Leucaena: A valuable agroforestry tree for fodder production in semi-arid Kenya

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Introduction

Livestock production in the semi-arid Kenya is constrained by inadequate quantity and quality of feeds. This is primarily due to low and erratic rainfall leading to low pasture growth and seasonal variation in productivity. Research work has been carried out in the region with an objective of evaluating legumes as sources of protein for livestock supplementation. A range of herbaceous and browse legumes species including several leucaena accessions were evaluated for adaptability and productivity in the semi-arid regions of eastern Kenya. Also considerable research has been conducted on nutritive quality and benefits of this tree legume to livestock.

The paper reviews past leucaena studies carried out at KARI-Katumani Research Centre, located 70 km SE of Nairobi (at 1º58'S, 38º28'E, 1600 m asl). The rainfall is bimodal with an annual average of 717 mm and mean temperature is 19ºC. Key highlights are given on dry matter (DM) yield, benefits of leucaena as livestock feed and the need to re-activate research on this important agroforestry tree.

Results

Dry matter production of leucaena

Thirty leucaena accessions were evaluated for dry matter and wood production at Katumani Research Centre. The yields were averaged over five harvests covering 18 months. Considerable variation exist between and within species. The hybrid, *L. leucocephala x L. pallida* CQ3439 out-yielded all the other accessions in both leaf (209.4 g/plant) and stem (96.5 g/plant) followed by L. pallida CQ3439. The yield of commercial cultivars, Cunningham, Peru and K8 were generally low and this was attributed to being more susceptible to damage by leucaena psyllid than the hybrids.

Table 1. Production of 30 accessions of leucaena in semi-arid Kenya

Species	Mean dry matter yield (g/plant)	
	Leaf	Stem
L. collinsii subsp. *collinsii* 52/88	74.7	29.5
L. collinsii subsp. *zacapana* 56/88	6.0	2.2
L. diversifolia 82/92	38.6	9.1
L. diversifolia 83/92	65.8	20.6
L. diversifolia K156	60.0	25.7
L. esculenta 47/87	60.8	16.9
L. lanceolata var *lanceolata* 43/85	19.3	4.0
L. lempirama 6/91	10.2	2.6
L. leucocephala subsp. *grabrata* cv. Cunningham	38.9	5.2
L. leucocephala subsp. *grabrata* cv. Peru	41.1	13.1
L. leucocephala subsp. *grabrata* cv. Tarramba	71.5	15.3
L. leucocephala subsp. *grabrata* cv. K636	61.4	17.1
L. leucocephala subsp. *grabrata* cv. K8	54.5	12.1
L. macrophylla subsp. *istmensis* 47/85	54.0	17.6
L. magnifica 19/87	39.9	15.6
L. multicapitula 81/87	4.1	1.0
L. pallida 137/94	108.1	47.8
L. pallida 79/92	89.3	41.2
L. pallida CQ 3439	118.7	57.5
L. pulverulenta 83/87	29.5	2.9
L. salvadorensis 36/88	29.3	5.7
L. trichandra 4/91	48.9	20.2
L. trichandra 53/88	98.6	55.5
L. trichodes 61/88	31.1	10.7
L. diversifolia x *L. leucocephala* KX F4 5/95	116.8	31.7
L. leucocephala x L. diversifolia UQ6	69.9	22.2
L. leucocephala K584 x *L. pallida* K748 UQ45.	209.4	96.5
L. leucocephala K636 x *L. pallida* K748 (KX2 F1)	96.7	48.1
L. leucocephala x *L. pallida* KX2 FS 2/92.	67.6	24.2
L. unknown hybrid 52/87	41.5	20.2
LSD (P = 0.05)	**24.3**	**10.6**

Source: Wandera and Njarui, 1998

Value of leucaena to livestock

Leucaena was compared with two legumes; siratro (*Macroptilium atropurpureum* cv. Siratro) and glycine (*Neonotonia wightii* cv. Cooper), as a supplements for dual purpose goats fed on a basal diet of natural pastures and Napier grass. The nutritive value on the basis of chemical composition, crude protein (CP) content and *in-vitro* dry matter digestibility (IVDMD) was determined. Leucaena had the highest CP (CP 23.73% of DM) and lowest fibre (NDF and ADF) content (Table 1). Goat supplemented with legumes maintained their weight while goats on basal diet lost weight.

Table 1. Comparison of chemical composition (% of DM) and *in-vitro* dry matter digestibility (IVDMD) of leucaena leaf meal with two feed supplements.

Feeds	CP	NDF	ADF	Ash	Polyphenol	Lignin	IVDMD
Siratro	14.71	43.86	30.18	13.31	1.43	8.41	55.31
Glycine	13.58	46.93	35.62	13.65	1.75	8.99	62.31
Leucaena	23.73	33.90	15.92	8.75	4.93	8.25	57.83
Napier grass	4.63	72.14	45.77	13.40	1.26	5.24	50.36
Natural pastures	3.38	76.61	54.14	11.13	0.45	8.50	34.11

Source: Njarui *et al.*, 2003

Table 2. Effect of leucaena leaf meal supplement on growth of Kenya dual-purpose goats compared with two herbaceous legumes.

Parameters	Basal diet* (control)	Basal diet supplemented with			P<0.05
		siratro	glycine	Leucaena leaf meal	
Initial average weight (kg)	20.38	20.50	20.25	20.25	
Final weight (kg)	18.38	21.50	21.63	22.88	
Average wt change (kg/84day)	-2.00	0.33	1.38	2.63	3.10
Average daily gain/loss (g)	-3.81	3.97	16.37	31.25	34.94

*Basal diet consisted of a mixture of natural pastures and Napier grass

Source: Njarui *et al.*, 2003

Utilisation of leucaena

Edible parts of Leucaena (leaves and stem < 6mm diameter) can be dried in the sun and made into leaf meal (Plate 1), or grazed directly in the field (Plate 2). Even under the intensive grazing Leucaena has the inherent potential to regenerate and sustain high fodder production. Leucaena can be left to grow for timber and firewood (Plate 3). The later can also be obtained from the un-edible stem during the processing of leaf meal. The leaf meal can be used by feed manufacturers in compounding feed rations for both ruminants and non-ruminants to cut feed costs down and offer more 'organic' feed.

Plate 1. Leucaena leaf meal stored in gunny bags for supplementation

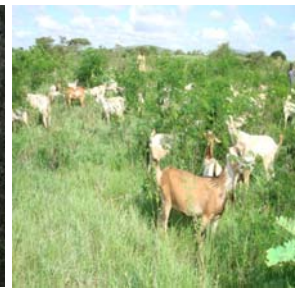

Plate 2. Goat browse on leucaena planted in natural pastures.

Plate 3. Leucaena trees-suitable for timber and fuel wood.

Conclusion and way forward

The high DM yield and gains on goat supplemented with leucaena indicates that there is great potential for utilisation of leucaena as livestock feed and for fuelwood. Best forage and stem yields were obtained from a hybrid which was also psyllid tolerant. Despite the good attributes of leucaena, the initial enthusiasm in the plant has since waned and the plant is almost forgotten. There is need to reactivate the research on this valuable agroforestry tree and improve its adoption by farmers. This can be achieved through;

- demonstrating best agronomic practices
- provide information on management of leucaena and
- provide good quality seeds to farmers
- There are constraints in seed availability of the hybrid. Seedling could be raised from stem cuttings but there is need to develop rooting protocols. Application of tissue culture techniques could be useful in this.

Reference

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