

ORIGINAL ARTICLE

PHENOTYPIC CORRELATIONS BETWEEN PRODUCTIVITY ELEMENTS OF RED CLOVER (*TRIFOLIUM PRATENSE* L.)**CORELAȚII FENOTIPICE ÎNTRE ELEMENTELE DE PRODUCTIVITATE LA TRIFOIUL ROȘU (*TRIFOLIUM PRATENSE* L.)****L MUNTEAN*, SAVATTI, M.****REZUMAT**

Studiul corelațiilor între elementele de productivitate ale trifoiului roșu (producția de masă verde, fân și sămânță) este un aspect foarte important pentru programele de ameliorare în vederea obținerii de cultivare cu productivitate ridicată.

Corelații pozitive, asigurate statistic, au fost observate la ambele grupe de ploidie, între producția de masă verde și fân în ambii ani de vegetație. Corelații negative au fost identificate între producția de sămânță și producția de masă verde la prima coasă a anului al doilea, în cazul diploizilor și între producția de sămânță și producția totală de masă verde și fân a anului întâi de vegetație, în cazul tetraploizilor

Cuvinte cheie: trifoi roșu/corelații fenotipice/elemente de productivitate/ cultivare diplode și tetraploide

ABSTRACT

Studying the correlations between productivity elements of red clover (green matter, dry matter and seed yield) is a very important aspect of breeding programs because it helps obtaining highly productive cultivars. Positive correlations, statistically assured, were observed between green and dry matter yields in both years of vegetation, for both groups of ploidy. Negative correlations were noticed between seed yield and first cut green matter yield in the 2nd year, for diploids and between seed yield and total green and dry matter in the 1st year, for tetraploids.

Key words: red clover/phenotypic correlations/productivity elements/ diploid and tetraploid cultivars

DETAILED ABSTRACT

Correlations are important for the breeder in order to associate all the possible valuable features in the newly created genotypes. The issue of correlations in red clover is still open and it may play an important part for the success of the breeding programs since it allows the elimination of the invaluable biological material even at very early stages and, on the other side, the selection of the valuable genotypes is faster and more accurate. Studying the correlations between productivity elements of red clover (green matter, dry matter and seed yield) is a very important aspect of the breeding programs because it helps obtaining highly productive cultivars.

To identify these correlations our study was carried out in Cluj-Napoca, between 2000-2001, on a germplasm collection of 45 diploid and 22 tetraploid cultivars, originating from Europe, Asia, America and Oceania.

The green matter, dry matter and seed yield in the first and second year were determined individually for each cultivar. The correlation of the productivity elements was done according to the ploidy groups, using the Bravis-Pearson model of calculating the correlation coefficient

Positive correlations, statistically assured, were observed between green and dry matter yields in both years of vegetation, for both groups of ploidy. Negative correlations were noticed between seed yield and first cut green matter yield in the 2nd year, for diploids and between seed yield and total green and dry matter in the 1st year, for tetraploids.

INTRODUCTION

Correlations are important for the breeder in order to associate all the possible valuable features in the newly created genotypes. The study of correlations in red clover has developed a lot lately considering the biological characteristics of the plant and the great number of internal and external factors that influence them. So far many of the studies have calculated different correlation coefficients between morpho-physiological characteristics (Savatti and Magyarosi, 1969; Savatti, 1973; Moisa, 1996), productivity and quality (Savatti and Magyarosi, 1969; Savatti, 1973; Mansat, 1996; Muntean, 2002), but only statistically assured ones were useful for breeding programs. However, these correlations should not be over appreciated since they can be influenced by other factors, others than genetic correlations (Savatti, 1973).

The purpose of the study of the correlations between productivity elements of red clover (green matter, dry matter and seed yield) is to find out the intensity of these relationships and to help obtaining highly productive cultivars. These correlations have been studied by Lindhard (1921), Nessler (1931), Schwelger et al (1963) Holm (1966), Friden (1966), Mansat et al (1966), Bond (1968), Goral (1968), Savatti (1973), Zapletalova (1993), Berg and Leath (1996), Venuto et al (1996), Jancys (1998), Vliegheer et al (1998), but the results have sometimes been contradictory.

The issue of correlations in red clover is still open and it may play an important part for the success of the breeding programs since it allows the elimination of the invaluable biological material even at very early stages and, on the other side the selection of the valuable genotypes is faster and more accurate (Muntean, 2002).

MATERIAL AND METHOD

The research was carried out in the ecological conditions of the University of Agricultural Sciences

and Veterinary Medicine - Cluj-Napoca and it lasted for 2 years (2000-2001). We examined 45 diploid genotypes and 22 tetraploid ones belonging to different varieties *expansum* Haussk, *var. serotinum* and *var. subnudum* Witte, subvar. *praecox* and *intermedium*.

The productivity elements taken into consideration for identifying correlations were: first year total green matter yield, second year first cut green matter yield, second year second cut green matter yield, second year total green matter yield, first year dry matter yield, second year dry matter yield and second year seed yield. For identifying these elements we used 10 m² trial plots for each cultivar. The calculation of correlations was done according to ploidy groups and using the Bravis-Pearson model of calculating the correlation coefficient (Ceapoiu, 1968).

RESULTS AND DISCUSSION

DIPLOID CULTIVARS

Examination of diploid red clover cultivars pointed out very significant positive correlations between total green and dry matter yields in both years of vegetation (Table 1). There was very significant positive correlations between the total green matter yield of the first year and that of the second year (first cut, second cut and the total one), which leads to the conclusion that the most productive forms can be selected even in the first year of vegetation.

The seed yield was positively correlated with total green matter in the first year, the second cut green matter yield in the second year, as well as with the dry matter yield but the correlation coefficients were not statistically assured (Table.1). As increasing seed yield is one of the most important objectives of red clover breeding, its correlations with the other productivity elements should be reevaluated in the future (for diploid forms) in order to be used in the breeding programs.

Table 1. The phenotypic correlation coefficients between productivity elements studied in the diploid red clover (*Trifolium pratense* L.) cultivars

Productivity elements	First cut green matter yield in the 2 nd year	Second cut green matter yield in the 2 nd year	Total yield of green matter in the 2 nd year	Total yield of dry matter in the 1 st year	Total yield of dry matter in the 2 nd year	Seed yield in the 2 nd year
Total yield of green matter in the 1 st year	0.512***	0.644***	0.675***	0.950***	0.616***	0.120
First cut green matter yield in 2 nd year		0.388**	0.895***	0.546***	0.866***	-0.123
Second cut green matter yield in 2 nd year			0.758***	0.566***	0.613***	0.173
Total yield of green matter in 2 nd year				0.661***	0.910***	-0.002
Total yield of dry matter in 1 st year					0.728***	0.154
Total yield of dry matter in 2 nd year						0.064

r 5% = 0,288

r 1% = 0,372

r 0,1% = 0,465

TETRAPLOID CULTIVARS

The correlation coefficients calculated for the tetraploid cultivars have shown that this group also has very significant positive correlations between total green and dry matter yields in both years of vegetation (Table 2). Compared to diploids, these cultivars did not have any statistically assured correlations between the green matter yields in the two years, which suggests that selection for highly productive forms cannot start in the first year. However, there were some statistically assured correlations between first and second cut yields in the second year, as well as between these and the total green matter in the second year.

Unlike the diploids, the results obtained in the tetraploids show that seed yield was significantly positively correlated with the second cut green matter yield in the second year, with the total green matter yield in the second year and with the total dry matter yield in the second year (Table 2). The positive correlations, statistically assured between seed yield and second cut green matter yield (2nd year) and total dry matter yield (2nd year) were also identified in more studies (Savatti, 1973; Moisa, 1996) which shows that they can be used successfully for indirectly increasing the seed yield in tetraploids.

Table 2. The phenotypic correlation coefficients between productivity elements studied in the tetraploid red clover (*Trifolium pratense* L.) cultivars

Productivity elements	First cut green matter yield in the 2 nd year	Second cut green matter yield in the 2 nd year	Total yield of green matter in the 2 nd year	Total yield of dry matter in the 1 st year	Total yield of dry matter in the 2 nd year	Seed yield in the 2 nd year
Total yield of green matter in the 1 st year	0.384	0.313	0.371	0.876***	0.293	-0.411
First cut green matter yield in 2 nd year		0.795***	0.956***	0.391	0.855***	0.366
Second cut green matter yield in 2 nd year			0.938***	0.334	0.846***	0.459*
Total yield of green matter in 2 nd year				0.386	0.898***	0.431*
Total yield of dry matter in 1 st year					0.518**	-0.324
Total yield of dry matter in 2 nd year						0.423*

r 5% = 0,423

r 1% = 0,537

r 0,1% = 0,652

CONCLUSION

OVERALL

The interaction between the studied morpho-physiological characteristics was proved by the different intensities of the correlation coefficients.

Correlation coefficients calculated for red clover have shown the existence of very significant positive correlations between total green and dry matter, in both years of vegetation. This aspect proves that green matter highly productive cultivars are rich as well in nutritive elements.

More than that, positive, statistically assured correlation coefficients between total dry matter in the first and second year suggest that identification of valuable forms for dry matter is possible in the first year.

In the second year of vegetation, there were positive correlations, statistically assured between red clover

forage productivity elements, which is a favorable aspect for breeding programs because green matter highly productive forms can be selected even at the first cut.

DIPLOID CULTIVARS

Positive correlations that existed between red clover green and dry matter yield in the first and second year prove that the most productive forms can be selected starting with the first year of vegetation.

TETRAPLOID CULTIVARS

The seed yield of red clover was positively correlated with total green and dry matter in the second year; therefore, we can indirectly increase seed yield by selection for green matter highly productive forms in the 2nd year of vegetation.

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