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Research Article

NUTRITIONAL STATUS OF CROP RESIDUES OF LANDRACES AS FODDER RESOURCE IN MAHARASHTRA, INDIA

KAUTHALE V.K.*, PATIL S.M., NALAWADE A.D., CHAVAN L.L. AND NAVALE Y. P.

BAIF Development Research Foundation, Pune 411058, India
*Corresponding Author: Email-vitthal.kauthale@baif.org.in

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Abstract- Crop residues are main fodder source for maintaining the livestock especially in remote areas. In the present study 67 fodder samples of rice, maize and sorghum were collected from farmer's field at Jawhar, Junner and Dhadgaon blocks in Palghar, Pune and Nandurbar districts of Maharashtra. The nutritional analysis was undertaken at BAIF Urulikanchan during 2016-17 to evaluate the, nutritional status of crop residues. The nutritional analysis revealed that the crude protein ranges from 2.7 to 6.12%, the crude fiber from 19.13 to 33.53%, the ether extract from 0.19 to 2.56 %, ash content from 3.38 to 26.02 % and silica content ranged from 1.25 to 23.58 %. The results directed that the crop residues of rice maize and sorghum can provide partial nutrition requirements of the animals and supplementation with concentrate feed or fortification of straw for productivity enhancement. The study also indicated that some of the rice and sorghum landraces have desirable fodder traits like high CP, EE, optimum CF and lesser silica content, however its grain and straw yield potential needs to be studied for further promotion.

Keywords- Fodder, Nutrition, Crop residues, Crop landraces.

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Introduction

Livestock production is the backbone of Indian agriculture and also plays a key role in providing employment in rural areas. This sector has been the primary source of energy for agricultural operations and major source of animal protein for masses [1]. Nutrition is one of the most critical constraints to increase animal productivity in developing countries [2].

In India local grasses, leaves of tree–shrubs and crop residues have major contribution in feeding livestock. Crop residue is defined as the non-edible plant parts for human which are left in the field after harvest. Some researchers also include remains that are generated from crop-packing plants or that are discarded during crop processing into the generic category of crop residue [3]. They may be left in the field as grazing for livestock and/or as mulch or transported to the homestead for stall feeding or use as fencing, building and roofing materials or as fuel [4].

Many workers emphasized the importance of crop residues as potential livestock feed varies with the type of crops grown—cereals, grain legumes, roots/tubers—and also with the proportion of land under food crops and with the yields of the relevant plant parts [3-6].

The areas with limited natural resources farmers are rearing dairy animal by feeding crop residues, local grass species and tree leaves. It was estimated that crop residues will provide more than 70% of the feed resources for Indian livestock by the year 2020 [6]. However, these crop residues are poor in palatability and nutritive value due to the presence of higher structural carbohydrates which can be overcome by incorporating in complete rations for ruminants [7]. In this context, the study of the nutritive value of feed and fodder has prime importance. This study assessed the nutrient composition of sixty-seven samples of straws and stover of landraces. As crop residues contribute significantly in fodder, their proximate analysis is essential to calculate ration composition which will compensate nutritional requirement of animals.

Material and methods:

Sample Collection: Dry fodder samples were collected from farmer's field in 2016 and 2017from three tribal areas *viz*., Jawhar (Dist. Palghar), Junnar (Dist. Pune) and Dhadgaon (Dist. Nandurbar) of Maharashtra. Collected samples were dried in shade and used for further laboratory analysis.

Nutritional Analysis: The analysis of the fodder samples was carried out in the laboratory of the Department of Animal Nutrition at Central Research Station of BAIF Development Research Foundation, Urulikanchan. Crude protein (CP %), crude fiber (CF %), oil/ether extract (EE %), ash and acid insoluble ash (Silica %) were determined by standard methods following AOAC [8].

Results and discussions

The range of nutritional elements of rice, sorghum and maize are depicted in [Table-1, 2 and 3]. In studied fodder samples the crude protein content ranged from 2.7 to 6.12%, the crude fiber content from 19.13 to 33.53 %, the EE from 0.19 to 2.56 %, ash content from 3.38 to 26.02 % and silica content ranged from 1.25 to 23.58 %

Among the rice landraces LRC 35 showed higher protein content (6.12%). Crude fiber content was highest in LRC 26 (30.89%), highest EE (2.56%) in LRC 18, highest ash content (26.02%) and highest silica (23.58%) in LRC 28. Among sorghum landraces of Dhadgaon block LRC 9 showed higher protein content (5.37%). LRC 2 was highest in crude fiber (33.53%), highest EE (1.01%) in LRC 3, highest ash content (7.76 %) in LRC 4 and highest silica in LRC 2 (3.12%).

Maize LRC 2 landraces of Dhadgaon block showed higher crude protein content,

ash and silica content 4.57 %, 9.01 %, 5.43 % respectively. Crude fiber content was highest in LRC 3 (28.97%), highest EE (0.84%) in LRC4.

Crude protein content is the most important criterion for judging feeds and fodder quality, although ADF, polyphenolics such as lignin and tannin content affect its availability to the animal [9]. Presence of high crude fiber in food material is reported to decrease dry matter digestibility in animals. The high crude fiber content therefore provides a good indication of nutritive value of the feed material [10].

Among studied 50 rice landraces 42 % fodder samples had less than average *i.e.*, 3.5% crude protein. 30% fodder samples ranged between 3.5-4.0 % crude protein. On the other hand, only 28 % fodder samples indicated quite higher amount of crude protein *i.e.*, more than 4 % [Table-1]. This indicated that some of the landrace straws are good source of protein as compare toothers. In case of sorghum stover 25% fodder samples had less than average *i.e.*, 4 % crude protein and 25% sample had more than 4.5 % crude protein. Remaining 50 % fodder samples contains CP rages between 4.0 - 4.5 %. CP content in maize stover samples ranged from 3.51 to 4.51%.

Table-1 *Nutritional Evaluation of rice straw*

Rice Landraces	Crude Protein %	Crude Fiber %	Ether Extract %	Ash %	Silica %
LRC1	3.14	29.72	1.34	19.56	12.76
LRC2	3.36	26.97	1.73	16.78	11.49
LRC3	4.09	28.15	1.26	18.45	12.20
LRC4	3.50	28.16	1.05	17.79	12.14
LRC5	4.21	25.90	0.97	19.73	12.61
LRC6	3.99	23.61	0.84	17.97	11.65
LRC7	2.70	23.12	0.81	18.61	12.47
LRC8	4.64	23.01	1.02	22.00	13.44
LRC9	4.18	24.74	1.18	18.62	12.97
LRC10	4.06	21.38	1.14	20.89	15.47
LRC11	3.62	23.42	1.19	16.46	12.31
LRC12	4.29	26.43	1.21	17.32	12.01
LRC13	3.01	27.18	1.14	18.11	11.87
LRC14	3.67	27.46	1.17	23.01	13.13
LRC15	3.78	28.68	1.21	15.15	9.24
LRC16	3.61	29.10	1.46	19.23	12.72
LRC17	4.05	25.51	1.16	14.32	9.70
LRC18	3.32	24.51	0.86	16.72	13.64
LRC19	3.60	25.39	1.08	15.19	10.14
LRC20	5.87	22.09	2.13	20.85	12.63
LRC21	3.04	25.47	2.14	15.95	11
LRC22	3.22	28.13	2.49	20.62	12.37
LRC23	3.49	25.47	1.82	18.16	11.18
LRC24	3.64	26.05	2.28	16.92	12.64
LRC25	3.77	26.56	2.32	16.87	11.75
LRC26	4.48	27.36	2.01	13.57	9.25
LRC27	3.08	26.01	2.56	18.08	12.24
LRC28	3.02	28.11	1.45	11.69	8.57
LRC29	6.12	22.6	1.36	19.90	12.60
LRC30	5.26	25.33	1.05	21.34	12.17
LRC31	3.49	27.51	1.04	16.88	11.21
LRC32	3.41	29.78	1.13	18.53	12.40
LRC33	3.54	28.48	2.07	16.91	8.87
LRC34	3.80	26.69	1.69	16.55	10.34
LRC35	3.19	25.81	0.47	17.24	11.26
LRC36	3.72	26.14	1.13	17.03	10.47
LRC37	3.45	27.05	1.71	16.49	9.36
LRC 38	2.73	29.58	0.24	17.34	15.16
LRC 39	3.36	30.89	0.23	14.46	9.98
LRC 40	4.07	30.84	0.22	12.78	9.16
LRC 41	3.41	25.46	0.25	20.79	18.08
LRC 42	3.88	25.74	0.23	19.37	16.63
LRC 43	3.12	28.73	0.21	15.60	13.52
LRC44	4.06	27.03	0.19	21.40	15.72
LRC 45	3.28	30.07	0.23	22.54	19.19
LRC 46	3.81	24.10	0.22	26.02	23.58
LRC 47	5.03	23.93	0.21	12.56	11.52
LRC 48	3.07	28.73	0.22	18.03	16.18
LRC 49	2.82	23.84	0.27	23.02	22.03
LRC 50	3.56	25.74	0.23	21.02	20.07

In studied rice straw samples 42 % fodder samples had more than 27 % crude fiber. On the other hand, 24 % fodder samples had less than 25% crude fiber. Remaining 34 % fodder samples rages between 25-27 % crude fibers. The sorghum stover sample ranged from19.13- 33.53% [Table-2]. CF content in maize stover samples ranged from 26.79 to 28.97 % [Table-3].

Table-2 *Nutritional Evaluation of Sorghum stover*

Sorghum Landrace	Crude Protein %	Crude Fiber %	Ether Extract %	Ash %	Silica %
LRC 1	4.11	27.93	1.48	5.32	2.47
LRC2	4.02	33.53	2.34	7.16	3.12
LRC3	4.46	29.44	2.36	5.7	3.09
LRC4	4.1	26.86	1.52	7.76	3.11
LRC5	3.71	30.43	2.26	5.18	2.35
LRC6	3.69	26.68	2.16	6.49	2.33
LRC7	3.35	24.04	0.92	3.38	1.25
LRC8	5.33	24.78	0.84	6.12	2.20
LRC9	5.37	29.21	0.74	5.56	3.09
LRC10	4.42	26.05	0.61	6.15	2.85
LRC11	4.61	20.6	0.52	6.57	3.09
LRC12	4.38	19.13	0.79	5.56	2.19

Table-3 *Nutritional Evaluation of Maize stover*

Maize Landraces	Crude Protein %	Crude Fiber %	Ether Extract %	Ash %	Silica %
LRC 1	4.57	28.81	0.67	9.01	5.43
LRC 2	4.42	26.87	0.81	7.24	4.29
LRC 3	3.51	28.97	0.76	8.31	5.08
LRC 4	3.60	27.05	0.84	7.75	4.71
LRC 5	4.26	26.79	0.60	6.80	4.05

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Ether extract represents fat content of sample. The sorghum stover has higher fat content as compare to maize and rice straws.

Ash percent is comparable with minerals content of fodder. Among studied rice landraces 34 % straw samples showed more than 19 % ash while 38 % samples have less than average *i.e.*, 17% ash, remaining 28 % samples have ash content ranged from 17-19 %. Sorghum landraces showed 5.5 - 6.5 % range for 50% stover sample. 25 % samples contained less than 5.5 % ash and 25% samples had more than 6.5 % ash content. Ash content in maize stover samples ranged from 6.8 to 9.0 %.

Silica is one of anti- nutritional element which limits absorption of nutrients. Studied samples have high variability in silica content. Silica content in rice straw samples ranged from 8.57 to 23.58 %. Silica content in sorghum stover samples ranged from 1.25 to 3.12 %. Silica content in maize stover samples ranged from 4.05 to 5.43 %.

Conclusion

The present study has highlighted the nutritive value and importance of the crop residues in livestock feeding. However, for better livestock production, concentrate feed must be supplemented along with green fodder and crop residues. Rice landraces LRC 4, LRC 10, LRC 17, LRC 18, LRC 19, LRC 23, LRC 25 and sorghum landraces LRC 2, LRC 3 LRC 8 are having desirable fodder traits like high CP, optimum CF, high EE and lesser silica content. These landraces need to be evaluated for grain and straw yield potential and the superior landraces may be promoted for cultivation.

Application of research: The research findings may be useful to animal nutritionist for formulation of the animal feed using the local fodder resources, particularly the crop residues. This research will also be useful to the researchers engaged in assessment of traditional varieties for their specific traits and further utilization in breeding programs.

Research Category: Crop Nutritional Analysis

Abbreviations
LRC: Landrace code
CP: Crude protein
EE: Ether extract

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***Principle Investigator: Dr. V. K. Kauthale**
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