



# Genotype-Environment Interaction in Hedge lucerne (*Desmanthus virgatus* (L.) Willd.) for Yield and Quality

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## INTRODUCTION

*Desmanthus virgatus* commonly known as hedge lucerne is a perennial shrub legume belonging to the family Fabaceae and subfamily Mimosoideae. The phenotypic expression of a character is influenced by the genotype and environmental factors. This forges the need to determine G x E magnitude in varying environments to identify the stable genotypes. The present investigation was conducted across four locations in Kerala to study the genotype x environment interaction in hedge lucerne for yield and quality.

## OBJECTIVE

To identify stable genotypes of hedge lucerne in varied environments with respect to yield and quality.

## MATERIALS AND METHODS

The study was conducted in the Department of Plant Breeding and Genetics, College of Agriculture, Vellayani, Thiruvananthapuram during 2016-2018. The field experiment was conducted at four locations of Kerala to determine the stability of eight genotypes of *Desmanthus virgatus* for yield and quality.

Location 1: RARS, Ambalavayal



Location 2: COA, Vellayani



Location 3: COH, Thrissur



Location 4: KVK, Kottarakkara



## RESULTS AND DISCUSSION

The analysis of variance showed significant differences among the eight hedge lucerne genotypes for all the characters studied across four environments.

Table 1. Analysis of Variance (mean square) for mean data over four locations.

Source of variations	df	Plant height	Number of branches plant <sup>-1</sup>	Length of branches plant <sup>-1</sup>	Number of leaves plant <sup>-1</sup>	Leaf to stem ratio	Number of pods cluster <sup>-1</sup>	Green fodder yield	Dry fodder yield	Dry matter production	Crude protein	Crude fibre
Genotypes	7	986.74**	26.36**	1195.33**	1123.67**	0.0321**	3.09**	286.39**	48.86**	89.25**	82.78**	28.73**
E+ (G x E)	24	12.48**	0.88**	2.41	47.24*	0.0012	0.04	19.61*	5.27**	6.17**	1.95**	1.79**
E	3	71.46**	5.08**	3.56	117.22**	0.0017	0.13**	62.27**	33.92**	38.09**	14.18**	12.84**
E(Lin)	1	214.39**	15.25**	10.70*	351.65**	0.0185**	0.37**	186.82**	101.77**	114.29**	42.55**	38.54**
G x E(Lin)	7	7.88**	0.56**	2.78	63.53*	0.0015**	0.03	32.80**	2.52**	2.15	0.27	0.38
Pooled deviation	16	1.87	0.12	1.72**	21.08**	0.0007	0.02	3.39	0.46**	1.17**	0.15	0.10
Pooled error	96	1.31	0.11	0.40	3.25	0.0005	0.02	3.05	0.20	0.25	0.35	0.62
Total	31	232.48	6.63	271.78	290.31	0.0085	0.73	79.86	15.12	24.93	20.21	7.87

\*\* Significant @ 1% \* Significant @ 5%

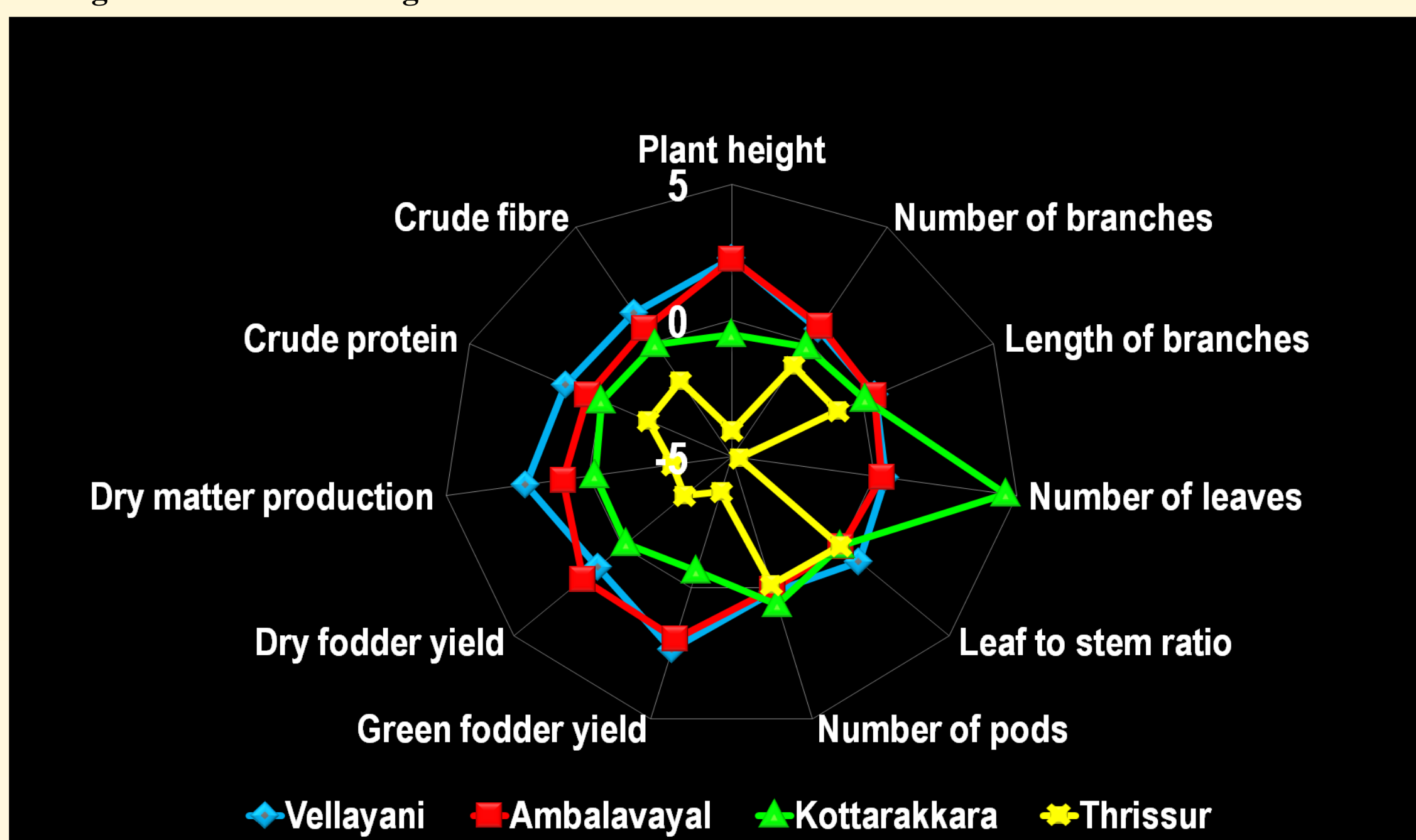


Fig 1. Estimates of environmental indices (I<sub>j</sub>) for each character under different locations

## Eberhart and Russell (1966) model

Stable genotype	$b_i = 1$	$S^2d_i = 0$
Suitable for favourable environments	$b_i > 1$	$S^2d_i = 0$
Suitable for unfavourable environments	$b_i < 1$	$S^2d_i = 0$

➤ Regression coefficient (b<sub>i</sub>), Minimum deviation from regression (S<sup>2</sup>d<sub>i</sub>).

Table 2. Estimation of Stability Parameters for yield and its component traits over four locations

Genotype	Plant height (cm)			Number of branches			Length of branches (cm)			Number of leaves		
	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>
T <sub>1</sub>	112.87	1.07	0.30	5.10	1.10	-0.09	22.96	0.62	0.05	145.03	0.58	-2.56
T <sub>2</sub>	86.81	1.41	0.56	6.40	1.58	0.11	34.78	3.31	4.60**	119.66	3.91	70.07**
T <sub>3</sub>	71.03	1.46	3.11	10.31	1.30	-0.04	35.53	-1.7	5.77**	99.69	0.86	31.00
T <sub>4</sub>	94.53	1.75	2.11	4.29	1.05	-0.03	54.49	1.12	0.92	124.86	0.66	16.47
T <sub>5</sub>	101.10	0.75	-0.21	6.29	0.92	-0.10	62.49	2.09	1.48*	139.84	0.06	26.98
T <sub>6</sub>	110.31	0.89	-0.32	4.56	1.42	-0.02	47.66	1.05	-0.02	141.04	0.82	1.41
T <sub>7</sub>	86.56	0.10	5.37	3.98	0.78	0.08	33.41	0.29	-0.26	112.17	0.46	-2.03
T <sub>8</sub>	116.75	0.56	1.44	10.34	-0.17	0.14	74.65	1.21	-0.09	143.33	0.66	1.39
Grand	97.49			6.41			45.75			128.20		
Genotype	Leaf to stem ratio			Number of pods			Green fodder yield			Dry fodder yield		
	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>
T <sub>1</sub>	0.89	0.75	0.005	1.51	2.12	0.011	112.35	1.12	-0.62	32.45	1.11	0.22
T <sub>2</sub>	0.71	2.52	-0.004	1.58	0.24	0.001	101.28	1.34	-0.30	27.46	1.28	0.05
T <sub>3</sub>	0.92	-0.17	-0.002	1.43	1.30	0.019	90.45	2.38	-2.55	23.52	1.40	0.54
T <sub>4</sub>	0.76	1.09	0.004	2.77	1.79	0.056*	100.67	1.74	0.001	31.23	1.27	-0.03
T <sub>5</sub>	0.67	0.37	-0.004	2.14	1.23	-0.003	98.75	-1.45	9.20	27.03	0.02	0.83*
T <sub>6</sub>	0.88	1.56	0.000	0.00	0.00	-0.005	110.48	1.26	-2.54	31.77	0.77	0.42
T <sub>7</sub>	0.84	1.18	0.007	2.52	0.89	0.015	109.02	0.07	1.15	30.12	0.94	0.65*
T <sub>8</sub>	0.83	0.68	0.008	2.38	0.42	0.031	115.42	1.52	-1.61	34.25	1.93	0.55
Grand mean	0.81			1.79			104.93			29.74		

Table 3. Estimation of Stability Parameters for yield and its component traits over four locations

Genotype	Crude protein			Crude fibre			Dry matter production		
	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>	Mean	b <sub>i</sub>	S <sup>2</sup> d <sub>i</sub>
T <sub>1</sub>	21.38	1.42	0.02	23.35	0.97	0.098	39.93	0.97	0.09
T <sub>2</sub>	15.51	0.92	0.29	22.71	1.26	0.004	32.62	0.99	0.98*
T <sub>3</sub>	14.59	1.21	-0.08	26.83	1.41	-0.139	28.89	1.50	1.13*
T <sub>4</sub>	13.12	0.97	0.01	23.59	0.45	-0.143	37.59	0.94	1.04*
T <sub>5</sub>	13.91	0.69	-0.02	28.21	0.96	0.054	31.37	0.70	0.71*
T <sub>6</sub>	20.26	0.89	-0.01	24.06	0.95	-0.116	40.62	1.34	0.47
T <sub>7</sub>	23.48	0.95	0.32	27.44	1.09	-0.027	40.32	0.27	3.95**
T <sub>8</sub>	24.39	0.91	-0.06	29.95	0.89	-0.145	40.04	1.25	0.49
Grand mean	18.34			25.77			36.42		

## Stable genotypes of Hedge lucerne over all locations



T<sub>1</sub> (IC 345276)



T<sub>4</sub> (IC 261839)



T<sub>7</sub> (TNDV 1)



T<sub>6</sub> (IC 421199)

## Stable genotypes in favourable environments



T<sub>8</sub> (Thumburmuzhi local)



T<sub>2</sub> (IC 343710)

Similar results were obtained in different studies conducted by ❖ Mehraj *et al.*, (2017) Oats for the characters number of leaves, leaf to stem ratio, green fodder yield, dry fodder yield and crude protein content.

## CONCLUSION

❖ The genotypes T<sub>1</sub> (IC 345276), T<sub>4</sub> (IC 261839), T<sub>6</sub> (IC 421199) and T<sub>7</sub> (TNDV 1) were stable over the four different locations.

❖ The genotypes T<sub>2</sub> (IC 343710) and T<sub>8</sub> (Thumburmuzhi local) showed stable performance under favourable environments.

## REFERENCE

➤ Mehraj, U., Abidi, I., Ahmad, M., Wani, B.A., Mir, S.D., and Dar, Z.A. 2017. Genotype x environment interaction for forage yield and its components in oats (*Avena sativa* L.). *Electr. J. Plant Breed.* 8(1):157-162.