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VIII. **Seasonal aspect of the ground vegetation** (phenological spectrum).

The aspect of the undergrowth of the beech forest changes rather considerably during every vegetative period. Some of the early spring species as *Isopyrum thalictroides*, *Galanthus nivalis*, *Corydalis*, *Adoxa*, *Scilla bifolia* soon disappear completely while others are developed fully later in the summer. *Epipogon aphyllus* has also only a short life-duration.

As an example, I quote the three aspects distinguished by MIKYŠKA (1) in the undergrowth of the beech forests and of the oak forests mixed with beech in the Štiavnické Středohoří (Slovakia).

Early spring aspect (species flowering to about the middle of May): *Anemone ranunculoides*, *Corydalis cava*, *C. digitata*, *Daphne mezereum*, *Chrysosplenium alternifolium*, *Isopyrum thalictroides*, *Petasites albus* and *Scilla bifolia*. The optimal floral development falls into the period before the new leaf-canopy closes.

Late spring aspect (lasting to the latter half or eventually to the end of June): *Actaea spicata*, *Alliaria officinalis*, *Asperula odorata*, *Carex pilosa*, *Dentaria bulbifera*, *Euphorbia amygdaloides*, *Glechoma hirsuta*, *Melica nutans*, *M. uniflora*, *Melitis melisophyllum*, *Oxalis acetosella*, *Poa nemoralis*, *Polygonatum officinale*, *P. multiflorum*, *Primula elatior*, *Ranunculus auricomus*, *R. lanuginosus*, *Stellaria holostea*, *Symphytum tuberosum*, *Veronica chamaedrys*, *Viola Riviniana* and *V. silvatica*.

Summer aspect (less distinctive): to the species with a longer flowering period belong the following: *Ajuga reptans*, *Asperula odorata*, *Galium Schultesii*, *Geranium Robertianum*, *Hieracium murorum*, *Myosotis silvatica*, *Viola Riviniana* also *silvatica*. Species flowering only during the summer are not numerous: *Astrantia major*, *Campanula trachelium*, *Epilobium montanum*, *Galeopsis pubescens*, *Hypericum hirsutum*, *Chrysanthemum corymbosum*, *Impatiens noli tangere*, *Knautia silvatica*, *Lactuca muralis*, *Lilium martagon*, *Melampyrum nemorosum*, *Phyteuma spicatum*, *Prenanthes purpurea*, *Sanicula europaea*, *Scrophularia nodosa*, *Senecio Fuchsii*, *Stachys silvatica* and *Valeriana sambucifolia*.

I restrict myself to this one example, because it is impossible to

present phenological spectra of every sociation and every type, not to mention the fact that the spectrum varies according to the exposure, altitude, as well as to climatic regions, etc.

IX. Shrub vegetation below canopy.

There are not, always, many strata in beech forests. The moss covering is nearly always lacking, the herbaceous undergrowth (in one or two layers) is more or less well developed but can also be suppressed (see F a g e t u m n u d u m), and the shrubby growth (young trees and true shrubs) is very unequally developed. As the most characteristic shrubs accompanying the beech, the following can be mentioned:

Cornus sanguinea
Corylus avellana
Daphne mezereum
Lonicera nigra
Lonicera xylosteum
Ribes alpinum
Ribes grossularia
Rosa pendulina
Rubus idaeus
Sambucus racemosa
Sorbus aria (chiefly on limestone)
Sorbus torminalis
Spiraea media (only in Subcarpathian Russia)

Rather characteristic for some beech forests are also *Evonymus verrucosa*, *Ligustrum vulgare* (ab.), *Stachylea pinnata* and *Viburnum opulus*. Besides, a good many other shrubs (for instance *Cornus mas*, *Crataegus*, *Cotoneaster tomentosa* (Carpathians only), *Berberis vulgaris*, *Rhamnus cathartica*, *Viburnum lantana* and some *Rosa* and *Rubus* species are sometimes present in some beech forest sociations.

X. Ground vegetation.

The ground vegetation is the most reliable basis for a sociological classification of beech forests, because the general tree stratum is uniform and the small number of accompanying trees cannot be depended upon for establishing definite sociations. Since a sociological classification of beech forests is exceedingly difficult, many authors avoid a definite evaluation and distinguish simply «types», often characterised also ecologically. These types, however, a r e n o t identical with the well-known C a j a n d e r ' s forest types, because these authors interpret the beech forest, including its tree