



Evaluation of Cassia Tora for Proximate Composition, Fodder Quality and Digestibility Parameters

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Received: 07 March, 2024

Revised: 05 May, 2024

Accepted: 11 May, 2024

ABSTRACT

The study was conducted to explore the possibility of utilization of *Senna tora* or *Cassia tora* or Wild senna complete plant for application as animal feed using the proximate analysis based on AOAC analytical standard and further the fodder quality and digestibility parameters were estimated using various factorial methods. Samples were pooled from in and around Fodder Unit, College of Veterinary Science, Hyderabad. Crude protein (CP) was 12.38 percent while crude fiber (CF) was 18.84. The CF recorded was higher than the conventional feeds generally used for non-ruminant livestock hence the plant may probably suit to be fed to ruminant and pseudo-ruminants. Other results were total ash 10.84 %, moisture content 13.10% and lipid content 2.63%. The Calcium was 4.38 % and Phosphorous 1.02%. The quality analysis of fibers was Neutral Detergent Fiber 59.45% and Acid Detergent Fiber was 35.99%. The estimated dry matter intake on dry matter basis was 2.02% and estimated digestibility parameters i.e. Relative Feed Value (RFV) was 95.24 %; Relative Feed Quality (RFQ) was 102.81 %. The other results of analysis were acid detergent lignin (ADL) 28.59%, hemi cellulose (HC) 23.46%, acid insoluble ash (AIA) 0.27% and silica 0.17 %. The analysis results depict potential nutritional use as animal feed which has to be further tested *in vivo* at various levels of inclusion.

HIGHLIGHTS

- Incorporation of *Senna tora* in the rations of ruminants has been discussed.
- *Cassia tora* factorially tested for RFQ and RFV.

Keywords: *Cassia Tora*, Relative Feed Quality (RFQ), Relative Feed Value (RFV), *Senna tora*

Wild senna (*Senna tora*) or *Cassia Tora* commonly called as Séné sauvage, sickle senna is rich in proteins and carbohydrates. It is an intrusive plant that is unpalatable for grazing animals. On account of degradation of pasture lands, *Cassia tora* can spread in fields out-competing other plants El Hadj *et al.* (2005). *Cassia tora* is considered as a poisonous plant in animals but the toxic element is not clearly defined. Toxicity has been observed in cattle and broilers, and other animals are also susceptible to the effects of this plant. The seeds showed toxicity on skeletal muscles, kidney and liver while the leaves and stem also had toxin whether in the green or dry form. It is observed that small ruminants eat *C. tora* in the pasture fresh or dry if nothing better is available. In India *Cassia*

tora, is known as Chakwar and utilized to feed livestock, because Chakwar (*C. tora*) seeds have been found to be very rich in protein. Dearth of knowledge as to how they can be utilized is second problem with the first being its fodder quality and digestibility. Out of the available plant species which can remain green late after the rainy season has passed if analyzed for possible inclusion in the feed can mitigate the shortage of fodder. The present study was taken up to assess the nutritional as well and feeding value

How to cite this article: Babu, A.S., Krishna, C.R. and Raju, S. 2024. Evaluation of Cassia Tora for Proximate Composition, Fodder Quality and Digestibility Parameters. *J. Anim. Res.*, 14(03): 227-229.

Source of Support: None; **Conflict of Interest:** None



of *Cassia Tora* for livestock. A systematic evaluation can open up economical and novel utilisation and inclusion approaches in the livestock diets or rations during normal or scarcity or disaster conditions in various forms.

MATERIALS AND METHODS

Forage quality assessment of whole plant sample approximately 1 kg was taken and then dried in the oven for 48 hours at 60 degree Celsius and prepared for chemical analysis. The samples were grounded with a Wiley mill to pass a 1 mm screen and analyzed for quality components. Proximate composition (AOAC, 2005) and cell wall constituents (Van Soest *et al.*, 1991) were estimated in the dried and pooled samples. Hemi-cellulose content was calculated by the difference between NDF and ADF. Ca and P content were determined by titration method (Talapatra *et al.*, 1940).

Total digestible nutrients (TDN), dry matter intake (DMI), digestible dry matter (DDM), digestible crude protein (DCP), net energy for lactation (NEL), digestible feed energy (DFE), relative feed value (RFV), relative forage quality (RFQ) and Digestible Energy DE were estimated according to the following equations adapted from Lithourgidis *et al.* (2006), Lebas (2013) and Kumar *et al.* (2016) from the measured variables:

1. Total digestible nutrients (TDN, %) = $87.84 - (0.7 \times \text{ADF})$
2. Dry matter intake (DMI, % DM basis) = $120 / \text{NDF}$
3. Dry matter digestibility (DDM, %) = $88.9 - (0.779 \times \text{ADF})$
4. Digestible crude protein (DCP, %) = $(0.929 \times \text{CP}) - 3.77$
5. NE_l (M Cal/Kg) = $(1.044 - (0.0119 \times \% \text{ADF})) \times 2.205$
6. Digestible feed energy (DFE, Mcal/kg) = $4.4 \times (\text{TDN} / 100)$
7. Relative feed value (RFV, %) = $(\text{DDM} \times \text{DMI}) / 1.29$
8. Relative feed quality (RFQ, %) = $(\text{TDN} \times \text{DMI}) / 1.23$
9. Digestible Energy (DE) = $15.627 + 0.000982 (\text{CP}^2) + 0.0040 (\text{EE}^2) - 0.0114 (\text{Ash}^2) - 0.169 (\text{ADF}) \pm 1.250 \text{ MJ/kg DM}$

RESULTS AND DISCUSSION

As the evaluation results of the basic whole plant of *Cassia tora* is not available from previous research or literature the present experiment results were compared with the majority conventional ingredients or feeds and fodder and it was found that fiber level was higher than that of the majority conventional ingredients that are used for producing feeds for non-ruminant livestock species. Hence it can be inferred that it may not be suitable to be used as feed ingredient for non-ruminant livestock species, but will probably better suit to ruminant and pseudo-ruminant.

The crude protein content of up to 12.38 % is comparable to those of feed ingredients such as cereals, usually used in rations of livestock indicating its potential to be used accordingly.

Table 1: Chemical composition in percent

Sl. No.	Item	<i>Cassia Tora</i>
1	Moisture	13.10
2	Dry Matter	86.90
3	Crude Protein	12.38
4	Crude Fat	2.63
5	Crude Fibre	18.84
6	Total Ash	10.84
7	Nitrogen free extract (NFE)	55.30
8	Neutral detergent fiber (NDF)	59.45
9	Acid detergent fiber (ADF)	35.99
10	Acid detergent lignin (ADL)	28.59
11	Cellulose	23.46
12	Hemicellulose (HC)	23.46
13	Acid insoluble ash (AIA)	0.27
14	Calcium	4.38
15	Phosphorous	1.02
16	Silica	0.17

Relative Feed Value (RFV) was equivalent to the values of the Brome grass in late vegetative bloom 91% (Fekadu *et al.*, 2017 and Dunham, 1998). Approximate forage quality based on above comparison can be used as an indicative to include them in the future experimental *in vitro* or *in vivo* trials to know the true nutritional potential for livestock feeding. High RFV index signifies superior forage quality. The RFV index estimates the digestible dry matter (DDM)

Table 2: Estimated digestibility parameters and quality

ITEM	TDN%	DMI%	DDM%	DCP%	NEL, Mcal/ kg	DFE, Mcal/ kg	RFV%	RFQ%	DE, MJ/kg DM
<i>Cassia Tora</i>	62.65	2.02	60.86	7.73	1.36	2.76	95.24	102.81	9.63

TDN = Total digestible nutrients; DMI = Dry matter intake; DDM = Digestible dry matter; DCP = Digestible crude protein; NEL = Net lactation for energy; DFE = Digestible feed energy; RFV = Relative feed value; RFQ = Relative forage quality; DE = Digestible energy.

from ADF, and calculates the DM intake potential (as a percent of body weight, BW) from NDF. RFV is an accurate measure for quality over protein content alone which provides an indication of digestibility and how much forage an animal can eat.

The RFQ index includes the differences in digestibility of the fiber fraction and can be used to more accurately guess animal performance and match animal needs. Relative Forage Quality (RFQ) percent of 102.81. In this context it has to be noted that as per Undersander, 2003, RFQ must be from 100 to 200 in order to support Cattle Type of Heifer and 18 to 24 months dry cow. While the RFQ-based Forage Quality Grading system given by Saha *et al*, 2010 classifies the RFQ of >185 as Supreme and RFQ of <90 as Utility. Based on the above two approaches defining RFQ, the values recorded in the present study have to be interpreted cautiously while including in the future feeding or nutritional evaluation trials. The RFQ stresses upon the fiber digestibility while RFV uses DDM intake. Accordingly to some extent it can be inferred that it can only be fed as a partial replacement in the diets with due care after further *in vivo* trials.

CONCLUSION

Results of experiment appeared comparable with that of the available literature. Effects on feed intake, nutrient utilization and growth performance at various inclusion levels and forms has to be taken up based on the above proximate composition, fodder quality and digestibility parameters. Their application as animal feed has to be further tested *in vivo*.

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