder-associated macromycetes. However, only 33 species are exclusively restricted to *Alnus incana* habitats. In spite of the rather long and continuous monitoring period, some of the elsewhere common, highly host-specific ectomycorrhizal symbionts of *Alnus* were not recorded at the research sites A-C, viz. *Cortinarius alnetorum, C. bibulus, Gyrodon lividus, Lactarius lilacinus* or *L. obscuratus*.

In the sallow thorn dominated habitat, 82 fungal taxa were encountered (23% ectomycorrhizal fungi, 26% lignicolous fungi, 51% terricolous saprobic fungi). In the examined research area, the *Hippophao-Berberidetum* is restricted to dry and wind-exposed gravel banks along the Rhine river. This association extends beyond the flood level and demonstrates mycofloristic peculiarities in sharp contrast to the situation found in the neighboring *Alnetum incanae*, viz.:

- absence of an early fungus aspect due to the relatively harsh local continental microclimate.

- moderate fruitbody production on account of the poor water content and retention capacity of the soil, which is predominantly composed of coarse gravel.
- comparatively low number of lignicolous fungi which taxonomically mostly belong to the Aphyllophorales (e.g. *Daedaleopsis, Phellinus* and *Polyporus*).
- dominance of the terricolous saprobic macromycetes *Clitocybe, Collybia, Hemimycena, Mycena* and *Panaeolus* which in small localized clearings are replaced by thermophilic species of *Bovista, Conocybe* and *Lycoperdon.*
- increase of ectomycorrhizal fungi (representatives of *Chroogomphus, Cortinarius, Hebeloma, Inocybe, Lactarius, Suillus* and *Tricholoma* mostly associated with *Salix* and *Pinus*) caused by suboptimal environmental site conditions (relatively low nutrient content of soil, periodical drought, comparatively high and low temperatures due to exposure).

The macromycete flora of the *Hippophao-Berberidetum* is characterized by thermophilic taxa usually found both in xerophytic meadows and pine forests. It is remarkable, however, that species of *Entoloma* and *Omphalina*, which are typical components of the *Xerobromion*, are absent or very rare at site D. From the mycosociological point of view, the mycoflora of the *Hippophao-Berberidetum* is poorly studied yet. Based on the little available data, the substrate-specialized *Phellinus hippophaëicola* must be considered as the most characteristic species of this association.

In general, natural riverine forests represent unique plant communities whose fungus flora is especially rich in rarely observed and even unknown fungal taxa. In the investigated plots, this fact is highlighted by the occurrence of many fungi registered in the Central European Red Data Books (e.g. *Inocybe ochracea, Leucopaxillus mirabilis* and *Psathyrella narcotica*, to name a few very rare species). In addition, two new macromycetes (*Psathyrella immaculata* and *Rhodocybe ardosiaca*) were discovered in the *Alnetum incanae* on the research sites.

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HASLER Andreas Reto. Experimentelle Untersuchungen über klonal wachsende alpine Leguminosen. Veröff. Geobot. Inst. ETH, Stiftung Rübel, Zürich. *111*, 104 S.

Experimental studies on clonal growth of alpine Leguminosae.

The study deals with the growth of 14 alpine *Leguminosae* species; it includes experiments in the greenhouse and the garden in Zurich as well as in alpine machine-graded ski runs near Davos. In addition, natural populations in undisturbed alpine areas were observed and compared with experimental series. The results obtained in the greenhouse and the garden trials contributed information to the establishment and regenerative growth as well as the resource distribution in the plant throughout the year. The field experiments contributed in the first place to conclusions about the expansive and reproductive growth and the dynamics of the individuals and populations.

As expected, all of the growth types included a genetic as well as an environmental component. During the establishment and reproductive growth, the potential of growth was mostly reflected in the speed of growth and in the dynamics of given individuals. During the regenerative growth, it was influenced by the physiological integration of the ramets and during the expansive growth by the capacity of resource uptake. The phenotypical plasticity of clonal growth was related to the growth type: the modifications of reproductive growth were rather slight, whereas the other growth types proved to be more variable. Cycles of establishment and expansive growth were characterized by seasonal changes, apparently resulting from differences in internal distribution of resources throughout the year.

The dynamic of the experimental populations was dominated at the beginning by the ramet-turnover. Later on, some of the individuals reached the reproductive phase and the age-state structure of populations became more differentiated. Further diversification relative to age-state hierarchy resulted from self-seeding and the subsequent development of new generations. However, this aspect could not have been investigated in detail on account of the limited research period.
Immigration of diaspores from the neighbouring areas was registered but not analysed.
In conclusion, the relevance of the results obtained to revegetation of machine-graded ski runs above the timberline is briefly discussed.

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TSCHURR Floris Reto : Experimentelle Untersuchungen über das Regenerationsverhalten bei alpinen Pflanzen. Veröff.Geobot.Inst.ETH, Stiftung Rübel, Zürich. *108*, 121 S.

Experimental studies on the regenerative behaviour of alpine plants.

Regenerative behaviour after damage in 19 alpine plant species was assessed on the individual and population levels in terms of ramet increase after cloning. To describe the course and capacity of regeneration, ten different experiments were carried out in the greenhouse, in controlled growth chambers and on field plots.
The following patial aspects of the course of regeneration were observed:

- Higher ramet increase for guerrilla species than for phalanx plants as a spreading strategy
- Connected ramets of an individual supported one another, but the quickest possible physiological independency of the single ramets seemed more important.
- For successful regeneration, the above/belowground biomass ratio was apparently a more important factor than the extent of damage.
- High nutrient application was not tolerated by the investigated alpine plants, and even damaged them.
- Differing sizes of initial ramets allowed no conclusions as to their regenerative ability.
- Belowground parts contributed, to a substantial extent, to the regeneration of an individual.
- The available soil volume was probably of secondary importance for regenerative behaviour.
- Low temperatures decreased regenerative growth in general.

Temporal aspects of the course of regeneration refer to the time when ramet production or mortality began and to the duration of these processes. The course of regeneration was broken down into three categories, one showing overcompensation after damage, one with about equal compensation and one with undercompensation. This classification was confirmed by the comparison between greenhouse and field trials. The investigated species could not be grouped by taxonomical criteria in their growth behaviour, they were dependent on the harsh ecological conditions. The cloning time was important because a seasonal dependency was determined with a growth optimum in spring and a minimum in summer. Planting time was also essential and should be as early as possible in the season. An acclimatization period of a sufficient duration before planting turned out to be necessary.
Regenerative capacity was evaluated by the number of possible cloning treatments per growing season. The capacity was invested differently, both qualitatively and quantitatively. Qualitatively, on one side, a trade off was observed: After vegetative growth, a flowering phase followed and was named an "either-or" strategy. On the other side, a "full-com-

prehensive insurance" strategy manifested itself in the parallel occurrence of both processes. Records of the fates of cloned individuals allowed quantitative conclusions. Mother ramets functioned as carriers of regenerative capacity because they predominantly survived the cloning treatments. In one case the regenerative capacity was partitioned over all cloned generations to the single individuals, in the other case, the capacity was invested at the beginning of the treatment. The latter possibility was controlled at the population level. The range of regenerative capacity was estimated from maximum cloning treatments in the greenhouse and in the growth chamber as relatively constant. It is therefore conceivable, that a course of regeneration, dominated by ecological factors, is based upon a genetically dominated regenerative capacity, although available only during certain age-stages.
Survival, self seeding and partly regular and intense flowering suggested fit experimental populations. The immigration processes in the field plots confirmed the importance of appropriate safe sites for diaspores as well as for vegetatively originating units. Safe site availability was optimized by covering the plots with geotextiles which functioned as diaspore traps.

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8. ENGLISCHE ZUSAMMENFASSUNGEN DER IM BERICHTSJAHR 1992 ABGESCHLOSSENEN DIPLOMARBEITEN

(Summaries of Diploma Theses)

BUCHELI Erika. Differenzierungsmuster und Stromabildung bei Grasendophyten. 73 S. (Polykopie).

Genetic differentiation and stromata formation of grass endophytes.

Isozyme variation of 369 isolates of *Acremonium* and *Epichloë* endophytes (*Clavicipitaceae*, tribe *Balansieae*) from 22 populations of nine host grasses (*Brachypodium silvaticum* [5 populations] *Bromus benekenii* [3], *B. ramosus* [1], *B. erectus* [1], *Elymus europaeus* [3], *Festuca altissima* [2], *F. gigantea* [5], *F. ovina* [1], and *F. rubra* [1]) was examined using starch gel electrophoresis. In total, there were 25 distinct multilocus genotypes, and all of the 14 presumed isozyme loci were polymorphic. Each genotype was confined to a single host species, except one which was found in common on *Festuca rubra* and *F. ovina*. Several genotypes of *Bromus benekenii* and *Festuca gigantea* occurred only in one population suggesting geographic differentiation of genotypes. A cluster analysis based on genetic identities between populations revealed five clusters separated by genetic identities of 0.16 to 0.54. All populations from *Bromus silvaticum, Elymus europaeus* and *Festuca altissima* were grouped in separate clusters each, indicating host specific differentiation of endophytes. The endophyte populations from the remaining *Festuca* or *Bromus* host species respectively, clustered closely by genus, which would be consistent with a coevolutionary relationship of endophytes.
The incidence of infection of host species was correlated with the habitat. In host species of open grasslands (*Festuca ovina, Bromus erectus*) less than 60% of plants were infected, whereas in woodland grasses (*Bromus silvaticum, Elymus europaeus, Bromus benekenii, Festuca altissima*) 90% or more of the plants contained an *Acremonium* endophyte. This observation and the difference in the number of genotypes found among strains from