# THE CLASSIFICATION OF GENOTYES ON THE QUANTITATIVE CHARACTERS AT ALOPECURUS PRATENSIS L., IN SIMIŞOARA CONDITIONS

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**ABSTRACT – The classification of genotyes on the quantitative characters at Alopecurus pratensis L., in Simişoara conditions**
The increasing production of forage crops is the basis that can provide a modern animal husbandry. This is possible only through the existence of a biological material of great value on the one hand, and on the other hand, the existence of appropriate agricultural technology required to a superior capitalization of the biological potential (COJOCARIU L. AND LALESCU D.V., 2010).
The goal of this paper is to classify some biotypes of *Alopecurus pratensis* collected from spontaneous flora through the main morphological production characters (namely the shoot plant number, the leaf plant number, the plant height and the dry matter) emphasizing the correlations between these characters.
The biological material studied was the *Alopecurus pratensis* biotypes collected from Banat area. More precisely, there where studied *Alopecurus pratensis* biotypes around Remetea Mare Mare Topolovatu, Lugoj, Traian Vuia Sinersig, Buzias and Albina.
It was shown the similarities between Alpha and Sinersig biotypes; Topolovatu Mare, Buzias, Albina and Lugoj biotypes; Remetea Mare and Traian Vuia biotypes.

**Keywords**: *Alopecurus pratensis* L., byotipes, quantitative characters, correlations .

## INTRODUCTION

*Alopecurus pratensis* is a fodder plant very valuable due to its large productions and to the superior features which it gives to the fodder.
In a modern, sustainable agriculture, the animal husbandry occupies an important place, it assures a large part of the human food. The development of this field of agriculture depends on assuring the fodder necessities for the animal feeding (COJOCARIU L., 2005).
Knowing the biological particularities of the fodder plants represents a first step of the genetic and amelioration researches or of the technology researches, in order to increase the quantity and the quality of the fodders (BARON V.S. ET AL., 2000).

## MATERIAL AND METHOD

The experiment was placed in the vegetation house of the Didactic and Experimental Station of the University of Agricultural Sciences and Veterinary Medicine of Banat, Timişoara.

The biological material researched under aspect of morphological characters variability consisted of biotypes collected during the year of 2009 in Banat.

In the spring of the year 2010, the germinated seeds of the studied biotypes have been sowed in vegetation pots in a soil substrate of cambic chernozem, taken from the field of the research station.

The observations on the morphological characters (shrub weight, shoot number/shrub, number of green leaves/shrub, shrub height, dry matter percent) of the studied biotypes and of the control too, were made in the period of ear formation.

The cases of our statistical analysis were the Remetea Mare, Topolovatu Mare, Lugoj, Traian Vuia, Sinersig, Buzias and Albina biotypes. The variables GT, NrLa, NrFrT, HT, and SU analyzed denoted respectively shrub weight, the shoot number/ shrub, number of green leaves/shrub, shrub height and the dry matter respectively. The statistical analysis has been performed by STATISTICA 8 package.

## RESULTS

The results achieved under aspect of morphological observations that were performed put in evidence the productive capacity of the studied biotypes so that the weight of the largest shrub was found in the biotype from Sinersig (154,1g), and the weight of the smallest shrub was registered for the biotype from Traian Vuia (123,2g) comparatively to the control which had a mean weight by 163g.

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 GT, NrFrT and NrLa.

**Table 1: Desciptive statistics for thevariables**

| | Descriptive Statistics | | | | | |
|---|---|---|---|---|---|---|
| Variable | Mean | Median | Minimum | Maximum | Variance | Std.Dev. |
| GT | 142,7875 | 146,6000 | 123,2000 | 163,7000 | 205,536 | 14,33651 |
| NrLa | 24,3500 | 24,0000 | 19,4000 | 31,3000 | 14,434 | 3,79925 |
| NrFrT | 138,0275 | 130,6250 | 95,6000 | 197,1900 | 1353,690 | 36,79253 |
| HT | 62,7375 | 63,1000 | 59,3000 | 65,2000 | 4,411 | 2,10030 |
| SU | 20,2312 | 19,9700 | 19,1600 | 21,5400 | 0,704 | 0,83928 |

**Table 2: Matrix of correlations for the variables**

| | Correlations matrix | | | | |
|---|---|---|---|---|---|
| Variable | GT | NrLa | NrFrT | HT | SU |
| GT | 1,000000 | 0,932619 | 0,929138 | 0,266271 | -0,434140 |
| NrLa | 0,932619 | 1,000000 | 0,968898 | 0,234439 | -0,564441 |
| NrFrT | 0,929138 | 0,968898 | 1,000000 | 0,263893 | -0,495834 |
| HT | 0,266271 | 0,234439 | 0,263893 | 1,000000 | 0,149332 |
| SU | -0,434140 | -0,564441 | -0,495834 | 0,149332 | 1,000000 |

Principal Component Analysis (PCA) has been performed on the 5 variables for the reference group with 8 cases. The results of PCA are shown in *Table 3.* to *Table 6.* and *Figure 1.* to *Figure 3.* The eigenvalues of the correlation matrix, the total variance (%), the cumulative eigenvalues, and cumulative variance (%) are shown in *Table 3.* There are 5 eigenvalues arranged in decreasing order, indicating the importance of the respective factors in explaining the variation of the data. Let us observe (*Figure 1.*) that the largest

eigenvalue (3,27) accounts for approximately 65,59% of the total variance and the second factor corresponding to the second eigenvalue (1,13) accounts for approximately 22,70% of the total variance, so the first and the second factors explain approximately 88,29% cumulative variance.

**Table 3: Eigenvalues of the correlation matrix and their total variance**

| | Eigenvalues of correlation matrix | | | |
|---|---|---|---|---|
| Value number | Eigenvalue | % Total variance | Cumulative Eigenvalue | Cumulative % |
| 1 | 3,279627 | 65,59254 | 3,279627 | 65,5925 |
| 2 | 1,135295 | 22,70590 | 4,414922 | 88,2984 |
| 3 | 0,483746 | 9,67491 | 4,898668 | 97,9734 |
| 4 | 0,074491 | 1,48983 | 4,973159 | 99,4632 |
| 5 | 0,026841 | 0,53682 | 5,000000 | 100,0000 |

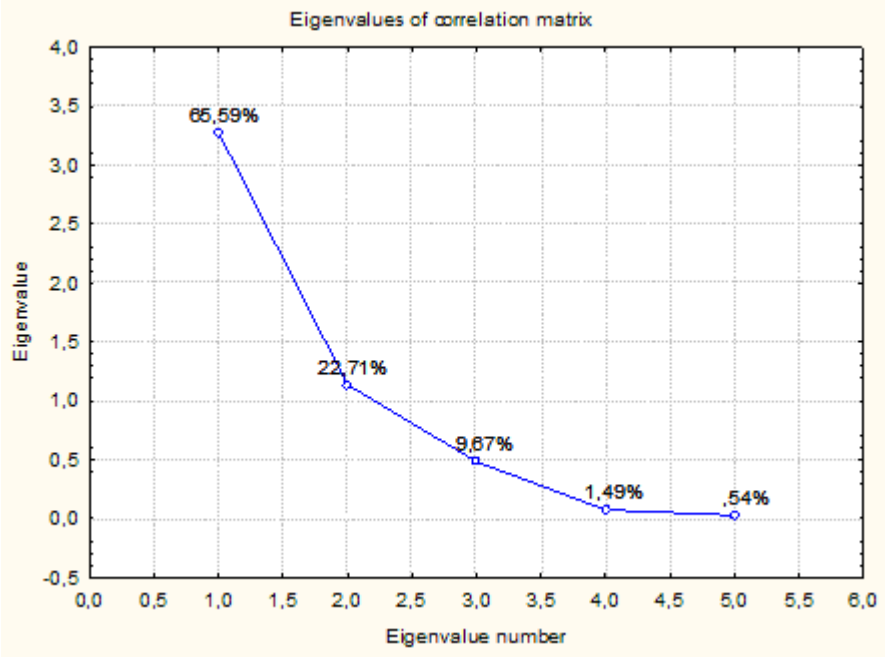


**Figure 1: Eigenvalues of the correlation matrix**

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

$$Y_1=-0,52*GT-0,54*NrLa-0,53*NrFrT-0,15*HT+0,34*SU$$

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

$$Y_2=0,07*GT-0,01*NrLa+0,04*NrFr+-0,82*HT+0,55*SU.$$

**Table 4: Eigenvectors of correlation matrix**

| Variable | Eigenvectors of correlation matrix | | | | |
|---|---|---|---|---|---|
| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
| GT | -0,524558 | 0,078349 | 0,303060 | 0,784804 | -0,104580 |
| NrLa | -0,543484 | -0,012094 | 0,129334 | -0,309470 | 0,769402 |
| NrFrT | -0,537143 | 0,044078 | 0,205599 | -0,526089 | -0,624895 |
| HT | -0,157005 | 0,828742 | -0,536797 | 0,019648 | 0,000259 |
| SU | 0,341014 | 0,552231 | 0,749003 | -0,105617 | 0,081176 |

It can be noticed (*Table 5.* and *Figure 2.*) that the first factor is negative correlated with GT, NrLa, NrFrT and HT variables and positive correlated with SU variable. The second factor is negative correlated only with NrLa, and positive correlated with the other variables. The circle in *Figure 2.* provide 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, based on correlations | | | | |
|---|---|---|---|---|---|
| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
| GT | -0,949962 | 0,083481 | 0,210784 | 0,214197 | -0,017134 |
| NrLa | -0,984235 | -0,012886 | 0,089954 | -0,084464 | 0,126053 |
| NrFrT | -0,972753 | 0,046965 | 0,142998 | -0,143586 | -0,102378 |
| HT | -0,284332 | 0,883026 | -0,373352 | 0,005362 | 0,000042 |
| SU | 0,617567 | 0,588404 | 0,520945 | -0,028826 | 0,013299 |

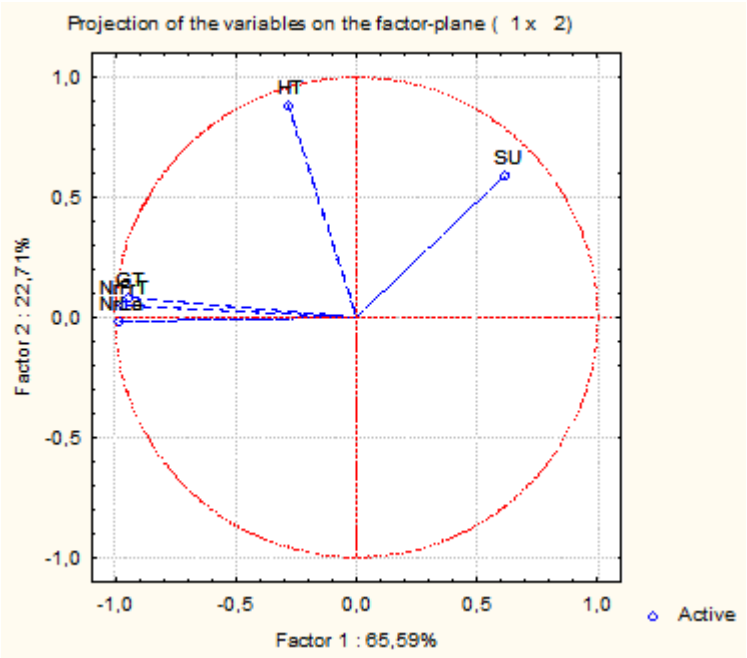


**Figure 2: Projection of the variables on the first two factor plane**

*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.

**Table 6: Factor coordinates of cases**

| Case | Factor coordinates of cases, based on correlations | | | | |
|---|---|---|---|---|---|
| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
| Remetea Mare | 1,79350 | -0,47226 | -0,332805 | 0,016599 | 0,073422 |
| Topolovatu Mare | -0,91253 | 0,05624 | -0,581012 | 0,209769 | -0,034037 |
| Lugoj | 1,38544 | 1,31770 | 0,404670 | -0,437573 | 0,122441 |
| Sinersig | -1,82203 | 0,84017 | -0,361397 | -0,194298 | -0,282037 |
| Traian Vuia | 2,23564 | -1,60460 | -0,085002 | -0,074249 | -0,154982 |
| Buzias | -0,24079 | 0,56797 | -0,874015 | 0,217813 | 0,193104 |
| Albina | 0,45934 | 0,68003 | 1,230015 | 0,414410 | -0,064128 |
| Alpha | -2,89858 | -1,38525 | 0,599545 | -0,152471 | 0,146216 |

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 Alpha and Sinersig biotypes; Topolovatu Mare, Buzias, Albina and Lugoj biotypes. These similarities have been also highlighted by another method (*Figure 4*).

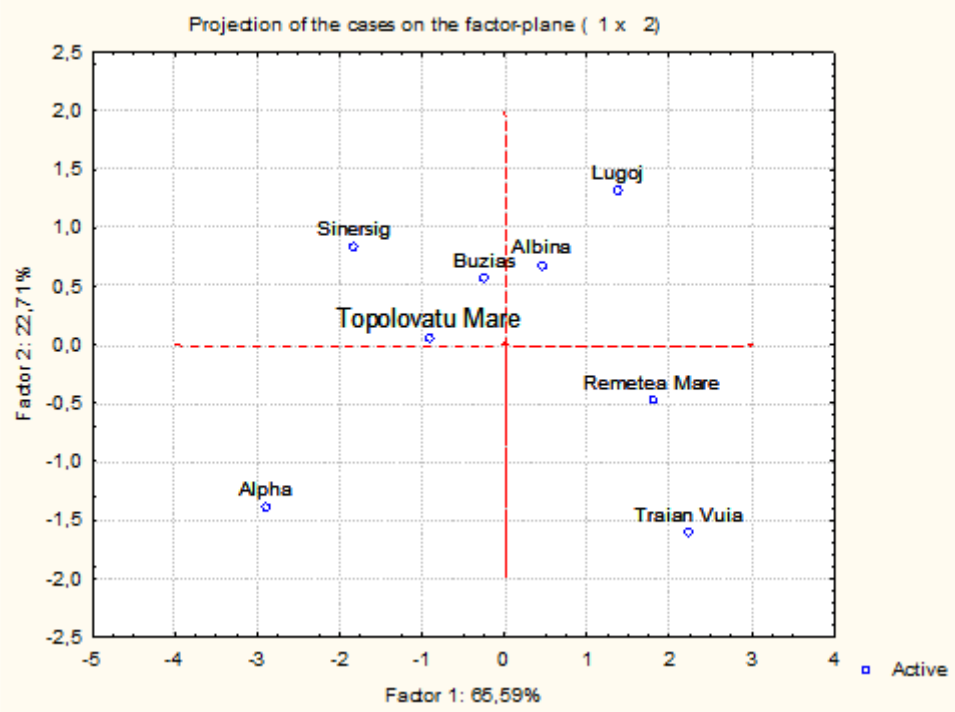


**Figure 3: Projection of the cases on the first two factor plane**

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

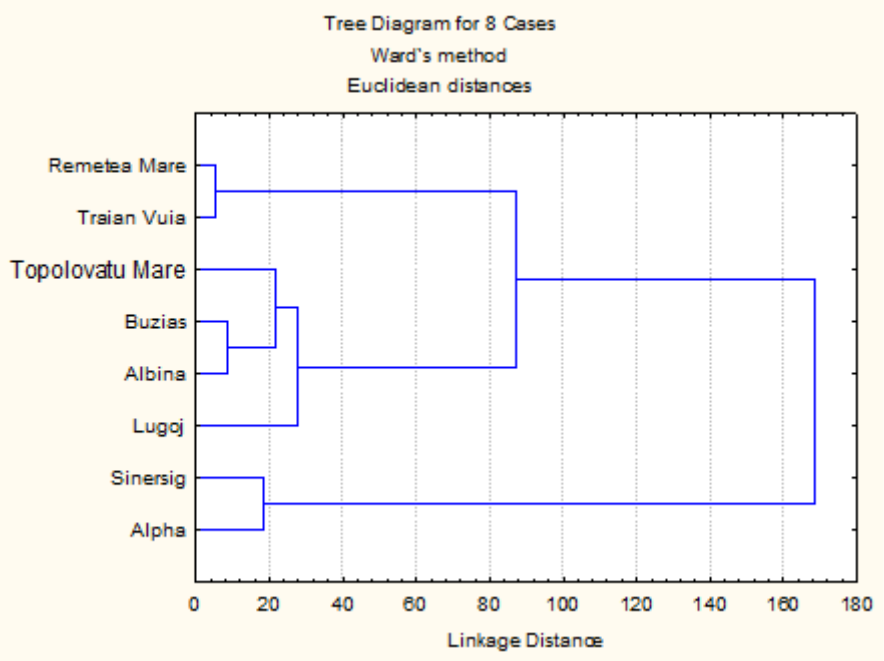


**Figure 4: Dendrogram of the cases**

## CONCLUSIONS

The statistical analysis above allow us to conclude that there are strong positive linear correlation (*Table 2.* and *Figure 2.*) between the number of shoots per plant, number of leafs per plant and plant weight..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 (*Figure 4.*), the similarities between Alpha and Sinersig biotypes; Topolovatu Mare, Buzias, Albina and Lugoj biotypes; Remetea Mare and Traian Vuia biotypes were pointed out.

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