# CONTRIBUTIONS TO THE PHYTOCOENOLOGICAL STUDY OF HORNBEAM AND BEECH FORESTS FROM OAŞ MOUNTAINS (NORTH-WESTERN ROMANIA)

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**Abstract**

In this paper we presented a phytocoenologic study of the phytocoenosis of the association *Carpino-Fagetum* Paucă 1941, found in the beech forests of the Oaş Mountain in the North-Western part of Romania. The characterization of the association under analysis as well as the presentation of the synthetic table have been done by selecting the most representative studies of mixed forests of hornbeam and beech in the Oaş Mountains.

The phytocoenosis of these associations were analyzed in terms of floristic composition, life forms spectrum, floristic elements, and ecological indices.

**Keywords:** phytocoenologic study, life forms, floristic elements, ecological indexes, Oaş Mountains

## INTRODUCTION

The Oaş Mountains are located in the north-western Carpathians. The studied region has a temperate continental climate with warmer summers and milder winters than the rest of the country, making the mixed forests of hornbeam and beech to be the most common in the area. They belong to the association *Carpino-Fagetum* Paucă 1941. They occupy a large part of the slopes with shaded or intermediate exposure at altitudes between 230-450m.

This association was described in North-Western Romania (Ardelean, A. et al, 1978; Ardelean, A., 1999; Boşcaiu, N. et al, 1966; Marian, M., 2008), in Transylvania (Drăgulescu, C., 1995; Pop, I. et al, 2002), in Banat (Sanda, V. et al, 2007). Several contributions to the study of the flora and the vegetation of Oaş Mountains have been made by (Ratiu, O., Gergely, I., 1979; Karácsony, C., Negrean, G., 1986-1987; Karácsony, C., 1995).

## MATERIALS AND METHODS

The identification, as detailed as possible, of the phytocoenosis of the association *Carpino-Fagetum* Paucă 1941 (Fig. 1), from the Oaş Mountains was based on field investigations during the years 2009 - 2011. The nomenclature of taxa was done according to (Ciocârlan, V., 2009). In the study of vegetation we used phytocoenological research methods of Central European school based on the principles and methods elaborated by (Braun-Blanquet, J., 1964; Ellenberg, H., 1974) and adapted by (Borza A., Boşcaiu N., 1965; Cristea, V. et al, 2004) at the particularities of the vegetal carpet in

our country.

For ordering and grouping the species in the association table (Table 1), to superior cenotaxons, sub-alliance, alliance, order and class were considered the traditional ecological-floristic systems of the authors (Braun-Blanquet, J., 1964; Ellemberg H., 1974; Tüxen, R., 1955; Soó, R., 1964-1980) and also the paper recently appeared belonging to (Sanda, V. et al, 2008).

Fig.1. Association *Carpino-Fagetum* Paucă 1941, Măgura Târşolţului (Oaş Mountains)

**RESULTS AND DISCUSSIONS**

The association *Carpino-Fagetum* Paucă 1941 was identified on slopes with discrete exposure (SW, W, NW, N, E), with a drop of 5°C-20°C, at altitudes of 230-450 m. Grown on meso-basic soils to eu-basic soils, rich in humus, which generally formed on crystalline schist.

The phytocoenosis of the association was identified in the following places: Turţ, Cămărzana (Podolnicească, Geamâna Mare), Batarci (Măgura), Aliceni, Târşolţ (Măgura Târşolţului, Dealul Bârloage), Bixad (Piatra Bixadului), Tarna Mare, Gherţa Mică, Turulung Vii.

The flora of carpino-fagetum was inventoried through 11 studies to a total of 114 species. Of the total number of species, 91 of them belong to the coenotaxa subordinating the association, and 23 species are transgressive and adjacent to other associations.

Table 1

Association *Carpino-Fagetum* Paucă 1941

| Biof. | Geoelem. | U | T | R | | No. of studies | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Exposure | SV | V | N | SV | E | N | S | NE | NE | NE | NE | |
| | | | | | | Altitudine | 400 | 400 | 350 | 400 | 420 | 450 | 240 | 400 | 400 | 350 | 230 | |
| | | | | | | Slope | 15 | 10 | 10 | 10 | 15 | 20 | 10 | 10 | 10 | 15 | 15 | |
| | | | | | | Coverage tree layer | 90 | 80 | 80 | 80 | 90 | 90 | 80 | 80 | 80 | 90 | 90 | |
| | | | | | | Coverage grass layer | 30 | 25 | 40 | 30 | 35 | 40 | 20 | 30 | 20 | 30 | 30 | |
| | | | | | | Surface | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | |
| | | | | | **Car. Ass.** | | | | | | | | | | | | | |
| PhM | E | 3 | 3 | 3 | *Carpinus betulus* | | 2 | 2 | **3** | 2 | 3 | 2 | 4 | 3 | 3 | 3 | 3 | V |
| PhM | E | 3 | 3 | 4 | *Fagus sylvatica* | | 4 | 4 | **3** | **4** | 3 | 4 | 1 | 2 | 3 | 2 | 2 | V |
| | | | | | **Lathyro hallersteinii -Carpinenion** | | | | | | | | | | | | | |
| H | Ec | 3,5 | 2,5 | 3,5 | *Aposeris foetida* | | . | + | + | . | . | + | + | + | . | + | + | IV |
| H | Eua(M) | 3 | 3 | 3 | *Campanula trachelium* | | . | . | + | . | . | + | . | . | . | . | . | I |
| H | E | 3 | 3 | 3 | *Carex digitata* | | + | . | . | . | . | + | . | + | . | . | + | II |
| H | Eua | 2,5 | 3 | 3 | *Carex pilosa* | | . | . | + | . | **1** | . | . | . | + | . | . | II |
| PhM | E | 3 | 3 | 3 | *Cerasus avium* | | . | + | + | + | . | . | + | + | . | . | + | III |
| G | Carp-B | 4 | 2 | 3 | *Festuca drymeja* | | . | + | + | + | . | + | . | . | + | . | . | II |
| H | E | 3 | 3 | 3 | *Digitalis grandiflora* | | . | . | + | . | + | + | . | . | + | . | . | II |
| H | Ec | 2,5 | 3 | 3 | *Galium schultesii* | | + | + | . | + | + | + | + | . | . | . | . | III |
| H | Carp-B | 2,5 | 3 | 4 | *Helleborus purpurascens* | | + | + | . | . | + | + | . | + | . | . | . | III |
| H | D-Pan | 3,5 | 2,5 | 3 | *Lathyrus transsilvanicus* | | . | . | . | . | . | . | . | + | . | . | . | I |
| Th | DB | 2,5 | 3 | 3 | *Melampyrum bihariense* | | . | . | + | + | . | . | . | + | + | . | . | II |
| H | E | 2,5 | 3 | 4 | *Melica uniflora* | | . | . | + | . | + | . | . | . | + | + | . | II |
| H | Ec | 2,5 | 3 | 5 | *Melittis grandiflora* | | + | . | . | . | . | . | + | . | + | . | + | II |
| H | Eua | 3,5 | 3 | 3 | *Ranunculus auricomus* | | . | + | + | . | . | + | + | + | + | . | . | III |
| H | Eua | 3 | 3 | 0 | *Stellaria holostea* | | . | . | . | . | + | . | . | . | + | . | . | I |
| PhM | E | 3 | 3 | 3 | *Tilia cordata* | | + | . | . | + | + | + | . | . | + | + | . | III |
| | | | | | **Symphytum cordati-Fagion** | | | | | | | | | | | | | |
| PhM | Ec | 3,5 | 3 | 3 | *Acer pseudoplatanus* | | + | . | . | . | + | . | . | . | . | . | . | I |
| H | End-Carp | 3 | 2 | 3 | *Aconitum moldavicum* | | . | . | . | . | . | . | . | . | + | . | . | I |
| G | DB | 3 | 3 | 0 | *Crocus banaticus* | | . | . | + | . | . | . | . | . | . | . | . | I |
| H | Ec | 2,5 | 3 | 3 | *Dactylis glomerata* | | . | . | . | + | + | . | + | . | . | . | + | II |
| G | End-Carp | 4 | 2,5 | 4 | *Dentaria glandulosa* | | + | . | . | . | . | + | . | . | . | . | . | I |
| H | Carp-B | 3,5 | 2 | 3 | *Pulmonaria rubra* | | . | . | + | . | . | . | . | + | . | . | . | I |
| Th | Cosm | 3 | 0 | 0 | *Stellaria media* | | . | . | . | . | . | . | + | . | . | . | + | I |
| | | | | | **Fagetalia sylvaticae** | | | | | | | | | | | | | |
| PhM | Eua | 3 | 3 | 3 | *Acer platanoides* | | + | . | . | + | + | + | + | + | + | + | . | IV |
| H | E | 3,5 | 0 | 0 | *Ajuga reptans* | | . | . | + | . | + | . | + | . | . | . | + | II |
| G | E | 3,5 | 3 | 4 | *Anemone ranunculoides* | | . | + | + | + | . | + | + | + | . | + | + | IV |
| H | Cosm | 4 | 2,5 | 0 | *Athyrium filix-femina* | | . | . | + | . | . | . | . | . | . | . | | I |
| H | Eua | 3,5 | 3 | 4 | *Asarum europeum* | | + | . | . | + | . | . | . | + | + | + | + | III |
| H | Eua | 3,5 | 3 | 3 | *Bromus benekeni* | | . | . | . | . | . | . | + | . | . | . | . | I |
| H | Eua | 3 | 2 | 0 | *Campanula rapunculoides* | | . | . | + | + | + | . | + | . | + | . | . | III |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H | Ec | 3,5 | 3 | 2 | *Carex brizoides* | + | + | + | + | . | + | . | + | + | . | + | IV |
| H | E | 4,5 | 3 | 3 | *Carex remota* | . | + | + | . | . | + | . | . | . | . | . | II |
| H | E | 3,5 | 3 | 4 | *Carex silvatica* | . | . | + | . | + | . | + | . | + | . | . | II |
| G | Eua | 3,5 | 3 | 4 | *Circaea lutetiana* | + | + | . | . | . | + | . | | + | . | . | II |
| H | Cp | 4 | 2 | 4 | *Chrysosplenium alternifolium* | . | . | + | . | . | + | . | . | + | . | . | II |
| H | Cp(bor) | 4 | 3,5 | 0 | *Dryopteris carthusiana* | . | . | . | . | . | + | . | . | . | . | . | I |
| H | Cosm | 4 | 3 | 0 | *Dryopteris filix mas* | . | + | + | . | + | + | . | + | + | . | + | IV |
| H | Eua(M) | 3 | 0 | 3,5 | *Epilobium montanum* | . | . | . | + | + | . | . | . | + | . | . | II |
| Ch | E | 3 | 3,5 | 4 | *Euphorbia amygdaloides* | + | . | + | + | + | . | . | + | + | + | + | IV |
| Th | Eua | 3 | 2 | 4 | *Galeopsis speciosa* | + | . | . | . | . | + | . | . | . | . | . | I |
| G | E | 3,5 | 3 | 4 | *Galantus nivalis* | . | + | + | + | + | . | + | + | . | + | + | IV |
| H | Eua | 3 | 3 | 3 | *Galium odoratum* | + | + | . | + | + | + | + | + | + | + | + | V |
| Th | Cosm | 3,5 | 3 | 3 | *Geranium robertianum* | . | . | + | . | + | . | + | . | . | . | + | II |
| Phn | Atl-M | 3 | 3 | 3 | *Hedera helix* | . | + | . | . | . | + | . | . | + | + | + | III |
| Th | Eua | 3 | 4 | 3 | *Impatiens noli-tangere* | . | . | + | + | . | . | + | + | . | . | . | II |
| H | Ec | 3 | 0 | 4 | *Lamiastrum galeobdolon* | + | . | . | . | + | + | . | . | . | + | . | II |
| H | Eua | 3 | 3 | 3 | *Lathyrus vernus* | . | . | + | + | . | . | . | + | + | + | + | III |
| H | E | 2,5 | 2,5 | 2 | *Luzula luzuloides* | + | . | + | + | . | . | . | . | + | + | . | III |
| H | E | 3,5 | 3 | 4 | *Mercurialis perennis* | . | . | . | . | . | + | . | + | + | + | + | III |
| H | Eua | 3,5 | 3 | 3 | *Myosotis silvatica* | + | . | . | . | . | . | . | . | . | . | + | I |
| H | Eua | 3,5 | 0 | 4 | *Paris quadrifolia* | . | + | . | . | + | + | . | . | + | . | . | II |
| H | E | 3,5 | 3 | 3 | *Pulmonaria officinalis* | . | . | . | . | + | + | + | + | . | . | + | III |
| Phn | E | 3 | 2,5 | 3 | *Rubus hirtus* | + | . | + | + | + | + | + | + | + | + | . | IV |
| H | Eua | 3,5 | 3 | 4 | *Salvia glutinosa* | . | . | . | . | + | + | . | . | . | + | . | II |
| H | Atl-M | 3,5 | 3 | 4 | *Sanicula europeea* | . | . | + | . | . | . | + | . | + | . | + | II |
| H | Eua | 3,5 | 3 | 0 | *Scrophularia nodosa* | . | . | + | . | . | . | . | + | . | . | . | I |
| H | Ec | 3 | 3 | 3 | *Symphytum tuberosum* | + | . | . | + | . | + | . | + | . | . | . | II |
| H | Ec | 3 | 2 | 0 | *Stachys alpina* | . | . | . | + | + | . | . | . | . | . | . | II |
| H | Eua | 3,5 | 0 | 0 | *Stachys silvatica* | + | + | . | . | . | . | + | . | . | . | . | II |
| PhM | Ec | 2,5 | 3 | 4 | *Tilia platyphyllos* | . | . | + | . | . | + | + | . | + | + | + | III |
| PhM | Eua | 4 | 3 | 3 | *Ulmus glabra* | . | . | . | . | . | + | . | . | . | . | + | I |
| Ch | Ec(M) | 3 | 3 | 3 | *Vinca minor* | + | . | . | + | . | . | + | . | + | + | + | III |
| H | E | 3 | 3 | 3 | *Viola riviniana* | + | . | + | + | + | . | . | . | + | + | . | III |
| | | | | | **Querco-Fagetea** | | | | | | | | | | | | |
| Phm | E | 2,5 | 3 | 3 | *Acer campestre* | . | . | + | + | + | . | + | . | + | . | . | III |
| G | E | 3,5 | 4 | 0 | *Anemone nemorosa* | - | + | - | + | + | + | - | + | - | + | + | IV |
| H | Eua | 3 | 3 | 4 | *Astragalus glycyphyllos* | + | . | . | . | . | . | + | . | . | . | . | I |
| H | Cosm | 3 | 0 | 4 | *Asplenium trichomanes* | . | . | . | + | . | . | . | . | + | . | . | I |
| PhM | Eua | 3 | 2 | 2 | *Betula pendula* | . | . | + | . | . | . | . | + | . | . | . | I |
| H | Eua(M) | 3 | 3 | 4 | *Brachypodium silvaticum* | + | . | + | + | . | . | + | . | . | . | . | II |
| G | E | 2 | 3 | 5 | *Cephalanthera rubra* | + | . | . | + | + | . | . | + | . | + | . | III |
| Phm | E | 3 | 3 | 3 | *Corylus avellana* | . | . | . | + | + | . | . | . | + | . | + | II |
| Phm | E | 2 | 3,5 | 4 | *Cornus mas* | . | . | . | . | . | . | + | . | + | . | . | I |
| Phm | E | 2,5 | 3 | 3 | *Crataegus monogyna* | . | + | . | + | + | . | + | . | . | . | + | III |
| Phm | E | 3 | 3 | 3 | *Euonymus europea* | . | . | . | . | + | . | + | . | . | + | . | II |
| H | Eua | 3 | 2,5 | 0 | *Fragaria vesca* | . | . | + | . | . | . | . | . | . | . | + | I |
| H | Eua(M) | 3 | 3 | 4 | *Geum urbanum* | . | . | . | + | + | . | + | + | . | . | . | II |
| Th | E(M) | 2,5 | 3 | 3 | *Lapsana communis* | . | + | . | . | . | . | . | . | . | . | . | I |
| Phm | E | 2,5 | 3 | 3 | *Ligustrum vulgare* | . | . | . | . | . | + | . | . | . | + | . | I |
| Th | Eua(M) | 2,5 | 3 | 3 | *Moehringia trinervia* | . | . | + | . | + | . | . | . | + | . | + | II |
| H | E | 3 | 3 | 0 | *Mycelis muralis* | + | + | + | + | + | + | . | + | . | . | . | IV |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G | Cp | 4 | 3 | 5 | *Phyllitis scolopendrium* | . | . | . | + | + | . | + | . | + | + | . | III |
| H | Eua | 3 | 3 | 0 | *Poa nemoralis* | . | + | + | . | . | + | . | . | . | + | . | II |
| PhM | Eua | 3 | 2 | 2 | *Populus tremula* | . | . | + | . | + | . | . | . | . | . | . | I |
| PhM | E | 2,5 | 3 | 0 | *Quercus petraea* | . | . | . | . | + | . | + | . | . | . | . | II |
| Phm | E | 3 | 3 | 3 | *Sambucus nigra* | . | . | . | . | . | . | . | + | . | . | . | I |
| G | E | 3,5 | 3 | 4 | *Scilla bifolia* | . | + | + | + | + | . | . | + | + | . | . | III |
| H | Eua | 3 | 0 | 0 | *Veronica chamaedrys* | + | . | . | . | . | + | . | . | . | . | . | I |
| H | Atl-M | 2,5 | 3,5 | 4 | *Viola odorata* | + | . | + | + | . | + | + | . | + | . | + | IV |
| H | Eua | 3 | 3 | 3 | *Viola reichenbachiana* | + | . | . | . | + | . | + | + | + | + | . | III |
| | | | | | **Qercetea pubescenti-Petraeae** | | | | | | | | | | | | |
| H | E(M) | 3 | 3 | 0 | *Campanula persicifolia* | . | + | . | . | . | . | . | + | . | . | . | I |
| G | E(M) | 2,5 | 3 | 4 | *Cephalanthera damasonium* | . | . | . | + | + | . | + | . | . | + | . | II |
| Ch | Eua | 2,5 | 3 | 2 | *Genista tinctoria* | . | . | . | + | + | . | . | . | . | . | . | I |
| H | Eua | 3 | 3 | 0 | *Hypericum perforatum* | . | . | . | . | . | . | . | + | . | . | . | I |
| H | B | 2 | 3,5 | 5 | *Oryzopsis virescens* | . | . | + | . | . | . | . | . | . | . | . | I |
| G | Eua(M) | 2 | 3 | 4 | *Polygonatum odoratum* | . | + | . | . | . | + | . | . | . | + | + | II |
| H | Eua | 2,5 | 3 | 4 | *Pulmonaria molliss* | . | . | + | . | . | . | + | . | . | + | + | II |
| PhM | E | 3 | 2,5 | 2 | *Sorbus aucuparia* | + | . | . | . | + | . | . | + | . | + | . | II |
| | | | | | ***Galio-Urticetea*** | | | | | | | | | | | | |
| TH | Eua(M) | 3 | 3 | 4 | *Alliaria petiolata* | + | . | . | . | . | + | . | . | . | . | . | I |
| H | Eua | 3 | 3 | 4 | *Chelidonium majus* | . | . | . | . | . | . | + | . | . | . | . | I |
| H | Eua | 3,5 | 3 | 0 | *Glechoma hederacea* | + | . | . | + | . | . | . | . | . | . | . | I |
| | | | | | ***Rhamno-Prunetea*** | | | | | | | | | | | | |
| Phm | E | 3 | 3 | 4 | *Cornus sanguinea* | . | + | . | + | + | + | . | + | . | + | . | III |
| Th | E | 3 | 3 | 0 | *Galeopsis tetrachit* | . | . | + | . | . | . | . | . | . | . | . | I |
| Th | Eua | 3 | 3,5 | 4 | *Torilis japonica* | . | . | . | . | + | . | + | . | . | . | . | I |
| Phn | E | 2 | 3 | 4 | *Rosa canina* | . | . | . | + | . | . | . | + | . | . | + | II |
| | | | | | **Variae syntaxa** | | | | | | | | | | | | |
| H | Alt-M | 3 | 3 | 3 | *Atropa belladonna* | . | . | + | + | . | . | . | . | + | + | . | II |
| H | Cp | 2 | 3 | 3 | *Calamintha clinopodium* | . | + | . | . | . | . | . | . | . | . | . | I |
| Th | Adv | 3,5 | 0 | 0 | *Oxalis europea* | . | . | . | + | . | . | . | . | . | . | . | I |
| H | E | 3,5 | 3,5 | 3,5 | *Polystichum aculeatum* | + | . | + | . | . | + | . | . | + | . | . | II |
| Ch | Eua | 4,5 | 3 | 4 | *Solanum dulcamara* | + | . | . | . | . | . | . | + | . | . | . | I |
| Th | Cp | 4 | 0 | 4 | *Stenatis annua* | . | . | . | + | . | . | . | . | . | . | . | I |
| Ch | Eua | 2 | 2 | 2 | *Veronica officinalis* | + | . | . | + | + | . | . | . | + | . | . | II |
| H | Eua | 3 | 4 | 0 | *Viscaria vulgaris* | . | . | . | . | . | . | . | + | . | . | . | I |

Place: 1. Măgura Târşolţului,17.07.2010; 2. Bârloage,17.07.210; 3.Tarna Mare,02.08.2011; 4,5. Cămărzana (Podolniceasca, 19.07.2011; Dealul Geamâna Mare,19.07.2011); 6. Piatra Bixadului, 26.07.2010; 7. Gherţa Mică, 15.07.2011; 8. Aliceni, 31.07.2009; 9.Turţ, 04.08.2010; 10. Batarciului, 30.07.2011; 11. Turulung-Vii 21.07. 2011.

The tree layer is dominated by *Fagus sylvatica* and *Carpinus betulis* making good canopy coverage of 0.8-0.9. Tree trunk thickness varies between 20-30 cm and the height between 20 - 28 m. The main species are accompanied sporadically by: *Tilia cordata, Quercus petraea, Acer campestre, Acer pseudoplatanus*.

The undergrowth and the seedlings cover roughly 5% - 10% of the area and consist of the following species: *Fagus sylvatica, Carpinus betulus, Acer pseudoplatanus, Acer campestre, Cornus mas*.

The undergrowth species, unevenly dispersed in the wooded area, consist of the following: *Cornus mas., Corylus avellana, Sambucus nigra, Cornus sanguinea, Rubus hirtus, Rosa canina, Crataegus monogina*.

The grassy layer presents with a high frequency: *Aposeris foetida, Asarum europaeum, Galium odoratum, Festuca drymeja, Carex brizoides Viola reichenbachiana, Mycelis muralis, Vinca minor.* The rest of the species in this biotope are subordinate to the sub alliance *Lathyro hallersteinii-Carpinenion* Boşcaiu et al. 1982, (*Stellaria holostea, Dactylis glomerata, Dentaria glandulosa)*, the alliance *Symphyto cordati-Fagion* Vida 1959, (*Acer pseudoplatanus, Aconitum moldavicum, Crocus banaticus*), the order *Fagetalia sylvaticae* Pawlowski in Pawlowski et al. 1928, (*Lamium galeobdolon, Lathyrus vernus, Rubus hirtus*) and the class *Querc-Fagetea* Br. -BL. et Vlieger în Vlieger em. Borhidi 1996, (*Quercus petraea, Carex digitata, Dentaria bulbifera, Anemone nemorosa*).

In the life forms spectrum (Fig. 2), the dominant are hemi-cryptophytes (H = 54,38%), their abundance being largely influenced by the mild temperate climate, and natural hazards (trees felled by wind and snow). The hemi-cryptophytes are followed by phanerophytes (Ph = 20,17%), geophytes (G = 10,52%), therophytes (Th + TH = 10,52%) and chamephytes (Ch = 4,38%).

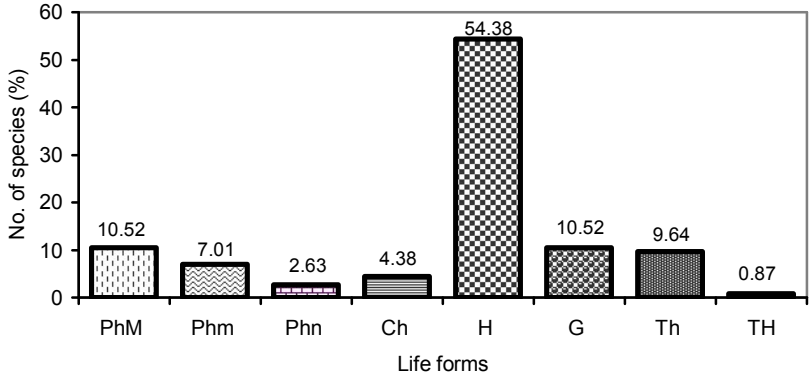


Fig. 2. Life forms spectrum of the association *Carpino-Fagetum* Paucă 1941

In the floristic elements spectrum (Fig. 3), Eurasian species are predominate (Eua = 35,96%), followed by European (E = 33,33%) and Central-European (Ec = 9,64%), and to a small degree Cosmopolitan species (Cosm = 4,38%), Circumpolar (Cp = 3,5%), Atlantic-Mediterranean (Atl-M = 3,5%), Daco-Balkanic (DB = 1,75%), Carpathian-Endemit (End-Carp = 1,75%), Balkanic (B = 0,87%), Daco-Pannonic (D-Pan = 0,87%), Adventive (Adv = 0,87%).

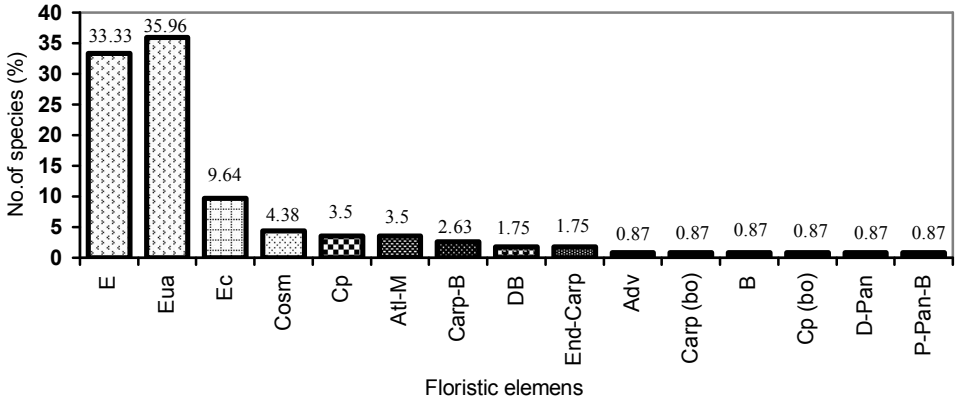


Fig. 3. Floristic elements spectrum of the association *Carpino-Fagetum* Paucă 1941

The diagram of the ecological indices (Fig. 4), shows that most species of the association are mesophytes in terms of humidity ($U_{3-3,5}$ = 67,54%), followed by xero-mesophytes ($U_{2-2,5}$ = 22,80%), mezo-hydrophytes ($U_{4-4,5}$ = 9,64%). Depending on the temperature the majority are mesothermophyte species ($T_{3-3,5}$ = 72,80%), followed by micro-thermophytes ($T_{2-2,5}$ = 15,78%), euri-thermophytes ($T_0$ = 8,77%) and moderate-thermophytes ($T_4$ = 2,63%), and from the chemical reaction of the soil, the dominant species are acid-neutrophytes ($R_{3-3,5}$ = 39,47%) followed by weak acid-neutrophytes ($R_4$ = 30,70%), euri-ionical ($R_0$ = 20,17%), acidophytes ($R_2$ = 6,14%) and neutral-basiphytes ($R_5$ = 3,50%).

The high percentage of mesophytes expresses the humidity of the station. The prevalence of micro-mesothermophytes is due to the relatively high temperature on the slopes. The dominance of neutrophytes followed by the weakly acid neutrophytes is consistent with moderate acidity of the substrate, because in the composition of the grassy layer the largest part are the acid-neutrophyte plants which vegetate on soils with pH = 5.8 to 6.5 (*Aconitum moldavicum, Aposeris foetida, Carex digitata, Carex pilosa, Dactylis glomerata, Festuca drimeja, Rubus hirtus*), followed by the weakly

acid-neutrophytes with pH = 6,5-7,0 (*Anemone ranunculoides, Carex sylvatica, Cytisus hirsutus, Melica uniflora, Salvia glutinosa*).

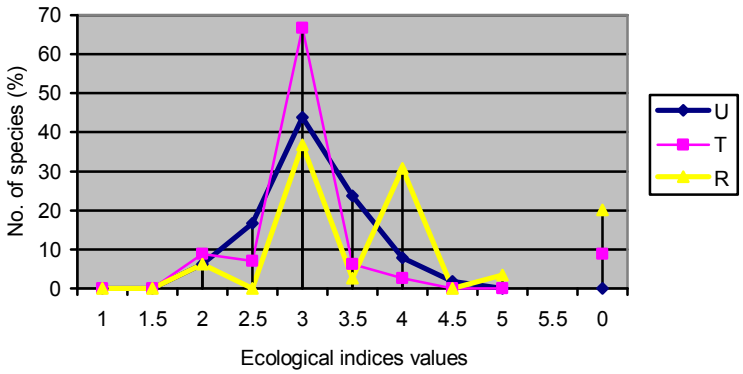


Fig. 4. Diagram of ecological indices for the association *Carpino-Fagetum* Paucă 1941

The phytocoenoses investigated by (Rațiu, O., Gergely, I., 1979), in the beech forests of the Oas Mountains placed the associations *Carpino-Fagetum* Paucă 1941 from a cenotaxonomic point of view in that period in the class *Querco-Fagetea* Br.-Bl. et Vlieger 1937, the order *Fagetalia silvaticae* Pawl. 1926, the aliance *Fagion dacicum* Soó 1960. The authors of the study conducted a total of 11 studies, a total of 103 species, during 1974-1979, also stating that these forests are the most common in the region.

Compared with the description performed by (Rațiu, O., Gergely, I., 1979), we can observe differences of the coenotaxonomic classification of the association *Carpino-Fagetum* Paucă 1941, from the Oaş Mountains. In the present study the investigated association, are classified in coenotaxonomic terms in the class *Querco-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937 em. Borhidi 1996, the order *Fagetalia sylvaticae* Pawlowschi in Pawlowschi et al. 1928, the alliance *Symphyto cordati-Fagion* Vida 1959, and sub-alliance *Lathyro hallersteinii-Carpinenion* Boşcaiu et al. 1982.

The plant association is dominated by hemicryptophytes (54.38%), followed by phanerophytes (20.17%) and from the floristic elements spectrum we can distinguish the Eurasian (35,96) and European (33,33%). From the ecologic point of view the majority are the mesophytes ($U_{3-3,5}$ = 67,54%), micro-mesothermal ($T_{3-3,5}$ = 72,80%), acido-neutrophytes ($R_{3-3,5}$ =39,47%) and weak acid-neutrophytes ($R_4$ = 30,70%).

The associations described are stable in terms of dynamics and ecological balance, none of the dominant species of the tree layer or of the grassy layer do not tend to replace each other.

The hornbeam and beech mixed forests of the Oaş Mountains have suffered in the past 30 years since the first description made by (Rațiu, O., Gergely, I., 1979), an anthropogenic influence due to the aggressive timber exploitation by traders, the abusive and uncontrolled cuttings by some owners.

The economic value of these forests is high; they provide wood for industry and as firewood. They also determine the formation of a thick litter with a rich herbaceous flora ('the mull flora").

**CONCLUSIONS**

The association *Carpino-Fagetum* Paucă 1941, is the main form of presentation of the beech forest from Oaş Mountains.

In the association of hornbeam and beech analyzed, the majority of the species are Eurasian, hemicryptophytes, their abundance is influenced by moderate temperate climate zone. The high percentage of mesophytes expresses the humidity and the micromesothermal abundance is the consequence of relatively high temperature on the slopes and the acid-neutrophylous dominance is the consistent with the acidity of the substrate.

It is necessary to maintain these forests in a natural state, because they have a role of anti-erosion protection, of hydrological balance adjustment and biodiversity conservation, also it is necessary to replant the deforested areas with native species and their rational exploitation.

**REFERENCES**


1. Ardelean, A., în colab. cu Colectivul Catedrei de Botanică a Universității "Babeş - Bolyai" Cluj- Napoca, 1978, Flora şi vegetația Munților Zărand, Universitatea "Babeş - Bolyai" din Cluj - Napoca, p. 215 (a obținut premiul "Emanoil Teodorescu" al Academiei Române în anul 1981).
2. Ardelean, A., 1999, Flora şi vegetația din Valea Crişului Alb – de la izvoare până la ieşirea din țară, Ed. "Vasile Goldiş" University Press, Arad, p. 311
3. Borza, Al., Boşcaiu, N., (1965): Introducere in studiul covorului vegetal. Academiei Romane Publishing House, Bucharest, 342 p.
4. Boşcaiu, N., Gergely, I., Rațiu, O., Micle, F., (1966): Descrierea asociației *Carpino-Fagetum* Paucă 1941 în: Boşcaiu, N., (ed.) Flora şi vegetația rezervației naturale„Defileul Crişului Repede". Contribuții
5. Braun-Blanquet, J., (1964): Pflanzensoziologie. Springer- Verlag, Wien-New York, 3, Aufl, pp. 12-24.
6. Ciocarlan, V., (2009): Flora ilustrată a Romaniei. Pteridophyta et Spermatophyta. Ceres Publishing House, Bucharest, 141 p.
7. Cristea, V., Gafta, D., Pedrotti, F., (2004): Fitosociologie, Editura Presa Universitară Clujeană, Cluj-Napoca, 394 p.

8. Ellenberg, H., (1974): Zeigerwerte der Gefässpflanzen Mitteleuropas - Scripta Geobotanica. Göttingen, 9: 1-97.
9. Drăgulescu, C., (1995): Flora şi vegetaţia din bazinul Văii Sadului. Constant Publishing House, Sibiu, 355 p.
10. Karácsonyi, C., Negrean G., 1986-1987, Contribuţii la flora Munţilor Oaş – Gutâi (jud. Satu Mare), Satu – Mare, St. Com., VII- VIII, 373-377.
11. Karácsonyi, C., 1995, Flora şi vegetaţia judeţului Satu Mare, Editura Muzeului Sătmărean.
12. Marian, M., (2008): Flora şi vegetaţia Culmii Codrului (jud. Satu-Mare). Universitatea de Nord Press, Baia Mare, 259 p.
13. Moldovan I., 1970 - Flora şi vegetaţia Muntelui Gutâi. Universitatea „Babeş-Bolyai", Teza de doctorat, Cluj Napoca.
14. Raţiu, O., Gergely I., Moldovan, I., 1977, Consideraţii fitocenologice asupra pădurilor depresionare din "Ţara Oaşului", Contrib. Bot., Cluj Napoca, 9-18.
15. Raţiu, O., Gergely I., Analiza complexă a florei „Ţării Oaşului", Contrib. Bot.,, Cluj-Napoca, 1978, 217-226.
16. Raţiu, O., Gergely I., Caracterizarea sinecologică a principalelor fitocenoze lemnoase din „ Ţara Oaşului" (jud. Satu Mare), Contrib. Bot. Cluj-Napoca, 1979,85-118.
17. Pop, I., Cristea, V., Hodişan, I., (2002): Vegetaţia Judeţului Cluj. (Studiu fitocenologic, ecologic, bioeconomic şi ecoprotectiv). Contribuţii Botanice, Cluj-Napoca, 35(2): 5-254.
18. Sanda, V., Răduţoiu, D., Burescu, P., Blaj-Irimia, I., (2007): Breviar fitocenologic. Partea a IV-a. Sitech Publishing House, Craiova, pp. 92-93.
19. Sanda, V., Kinga, O., Burescu, P., (2008): Fitocenozele din Romania, sintaxonomie, structură, dinamică şi evoluţie. Ars Docendi Publishing House, Bucharest, 570. p.
20. Soó, R., (1964-1980): A magyar flora és vegetacio rendszertani, növényföldrajzi kézikönyve, Akadémiai Kiadó, Budapest, pp. 1-6.
21. Tüxen, R., (1955):Das System der nordwestdeutschen Pflanzengesellschaften, Mitt Floristic-Sociologie Arbeitsgen, n. Folge, 5: 155-176.