

ASPECTS REGARDING THE TYPES OF PERMANENT MEADOWS FROM THE HILLY AREA OF SLĂNIC-BUZĂU HYDROGRAPHIC BASIN

ASPECTE PRIVIND TIPURILE DE PAJIȘTI PERMANENTE DIN ZONA COLINARĂ A BAZINULUI HIDROGRAFIC SLĂNIC-BUZĂU

CHELARIU ELENA-LILIANA

University of Agricultural Sciences and Veterinary Medicine Iasi

Abstract. *In the present paper are presented the main types of permanent meadows from the hilly area of Slănic-Buzău superior hydrographic basin.*

After the researches carried out in the 2001-2004 period, 5 types/subtypes of permanent meadows (Festuca valesiaca Schleich. - Brachypodium pinnatum (L.) Beauv., Festuca rupicola Heuff. - Agrostis capillaris L., Festuca valesiaca Schleich., Agrostis capillaris L. - Poa pratensis L., Botriochloa ischaemum (L.) Keng.) were identified. The largest area is occupied by Festuca valesiaca Schleich. - Brachypodium pinnatum (L.) Beauv. meadows.

The production of the meadows was between 925 kg/ha DM at Botriochloa ischaemum (L.) Keng. meadows and 2248 kg./ha DM at Festuca rupicola Heuff. - Agrostis capillaris L. meadows.

Rezumat. *În această lucrare sunt prezentate principalele tipuri/subtipuri de pajiști permanente din zona colinară a bazinului hidrografic superior Slănic – Buzău.*

În urma cercetărilor desfășurate în perioada 2001-2004 au fost identificate 5 tipuri/subtipuri de pajiști permanente (Festuca valesiaca Schleich. - Brachypodium pinnatum (L.) Beauv., Festuca rupicola Heuff. - Agrostis capillaris L., Festuca valesiaca Schleich., Agrostis capillaris L. - Poa pratensis L., Botriochloa ischaemum (L.) Keng.). Cea mai mare suprafață este ocupată de pajiștile de Festuca valesiaca Schleich. - Brachypodium pinnatum (L.) Beauv.

Producția pajiștilor identificate a fost cuprinsă între 925 kg/ha S.U. la pajiștile de Botriochloa ischaemum (L.) Keng. și 2248 kg/ha S.U. la pajiștile de Festuca rupicola Heuff. - Agrostis capillaris L.

The establishment of the criteria's regarding the possibilities of identifying the types of meadows represents the result of the researches made by famous personalities in folders field of activity (**Anghel Gh., Țucra I., Cardașol V., Bărbulescu C., Motcă Gh. etc.**), and starting from this base was elaborated a general paperwork for our country in 1987 under the supervision of the Institute for Research and Production of Meadows Crop Măgurele-Brașov.

In according with the elaborated methodology the criteria's for identifying the types of meadows are as follow: floral composition, stationary conditions, meadow productivity, the applied technologic measures, vegetation evolution function of these measures.

Floral composition in considered to be the basic criteria for identifying the meadow type and the stationary conditions could influence the floral composition, productivity or the application of some technologic measures, an important role being reserved to relief and soil.

Meadows productivity, which expresses the production capacity, resulted from the quality and yield of the evaluated fodder, and technologic measures could be criteria for differentiating the types of meadows.

Under the influence of applied technologies could be produced modifications at the level of meadows stations so a modification of meadow floral composition will take place resulting another type of meadow, named derivate type, if we renounce at the requested technologic measures the derivate types of meadows come back at the basic type of the area.

MATERIAL AND METHOD

The researches were carried out in 2001-2004 period, in the hilly area of Slănic-Buzău hydrographic basin.

Vegetation mapping was made with the help of geo-botanic maps at a 1:10000 scale using the method of route mapping. Before starting the proper mapping information's regarding ecologic, technologic, economic and organizational conditions were collected from the researched area. The plats with permanent meadows were divided in sections, by drawing some perpendicular axis on the base line of relief, at distances of 200 m.

Determination of the floral composition was made by geo-botanic method choosing test surfaces of 100 m² and inside them floral determinations was made.

The visual appreciation consists in presenting the percentage of the covered surface by the projection of the airy parts of all the plants from herbal carpet (general cover) and the main groups of plants (specific cover). At making the floral determination the species were from the following groups, in order of their domination: dominant species (with 30-40% cover rate), followed by co-dominant species (with a cover rate of 15-25%) and indicators species with a weak participation into the vegetal Carpet. At establishment of the numbers of determinations from each meadow type we took in consideration the uniformity of floral composition and the numbers of species that make the vegetation.

RESULTS AND DISCUSSIONS

Slănic-Buzău hydrographic basin has a total surface of 43820 ha from which around 25027 are in the hilly area and 11278 ha in the mountain area.

In the hilly area the permanent meadows occupies 6267 ha (figure 1) from which 1280 are placed on lands with a slope till 10%, 2430 ha with a slope of 10-15%, 2152 ha with 15-25% slope and 405 ha on lands with a slope bigger than 25%. From the area covered with permanent meadows over 4250 ha are affected by different forms of erosion.

Till 1968 were known in the area around 220 vascular plants species and at the present time the number of known species reached 999.

Due to the geographic position the researched territory is under a strong influence of the East and South-East continental climate, if at this factor we join local conditions, different types of rocks and soils, strong erosion, the presence of salty soils, mountain approach, man's influence etc., we could found the explanation for the great and various numbers of species from the sub-Carpathian area of Slănic-basin.

At mapping the floral composition the founded species were placed in groups, in the order of their domination: dominant species, co-dominant ones and indicators species.

For vegetation study by geo-botanic method was limited the contour of phytocenoses tracking the uniformity of floral composition in according with ecologic factors, and after that the test areas were choose and inside of them floral determinations were made. To study the vegetation we started from identification of type/subtype of meadow by establishing the dominant specie and the eco-pedologic factors.

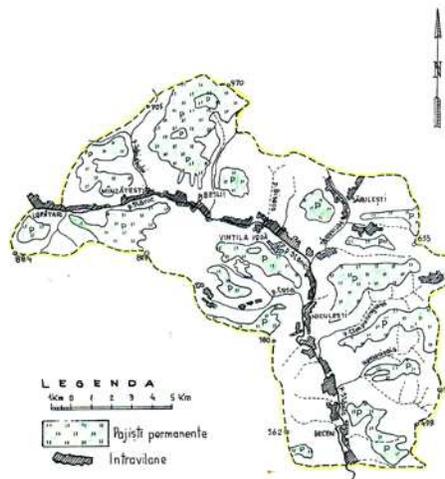


Figure 1 - Permanent meadows from the hilly area of Slănic-Buzău basin

In according with the eco-pedologic conditions 5 types/subtypes of representative permanent meadows were identified (table 1), with different floral composition, fact which influence the initial agronomical and fodder value.

The greatest areas with meadows are covered by *Festuca valesiaca* Schleich. - *Brachypodium pinnatum* (L.) Beauv. meadows (2254 ha), followed by *Festuca rupicola* Heuff. - *Agrostis capillaris* L. meadows (2120 ha), *Festuca valesiaca* Schleich. meadows (735 ha), *Agrostis capillaris* L. - *Poa pratensis* L. (461 ha).meadows and *Botriochloa ischaemum* (L.) Keng meadows (316 ha).

Also were identified other meadows types/subtypes such as the meadows from salty soils (122 ha), *Carex humilis* Leyss. meadows (126 ha) and *Stipa stenophylla* Wahlbg. meadows (133 ha).

The production of permanent meadows was determinate by mown in hay field regime, and the obtained results were function of soil fertility, meadows' type, land exposure and slope, exploitation way etc.; the average production was between 925kg/ha dry matter at *Botriochloa ischaemum* L meadows to 2248 kg/ha dry matter at *Festuca rupicola* Heuff. - *Agrostis capillaris* L. meadows.

From table 1 could be observed that *Festuca valesiaca* Schleich meadows are spreaded at altitudes of 300-500 m, on lands with 15-25 % slope with a south, south-west exposure, were are favorable conditions for this association (unfavorable humidity regime, compacted soil, strong evapo-transpiration). The dominant specie is associated with *Agropyron pectiniform* and *Koeleria cristata*. Legumes participate in a low proportion and are represented by species, in their great majority, with lower nutritive value. From the legumes more valuable we could mention, *Medicago falcata*, *Medicago lupulina*, *Onobrychis viciifolia*. In the herbal composition could be found plants from other botanic from families which have pour demands for water such as: *Artemisia austriaca*, *Galium verum*, *Plantago lanceolata*, *Stipa capillata*, *Astragalus austriacus* etc.

Table 1

Types/subtypes of representative meadows from hilly region

Meadows' type	Dominant and Co-dominant species	Alt [m]	Slope [%]	Occupied surface [ha]	Yield [kg/ha] DM
<i>Festuca valesiaca</i>	<i>Festuca valesiaca</i> , <i>Festuca rupicola</i> , <i>Agropyron pectiniforme</i> , <i>Koeleria cristata</i> , <i>Stipa capillata</i> , <i>Botryochloa ischaemum</i> , <i>Medicago falcata</i>	300-500	15-25	735	1755
<i>Botryochloa ischaemum</i>	<i>Botryochloa ischaemum</i> , <i>Festuca valesiaca</i> , <i>Stipa capillata</i> , <i>Stipa lessingiana</i> , <i>Poa bulbosa</i> , <i>Medicago falcata</i> , <i>Lotus corniculatus</i>	300-550	20-25 and over 25	316	925
<i>Festuca valesiaca</i> - <i>Brachypodium pinnatum</i>	<i>Festuca valesiaca</i> , <i>Brachypodium pinnatum</i> , <i>Poa pratensis</i> , <i>Dactylis glomerata</i> , <i>Agropyron repens</i> , <i>Lolium perenne</i> , <i>Medicago falcata</i> , <i>Lotus corniculatus</i>	500-750	5-20	2254	2230
<i>Festuca rupicola</i> – <i>Agrostis capillaris</i>	<i>Festuca rupicola</i> , <i>Agrostis capillaris</i> , <i>Festuca pratensis</i> , <i>Festuca pseudovina</i> , <i>Lolium perenne</i> , <i>Poa pratensis</i> , <i>Cynosurus cristatus</i> , <i>Trifolium repens</i> , <i>Trifolium pratense</i> , <i>Lotus corniculatus</i> , <i>Medicago lupulina</i>	300-750	1-20	2120	2248
<i>Agrostis capillaris</i> - <i>Poa pratensis</i>	<i>Agrostis capillaris</i> , <i>Poa pratensis</i> , <i>Alopecurus pratensis</i> , <i>Lolium perenne</i> , <i>Dactylis glomerata</i> , <i>Festuca pratensis</i> , <i>Trifolium repens</i> , <i>Trifolium pratense</i> , <i>Lotus corniculatus</i>	650-820	5-10	461	2160

From economic point of view, these meadows could be considered as moderate meadows with yields of 1125-2450 kg/ha DM and with a limited production potential, determined by a weak reaction to fertilizers of the dominant species and by its resistance to floral composition modification. Generally are closed meadows which could be by a method of soil erosion damping if are rationally used.

Meadows of *Botriochloa ischaemum* (L.) Keng. are spreaded at the some altitudes, on lands with slope of 20-25% and over 25%, on the sunny side of the mountain, on pasturelands used with a great number of animals from early spring to late in autumn. Surface erosion, weak of water, decrease of the soluble nutritive substances reserve, decrease the number of plants' species from this association. The characteristic species are: *Botriochloa ischaemum*, *Festuca valesiaca*, *Stipa capillata*, *Poa bulbosa*, *Medicago minima*, *Plantago lanceolata*, *Euphorbia nicaeensis* și *Achillea setacea*.

The economic value of these meadows is very small with small yields of 780-1210 kg/ha DM from the surfaces studied by us. The fodder has a weak quality, the dominant species being less consummated by animals and only in the first stages of vegetation.

The meadows of *Festuca valesiaca* Schleich. - *Brachypodium pinnatum* (L.) Beauv. are representative for the steppe and silvo-steppe areas, but due to the fact that the species that gives that type of meadows have a great ecologic plasticity, the spreading area is much larger.

Generally are found on slope lands, frequent eroded, with low fertility.

The dominant species, *Festuca valesiaca*, is accompanied by *Brachypodium pinnatum* species with is co-dominant, and we also found the following species: *Dactylis glomerata*, *Festuca pratensis*, *Poa pratensis*, *Botriochloa ischaemum*, *Koeleria cristata*, *Cynodon dactylon*, *Bromus inermis*, *Poa angustifolia*, *Agrostis capillaris* etc. from gramineous; *Medicago falcata*, *Trifolium pratense*, *Onobrychis viciifolia*, *Coronilla varia*, *Trifolium montanum*, *Lotus corniculatus*, *Medicago lupulina*, *Medicago sativa*, *Vicia cracca*, *Astragalus onobrychis*, *Vicia angustifolia* etc. from legumes and *Filipendula hexapetala*, *Tragopogon pratensis*, *Teucrium chamaedrys*, *Hieracium pilosella*, *Plantago media*, *Prunella vulgaris*, *Plantago lanceolata*, *Leucanthemum vulgare*, *Inula hirta*, *Erigeron annuus*, *Centaurea scabiosa*, *Achillea millefolium*, *Knautia arvensis*, *Salvia verticillata*, *Galium glaucum*, *Nepeta cataria*, *Campanula glomerata*, *Eryngium campestre*, *Rhinanthus rumelicus*, *Taraxacum serotinum* etc. from others group. This floral composition is due to the areas' ecologic conditions, and also due to the fact that this type of meadow occupies a large area from the total surface of the meadows from the hilly region. The economic value of these meadows is medium with yields between 1275 and 2650 kg/ha DM.

Festuca rupicola Heuff. - *Agrostis capillaris* L. meadows can be found on plateaus and sides with small slopes from hilly area, with a 300-750 m altitudes due to soil compaction realized by sheep's pasturing. The dominant species *Festuca rupicola* and co-dominant one *Agrostis capillaris* are together with: *Festuca pseudovina*, *Festuca pratensis*, *Lolium perenne*, *Cynosurus cristatus*, *Trifolium repens*, *Medicago lupulina*,

Lotus corniculatus etc. The most frequent species from others group are: *Potentilla argentea*, *Echium vulgare*, *Thymus pannonicus*, *Scabiosa ochroleuca*, *Leucanthemum vulgare* etc.

Those meadows have productions of over 1600 kg/ha dry matter on pastures and almost twice time bigger at hay lands, with a good reaction at fertilization and maintenance.

Agrostis capillaris L. – *Poa pratensis* L. meadows are spreaded on terraces, small slope sides and various soils, the dominant specie being adapted to less favourable nutrition conditions, at 700-900 m altitudes. From the point of view of floral composition are characterized by the domination of *Agrostis capillaris* specie which covers over 25%. This specie is accompanied by valuable gramineous such as: *Poa pratensis*, *Festuca pratensis*, *Phleum pratense*, *Dactylis glomerata*, *Trisetum flavescens*, *Festuca rubra* etc. The legumes are represented by many species and cover 10-15%. More frequent are species: *Trifolium pratense*, *Trifolium hybridum*, *Trifolium campestre*, *Lotus corniculatus* etc.

The species from other botanic families are, also, very numerous, many meadows being weeded with: *Leucanthemum vulgare*, *Cichorium intybus*, *Achillea millefolium*, *Knautia arvensis*, *Scabiosa ochroleuca*, *Prunella vulgaris*, *Plantago lanceolata* etc. (tab. 5.1). From the economic point of view these meadows could be considered good meadows with yields of over 1800 kg/ha DM.

CONCLUSIONS

1. In the research period were identify representative 5 types/subtypes of permanent meadows with various floral composition (*Festuca valesiaca* Schleich. - *Brachypodium pinnatum* (L.) Beauv., *Festuca rupicola* Heuff. - *Agrostis capillaris* L., *Festuca valesiaca* Schleich., *Agrostis capillaris* L. - *Poa pratensis* L., *Botriochloa ischaemum* (L.) Keng.)

2. *Festuca valesiaca* - *Brachypodium pinnatum* (L.) meadows and the ones of *Festuca rupicola* Heuff. - *Agrostis capillaris* L. are the most spread ones in the hilly area of Slănic de Buzău superior basin, and occupy the largest areas

3. The yield of permanent meadows was between 925kg/ha dry matter at *Botriochloa ischaemum* L. meadows and 2248 kg/ha dry matter at *Festuca rupicola* Heuff. - *Agrostis capillaris* L. meadows.

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