ASPECTS OF GROWTH AND DEVELOPMENT OF SHOOTS IN THE SHRUBS OF *ALOPECURUS PRATENSIS* L..

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Abstract: *The problem of intensive production is of stringent actuality, being the main leverage in increasing herds and livestock production. In this sense it has an important role in widening its product range forage plants, in our case is about the species Alopecurus pratensis L. Perennial forage grasses from which Alopecurus pratensis L. is part of, is an important source of fodder, due to their special agrobiological attributes ie continuous forming of nodes basal shoots, leaf growth in the basal meristem not destroyed by pastures. Among these species, Alopecurus pratensis L. opens the opportunity to achieve outstanding productions by the ability to adapt to a wide range of environmental conditions but also by the character of production (Luminita Cojocariu, 2005). Morphology of grasses can be conceptualized as a hierarchical arrangement of subunits or structural modules (Briske 1991). Studies required for plant growth and development that are particularly important, so that shoots of this species and forage grasses in general are closely linked with production. Biological material was studied on shoots development comprises 10 biotypes (Remetea Mare, Topolovățu Mare, Chizătău,, Lugoj, Traian Vuia, Faget, Sinersig, Buzias, Cheveresu Mare, Albina.) collected in 2007 in Banat. Studied biotypes were sown in pots of vegetation in autumn 2007, then in the spring of 2008 were transplanted in field of research at the University of Agriculture And Veterinary Medicine Timisoara Sciences. Observations on the biological (number of shoots, diameter shrubs or made during the vegetation period, after the third mowing in autumn 2008 falling on to autumn 2009. The maximum number of shoots was recorded in first year averaged 33.3 on the Buzias biotype and the minimum number of Traian Vuia biotype (23.5); in second year maximium was Remetea Mare (53.7) biotype and minimum was recorded at biotype of Traian Vuia (38.2). With regard to the shrubs diameter in first year, the minimum is registered to biotype of Traian Vuia (15.3cm) and the maximum of the Albina (20.3cm) biotype, in second year returned minimum of Faget biotype (22.8cm) and the maximum at the Remetea Mare (30.3cm) biotype.*

***Key word**: Alopecurus pratensis L., biotypes, number of shoots, diametrer shrubs.*

INTRODUCTION

The extension of sown pastures is related to the intensity of farming systems. As specialization and improvement of breeds of animals for meat or milk was necessary cultivation of fodder plant species such as *Alopecurus pratenis* L., to ensure quality of feed.

Alopecurus pratensis L. specie can be used as a pasture plant, producing biomass along grazing season. It also is widely used for hay on wetlands, because they have a high productivity (ALAIN PEETERS, 2004).

The high economic value of the species of *Alopecurus pratensis* L., is given by two essential elements, high productivity first and second high forage value, having high consumability and digestibility (MOISUC AL., DUKIC D., 2002).

For these aspects the necessary research on growth and development to *Alopecurus pratensis* L. shoots are very important, so that the shoots of the graminaceous forage species and how generally are closely linked with production capacity.

MATERIALS AND METHODS

The experiments were performed in the experimental field of the discipline of Meadow and forage plant cultivation from the Experimental Didactic Station of the U.S.A.M.V.B. Timisoara. The soil where the experiments had been placed is a cambic chernozem.

The evolution of climatic resources within the period 2007-2009 distinguishes their oscillatory character, with notable deviations from the multi-annual mean value.

For the achievement of research there has been used seeds of *Alopecurus pratensi*s L., from the local population of ten (Remetea Mare, Topolovățu Mare, Chizătău, Lugoj, Traian Vuia, Faget, Sinersig, Buzias, Cheveresu Mare, Albina) from Banat area were seeded in potting mixes in autumn 2007.

In 2008, after the third mowing, there have been made observations on the growth and development of shoots in biotypes of *Alopecurus pratensis* L., studied, then in autumn the same year, the ten biotypes were transplanted in potting in the experimental field of research.

In 2009 the phenological observations on development and growth of shoots were made directly in the field of resort.

Statistical analysis have been perfomed by STATISTICA 8 package. The cases of our statistical analysis were the biotypes Remetea Mare, Topolovățu Mare, Chizătău,, Lugoj, Traian Vuia, Faget, Sinersig, Buzias, Cheveresu Mare, Albina. To facilitate the terminology the following abbreviations were chosen: NrFr - number shoots, DT- diameter shrubs.

The variables NrFr08, NrFr09, DT08, DT09 analyzed were respectively the shoots number in 2008, the shoots number in 2009, the plant diameter in 2008 and the plant diameter in 2009.

RESULTS AND DISCUSSION

After phenological observations on plant growth and development of biotypes studied, the maximum number of shoots was recorded during the first year averaged 33.3 at Buzias biotype and the minimum number of Traian Vuia biotype (23.5) in the second year at the maximum being biotype of Remetea Mare (53.7) and the minimum recorded being biotype of Traian Vuia (38.2). With regard to the shrubs diameter in first year minimum diameter is registered to biotype of Traian Vuia (15.3cm) and the maximum of the biotype of Albina (20.3cm), in the second year minimum returned biotype of Faget (22.8cm) and the maximum to biotype Remetea Mare (30.3cm).

The basic descriptive statistics are presented in *Table 1* and the correlation matrix in *Table 2*. It was observed strong positive correlations between the variables NrFr08 and NrFr09 (0,89), DT08 and DT09 (0,70), and no negative correlations.

Table 1

Descriptive statistics

Variable	Descriptive Statistics				
	Valid N	Mean	Minimum	Maximum	Std.Dev.
NrFr08	10	28,08333	23,53333	33,33333	2,881154
NrFr09	10	45,91000	38,26667	53,70000	4,885783
DT08	10	17,98333	15,30000	20,36667	1,748597
DT09	10	25,71333	22,80000	30,30000	2,573905

Principal Component Analysis (PCA) has been performed on the 4 variables for the reference group with 10 cases. The results of PCA are shown in Table 3 to Table6 and Figure 1 to Figure 3.

Table 2

Correlations matrix

Variable	Correlations matrix			
	NrFr08	NrFr09	DT08	DT09
NrFr08	1,000000	0,893926	0,653836	0,477225
NrFr09	0,893926	1,000000	0,590755	0,705188
DT08	0,653836	0,590755	1,000000	0,707129
DT09	0,477225	0,705188	0,707129	1,000000

Table 3

Eigenvalues of correlation matrix

Value number	Eigenvalues of correlation matrix			
	Eigenvalue variance	% Total Eigenvalue	Cumulative %	Cumulative variance
1	3,018843	75,47108	3,018843	75,4711
2	0,596732	14,91831	3,615576	90,3894
3	0,362401	9,06002	3,977976	99,4494
4	0,022024	0,55059	4,000000	100,0000

The eigenvalues of the correlation matrix, percent of total variance, cumulative eigenvalues, and cumulative percent are shown in Table 3. There are 4 eigenvalues arranged in decreasing order, indicating the importance of the respective factors in explaining the variation of the data.

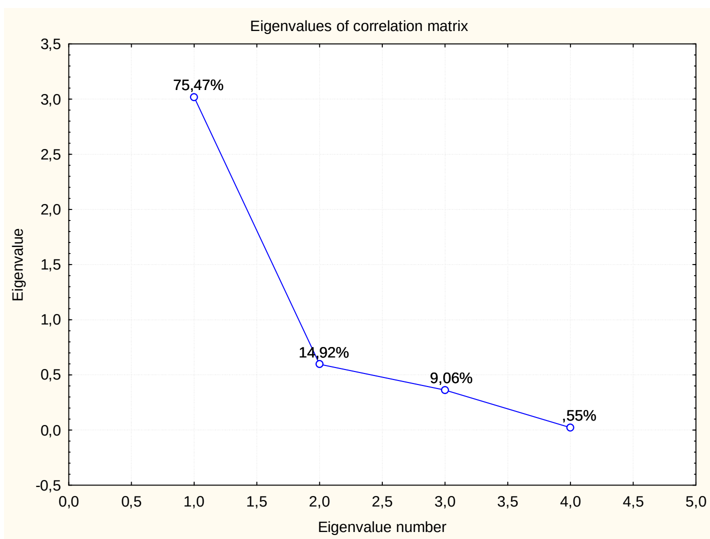

Figure 1 Eigenvalues of correlation matrix

Let us observe (see Figure 1) that the largest eigenvalue (3,01) accounts for approximately 75,47% of the total variance and the second factor corresponding to the second eigenvalue (0,59) accounts for approximately 14,91% of the total variance, so the first and the second factors explain approximately 90,38% cumulative variance.

Because the analysis is based on the correlation matrix, the results displayed in the *Table 4* can be interpreted as the correlations of the respective variables with each factor. Thus we can conclude that the first component (corresponding to the first eigenvalue) is the linear combination:

$$Y_1=-0,50*NrFr08-0,53*NrFr09-0,48*DT08-0,47*DT09$$

and the second component (corresponding to the second eigenvalue) is the linear combination:

$$Y_2=-0,58*NrFr08-0,35*NrFr09+0,40*DT08+0,60*DT09.$$

Table 4

Eigenvectors of correlation matrix

Variable	Eigenvectors of correlation matrix			
	Factor 1	Factor 2	Factor 3	Factor 4
NrFr08	-0,505188	-0,585514	0,217603	0,595489
NrFr09	-0,531870	-0,354455	-0,412839	-0,648876
DT08	-0,485745	0,401634	0,723508	-0,281563
DT09	-0,475342	0,608461	-0,508674	0,380888

It can be noticed (see *Table 5* and *Figure 2*) that the first factor is negative correlated with all variables. The second factor is negative correlated with NrFr08 and NrFr09, and positive correlated with DT08 and DT09. The circle in Figure 2 provides a visual indication (scale) of how well each variable is represented by the factors Y_1 and Y_2 ; the closer a variable in this plot is located to the unit circle, the better is its representation by the current coordinate system. One interesting result shown in *Figure 2* is that the variables are clustering, another proof of the correlation between the variables in the same cluster.

Table 5

Factor coordinates of the variables

Variable	Factor coordinates of the variables			
	Factor 1	Factor 2	Factor 3	Factor 4
NrFr08	-0,877755	-0,452301	0,130996	0,088372
NrFr09	-0,924115	-0,273811	-0,248528	-0,096295
DT08	-0,843974	0,310256	0,435550	-0,041785
DT09	-0,825899	0,470027	-0,306220	0,056525

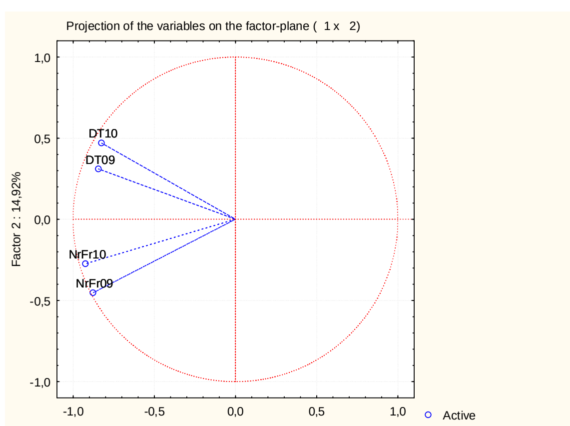

Figure 2 Projection of the variable on the factor-plane (1x2)

Table 6 reveals the coordinates of the observations corresponding to the new factors associated with the eigenvalues and eigenvectors of the correlation matrix. It can be noticed the relevance of the first two coordinates (see table 5).

Table 6

Factor coordinates of cases

Case	Factor coordinates of cases			
	Factor 1	Factor 2	Factor 3	Factor 4
1	-2,21943	0,57768	0,069464	-0,009397
2	-1,57193	-1,63253	0,199114	0,048486
3	0,95289	-0,35918	0,686971	0,116769
4	-0,23525	0,34081	1,108660	0,050966
5	1,61534	-0,75870	-0,360394	-0,225047
6	1,69287	-0,22879	-0,317073	-0,100932
7	-2,43093	0,13517	-0,997740	0,096336
8	0,01272	1,04375	0,209380	-0,195444
9	2,67938	0,47357	-0,482641	0,263093
10	-0,49566	0,40821	-0,115741	-0,044830

The projection of the observations on the plane determined by the first two factors Y_1 and Y_2 is shown in *Figure 3*. It can be noticed the similarity of Albina, Remetea Mare and Buzias biotypes; Cheveresu Mare, Chizatau, Faget and Lugoj biotypes; Topolovatu Mare, Sinersig and Traian Vuia biotypes. These similarities have been also highlighted by another method (see *Figure 4*).

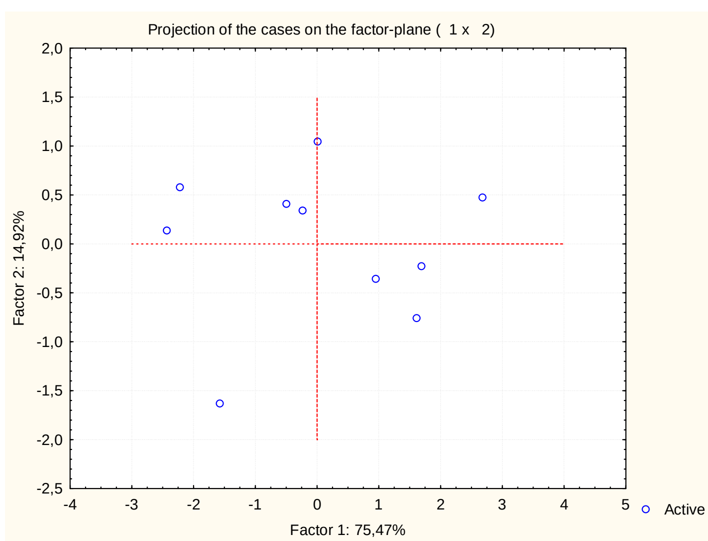

Figure 3 Projection of the cases on the factor-plane (1x2)

It was performed a classification of the analyzed biotypes by Ward's method in cluster analysis using the Euclidean distance. The biotypes Albina and Remetea Mare; Cheveresu Mare and Chizatau; Lugoj and Faget; Topolovatu Mare and Sinersig have formed clusters showing strong similarity between them (see *Figure 4*).

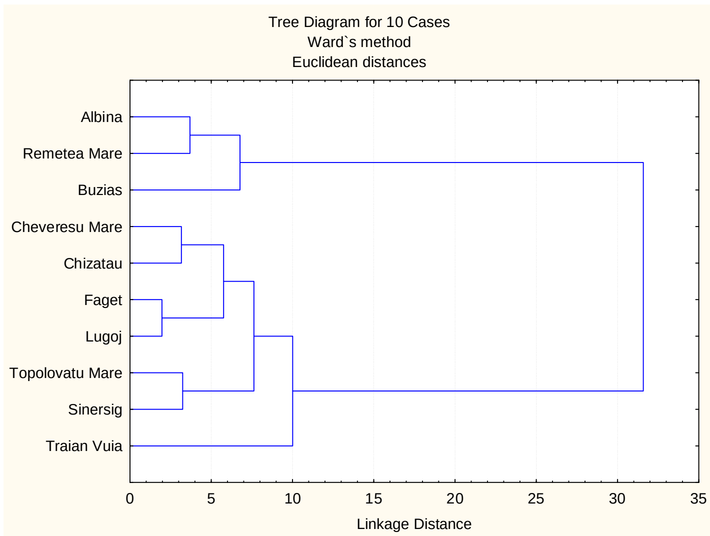

Figure 4 Tree Diagram for 10 Cases Ward's method Euclidean distances

CONCLUSIONS

Due to the relief, the climate and soil conditions in which populations were formed, there were close ties between the studied biotypes.

The statistical analysis above allow us to conclude that there are strong positive linear correlation (see Table 2 and Figure 2) between the numbers of shoot plant in 2008 and 2009 respectively. The same strong positive linear correlation was remarked between the the plant diameters in 2008 and 2009 respectively. A visual evidence of the correlations mentioned above is also the clustering trend noticed in Figure 2. By the Ward method in cluster analysis using the Euclidean distance (see Figure 4), the similarities between Albina, Remetea Mare and Buzias; Cheveresu Mare, Chizatau, Faget, Lugoj, Topolovatu Mare, Simersig and Traian Vuia were pointed out.

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