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Comparison of Some Exotic Lucerne (*Medicago sativa*) Genotypes for Green Fodder Yield

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Abstract: There was significant variability found for plant height and green fodder yield among forty-eight genotypes of Lucerne. Moderate coefficients of variation and high heritability estimates for plant height and green fodder yield among the Lucerne genotypes suggested that a greater improvement is possible by hybridizing groups-I (Beaver, E-542 genotypes), group-II (GR 793, Russian #36, 75-527) and group-III (African Pop, GR 692, Griamn-2, Hunter River) which may produce better segregants for increased green fodder yield.

Key words: Alfalfa, fodder, selection criteria, heritability

Introduction

Genetic improvement in forage yield for alfalfa (*Medicago sativa*) in Pakistan has been very low. It is because, there are the difficulties connected to the plant characteristics, such as autotetraploidy and allogamy. There are also difficulties in reproductive mechanism with hermaphrodite flowers, the plant architecture (herbaceous plant) and most of all the meadow condition, that is density, numerical and biological. All that is not enough to explain the very moderate success obtained in breeding for yield. Other factors can play a role, such as the research programme strategy and its effectiveness.

It is necessary to say that in the laboratories of science applied to agriculture the number of pathologists, biochemists, geneticists, cytologists and over all molecular biologists is increasing. On the contrary, the figure of the breeder has nearly disappeared. In a complex forage species as alfalfa it will be impossible to achieve important advances without breeding science. Important concepts as genetic load, biological density, adaptative reaction, vigor, linkat, level of complementarily and others will be able to show the whole of their operational value only through breeding. Breeding for vigor includes all the most important traits and processes of the plant: forage yield, vegetative growth, resistance to various stresses or diseases, seed production and so on (Rotili and Zannone, 1977; Rotili, *et al*., 1998). The term vigor is therefore considered as a big container in which all our activity can be put (Wilsie, 1958; Busbice and Wilsie, 1966; Demarly, 1971, Rotili *et al*., 1979, 1996).

However research activity is aimed at the creation of new populations. Therefore, opinion on this activity is referred to (a) the final product (the new variety) and (b) the adopted process. For the first point, the aspects concerning forage production, quality and seed production; as for the second point, all those elements belonging to the subject called "breeding methodology" can be taken into account. Keeping in view the above points, the present experiment is conducted to, evaluate forty-eight lucerne genotypes for green fodder yield and to classify the exotic germplasm into distinct groups for future hybridization programme.

Materials and Methods

This experiment was conducted in the research area of the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad on 8th November, 1999. Forty-eight exotic genotypes of Lucerne (Beaver, E-542, GR 793, Russian 136, 75-527, African Pop, GR 692, Griamn-2, Hunter River, Booposoiae, C 31-2, C-17, Chilean, CUF 101, Flemish, GR 647, GR 715, GR 745, GR 800, Gramm-2 Canada, Harry Perumid Israel, Loghpa, #53, #766, Cossach, GR 722, Harry Perumid Kenya, Mandum, #265, #1291, Northern Sgnth, R251, SHA He, T Rek, Turkish Pop, W 268, #47, #70, #71, AK-3a, Oman, Ligerni-D Egypt, K 1107, Pumpa Argentina, #42, #64, 110 8, Ligerni-D Egypt, K 1107, Pumpa Argentina, #42, #64 and 110 B) were raised in a modified randomized complete block design with two replications. Forty eight genotypes of lucerne were assigned to two blocks and each block consisted of twenty-four genotypes. The experimental unit consisted of single row plot with 0.46 x 3.66 m size. Normal cultural practices were applied to the plants throughout their growing period. The experiment was harvested for green fodder yield/m row length (kg). Other plant trait, such as plant height (cm) of ten randomly selected plant for each genotype also recorded at the harvest.

Data were analyzed for the analysis of variance technique (Steel and Torrie, 1980). Thereafter correlation coefficients (Kwon and Torrie, 1964) and estimates of broad sense heritability were also obtained to determine the superior progenies. Mean and coefficients of variation (CV%) were also calculated for each indicated trait.

Results and Discussion

There were significant differences between genotypes with block (Table 1). But differences between blocks and replications within blocks found to be non significant. The coefficients of variation (CV%) was found to high for green fodder yield 117.94%) than plant height (15.25%). Heritability estimates (Table 2) were also found higher for green fodder yield (74.95%) than plant height (50.74%). The linear correlation coefficient (r = 0.530***) between plant height

Table 1: Mean squared values of plant height and green fodder yield among forty-eight Lucerne (*Medicago sativa*) genotypes

Source	d.f	Plant height	Green fodder yield
Blocks	1	3241.1	2.2509
Reps/Blocks	2	125.6	0.7651
Genotypes/Blocks	46	165.7**	0.3214**
Error	46	66.4	0.0805

** = Significant at 0.01 probability level

Table 2: Mean ± Standard deviation, coefficient of variation (%) and heritability broad sense (h^2_{BS}) for indicated plant traits among Lucerne (*Medicago sativa*) genotypes

Plant trait	Mean ± SD	CV (%)	h^2_{BS}
Plant height (cm)	80.06 ± 12.21	15.25	50.74%
Green fodder yield (kg)	2.70 ± 0.48	17.94	74.95%

Table 3: Classification of forty-eight Lucerne genotypes into eight distinct groups on the basis of their green fodder yield performance

Group number	Total genotypes	Genotypes
I	2	Beaver, E-542
II	3	GR 793, Russian #36, 75-527
III	4	African Pop, GR 692, Griamn-2, Hunter River
IV	15	Booposoiae, C 31-2, C-17, Chilean, CUF 101, Flemish, GR 647, GR 715, OR 745, GR 800, Gramm-2 Canada, Harry Perumid Israel, Loghpa, #53, #76B
V	2	AK-3a, Oman
VI	15	Cossach, GR 722, Harry Perumid Kenya, Mandum, #265, #1291, Northern Sgnth, R-251, SHA He, T Rek, Turkish Pop, W 268, #47, #70, #71
VII	6	Ligerni-O Egypt, K 1107, Pumps Argentina, #42, #64, 110 B
VIII	1	#12835

and green fodder yield was found to be highly significant ($p < 001$). These results suggested that green fodder yield may be good indicator while selecting genotypes for further breeding programme. Studies on breeding of forage crops chiefly concern selection methods (Theurer and Elling, 1964; Busbice, 1970; Demarly, 1971, 1977; Hill, 1975; Rotili, 1976, 1977).

However, the forty-eight genotypes were classified into eight distinctive groups on the basis of green fodder yielding performance (Table 3). However, Trimble *et al.* (1987) suggested that alfalfa breeder should be concerned about the cutting regime used when evaluating germplasm for herbage yield as the cutting and soil regime can affect the rank in performance among alfalfa germplasms. But in our study we ranked the tested genotypes into eight groups on the basis of green fodder yield and found that group IV and VI each had fifteen genotypes whereas group I and IV each comprised two genotypes. Hybridization among groups I, II and III can produce better segregants for increased green fodder yield.

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