

CORRELATIONS DEPENDENCE AND DEGREE OF VARIATION BETWEEN YIELD AND SOME MORPHOLOGICAL PARAMETERS IN BIRDSFOOT TREFOIL (*LOUS CORNICULATUS L.*) ACCESSIONS

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Abstract

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During the period 2008-2010 in the experimental field of RIMSA-Troyan were traced correlations dependence and degree of variation between the yield of dry mass, some morphological parameters in local populations of birdsfoot trefoil originating: Shumen, Nesebar, Kiten, Tryavna, Sadovo and genotypes of the varieties: C. Podolyanskiy (Russia), Dedinovski (Russia), Martanskiy (Russia), Zora (Serbia) Bokor (Serbia) Smolenskiy (Russia). For this purpose was applied of the data the methods of the correlation and variation analysis were used. It was found that the highest average yield value of dry mass showed a variety Dedinovski (163.1 kg.ha⁻¹) and local populations originating Kiten and Nessebar (144.1 and 143.1 kg.ha⁻¹). In cultivar Bokor was found moderate variability and higher in all other tested samples due to soil and climatic conditions and their genetic gifts. The leafiness was best expressed in populations originating Sadovo and Kiten (47.2%), including local population of Nessebar (46.3%). The Variety Martanskiy (CV - 5.1%) and population Shumen (CV - 5.6%) showed a very low variability of this parameter. Positive weak correlation dependence was found between of dry mass yield and percentage shares of the generative organs ($r = 0.3241$) and very strong correlation ($r = 0.818036$) between the height and the percentage contribution of the stems.

Key words: birdsfoot trefoil, accessions, correlation and variance analysis

Introduction

Birdsfoot trefoil is forage crop, characterized by good adaptability to different soil and climatic conditions (Papadopoulos and Kelman, 1999) and has high nutritional value (Barian, 2002; Radovic et al., 2003). Studies estimate of Kyuchukova (2008) on accessions birdsfoot trefoil, was found that there was weak positive correlation between effec-

tive yield and forage height and average between the yield of forage and number of stems. Data to test different varieties and populations of birdsfoot trefoil show differences in terms of productivity, botanical and morphological composition of the grass grown under different soil conditions (Ayres et al., 2007). In the light gray pseudopodzolic soils was found that in cuts for feed are in the highest correlation with the percentage of stems and dry

matter yield and in seed cuts by the number of seed in pod and seed yield (Churkova, 2010). In breeding programs it is essential that the demand for varieties and populations with low variability of the individual parameters carries of valuable genoplasm (Churkova, 2008, 2010).

The purpose of this study was to establish correlations dependence between forage yield and some important quantitative traits, which will have a theoretical basis for breeding of new varieties.

Material and Methods

The study was conducted during the period 2008-2010 in the experimental field of RIMSA - Troyan on light gray pseudopodzolic soil. The experience has been set according to the block method in four reiterations with a size of the trial platform of 1 square meters. Object of study were populations originating: Shumen, Nessebar, Kiten, Tryavna Sadovo and genotypes of the varieties: C. Podolyanskiy (Russia), Dedinovski (Russia), Martanskiy (Russia), Zora (Serbia) Bokor (Serbia), Smolenskiy (Russia). By comparison was used a variety Targovishte 1 (St).

The method of soil treatment is given in our other post (Churkova and Mihovski, 2000). The sowing was performed manually, at depth of 0.5-1.0 cm and sowing rate 12.0 kg.ha⁻¹. The phosphorous and potassium fertilizers were applied as reserve at a rate of 320 kg.ha⁻¹ a. i., while nitrogen was applied at one fertilization 60 kg.ha⁻¹ a. i., before sowing.

The birdsfoot trefoil harvesting was conducted at the stage budding – early of flowering of the grass.

The study included average data of the different characteristics by years. The average values (\bar{x}), minimum (min) and maximum (max) limits of the morphological composition of the grass and productivity were calculated (Lidanski, 1988). The yield of dry mass was determined in kg.ha⁻¹, and morphological composition of the grass was established by taking average accessions in un-

dergrowth and years and calculated an average for the period of study in the percentage by weight. The degree of variation (CV) of parameters was determined though variation coefficient according to the scheme of Mamaev (Lidanski, 1988): up to 7% - very low, 7.1 to 12% low, 12.1 to 20% moderate; 20.1 - 40% high; over 40% - very high. Correlations (r) of Brave and Pirson (Lidanski, 1988) were calculated to prove the relations between the different characteristics and their influence on productivity as well as between them. The data was processed by Microsoft Excel.

Results and Discussion

The data from the mean, minimum and maximum limits values, variation coefficients and arithmetic errors are presented in Table 1 and those for correlations dependence between them at Table 2.

Among the data obtained shows that the maximum values in leafiness tested varieties and populations in the range from 43.2% in variety Bokor to 55.7% in variety Dedinovski, a minimum of 30.8% in variety Bokor to 41.2% in local population Kiten. The highest average values in leafiness reported in populations originating Sadovo and Kiten (47.2%), including local population of Nessebar (46.3%), which departs from them by 0.9 points. The variation coefficients calculated show that leafiness was best expressed in a variety Martanskiy (CV - 5.1%), population Shumen (CV - 5.6%), a variety Targovishte (CV - 6.2%), which have very low variability of this parameter. Low variability showed populations originating Kiten and Nessebar (CV - 9.5 and 8.8%), varieties Zora and Smolenskiy (CV - 8.0 and 9.1%), moderate - the local population Tryavna (12.3), Local population Sadovo (CV - 16.3 %), variety V. Podolyanskiy (CV - 15.0%) and variety Bokor (CV - 17.6%). Single variety with known high variability in the parameter was the leafiness variety Dedinovski (CV - 21.0%).

The stems percentage contribution maximum

Table 1

Average arithmetical (x), minimum and maximum values and variation coefficient (CV) of the morphological parameters in local populations and varieties

Varieties and populations	% leaffiness				% stems				% Generative organs			
	min	max	x	VC	min	max	x	VC	min	max	x	VC
Targovishte 1	40.0	46.1	42.4	6.2	30.8	55.6	47.8	24.3	2.8	23.1	9.8	97.1
Population Shumen	38.9	44.4	41.5	5.6	27.8	52.9	41.7	27.5	5.9	33.3	16.8	77.4
Local population Nesebar	40.0	50.0	46.3	9.5	31.3	55.0	42.1	23.3	5.0	21.9	11.6	62.2
Local population Kiten	41.2	50.1	47.2	8.8	16.7	56.7	38.4	42.9	2.1	33.3	14.4	92.9
Local population Tryavna	37.0	47.9	43.0	12.3	37.0	50.0	43.6	13.5	6.2	25.9	13.4	64.3
Local population Sadovo	40.5	54.2	47.2	16.3	27.0	58.6	39.3	34.4	0.9	32.4	13.5	99.0
V, Podolyanskii (Russia)	31.2	44.7	39.7	15.0	37.5	55.0	45.6	16.2	5.0	31.2	14.7	79.7
Dedinovskii (Russia)	34.1	55.7	43.4	21.0	22.7	50.0	36.2	32.1	6.2	43.2	20.5	79.0
Martanskii (Russia)	40.0	44.4	41.6	5.1	40.0	53.8	47.9	14.2	4.1	20.0	10.5	66.7
Zora (Serbia)	36.8	44.3	40.1	8.0	31.6	58.4	48.7	24.3	2.6	31.6	11.1	123.5
Bokor (Serbia)	30.8	43.2	37.4	17.6	42.9	61.4	53.4	14.5	1.2	15.4	9.2	73.8
Smolenskii (Russia)	38.9	48.5	44.2	9.1	27.8	56.8	43.3	26.0	1.4	33.3	12.6	113.0

Table 2

Average arithmetical (x), minimum and maximum values and variation coefficient (CV) and statistical error (SD) of the dry mass yield (kg.ha⁻¹) in local populations and varieties

Varieties and populations	Min kg,ha ⁻¹	Max kg,ha ⁻¹	X kg,ha ⁻¹	VC, %	SD
Targovishte 1	91.2	180.0	138.4	26.3	364.5
Population Shumen	91.2	173.2	138.7	25.0	346.9
Population Shumen	87.2	172.7	144.1	27.9	401.9
Local population Nesebar	87.7	174.7	143.1	27.5	393.1
Local population Kiten	89.7	165.0	137.1	24.5	336.5
Local population, Tryavna	93.0	172.5	142.5	24.7	352.6
Local population Sadovo	87.2	163.0	131.5	24.5	322.1
V, Podolyanskii (Russia)	106.7	210.7	163.1	26.3	429.0
Dedinovskii (Russia)	98.0	171.2	141.2	22.2	313.4
Martanskii (Russia)	83.5	184.2	140.5	30.0	421.8
Martanskii (Russia)	102.0	149.7	131.0	15.9	208.0
Smolenskii (Russia)	87.2	170.5	135.3	26.0	351.9

value was recorded in variety Bokor (61.4%), with the highest average value $x = 53.4\%$. The greatest variation ranges of the values between the accessions was observed in local populations originat-

ing Kiten (CV - 42.9%), which was reported at a minimum value of 16.7% and 56.7% maximum. The relatively low value of the variation coefficient 16.2% in variety V. Podolyanskiy due to a differ-

Table 3

Correlation coefficients between dry mass yield, stem height morphological parameters in local populations and varieties

Parameters	Stem height, cm	% leafiness	% stems	% Generative organs
Dry mass yield, kg.ha ⁻¹	-0.017017	-0.18577	-0.22812	0.3241
Stem height, cm		-0.08036	0.818036	-0.78001
% leafiness			-0.26331	-0.25082
% stems				-0.86782

ence of 17.5 points between the minimum (37.5%) and maximum (55.0%) value on this parameter. The calculated values of the parameter stem percentage that the average degree of variability was recorded in plants from local populations Tryavna (13.7%) and varieties: V. Podolyanskiy, Martanskiy and Bokor (CV - 16.2, 14.2 and 14.5%). All other accessions have high variability in this parameter (CV - of 23.3 to 42.9%)

The values of the generative organs percentage in grass composition vary within wide limits in individual parameters. The variation limits in variety Zora were from 2.6 to 31.6%, average value $x = 11.1\%$ and an exceptionally high degree of variability CV = 123.5%. The highest maximum and average values of this parameter - 43.2% and 20.5% were recorded in variety. The degree of variability in all tested varieties and populations was very high (CV - 64.3 to 123.5%). This is due to the fact that the flowering stage in birdsfoot trefoil is quite stretched. The studied accessions have different duration of this stage, which is mainly determined by varietal characteristics and climatic conditions.

The results of the yield of dry mass of the tested accessions were shown in Table 2. All accessions showed high productivity during the years of study. The tested local populations only local population originating Tryavna, where it was recorded average value of yield $x = 137.1 \text{ kg.ha}^{-1}$ inferior standard Targovishte 1 ($x = 138.4 \text{ kg.ha}^{-1}$). The introduced varieties V. Podolyanskiy, Bokor and Smolenskiy was less productive than the standard, with established the average yield on dry mass $x = 131.5,$

131.0 and 135.3 kg.ha⁻¹.

The favorable combination of humidity and temperature during the years of study during the vegetation is the main reason for obtaining high yields. This in turn contributed to the receipt of two and three cuts, a prerequisite for high productivity. The variety Dedinovskiy (163.1 kg.ha⁻¹) was recorded highest average (x) of this parameter, as well as local populations originating Nessebar and Kiten (144.1 and 143.1 kg.ha⁻¹). The variety Bokor had average degree of variability (CV = 15.9%) and minimum and maximum values: 102.0 and 149.7 kg.ha⁻¹. The remaining variety have a high degree of variability (CV - 22.2 to 30.0%). The highest maximum values of dry mass yield were reported in Variety Dedinovskiy (210.7 kg.ha⁻¹) and Zora (184.2 kg.ha⁻¹).

Positive correlation of weak strength was found between (Table 3) dry mass yield only and the Generative organs percentage ($r = 0.3241$). The very strong correlation between height and the stems percentage of was established ($r = 0.818036$). The inverse correlation was found between the dry mass yield and height ($r = -0.017017$), and leafiness percentage ($r = -0.18577$) and stems percentage ($r = -0.22812$), which corresponds to research Kyuchukova (2008).

Conclusions

In the light gray pseudopodzolic soils studied local populations and varieties showed high productivity. The average value on this parameter was highest for variety Dedinovskiy (163.1 kg.ha⁻¹),

and for the local populations originating Nessebar and Kiten (144.1 and 143.1 kg·ha⁻¹). The moderate variability was found in variety Bokor and higher in all other accessions tested showed that soil and climatic conditions and genetic characteristics were a major factor in the manifestation of productive talent. In terms of average leafiness was best expressed in populations originating Sadovo and Kiten (47.2%), including local population of Nessebar (46.3%) and the degree of variability in variety Martanskiy (CV - 5.1%) and population Shumen (CV - 5.6%), which have very low variability of this parameter. There was weak positive correlation between dry mass yield and percentage shares generative organs ($r = 0.3241$) and very strong correlation ($r = 0.818036$) between the height and stems percentage.

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