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Short Communication

Nutritive Value of Commonly Used Groundnut Varieties in Dryland Areas of Andhra Pradesh

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Groundnut (*Arachis hypogaea L.*), also known as peanut, is a legume crop and is important in human nutrition, due to its high protein and energy content. In addition to the seed, peanut plants produce high-protein forage that has long been used as ruminant feed (Sharma *et al.,* 2010). Crop residues from groundnut and sorghum (*Sorghum bicolor (L.) Moench*) constitute important fodder resources in the semi-arid tropics (SAT) of India (Zerbini and Thomas, 1999, Larbi *et al.,* 1999, Rama Devi *et al.,* 2000, Omokanye *et al.,* 2001). Haulms from groundnut constitute approximately 45% of the total plant biomass and provide excellent forage for livestock in many regions. Haulms are rich in protein and more palatable than many other fodders (Liao and Holbrook, 2007). In Andhra Pradesh, groundnut haulms are carefully harvested and then dried at the homestead, on house roofs and other sunny places protected from livestock.

In crop-livestock system of dryland farming situation, fodder shortage, shrinking common property resources and limited arable land are the major constraints to higher livestock productivity. There is an immense need for increasing the value of groundnut as a food-feed crop for which both pod and haulm yields and quality traits are important. A number of improved groundnut varieties have been released to suit agro-climatic conditions of the different states in India. Improving the productivity of groundnut can address pod as well as haulm traits, but there is a lack of information on the variability amongst varieties for the fodder quality of their haulms. Hence, the present study was carried out to determine the haulms quantity in terms of yield and quality in terms of fiber fractions, lignin, crude protein, and *in vitro* digestibility of various varieties of groundnut grown under field conditions.

A total of twelve varieties (K-6, K-9, K-134 (Vemana), Kadiri-Harithandra, ICGV-00308, ICGV-86015, ICGV-91114 (early-maturing, matures in 95 days), TMV-2 (similar to farmer's local cultivar, matures in 110 days), Ananta, Greeshma, Narayani and Abhaya were collected from three locations (Table 2) in Andhra Pradesh. The samples were dried in a hot air oven at 60 ± 5°C, milled in a hammer mill through 2 mm sieve for chemical analyses and *in vitro* digestibility. The groundnut haulms were analyzed in the laboratory for nitrogen content by Kjeldahl method and for neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL) and for *in vitro* true organic matter digestibility (OMD) as described by Goering and Van Soest (1970). Haulm yield was estimated by determining within 5.0 x 4.8 m quadrates at each field in all the three locations after harvesting the pods. The quadrats were taken at 5 different (four corners and a central) locations in each field.

The chemical composition of various varieties of groundnut haulms is shown in Table 1. Dry matter (%) content of various varieties was found to be almost similar. However, ash content was low in K-6 variety (8.75%) and high in TMV-2 variety (13.44%) which may be attributed to their early or late maturing nature, respectively.

Laboratory fodder quality traits, like content of nitrogen (N x 6.25 is an estimate of crude protein content), NDF, ADF, ADL and *in vitro* OMD are often employed in roughage and forage analysis. From the perspective of ruminant nutrition, supplemented fodder should contain a minimum of 1.2% of nitrogen (Van Soest, 1994) as a critical basal nutrient for the rumen microbes to digest fodder efficiently. The results in Table 1 show that all haulms had nitrogen content well above this threshold level. The findings are in similar line as suggested by Liao and Holbrook (2007).

Neutral detergent fiber (NDF) is the structural component of the plant, specifically cell wall content (cellulose + hemicellulose + lignin), which was low in Abhaya variety (31.4%) and high in ICGV 91114 variety (38.2%). NDF is a predictor of voluntary intake because it provides bulk or rumen fill. In general, low NDF values are desired because NDF increases as forages mature. On the other hand, cell contents (100-NDF) are thought to be almost completely digestible and all varieties of groundnut haulms investigated consisted of more than 50% of cell contents.

Acid detergent fiber (ADF) represents the least digestible plant component, including cellulose and lignin. ADF values are inversely related to digestibility, so forages with low ADF concentrations are usually higher in energy. Higher ADF values were found in ICGV 91114 variety, whereas lower were found in Abhaya variety of groundnut haulm (Table 1). Similarly, Abhaya variety had low lignin content (3.8%), whereas Narayani variety had high lignin content (5.0%).

Sugar content was low in TMV-2 and high in K-6 variety of groundnut haulms. This has resulted in higher ME content of K-6 variety (9.8 MJ/kg) and lower ME content of TMV-2 variety (8.3 MJ/kg) which may be attributed to its maturing nature of either early or late. Groundnut haulm has a similar energy value to maize stover but is higher in protein (Addy and Thomas, 1977). I*n vitro* organic matter digestibility (IVOMD) also varied from 59.7 to 67.0% in TMV-2 and K-6 varieties, respectively and the results are in agreement with Savadogo *et al*. (2000).

Table 1 : Chemical composition (DM Basis) and *in vitro* digestibility of OM content of various varieties of groundnut haulms*

Varieties of groundnut	DM (%)	Ash (%)	Nitrogen (%)	NDF (%)	ADF (%)	Lignin (%)	Sugars (%)	ME (MJ/kg)	IVOMD (%)
K-6	91.4 ± 0.01	8.8 ± 0.02	2.3 ± 0.01	37.2 ± 0.13	22.3 ± 0.01	4.7 ± 0.01	9.4 ± 0.02	9.8 ± 0.02	67.0 ± 0.05
K-9	91.4 ± 0.02	10.7 ± 0.03	2.6 ± 0.01	33.5 ± 0.07	20.1 ± 0.01	4.1 ± 0.01	8.6 ± 0.02	9.6 ± 0.03	66.2 ± 0.12
K-134 (Vemana)	91.4 ± 0.02	11.0 ± 0.01	2.3 ± 0.01	36.7 ± 0.04	22.9 ± 0.02	4.8 ± 0.01	7.6 ± 0.01	9.3 ± 0.03	64.6 ± 0.13
Kadiri - Harithandra	91.4 ± 0.01	10.5 ± 0.02	2.9 ± 0.01	34.2 ± 0.03	21.0 ± 0.01	4.2 ± 0.01	6.6 ± 0.01	9.5 ± 0.01	66.6 ± 0.09
ICGV 00308	91.4 ± 0.01	11.0 ± 0.04	2.6 ± 0.01	34.5 ± 0.11	23.3 ± 0.03	4.5 ± 0.01	7.0 ± 0.01	9.3 ± 0.01	64.7 ± 0.03
ICGV 86015	91.4 ± 0.01	10.6 ± 0.02	2.6 ± 0.01	35.4 ± 0.09	21.9 ± 0.01	4.9 ± 0.01	8.1 ± 0.01	9.1 ± 0.03	63.2 ± 0.06
ICGV 91114	91.3 ± 0.03	11.1 ± 0.02	2.7 ± 0.01	38.2 ± 0.02	24.5 ± 0.01	4.7 ± 0.01	6.3 ± 0.02	9.2 ± 0.01	64.7 ± 0.11
TMV - 2	91.3 ± 0.01	13.4 ± 0.01	2.8 ± 0.01	34.2 ± 0.12	23.2 ± 0.02	4.5 ± 0.01	5.0 ± 0.01	8.3 ± 0.03	59.7 ± 0.10
Ananta	91.5 ± 0.01	11.3 ± 0.01	2.6 ± 0.01	34.6 ± 0.04	22.9 ± 0.01	4.1 ± 0.01	6.5 ± 0.01	9.4 ± 0.01	65.6 ± 0.05
Greeshma	91.4 ± 0.01	11.9 ± 0.03	2.6 ± 0.01	32.4 ± 0.03	21.5 ± 0.01	4.1 ± 0.01	6.0 ± 0.01	9.3 ± 0.01	65.4 ± 0.09
Narayani	91.4 ± 0.01	10.3 ± 0.03	2.5 ± 0.01	37.6 ± 0.11	23.1 ± 0.03	5.0 ± 0.02	8.0 ± 0.01	9.6 ± 0.01	66.4 ± 0.11
Abhaya	91.5 ± 0.01	10.7 ± 0.01	2.8 ± 0.01	31.4 ± 0.07	19.9 ± 0.02	3.8 ± 0.01	7.8 ± 0.01	9.5 ± 0.01	66.6 ± 0.10

* mean of 6 values

Haulm yield (tons/ha) from different varieties of groundnut suggested that the Kadiri-Harithandra variety is less productive, whereas Ananta variety is highly productive (Table 2). However, Veeramani and Subrahmaniyan (2011) reported slightly higher yield of the latter than the former.

The relationship between laboratory haulm quality estimates and digestibility of haulms are reported in Table 3. A significant negative relationship registered between ash content and *in vitro* OMD as the former interferes the digestibility of any organic material. Significant positive relationship was observed between *in vitro* OMD and sugar and also metabolizable energy as the latter provides readily available energy for the bacteria present in the rumen which in turn, results in better digestibility. Groundnut haulms provides the most easily available protein-rich roughage alternative to the stovers like maize, sorghum etc, although its supply is limited to some dryland areas.

Substantial variation in haulm quantity and quality as ruminant fodder was observed among the groundnut varieties studied. This variability could be exploited through crop improvement for production of highly nutritive and digestible groundnut haulms to meet the nutrient requirements of livestock in drylands. The haulms of groundnut crop would be an important protein-rich forage supplement during the lean season. From the laboratory measurements, *in vitro* OMD and lignin content seem to be suitable for use in the initial screening of germplasm but further in-depth analysis of the laboratory quality traits and *in vivo* animal experimentation is essential.

Table 2 : Haulm yield (tons/ha) from different varieties of groundnut during kharif season

Variety	Location	Fresh haulm yield	Dried haulm yield
K-6	ARS, Kadiri	2.75	1.97
K-9	ARS, Kadiri	2.34	1.67
K-134 (Vemana)	ARS, Kadiri	1.65	1.18
Kadiri - Harithandra	ARS, Kadiri	1.48	1.06
ICGV 00308	ARS, Anantapur	2.88	2.06
ICGV 86015	ARS, Anantapur	1.52	1.09
ICGV 91114	ARS, Anantapur	1.79	1.28
TMV - 2	ARS, Anantapur	2.69	1.92
Ananta	ARS, Kadiri	3.34	2.38
Greeshma	RARS, Tirupati	2.34	1.67
Narayani	RARS, Tirupati	2.86	2.04
Abhaya	RARS, Tirupati	2.29	1.64

Table 3 : Relationships between laboratory haulms quality measurements and digestibility of haulms from 12 varieties of groundnut

Attributes	DM	Ash	Nitrogen	NDF	ADF	Lignin	Sugars	ME	Haulm yield
IVOMD	0.4380	-0.7749**	-0.2887	-0.0045	-0.4122	-0.2482	0.6168**	0.9831**	0.0443

** P<0.01

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