Assessment of Fodder Production Potential of Lucerne (*Medicago sativa* L.,) Genotypes for Sustainable Live stock Production

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Abstract

The present study was conducted with Nine genetically diverse and improved perennial cultures of Lucerne along with two national checks were studied in randomized block design with three replications at AICRP on Forage Crops, Hyderabad continuously for three years i.e from Rabi 2010-11, 2011-12 and 2012-13 . The national checks include Anand-2 and RL-88. Nine genetically diverse and improved perennial cultures of Lucerne along with two national checks were studied in randomized block design with three replications at AICRP on Forage Crops, Hyderabad continuously for three years i.e from *rabi* 2010-11, 2011-12 and 2012-13. The results revealed that the entries registered highly significant differences among themselves for all the characters except crude protein content in all the years. The results revealed that the entry RLH-4 recorded highest green fodder yield of 237.4 q ha^{-1} , 297.1 q ha^{-1} and 273.5 q ha^{-1} respectively for three consecutive years ,while for dry fodder and crude protein the entry RLH-5 showed superior performance of 82.5 q ha^{-1} & 17.3 q ha^{-1} respectively in 1st year of testing. However in 2nd and 3rd year again RLH-4 maintained significant superiority for both dry fodder (62.5 q ha^{-1}, 57.5 q ha^{-1} respectively) and crude protein (13.4 q ha^{-1} , 12.2 q ha^{-1} respectively) yields. The results also inferred that the check variety Anand-2 is suitable to cultivate as annual fodder legume, while RL-88 occupies place in perennial fodder legumes.

Keywords: Lucerne, genotypes, livestock, fodder production, green fodder, dry fodder, crude protein

1. Introduction

Lucerne (*Medic ago sativa* L.) is a temperate perennial legume capable of producing high quality forage throughout the year. The plant also contains sufficient concentrations of vitamins and most minerals for all classes of livestock. Livestock production can be substantially increased by using lucerne. It is a valuable forge crop of dry and irrigated area. It is a persistent, productive as well as heat and drought resistant crop. It tolerates short spell of drought but not water logging and high humidity in the rainy season.Cultivated lucerne is an out crossing auto- tetraploid plant developed by combining *different M. sativa and M. falcata* germplasm sources in order to maximize heterosis and to secure multiple pest resistance (Gherardi *et al*., 1998), In addition, cultivated Lucerne varieties exist as synthetic varieties developed by random intermating of selected parents from 9 original germplasm sources (Segovia-Lerma et al., 2003; Muller et al., 2005). As a consequence, the genetic structure of lucerne cultivars is not definite compared to fixed cultivated forms like inbred lines or hybrids. This species presents large genetic diversity as it is cultivated in different zones in the globe with contrasting environments (Prosperi *et al.,* 1995).

2. Materials and Methods

Nine genetically diverse and improved perennial cultures of Lucerne along with two national checks were studied in randomized block design with three replications at AICRP on Forage Crops, Hyderabad continuously for three years i.e from *Rabi* 2010-11, 2011-12 and 2012-13. The national checks

include Anand-2 and RL-88.The soil was sandy loam in texture with pH of 8.13, low in available Nitrogen, medium in available phosphorous and available K_2O. The crop was supplied with recommended dose of fertilizer 20-50-40 kg of N, P_2O_5 and K_2O/ha respectively and sown in row to row spacing of 30cm with solid row planting. The crop was harvested at 10% flowering stage in all the cuts during the study period. The first cut was made at 65days after sowing while later cuts were obtained at 21 days interval during winter season and at 30 days interval during Kharif & summer seasons. Five hundred grams of green samples from each plot was drawn for dry matter percentage, ground in a willey mill and used for quality analysis. The crude protein was estimated as per the method of India Standard Institute. The recorded data was analyzed through the standard procedure of analysis of variance according to the Randomized Complete Block Design .

3. Results and Discussion

The mean data of green fodder yield and other morphological characters of the entries evaluated during Rabi 2010-11, 2011-12 and 2012-13 are presented in Table 1, 2 and 3 respectively. The results revealed that the entries registered highly significant differences among themselves for all the characters except crude protein content in all three years. The results of Rabi 2010-11 presented in Table 1 revealed that the entry RLH-4 recorded highest green fodder yield of 237.4 q ha^{-1} over the best check variety Anand -2 (229.1 q ha^{-1}) followed by RLH-5(233.2 q $ha^{-1)}$. For dry fodder the entry RLH-5 was proved to be superior yielding 82.5 q ha^{-1} as against the best check variety Anand-2 (72.8 q ha^{-1}).Even though non significant variation observed among the entries for crude protein content, the entry CAP-3-2 recorded high crude protein content of 23.2%.Between two check varieties the mean performance of Anand -2 found to be superior for all the characters studied in 1st year. This was in conformity with the results of Patel *et al*., 1987, who observed superior performance of Anand-2 variety compared to LLC-3 at Anand.

The results of Rabi 2011-12 mentioned in Table 2 showed the increased green fodder yields irrespective of genotypes from 1st year to 2nd year of evaluation which attributes that the plants produce more tillers as cuttings progress. Among the genotypes studied, the highly significant green fodder, dry fodder and crude protein yields were recorded by RLH-4 (297.1 q ha^{-1} , 62.5 q ha^{-1} & 13.4 q ha^{-1}) respectively over the best check variety RL-88(240.2 q ha^{-1} ,50.7 q ha^{-1} & 11.1 q ha^{-1}) respectively. The same trend of significant superiority was maintained by RLH-4 in 3rd year of testing for green fodder (273.5 q ha^{-1}) dry fodder (57.5 q ha^{-1}) and crude protein (12.2 q ha^{-1}) yields over the best check RL-88.Between two check varieties RL-88 showed superior performance in 2nd and 3rd year of testing for all the characters. This reveals the perennial nature of RL-88 with high regeneration capacity. Purushotham et al*.,* 1997, also observed superior performance of RLS-88 and Anand -3 varieties of lucerne as they were tall in nature and had high regeneration capacity.

Table 1: Mean performance of Lucerne genotypes studied during *rabi* 2010-11

Sl. No.	Genotype	Green fodder yield (q ha^{-1})	Rank	Dry fodder yield (q ha^{-1})	Rank	Crude protein (%)	Crude protein yield (q ha^{-1})	Rank
1.	RLH-5	233.2	2	82.5	1	21.0	17.3	1
2.	CAP-3-2	191.6	8	66.2	6	23.2	15.3	3
3.	ALP-1-1	199.9	7	62.2	8	22.3	13.8	6
4.	Anand-2©	229.1	3	72.8	2	21.1	15.4	2
5.	ACP-3-1	215.9	5	69.5	4	21.9	15.2	4
6.	RL-88©	183.3	10	63.1	7	21.4	13.2	8
7.	BRB-07-1	223.5	4	67.0	5	21.9	14.7	5
8.	RLH-4	237.4	1	71.9	3	21.4	15.3	3
9.	Anand-23	209.6	6	58.7	9	22.8	13.3	7
10.	RRP-5-4	184.6	9	54.9	10	21.4	11.7	9
11.	ACP-1-2	166.6	11	54.8	11	20.1	11.2	10
	GM	206.8		65.8			14.2	
	SEm±	14.2		5.0			1.1	
	CD (*p*=0.05)	41.8		14.6			3.4	
	CV%	11.9		13.1			13.9	

Table 2: Mean performance of Lucerne genotypes studied during 2011-12

Sl. No.	Genotype	Green fodder yield (q ha^{-1})	Rank	Dry fodder yield (q ha^{-1})	Rank	CP	Crude protein yield (q ha^{-1})	Rank
1.	RLH-5	247.1	4	56.2	3	21.2	11.9	3
2.	CAP-3-2	271.6	2	57.2	2	23.2	13.2	2
3.	ALP-1-1	220.7	9	48.2	7	22.6	10.9	6
4.	Anand-2©	224.9	8	47.5	8	21.8	10.3	8
5.	ACP-3-1	210.3	10	44.5	10	21.3	9.5	9
6.	RL-88©	240.2	6	50.7	5	22.1	11.1	5
7.	BRB-07-1	233.2	7	49.7	6	21.9	10.9	6
8.	RLH-4	297.1	1	62.5	1	21.4	13.4	1
9.	Anand-23	254.1	3	51.0	4	22.8	11.6	4
10.	RRP-5-4	245.0	5	50.7	5	21.4	10.8	7
11.	ACP-1-2	197.1	11	45.4	9	21.7	9.9	8
	GM	240.1		51.3			11.2	
	SEm±	17.3		3.9			0.9	
	CD (*p*=0.05)	51.2		11.5			NS	
	CV%	12.0		13.0			15.0	

Table 3: Mean performance of Lucerne genotypes studied during 2012-13

Sl. No.	Genotype	Green fodder yield (q ha^{-1})	Rank	Dry fodder yield (q ha^{-1})	Rank	CP	Crude protein yield (q ha^{-1})	Rank
1.	RLH-5	229.1	2	48.8	2	20.3	10.0	2
2.	CAP-3-2	211.0	6	41.8	6	21.7	9.1	6
3.	ALP-1-1	188.8	8	39.6	8	21.7	8.6	7
4.	Anand-2©	187.4	9	38.9	9	22.2	8.6	7
5.	ACP-3-1	187.4	9	38.8	10	20.7	8.1	9
6.	RL-88©	216.6	5	44.8	3	20.7	9.2	5
7.	BRB-07-1	220.7	3	44.2	5	21.0	9.3	4
8.	RLH-4	273.5	1	57.5	1	21.3	12.2	1
9.	Anand-23	219.4	4	44.5	4	21.7	9.6	3
10.	RRP-5-4	201.3	7	40.3	7	20.3	8.2	8
11.	ACP-1-2	177.7	10	38.5	11	21.0	8.1	9
	GM	210.3		43.4			9.2	
	SEm±	14.1		3.3			0.8	
	CD (*p*=0.05)	41.7		9.9			2.6	
	CV%	11.6		13.5			17.4	

4. Conclusion

Based on the green fodder, dry fodder and crude protein yield performance of the entries studied over three consecutive years revealed that the two entries viz., RLH-4 and RLH-5 were identified to be suitable for cultivation in the region. The results also inferred that the check variety Anand-2 is suitable to cultivate as annual fodder legume, while RL-88 occupies place in perennial fodder legumes.

5. References

Mc Donald,W., Nikandrow, A., Bishop, A., Lattimore, M., Gardener, P.,Williams, R., Hyson, L., 2003. Lucerne for pasture and fodder . Ag fact P_2. 2.25, third edition.

Gherardi, M., Mangin, B., Goffinet, B., Bonnet, D., Huguet. T., 1998. A method tomeasure genetic distance between allogamus populations of alfalfa (*Medicago sativa*) using RAPD molecular markers. Theor. Appl. Genet., 96, 406−412

Muller, M.H., Poncet, C., Prospery, M., Santoni, S., Ronfort, J., 2005. Domestication history in the Medicago sativa species complex.Inferences from nuclear sequence polymorphism. Ecol., 15, 1589−1602.

Patel, J.R., Patel, P.C., Saiyad, M.M., 1987. Effect of sowing dates and seed rate on forage yield and quality of different genotypes of Lucerne. Forage Research, 13, 25−32.

Prosperi, J.M., Ronfort, J., Angevain, M., Bonnin, I., Chaulet, E., Genier, G., Jenczewski, E., Olivieri, I., 1996. Genetic diversity, preservation and use of genetic resources of Mediterranean legumes: Alfalfa and medics. In: The Genus Medicago in the Mediterranean region: Current situation and prospects in research. *Cahiers Options Mediterraneennes,* Vol. 1871−1889.

Purushotham, S., Naga Raja, K., Sidda Raju, R., 1997. Performance of Lucerne varieties under irrigation. Current Research 26, 226−227.

Segovia-Lerma, A., Cantrell, R.G., Conway J.M., Ray, I.M., 2003. AFLP-based assessment of genetic diversity among nine alfalfa germplasm using bulk DNA templates. Genome, 46, 1−58 .