STATISTICAL MODELLING OF FUNCTIONAL DEPENDENCE BETWEEN SOME CHARACTERS OF THE *ALOPECURUS PRATENSIS* L. IN CONDITIONS OF TIMIŞOARA

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Abstract

Alopecurus pratensis L. species, like any plant grown for the vegetative forage, which contributes to the formation of several elements. Depending on their behavior and the knowledge about the dependence between these characters, we can influence the production of forage (Horablaga M. and Moisuc A., 2003; Cojocariu L. and Lalescu D.V., 2010).

The purpose of this paper is to find the functional dependence of some characters, which influences the biomass production at Alopecurus pratensis L. The statistical analysis allowed us to draw some conclusions about the studied characters. Thus there are positive correlations between the number of tillers per plant, plant height, leaf area and dry substance in 2009 and 2010. Based on these correlations we determined the functional dependence between these characters, the linear regression equations, the species Alopecurus pratensis L. in conditions of Timişoara.

Key words: *Alopecurus pratensis* L., number of shoots, plant height, foliar surface dry matter, correlations.

INTRODUCTION

The perennial fodder graminaceous represent an important source of forage for the ruminant animals, constituting the basal component of the permanent grasslands which represent a surface two times larger than the arable terrains in the world, totalizing 3 billions ha, meaning 25% of planetary surface (Luminița C., 2005).

The extension in the production of a large and various ranges of species and kinds imposes the elaboration of some technological solutions able to allow an optimal energy-protein ratio for the animal feeding and to offer multiple possibilities for forage usages. The forage obtained from the perennial fodder graminaceous, in our case the species *Alopecurus pratensis* L., must assure a continuous supplying with food of the animals, so it must be characterized by a rhythmic production during the vegetation season and a good conservation (Dietl W. 1983; Kline P.K., 1993; Robert F. B. et all., 2007).

The forage production of the perennial fodder graminaceous, in our case the meadow foxtail, is extremely valuable because of a good consume of it as forage, so that certain authors (Tingle, J. N. and Van Adrichem, 1974; Baron V.S. et all., 2000; Horablaga M. and Moisuc A., 2003) performed researches, in different environmental conditions, on their production characters, in order to highlight the fodder value of this plant.

MATERIAL AND METHOD

The experience was placed within the experimental field of the discipline Grasslands and fodder plants cultivation of the Faculty of Agriculture from Timişoara during the period 2008-2010.

The evolution of climatic resources within the period 2008-2010 distinguishes their oscillatory character, with notable deviations from the multi-annual mean value. The year of 2010 was different from the anterior years because in its first part the precipitations were more significant, which influenced the well growth and development of this species that finally is one of the plants with high requirements for humidity.

The soil where the experiments had been placed is a cambic chernozem.

To realize the experiments there was used the kind Alpha of *Alopecurus pratensis* L., improved at the Research Institute Saatzucht Steinach Germany. The seeds were sown in the field of the discipline Grasslands and fodder plants cultivation in the autumn of 2008, respectively in the autumn of 2009.

The phonological observations (shoots number, height of the bush, foliar surface of the bush, percentage of dry matter) for the studied kind were made at each mowing (three mowing actions) in the production year of 2009, as well as in the next year, 2010, and the observations upon the production characters were the same as in the anterior years.

For the sake of simplicity, in our statistical analysis, number of shoots per plant, plant height, foliar surface and dry matter in 2009 and 2010 respectively were denoted by NrFr09, H09, S09, SU09 and NrFr10, H10, S10, SU10. The statistical analysis has been performed by STATISTICA 8 package (Petersen R.G., 1994 ; Mead R., 2002).

RESULTS AND DISCUSSIONS

Of great importance for the cultivation of *Alopecurus pratensis* L. are the following characters: foliar surface, shoot number, plant height and dry matter. Therefore, the productivity directions for the *Alopecurus pratensis* L. are pointed toward increasing of vegetative mass which will assure a large quantity of forage.

The goal of this paper is to find the functional dependence between the main production characters of the *Alopecurus pratensis* L.

A linear regression analysis of the plant height in 2009 based on the number of shoots in 2009 was performed (see Table 1). It was determined that the proportion of variance in the number of shoots per plant (59904) was statistically significant (F=4598, df=1) for p value under 0,05 (95% confidence interval), where the F ratio provided the test of statistically significance.

Table 1

Regression line coefficients between shoots number and plant height-ANOVA

Effect	Univariate Tests of Significance for H09 SS	Degr. of Freedom	MS	F	p
Intercept	59904,02	1	59904,02	4598,176	0,000000
NrFr09	880,37	17	51,79	3,975	0,009630
Error	156,33	12	13,03		

The regression equation $y=b_0+b_1x$ is the linear equation used to fit the best straight line to the data (see Figure 1). The dependent variable H09 was expressed as the equation

$$H09 = 58,24 - 0,19*NrFr09,$$

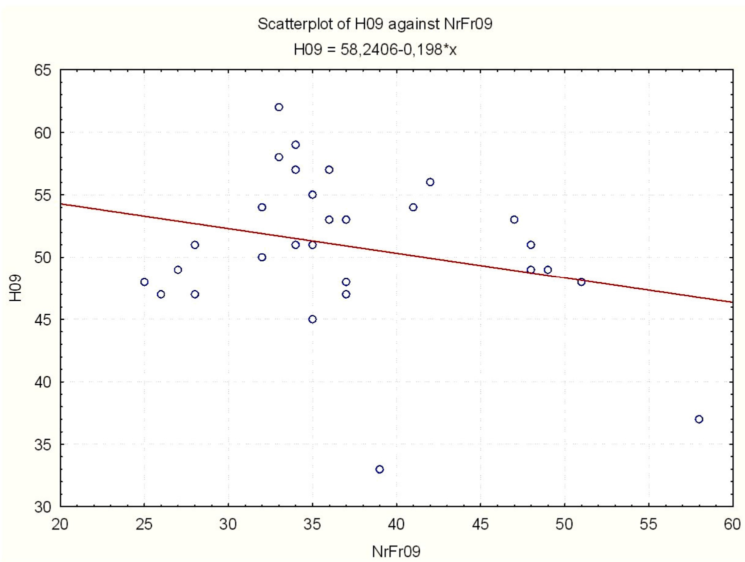

Fig. 1 Linear dependence between plant height (H09) and number of shoots (NrFr09)

A linear regression analysis of the foliar surface of plant in 2009 based on the number of shoots (see Table 2). It was determined that the proportion of variance in the foliar surface (1836) was statistically significant (F=347, df=1) for p value under 0,05 (95% confidence interval), where the F ratio provided the test of statistically significance.

Table 2

Regression line coefficients between number of shoots and foliar surface - ANOVA

Effect	Univariate Tests of Significance for S09				
	SS	Degr. of Freedom	MS	F	p
Intercept	1836,081	1	1836,081	347,4080	0,000000
"NrFr09"	91,415	17	5,377	1,0175	0,499627
Error	63,421	12	5,285		

The regression equation $y=b_0+b_1x$ is the linear equation used to fit the best straight line to the data (see Figure 2). The dependent variable NrFr09 was expressed as the equation

$$SU09 = 20,075 + 0,06*NrFr09$$

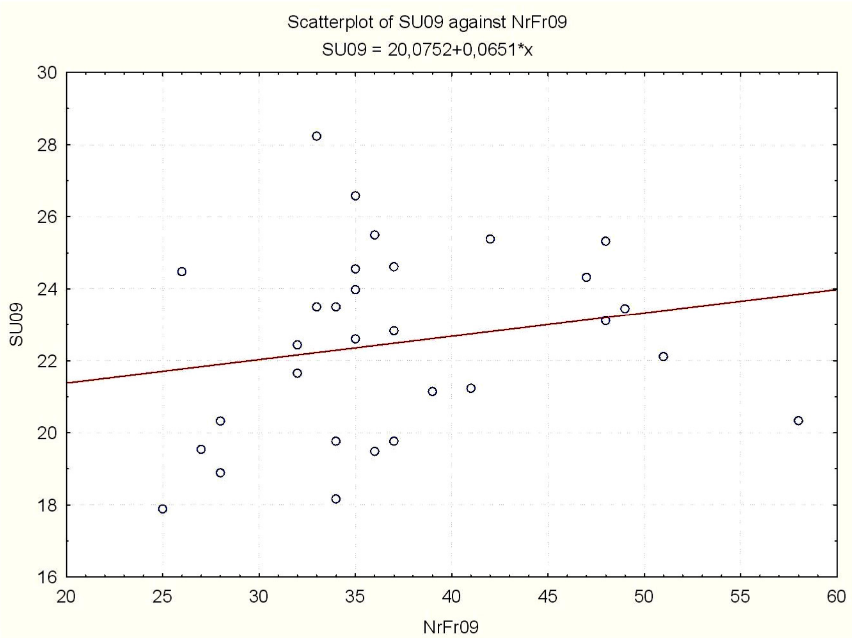

Fig. 2 Linear dependence between dry matter (SU09) and number of shoots (NrFr09)

To test whether the dry matter in 2009 is statistically significant (see Table 3) a linear regression analysis of the dry matter based on plant height in 2009 was also performed. It was determined that the proportion of variance in the plant weight (12046) was statistically significant (F=1391, df=1) for p value under 0,05 (95% confidence interval), where the F ratio provided the test of statistically significance.

Table 3

Regression line coefficients between dry matter and plant height - ANOVA

Effect	Univariate Tests of Significance for SU09 SS	Degr. of Freedom	MS	F	p
Intercept	12046,00	1	12046,00	1391,498	0,000000
"H09"	74,74	15	4,98	0,576	0,849896
Error	121,20	14	8,66		

The regression equation $y=b_0+b_1x$ is the linear equation used to fit the best straight line to the data (see Figure 3). The dependent variable SU09 was expressed as the equation

$$SU09 = 14,86 + 0,14*H09,$$

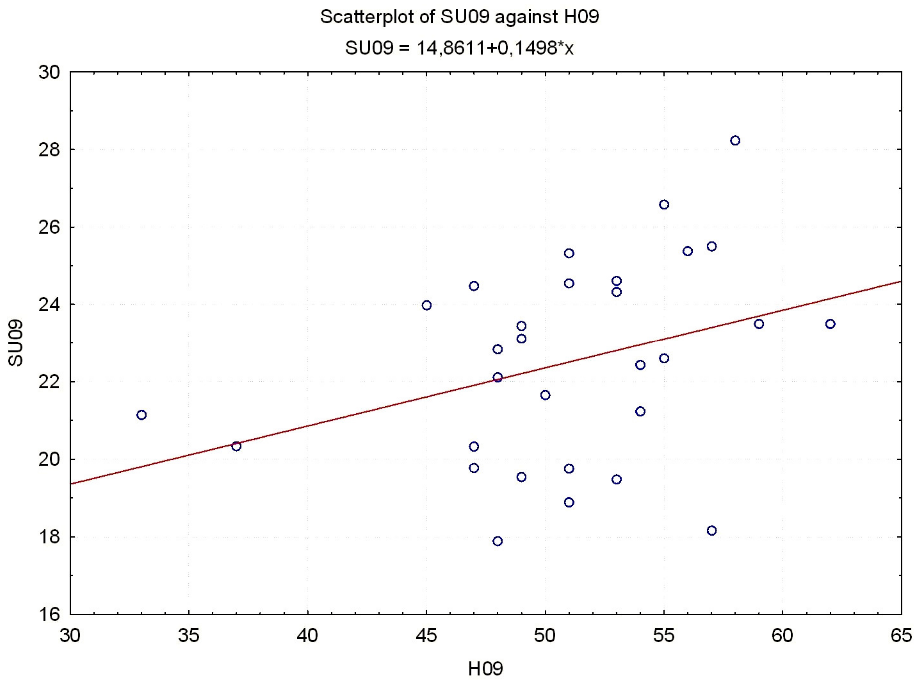

Fig. 3 Linear dependence between dry matter (SU09) and plant height (H09)

A linear regression analysis of the foliar surface of plant in 2010 based on the plant height in 2010 was performed in order to test whether the foliar surface is statistically significant (see Table 4). It was determined that the proportion of variance in the foliar surface (2618) was statistically significant (F=2618, df=1) for p value under 0,05 (95% confidence interval), where the F ratio provided the test of statistically significance.

Table 4

Regression line coefficients between foliar surface and plant height - ANOVA

Effect	Univariate Tests of Significance for S10 SS	Degr. of Freedom	MS	F	p
Intercept	2618,684	1	2618,684	457,1503	0,000000
"H10"	108,491	18	6,027	1,0522	0,480781
Error	63,011	11	5,728		

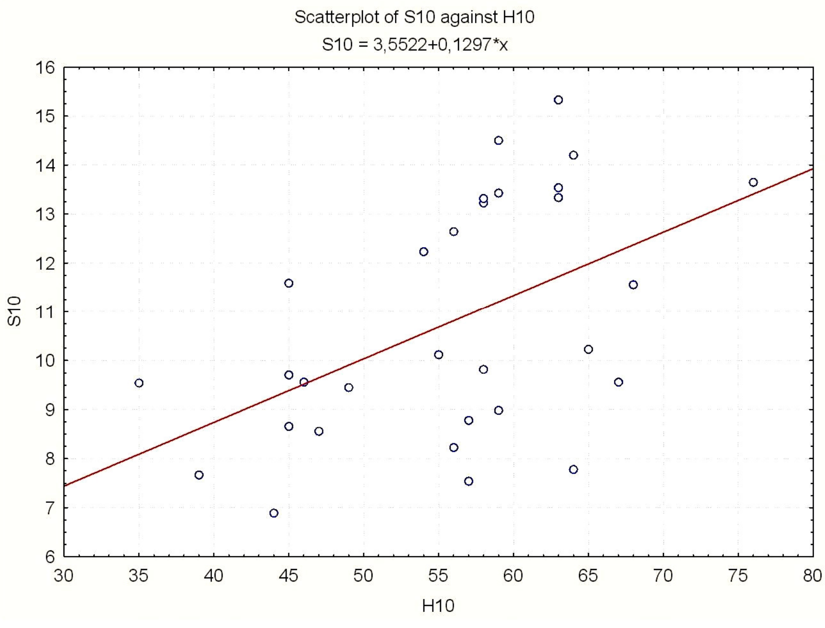

Fig. 4. Linear dependence between foliar surface(S10) and plant height (H10)

The regression equation $y=b_0+b_1x$ is the linear equation used to fit the best straight line to the data (see Figure 4). The dependent variable S10 was expressed as the equation.

$$S10 = 3,55 + 0,12*H10.$$

CONCLUSIONS

Due to weather conditions beneficial to the studied species, in 2010 it was recorded a more significant production of vegetative forage, in return the percentage of dry matter was lower compared to an year earlier.

There are positive linear correlations between number of shoots per plant, plant height, foliar surface and dry matter in 2009 and 2010 respectively, the main production characters of the *Alopecurus pratensis* L. Based on these correlations we determined the functional dependence by the regression line equations between the number of shoots per plant, high waist, foliar surface of plant and dry matter respectively for the years 2009 and 2010 in conditions of Timisoara. The 95% confidence intervals and the statistical significance of the models were pointed out.

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