Nutritional evaluation of some ruminant feedstuffs by *in vitro* gas production technique

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ABSTRACT

The study was conducted to assess nutritional characteristics of some ruminant feedstuffs by using *in vitro* gas production technique. The commonly available feed samples of concentrates (n,18), dry (n,9) and green (n,28) roughages were collected from different parts of Gujarat. All the ground feed and fodder samples were analyzed for crude protein, ether extract, crude fiber, neutral detergent fiber, acid detergent fiber, total ash and acid insoluble ash. Metabolizable energy (ME) and total digestible nutrients (TDN) were estimated by incubating 200 mg of each of the samples with rumen mixed microbe inoculums for 24 h period, taken from fistulated buffaloes. Amongst concentrate feeds, safflower meal had lowest ME (7.21 MJ/kg DM) and TDN (48.80%) values, whereas, maize grain had highest ME (14.11 MJ/kg DM) and TDN (85.82%) values. Similarly, in dry roughages, rice husk had lowest and groundnut straw has highest ME (4.48 vs 8.93 MJ/kg DM) and TDN (22.23 vs 58.62%) values. The values of ME and TDN ranged from 5.05 to 9.15 MJ/ kg DM and 37.23 to 59.24% in green roughages, with lowest in bamboo leaves and highest in mustard Chinese cabbage. Chemical composition and energy values reported for various feed and fodders in this communication could be used for formulating ration of field animals and under farm conditions for better utilization of these commonly available feed resources.

Key words: Feedstuffs, In vitro gas production, Metabolizable energy, Total digestible nutrients

Database on nutritive values, access and use of such information will have a significant impact on improved animal performance and productivity (Devendra and Leng 2011). The diversity in the nutritive value of different feedstuffs needs some easy and efficient method of their nutritional evaluation; therefore, some alternative laboratory methods are required. Recently the in vitro gas production technique has been proposed in use for determining fermentation kinetics of ruminant feed (Menke et al. 1979, Menke and Steingass 1988, Blummel and rskov 1993, Tessema and Baars 2004, Bohra et al. 2008). Datt et al. (2009) also used the *in vitro* gas production technique to evaluate nutritive values of leguminous and non-leguminous crops. With respect to concentrates, dry and green roughage feed resources available in Gujarat, limited information is available on the chemical composition and nutritive value.

²Senior Scientist (akannan72@rediffmail.com), Animal Nutrition, IVRI Regional Station, Palampur, Himachal Pradesh 176 061 India. Due to the development of new plant varieties and change in cultivation and processing methods, there is need for estimating M E and TDN values of various feed ingredients, from time to time. Keeping these points in view, present study was designed to evaluate nutritive values of concentrates, dry and green roughage feed sources for ruminants using the *in vitro* gas production technique.

MATERIALS AND METHODS

Sample collection: The commonly available feed samples of concentrates, dry and green roughages were collected from different parts of Gujarat. In concentrates maize (Zea mays), jowar (Sorghum bicolor), bajra (Pennisetum glaucum), broken rice (Oryza sativa), wheat bran (Triticum spp.), deoiled rice bran (Oryza sativa), rapeseed meal (Brassica napus), groundnut meal (Arachis hypogaea), soybean meal (Glycine max), cottonseed meal (Gossypium spp.), sunflower meal (Helianthus annus), guar korma (Cyamopsis tetragonoloba), mustard oil cake (Brassica spp.), safflower meal (Carthamus tinctorius), maize bran (Zea mays), soybean flakes (Glycine max), Isabgol Lali (Plantago ovata) and Isabgol Jeeraru were collected. Paddy straw (Oryza sativa), wheat straw (Triticum spp.), jowar straw (Sorghum bicolor), bajra straw (Pennisetum glaucum), maize straw (Zea mays),

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sugarcane tops (Saccharum officinarum), groundnut straw (Arachis hypogaea), masoor straw (Lens culinaris) and rice husk (Oryza sativa) were collected as a dry roughages. Whereas, in green roughages bamboo leaves (Filgueirasia arenicola), rice bean (Vigna umbellata), hedge lucerne (Desmanthus virgatus), butterfly pea (Centrosema molle), stylo (Stylosanthes guianensis), nandi grass (Setaria splendida), siratro (Macroptilium atropurpureum), green panic grass (Panicum maximum), guinea grass (Megathyrsus maximus), rhodes grass (Chloris gayana), para grass (Brachiaria mutica), congo signal grass (Brachiaria ruziziensis), dhaman grass (Cenchrus setigerus), blue panic grass (Panicum antidotale), Hybrid Napier bajra CO3, Hybrid Napier bajra CO1, Hybrid Napier bajra PBN233, Hybrid Napier bajra PBN83, Hybrid Napier bajra PBN2, Hybrid Napier bajra PBN231, Hybrid Napier bajra RBC2, cowpea EC 4216, Hybrid Napier bajra CO4, guinea grass CO2, Hybrid sorghum (Sorghum bicolor×Sorghum sudanense), sugar beet (Beeta vulgaris), mustard-Chinese cabbage and mustard (Brassica spp.) were collected. All the feeds and fodder samples were ground to pass through 1 mm screen and analyzed in triplicate for dry matter (DM), crude protein (CP), ether extract (EE), crude fiber (CF) and ash contents as per the methods of AOAC (1995). The cell wall constituents were estimated by the methods of Goering and Van Soest (1991).

In vitro gas production technique: For in vitro studies, rumen liquor was collected from two rumen cannulated adult male buffaloes (body weight = 589.6 ± 18.6 kg), strained through a 4-layered muslin cloth and pooled together which was used as inoculum source. The donor animals were fed 60% wheat straw and 40% concentrate according to their requirements (Kearl 1982). About 200 mg of feed sample was taken in a glass syringe and 30 ml of mixed buffered rumen liquor was added and incubated for 24 h, in a water bath at 39°C. Gas measurements were carried out at 0, 2, 4, 6, 8, 10, 12 and 24 h after incubation. Incubations were stopped at 24 h by dipping the syringes in cold water. All the determinations were carried out in triplicate. ME value of concentrates and roughages were calculated by using the prediction equations of Menke and Steingass (1988), whereas, TDN was calculated from ME value as per the equation of NRC (1989).

The prediction equations for concentrate feeds are:

ME (MJ/kg DM) = 1.06 + 0.1570×gas produced (ml/200mg DM) + 0.0084×CP (g/kg DM) + 0.022 × EE (g/kg DM) -0.0081 × Ash (g/ kg DM)

For roughages:

- $$\begin{split} & \text{ME} \ (\text{MJ/kg} \ \text{DM}) = 2.20 + 0.13570 \times \text{gas produced} \ (\text{ml/200mg} \\ & \text{DM}) + 0.0057 \times \text{CP} \ (\text{g/kg} \ \text{DM}) + 0.00286 \times (\text{EE})^2 \ (\text{g/kg} \ \text{DM}) \\ & \text{ME} \ (\text{MCal/kg} \ \text{DM}) = \text{ME} \ (\text{MJ/kg} \ \text{DM})/4.184 \end{split}$$
- TDN was calculated from ME value as per the following equation (NRC 1989).
- TDN (%) = [ME (MCal/kg DM) +0.45]/ 0.0445309

RESULTS AND DISCUSSION

Composition of feeds and fodders: The chemical composition of different feeds and fodders are presented in Table 1. Generally, wide variations existed in the chemical composition of the investigated feedstuffs. Amongst concentrate feeds, CP content ranged from 8.10% for jowar grain to 45.37% for guar korma. EE content ranged from 0.06% for safflower meal to 11.76% for Isabgol Lali. Lowest neutral detergent fiber (NDF) and acid detergent fiber (ADF) were observed in maize grain whereas, highest in soybean flakes. Total ash content ranged from 1.00% for broken rice to 13.21% for deoiled rice bran. The chemical composition of concentrate feeds observed is in accordance with that of NRC (2001) and Mandal et al. (2003). CP content ranged from 2.85% for wheat straw to 12.00% for groundnut straw in dry roughages. EE content ranged from 1.02% for wheat straw to 2.32% for groundnut straw. Wheat straw contained highest NDF and ADF values whereas, masoor straw contained lowest NDF and ADF values. Total ash content ranged from 6.99% for groundnut straw to 19.45% for paddy straw. These results of chemical composition of straws corroborate the earlier reports of NRC (1982), Ranjhan (1998), Mandal et al. (2003) and Kumarmath et al. (2004).

Amongst green roughages, CP content ranged from 5.84% for *nandi* grass to 30.98% for mustard. EE content ranged from 1.07% for stylo to 4.89% for mustard. Total ash content ranged from 4.99% for stylo to 20.47% for mustard Chinese cabbage. Among all the feed and fodder samples, highest CP content was observed in *guar korma* (45.37%) followed by soybean meal (45.00%) and cottonseed meal (38.50%). Highest EE content was observed in Isabgol *lali* (11.76%) followed by cottonseed meal (9.30%) and mustard oilcake (9.17%). Highest NDF and ADF contents were observed in bamboo leaves and lowest in sugarbeet. The chemical composition and cell wall constituents of green roughages were in the range reported earlier by other workers (Ranjhan 1998, Kumarmath *et al.* 2004, Datt *et al.* 2009).

Energy values: Amongst concentrate feeds, safflower meal had lowest ME and TDN values, whereas, maize had highest ME and TDN values (Table 2). *Jowar, guar korma* and Isabgol *Lali* also had higher ME value in concentrates. Our results are in agreement with that of Ranjhan (1998) and Khanum *et al.* (2007). Amongst dry roughages, rice husk had lowest ME and TDN value, whereas, groundnut straw had highest ME and TDN value (Table 2). Ranjhan (1998) and Mandal *et al.* (2003) also reported similar ME and TDN values of straws as observed in present study.

Similarly, amongst green roughages, bamboo leaves had less ME and TDN values whereas, mustard Chinese cabbage had highest ME (9.15 MJ/kg DM) and TDN (59.24%) value (Table 2). The ME and TDN values of green roughages observed in present study are in agreement with that of Aka and Kamalu (2004),Jadhav *et al.* (2007) and Datt *et al.* (2009).

Table 1. Chemical composition of concentrates, dry and green roughages (% on DM basis)

Parameter	DM	СР	EE	CF	NDF	ADF	Total ash	AIA
Concentrates								
Maize (Zea mays)	92.10	9.39	3.66	8.60	13.55	3.57	1.28	0.89
Jowar (Sorghum bicolor)	92.09	8.10	2.53	11.09	16.55	5.95	2.67	1.03
Bajra (Pennisetum glaucum)	92.00	11.20	3.50	10.45	17.20	4.55	4.90	1.21
Broken rice (Oryza sativa)	87.60	8.80	1.70	0.90	22.60	10.95	1.00	0.54
Wheat bran (Triticum spp.)	94.16	17.06	3.47	15.12	63.50	15.50	5.91	1.98
Deoiled rice bran (Oryza sativa)	92.20	15.10	0.56	18.00	51.54	23.06	13.21	2.96
Rapeseed meal (Brassica napus)	93.49	37.62	0.84	8.51	22.50	17.55	8.89	1.02
Groundnut meal (Arachis hypogaea)	92.00	43.30	1.20	13.27	14.68	6.50	6.50	1.04
Soybean meal (<i>Glycine max</i>)	90.00	45.00	1.60	8.54	13.64	8.80	8.50	0.89
Cottonseed meal (Gossypium spp.)	92.00	38.50	9.30	7.47	28.50	20.00	8.10	0.80
Sunflower meal (Helianthus annus)	92.00	26.85	6.84	25.45	40.00	26.55	10.5	1.04
Guar korma (Cyamopsis tetragonoloba)	93.30	45.37	4.52	12.54	31.22	17.77	5.60	1.06
Mustard oil cake (<i>Brassica</i> spp.)	93.92	36.40	9.17	14.05	24.34	13.87	7.95	0.95
Safflower meal (Carthamus tinctorius)	81.25	35.24	0.06	10.40	44.85	32.08	6.66	1.12
Maize bran (Zea mays)	88.90	9.60	3.04	8.05	17.50	10.01	2.40	0.42
Soybean flakes (<i>Glycine max</i>)	93.88	13.38	5.04	27.07	67.20	50.00	4.93	1.05
Isabgol lali (Plantago ovata)	93.31	31.61	11.76	11.37	53.20	30.33	6.20	1.04
Isabgol jeeraru	92.08	17.19	2.62	32.10	56.95	31.62	2.21	0.54
Dry roughages								
Paddy straw (Oryza sativa)	90.85	3.54	1.65	42.58	69.80	46.30	19.45	2.54
Wheat straw (Triticum spp.)	92.87	2.85	1.02	35.47	79.12	54.92	10.48	1.02
Jowar straw (Sorghum bicolor)	91.58	3.94	1.84	34.58	77.46	49.57	12.41	2.08
Bajra straw (Pennisetum glaucum)	92.45	3.54	1.24	35.24	73.36	50.08	10.58	1.54
Maize straw (Zea mays)	91.24	3.68	1.84	33.24	71.20	42.50	11.24	0.87
Sugarcane tops (Saccharum officinarum)	93.36	5.73	1.32	32.00	69.53	43.53	8.50	3.80
Groundnut straw (Arachis hypogaea)	85.47	12.00	2.32	32.99	64.32	42.13	6.99	0.87
Masoor straw (Lens culinaris)	93.98	5.51	1.99	36.87	62.52	41.51	8.25	1.04
Rice husk (Oryza sativa)	89.78	2.94	1.15	28.01	68.70	42.01	15.38	12.20
Green roughages								
Bamboo leaves (Filgueirasia arenicola)	93.99	15.47	1.48	27.48	73.05	41.65	13.88	3.42
Rice bean (Vigna umbellata)	18.84	16.43	2.04	26.95	54.61	39.24	10.48	1.74
Hedge lucerne (Desmanthus virgatus)	28.22	18.75	2.79	22.42	42.45	31.84	6.27	0.48
Butterfly pea (<i>Centrosema molle</i>)	37.44	18.69	2.27	26.64	43.68	38.45	5.99	0.71
Stylo (Stylosanthes guianensis)	30.41	14.46	1.07	26.24	51.34	29.87	4.99	0.17
Nandi grass (Setaria splendida)	21.67	5.84	1.83	25.26	67.21	39.20	8.80	2.86
Siratro (Macroptilium atropurpureum)	24.80	13.06	1.61	23.29	55.60	41.55	8.11	1.72
Green panic grass (Panicum maximum)	18.77	10.54	1.51	25.30	63.81	35.62	11.11	4.24
Guinea grass (Megathyrsus maximus)	22.04	6.02	1.54	27.97	69.65	40.64	12.72	3.22
Rhodes grass (Chloris gayana)	33.68	8.85	2.12	25.99	53.74	31.47	11.18	4.51
Para grass (Brachiaria mutica)	16.23	22.97	3.14	16.30	71.57	41.15	13.28	2.19
Congo signal grass (<i>Brachiaria ruziziensis</i>)	61.37	13.29	2.30	21.09	64.19	36.18	12.55	3.43
Dhaman grass (Cenchrus setigerus)	29.04	10.49	2.05	23.85	63.29	40.07	10.29	9.12
Blue panic grass (Panicum antidotale)	19.25	10.90	1.71	20.95	62.45	36.73	11.21	4.06
Hybrid Napier bajra CO3	25.30	6.23	1.84	23.11	69.09	39.60	13.54	3.28
Hybrid Napier bajra CO1	20.83	9.93	2.91	23.40	66.37	39.22	13.33	3.57
Hybrid Napier bajra PBN233	18.06	14.71	3.19	20.77	67.53	36.80	13.44	2.97
Hybrid Napier bajra PBN83	25.34	19.65	2.81	24.19	68.44	39.34	10.28	2.61
Hybrid Napier bajra PBN2	23.54	13.36	2.90	20.79	70.05	40.13	12.11	2.81
Hybrid Napier bajra PBN231	22.12	10.38	2.19	26.60	69.95	39.54	9.62	2.31
Hybrid Napier bajra RBC 2	21.24	12.20	2.11	26.56	66.88	38.08	9.88	1.62
Hybrid Napier bajra CO4	22.34	13.37	3.29	25.64	67.81	37.80	12.82	3.10
Cowpea EC 4216	21.35	23.80	2.59	16.46	52.64	33.63	9.52	1.29
Guinea grass CO2	18.65	10.87	3.43	24.79	66.78	39.85	13.45	2.95
Hybrid sorghum (Sorghum bicolor×	24.57	14.30	2.42	25.69	71.31	41.34	10.57	2.32
Sorghum sudanense)								
Sugar beet (Beeta vulgaris)	20.14	23.59	4.64	6.94	16.90	7.98	15.63	2.06
Mustard-Chinese cabbage	54.84	28.55	2.66	7.39	28.38	17.34	20.47	5.05
Mustard (Brassica spp.)	24.15	30.98	4.89	7.53	33.48	18.98	12.90	1.80

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Table 2. Energy values of concentrates, dry and green roughages predicted by using in vitro gas production technique

$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Name of feed*	ME (M.	J/kg DM)	TDN (%)		
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Maire (25)13.40-14.6214.11 ± 0.1082.00-88.5985.82 ± 0.52Bayre (20)12.20-13.3012.61 ± 0.2175.00-82.0077.79 ± 1.12Broken rice (12)11.40-13.1012.16 ± 0.2071.30-81.1075.39 ± 1.10Wheat brain (25)11.13-13.2112.03 ± 0.1869.83-81.0174.65 ± 0.94Deoiled rice bran (25)76.00-84.080.3 ± 0.0951.00-55.0053.22 ± 0.51Rapesed meal (30)9.37-11.7010.62 ± 0.1060.41 * 72.9067.12 ± 0.55Groundmut meal (11)10.00-11.0010.43 ± 0.0964.00-69.0066.07 ± 0.48Soyhean meal (13)12.20-13.0012.73 ± 0.0676.00-80.0078.41 ± 0.32Sunflower meal (30)9.33-10.359.87 ± 0.0461.25-65.6763.08 ± 0.20Sunflower meal (12)8.30-09.208.80 ± 0.0856.00 ± 0.0480.26 ± 0.70Mustard oil cake (30)11.75-14.0813.15 ± 0.1177.37-86.4882.62 ± 0.70Mater and (12)6.30-07.667.21 ± 0.1345.31-51.2048.80 ± 0.71Maize bran (12)8.30-49.0953.37-58.5451.2048.80 ± 0.71Maize bran (12)10.01-11.5010.54 ± 0.1164.45-68.1466.71 ± 0.24Maize straw (21)10.02-11.1010.54 ± 0.1164.45-68.1466.71 ± 0.24Dry maginges10.1011.72 ± 0.2571.84-75.8972.28 ± 1.42Dry maginges10.1410.22 ± 0.2571.85 ± 0.3144.56 ± 0.94Maize straw (22)5.31 - 6.406.01 ± 0.1440.03 - 46.52<	Concentrates					
$\begin{split} \begin{array}{llllllllllllllllllllllllllllllllllll$	Maize (25)	13.40-14.62	14.11 ± 0.10	82.00-88.59	85.82 ± 0.52	
$ \begin{array}{c} \hline product (20) & 12 20 - 13 30 & 12 61 \pm 0 21 & 75.06 + 220 & 77.79 \pm 1.10 \\ Wheat brain (22) & 11.43 - 13 21 & 12.03 \pm 0.18 & 69.83 - 81.10 & 75.39 \pm 1.10 \\ Wheat brain (25) & 11.13 - 13 21 & 12.03 \pm 0.18 & 69.83 - 81.10 & 75.39 \pm 1.10 \\ Wheat brain (25) & 11.13 - 13 21 & 12.03 \pm 0.18 & 69.83 - 81.10 & 75.39 \pm 1.10 \\ Rapescel meal (30) & 9.37 - 11.70 & 10.62 \pm 0.19 & 60.04 + 72.90 & 67.12 \pm 0.55 \\ Groundmut meal (11) & 10.00 - 11.00 & 10.43 \pm 0.09 & 51.00 - 55.00 & 75.22 \pm 0.51 \\ Soybean meal (13) & 12.20 - 13.00 & 12.73 \pm 0.06 & 76.00 - 80.00 & 78.41 \pm 0.32 \\ Cottonsced meal (30) & 9.53 - 10.35 & 9.87 \pm 0.04 & 61.25 - 65.67 & 63.08 \pm 0.20 \\ Sunflower meal (12) & 8.50 - 69.20 & 8.80 \pm 0.08 & 56.00 - 60.00 & 57.53 \pm 0.41 \\ Mark and (18) & 12.61 - 14.23 & 13.15 \pm 0.13 & 77.78 - 64.8 & 82.63 \pm 0.70 \\ Mustard oil cake (30) & 11.75 - 14.08 & 13.16 \pm 0.11 & 73.15 - 85.70 & 80.76 \pm 0.60 \\ Soybean flakes (12) & 10.01 - 11.50 & 10.54 \pm 0.11 & 64.45 - 68.14 & 66.71 \pm 0.24 \\ Isabgol jearnu (12) & 12.50 - 14.04 & 13.22 \pm 0.25 & 79.85 - 82.45 & 81.106 \pm 0.47 \\ Dry toughages \\ Dry toughages$	Iowar (30)	12.66–14.08	13.76 ± 0.09	78 30-89 73	83.97 ± 0.50	
	Baira (20)	12.20–13.30	12.61 ± 0.21	75.00-82.00	77.79 + 1.12	
Wheat thran (25)11.13-13.2112.03 \pm 0.1869.83-81.0174.65 \pm 0.04Bogiesder torn (25)7.60-8408.03 \pm 0.0951.00-55.0053.22 \pm 0.51Rapssed meal (30)9.37-11.7010.62 \pm 0.1060.41-72.9067.12 \pm 0.55Groundnut meal (11)10.00-11.0010.43 \pm 0.0964.00-69.0066.07 \pm 0.48Soybean meal (30)9.53-10.359.87 \pm 0.0461.25-65.6763.08 \pm 0.20Sunflower meal (12)8.50-49.208.80 \pm 0.0856.00-60.0075.70 \pm 0.41Gaur korma (18)12.61-14.2313.51 \pm 0.1377.77-86.4882.63 \pm 0.70Mustard oil cake(30)11.75-144.0813.161 \pm 0.1373.77-86.4882.63 \pm 0.70Sunflower meal (12)8.00-94.88.50 \pm 0.0953.37-58.5445.222 \pm 1.08Soybean flakes (12)10.01-11.5010.54 \pm 0.1164.45-68.1466.71 \pm 0.24Soybean flakes (12)10.01-11.5010.54 \pm 0.1164.45-68.1466.71 \pm 0.24Soybean flakes (12)10.01-77.1010.54 \pm 0.1164.45-68.4551.91 \pm 1.03Soybean flakes (12)10.01-77.1010.54 \pm 0.1164.45-68.4551.91 \pm 1.03Soybean flakes (12)10.01-77.1010.54 \pm 0.014.45.524.56 \pm 5.54Soybean flakes (12)5.30 - 6.506.01 \pm 0.1440.91 - 44.1742.26 \pm 0.38Soybean flakes (12)5.70 - 7.106.01 \pm 0.1440.91 - 44.1742.26 \pm 0.38Soybean flakes (12)5.70 - 7.106.12 \pm 0.244.55 - 4.12 </td <td>Broken rice (12)</td> <td>11 40-13 10</td> <td>12.01 ± 0.21 12.16 ± 0.20</td> <td>71 30-81 10</td> <td>75.39 ± 1.10</td>	Broken rice (12)	11 40-13 10	12.01 ± 0.21 12.16 ± 0.20	71 30-81 10	75.39 ± 1.10	
	Wheat bran (25)	11 13-13 21	12.03 ± 0.18	69.83-81.01	74.65 ± 0.94	
Rapesed neal (30)9.37-11.7010.62 ± 0.1060.41-72.9077.12 ± 0.55Groundnut med (11)10.0-11.0010.43 ± 0.0964.00-69.0066.07 ± 0.48Styhean med (13)12.20-13.0012.73 ± 0.0676.00-80.0078.04 ± 0.20Sunflower med (12)8.50-49.208.80 ± 0.0856.00-60.0075.02 ± 0.41Graur korma (18)12.61-14.2313.51 ± 0.1377.77-86.4882.03 ± 0.70Musard ol cake (30)11.75-144.0813.161 ± 0.1173.15-85.7088.05 ± 0.61Sufflower med (12)8.00-49.488.50 ± 0.0153.15-85.7488.05 ± 0.71Soybean flakes (12)10.01-11.5010.54 ± 0.1164.45-68.1466.71 ± 0.24Sufflower med (12)12.50-14.0413.22 ± 0.2579.88-82.4581.06 ± 0.47Isabgol lai (12)12.50-14.0413.22 ± 0.5771.48-75.8972.289 ± 1.42Vent straw (25)5.40 - 6.906.25 ± 0.1040.03 ± 6.5244.56 ± 0.54Jory roughes7.106.31 ± 0.2041.53 - 47.1245.31 ± 1.10Maize bran (12)5.70 - 7.106.31 ± 0.2041.53 - 47.1245.41 ± 1.10Maize straw (12)7.50 - 7.366.40 ± 0.1945.45 - 49.0147.44 ± 0.52Jogarcan tops (12)5.70 - 6.806.10 ± 0.1444.13 - 45.9943.61 ± 0.84Groundnut straw (12)7.56 - 9.018.93 ± 0.1256.45 - 6.01 ± 0.86 ± 2.99 ± 0.70Rice bask (15)4.15 - 4.624.48 ± 0.1518.85 - 25.1322.23 ± 0.85Groundnut straw (12)7.56 - 9.01	Deoiled rice bran (25)	7 60-8 40	8.03 ± 0.09	51.00-55.00	53.22 ± 0.51	
$\begin{array}{c} \mbox{real} (11) & 10.00 & 10.04 \pm 0.00 & 64.00 + 60.00 & 66.07 \pm 0.48 \\ \mbox{Soybean meal} (13) & 12.20 \pm 13.00 & 12.73 \pm 0.06 & 76.00 + 80.00 & 78.41 \pm 0.32 \\ \mbox{Soybean meal} (13) & 12.20 \pm 13.00 & 12.73 \pm 0.04 & 61.25 + 65.67 & 63.08 \pm 0.20 \\ \mbox{Sundowr meal} (12) & 8.50 - 40.20 & 8.80 \pm 0.08 & 56.00 - 60.00 & 57.50 \pm 0.41 \\ \mbox{Mustard oil cake} (30) & 11.75 \pm 14.08 & 13.16 \pm 0.11 & 77.17 + 86.48 & 82.63 \pm 0.70 \\ \mbox{Mustard oil cake} (30) & 11.75 \pm 14.08 & 13.16 \pm 0.11 & 73.15 \pm 85.70 & 80.61 \pm 0.64 \\ \mbox{Soybean} flakes (12) & 10.00 \pm 1.16 & 10.14 & 43.51 \pm 51.20 & 48.80 \pm 0.71 \\ \mbox{Mathes} (12) & 10.04 \pm 1.25 & 10.13 & 47.51 \pm 20.5 & 77.48 \pm 75.88 & 55.22 \pm 1.08 \\ \mbox{Soybean} flakes (12) & 10.04 \pm 1.24 & 11.72 & 1.15 & 77.148 \pm 75.89 & 72.89 \pm 1.42 \\ \mbox{Dyshap} flakes (12) & 10.45 \pm 1.24 & 11.72 & 1.15 & 77.148 \pm 75.89 & 72.89 \pm 1.42 \\ \mbox{Dyshap} flakes (12) & 10.45 \pm 1.24 & 11.72 & 1.15 & 77.148 \pm 75.89 & 72.89 \pm 1.42 \\ \mbox{Dyshap} flakes (12) & 0.36 \pm 0.24 & 0.01 \pm 0.01 & 40.03 \pm 4.65.2 & 44.56 \pm 0.54 \\ \mbox{Matraw} (25) & 5.31 \pm 6.40 & 6.01 \pm 0.14 & 40.91 \pm 4.17 & 42.36 \pm 0.38 \\ \mbox{Mise straw} (25) & 5.30 \pm 6.90 & 6.25 \pm 0.10 & 40.03 \pm 4.65.2 & 44.56 \pm 0.54 \\ \mbox{Bayraw} ratw (12) & 6.70 \pm 7.10 & 6.31 \pm 0.20 & 41.53 \pm 7.12 & 45.41 \pm 1.10 \\ \mbox{Bayraw} ratw (12) & 5.70 \pm 7.10 & 6.31 \pm 0.20 & 41.53 \pm 4.712 & 45.41 \pm 1.10 \\ \mbox{Bayraw} ratw (12) & 5.43 \pm 6.92 & 6.29 \pm 0.05 & 40.15 \pm 4.665 & 42.99 \pm 0.03 \\ \mbox{Green traw} (12) & 5.43 \pm 6.92 & 6.29 \pm 0.05 & 40.15 \pm 4.665 & 42.99 \pm 0.03 \\ \mbox{Green traw} (12) & 5.43 \pm 6.92 & 6.29 \pm 0.03 & 41.53 \pm 5.13 & 22.23 \pm 0.43 \\ \mbox{Green traw} (12) & 5.43 \pm 6.92 & 6.09 & 33.61 \pm 42.0 & 37.35 \pm 6.64 & 24.98 \\ \mbox{Masor straw} (12) & 5.43 \pm 6.92 & 6.09 & 33.61 \pm 42.0 & 37.35 \pm 6.65 & 22.99 \pm 0.03 \\ \mbox{Green trav} (12) & 5.43 \pm 6.92 & 6.09 & 33.61 \pm 42.0 & 37.35 \pm 6.65 & 22.99 \pm 0.03 \\ \mbox{Green trav} (12) & 5.43 \pm 6.92 & 6.09 & 33.61 \pm 42.0 & 37.35 \pm 6.65 & 22.99 \pm 0.03 \\ \mbox real (9) & 6.35 \pm 7.75 & 7.73 \pm 0.$	Rapeseed meal (30)	9 37-11 70	10.62 ± 0.09	60 41-72 90	67.12 ± 0.51	
$\begin{array}{c} 0.001 \\ 0.021 \\ 0.022 \\$	Groundnut meal (11)	10.00 11.00	10.02 ± 0.10 10.43 ± 0.09	64.00 69.00	66.07 ± 0.48	
Joycan field12.5 </td <td>Souhean meal (13)</td> <td>12 20 13 00</td> <td>10.43 ± 0.09</td> <td>76.00 80.00</td> <td>78.41 ± 0.32</td>	Souhean meal (13)	12 20 13 00	10.43 ± 0.09	76.00 80.00	78.41 ± 0.32	
$ \begin{array}{c} \text{Condinated intar} (15) & 5.15-0.02 & 5.01 \pm 0.04 & 01.2-0.07 & 0.5.03 \pm 0.207 \\ \text{Surflower meal} (12) & 8.50-0.02 & 8.00 \pm 0.08 & 56.00-60.00 & 57.50 \pm 0.41 \\ \text{Guar korma} (18) & 12.61-14.23 & 13.51 \pm 0.13 & 77.77-86.48 & 82.63 \pm 0.07 \\ \text{Mustard oil ca(s (30) & 11.75-14.08 & 13.16 \pm 0.11 & 73.15-85.70 & 80.76 \pm 0.60 \\ \text{Safflower meal} (12) & 8.03-09.48 & 8.50 \pm 0.09 & 53.37-58.54 & 55.22 \pm 1.08 \\ \text{Soybean flakes} (12) & 10.01-11.50 & 10.54 \pm 0.11 & 64.45-68.14 & 66.71 \pm 0.24 \\ \text{Isabgol lail} (12) & 12.50-14.04 & 13.22 \pm 0.25 & 79.85-82.45 & 81.06 \pm 0.67 \\ \text{Isabgol lail} (12) & 10.45-12.47 & 11.72 \pm 0.15 & 71.48-75.89 & 72.89 \pm 1.42 \\ Dryr moghages & & & & & & & & & & & & & & & & & & &$	Cottonseed meal (30)	0.53 10.35	9.87 ± 0.00	61 25 65 67	73.41 ± 0.32	
	Sunflower meet (12)	9.55-10.55	9.87 ± 0.04	56.00 60.00	03.08 ± 0.20 57 50 ± 0.41	
$ \begin{array}{c} \text{Gatar Norma} (18) & 12.61 - 14.23 & 13.51 \pm 0.13 & 7.17 - 80-48 & 52.05 \pm 0.07 \\ \text{Mustard oil cake (30) } 11.75 - 14.08 & 13.16 \pm 0.11 & 73.15 - 85.70 & 80.76 \pm 0.66 \\ \text{Safflower meal} (12) & 6.30 - 07.66 & 7.21 \pm 0.13 & 45.31 - 51.20 & 48.80 + 0.71 \\ \text{Maize bran} (12) & 10.01 - 11.50 & 10.54 \pm 0.11 & 64.45 - 68.14 & 66.71 \pm 0.24 \\ \text{Isabgol lail} (12) & 12.50 - 14.04 & 13.22 \pm 0.25 & 79.85 - 82.45 & 81.06 \pm 0.47 \\ \text{Isabgol lail} (12) & 10.50 - 14.04 & 13.22 \pm 0.25 & 79.85 - 82.45 & 81.06 \pm 0.67 \\ \text{Isabgol lail} (12) & 10.45 - 12.47 & 11.72 \pm 0.15 & 71.48 - 75.89 & 72.89 \pm 1.42 \\ Dry mughages & & & & & & & & & & & & & & & & & & &$	Sumower mean (12)	8.30-09.20	6.60 ± 0.06	30.00-00.00	57.50 ± 0.41	
	Guar korma (18)	12.01-14.23	13.51 ± 0.13	//.//-80.48	82.03 ± 0.70	
Salflower meal (12)6.30-07.66b7.21 ± 0.1345.1-51.2048.80± 0.71Maize bran (12)8.03-09.488.50 ± 0.0953.37-58.5465.22± 1.08Soybean flakes (12)10.01-11.5010.54 ± 0.1164.45-68.1466.71 ± 0.24Isabgol lail (12)12.50-14.0413.22 ± 0.2579.85-82.4581.06 ± 0.47Isabgol lail (12)10.45-12.4711.72 ± 0.1571.48-75.8972.89 ± 1.42Paddy straw (25)5.31 - 6.406.01 ± 0.1440.91 + 44.1742.36 ± 0.38Morar straw (20)7.03 - 8.488.14 ± 0.2346.37 - 56.5451.91 ± 1.08Bajra straw (12)6.07 - 7.106.31 ± 0.0241.53 - 47.1245.11 ± 1.10Maize straw (12)6.07 - 7.366.40 ± 0.1945.45 - 4.90.147.44 ± 0.92Sugarcane tops (12)5.50 - 6.806.10 ± 0.1444.13 - 45.9943.61 ± 0.84Maize straw (12)5.50 - 6.806.10 ± 0.1444.13 - 45.9943.61 ± 0.84Maize straw (12)7.56 - 9.018.93 ± 0.125.64.5 - 60.125.86.2 ± 0.88Masco straw (12)5.43 - 6.926.29 ± 0.0540.15 - 4.66.542.99 ± 0.70Green nonghages33.61-42.037.23 ± 0.4737.23 ± 0.47Rice bask (15)4.15 - 4.624.48 ± 0.1518.85 - 25.1322.23 ± 0.83Green nonghages33.61-42.037.23 ± 0.4757.24 ± 0.0444.75-50.0947.92 ± 0.43Hedge lucerne (9)6.13 - 6.716.52 ± 0.0341.50 - 55.05 ± 0.1245.86 ± 0.46Sylo (9)7.30 - 8.84 <td< td=""><td>Mustard oil cake (30)</td><td>11.75-14.08</td><td>13.16 ± 0.11</td><td>/3.15-85.70</td><td>80.76 ± 0.60</td></td<>	Mustard oil cake (30)	11.75-14.08	13.16 ± 0.11	/3.15-85.70	80.76 ± 0.60	
Marze bran (12)8.03-49.488.20 ± 0.095.3.7>8.5.455.22± 1.08Soybean flaks (12)10.01-11.5010.54 ± 0.1164.45-68.1466.71 ± 0.24Isabgol jerraru (12)10.45-12.4711.72 ± 0.1571.48-75.8972.89 ± 1.42Dry roughages10.45-12.4711.72 ± 0.1571.48-75.8972.89 ± 1.42Pady straw (25)5.31 - 6.406.01 ± 0.1440.91 - 44.1742.36 ± 0.38Meat straw (21)7.03 - 8.488.14 ± 0.2346.37 - 56.5451.91 ± 1.08Barja straw (12)5.70 - 7.106.31 ± 0.2041.53 - 47.1245.41 ± 1.10Maize straw (12)5.05 - 6.806.10 ± 0.1444.13 - 4.5943.61 ± 0.84Groundnut straw (12)7.56 - 9.018.93 ± 0.1256.45 - 60.1258.62 ± 0.88Mascor straw (12)5.43 - 6.926.29 ± 0.0540.15 - 46.6542.99 ± 0.70Rice husk (15)4.15 - 4.624.48 ± 0.1518.85 - 25.1322.23 ± 0.83Green roughages3.61-42.07.33 ± 0.0446.47-50.0947.22 ± 0.43Barboo laeves (30)4.38-5.955.05 ± 0.093.61-42.037.23 ± 0.47Rice husk (15)4.15 - 4.624.48 ± 0.1518.85 - 25.1322.23 ± 0.83Green roughages3.61-62.04.48 ± 0.1518.85 - 25.1322.23 ± 0.83Green roughages3.61-42.037.23 ± 0.473.52 ± 0.464.54 + 50.94Green pain grass (9)6.30-7.586.97 ± 0.0745.6943.86 ± 0.46Butterfly pea (9)6.39-7.557.24 ± 0.0445.47	Safflower meal (12)	6.30-07.66	7.21 ± 0.13	45.31-51.20	48.80 ± 0.71	
Soybean flakes (12)10.01-11.5010.54 ± 0.1164.3-68.1466.71 ± 0.24Isabgol lai (12)12.50-14.0413.22 ± 0.2579.85-82.4581.06 ± 0.47Isabgol lai (12)10.45-12.4711.72 ± 0.1571.48-75.8972.89 ± 1.42Pady straw (25)5.31 - 6.406.01 ± 0.1440.91 - 44.1742.36 ± 0.38Meat straw (25)5.40 - 6.906.25 ± 0.1040.03 - 46.5244.56 ± 0.54Jowar straw (20)7.03 - 8.488.14 ± 0.236.37 - 56.5451.91 ± 1.08Bajra straw (12)6.03 - 7.366.40 ± 0.1945.45 - 4.90.147.44 ± 0.92Sugarcane tops (12)5.50 - 6.806.10 ± 0.1444.13 - 45.9943.61 ± 0.84Groundnut straw (12)7.56 - 9.018.93 ± 0.1256.65 - 60.1258.62 ± 0.88Green roughages6.00 ± 0.1444.13 - 45.9943.61 ± 0.844.85 ± 20.13Bascor straw (12)5.43 - 6.926.29 ± 0.0540.15 - 46.6542.99 ± 0.70Rice has(15)4.15 - 4.624.48 ± 0.1518.85 ± 25.1322.23 ± 0.83Green roughages71.77.757.33 ± 0.0445.47-50.0947.92 ± 0.43Batterfly pa (9)6.33 - 7.557.24 ± 0.0445.47-50.0947.92 ± 0.43Hedge lucerne (9)6.13-6.716.52 ± 0.0341.50-45.6943.86 ± 0.46Butterfly pa (9)6.50 - 7.686.97 ± 0.0745.05-15.1147.99 ± 0.72Strattor (9)6.50 - 7.686.97 ± 0.0745.55 ± 0.51.3147.99 ± 0.54Green panic grass (9)6.33 - 7.447.1	Maize bran (12)	8.03-09.48	8.50 ± 0.09	53.37-58.54	55.22 ± 1.08	
	Soybean flakes (12)	10.01–11.50	10.54 ± 0.11	64.45-68.14	66.71 ± 0.24	
	Isabgol lali (12)	12.50-14.04	13.22 ± 0.25	79.85-82.45	81.06 ± 0.47	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	Isabgol jeeraru (12)	10.45–12.47	11.72 ± 0.15	71.48–75.89	72.89 ± 1.42	
Paddy straw (25) $5.31 - 6.40$ 6.01 ± 0.14 $40.91 - 44.17$ 42.36 ± 0.38 Wheat straw (20) $7.03 - 8.48$ 8.14 ± 0.23 $46.37 - 56.54$ 51.91 ± 1.08 Bayra straw (12) $5.70 - 7.10$ 6.31 ± 0.20 $41.33 - 47.12$ 45.41 ± 1.10 Maize straw (12) $5.70 - 7.10$ 6.31 ± 0.20 $41.33 - 47.12$ 45.41 ± 1.10 Maize straw (12) $5.50 - 6.80$ 6.10 ± 0.19 $45.45 - 49.01$ 47.44 ± 0.92 Sugarcane tops (12) $5.50 - 6.80$ 6.10 ± 0.14 $41.3 - 45.99$ 43.61 ± 0.84 Groundnut straw (12) $5.43 - 6.92$ 6.29 ± 0.05 $40.15 - 46.65$ 42.99 ± 0.70 Rice husk (15) $4.15 - 4.62$ 4.48 ± 0.15 $18.85 - 25.13$ 22.23 ± 0.83 <i>Green roughagesanboo</i> $4.38 - 5.95$ 5.05 ± 0.09 $33.61 - 42.0$ 37.23 ± 0.47 Rice bean (9) $6.13 - 6.71$ 6.52 ± 10.3 $41.50 - 45.69$ 43.86 ± 0.46 Butterfly pea (9) $6.93 - 7.55$ 7.24 ± 0.04 $45.47 - 50.25$ 47.52 ± 0.46 Nandi grass (9) $6.50 - 7.68$ 6.85 ± 0.06 $46.45 - 50.06$ 47.99 ± 0.72 Nandi grass (9) $6.30 - 7.68$ 6.69 ± 0.07 $45.01 - 51.31$ 47.99 ± 0.72 Siratro (9) $6.30 - 7.68$ 6.62 ± 0.04 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92 - 7.22$ 6.44 ± 0.08 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92 - 7.22$ 6.44 ± 0.08 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) </td <td>Dry roughages</td> <td></td> <td></td> <td></td> <td></td>	Dry roughages					
Wheat straw (25) $5.40 - 6.90$ 6.25 ± 0.10 $40.03 - 46.52$ 44.56 ± 0.54 <i>Bajra</i> straw (20) $7.03 - 8.48$ 8.14 ± 0.23 $46.37 \cdot 56.54$ 51.91 ± 1.08 <i>Bajra</i> straw (12) $6.03 - 7.36$ 6.40 ± 0.19 $45.45 \cdot 49.01$ 47.44 ± 0.92 Sugarcane tops (12) $5.50 - 6.80$ 6.10 ± 0.14 $44.13 - 45.99$ 43.61 ± 0.84 Groundnut straw (12) $7.56 - 9.01$ 8.93 ± 0.12 $56.45 \cdot 60.12$ 58.62 ± 0.88 Mascor straw (12) $5.43 - 6.92$ 6.29 ± 0.05 $40.15 \cdot 46.65$ 42.99 ± 0.70 Rice husk (15) $4.15 - 4.62$ 4.48 ± 0.15 $18.85 - 25.13$ 22.23 ± 0.83 <i>Green roughagesBamboo leaves</i> (30) $4.38 - 5.95$ 5.05 ± 0.09 $33.61 - 42.0$ 37.23 ± 0.47 Rice bean (9) $7.17 - 7.53$ 7.33 ± 0.04 $46.47 - 50.09$ 43.86 ± 0.46 Butterfly pea (9) $6.53 - 7.55$ 7.24 ± 0.04 $45.47 - 50.25$ 47.52 ± 0.46 Sylo (9) $7.30 - 8.84$ 7.92 ± 0.10 $49.29 - 54.71$ 51.99 ± 0.67 Nandi grass (9) $6.50 - 7.68$ 6.87 ± 0.07 $45.01 - 51.31$ 47.49 ± 0.72 Siratro (9) $6.33 - 7.44$ 7.12 ± 0.03 $46.75 - 50.06$ 48.31 ± 0.33 Guinea grass (9) $5.92 - 7.22$ 6.44 ± 0.08 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92 - 7.22$ 6.44 ± 0.04 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $7.31 - 8.77$ 7.55 ± 0.04 $49.35 - 52.33$ 50.62 ± 0.04 Rhodes	Paddy straw (25)	5.31 - 6.40	6.01 ± 0.14	40.91 - 44.17	42.36 ± 0.38	
$ Jowar straw (20) 7.03 = 8.48 8.14 \pm 0.23 46.37 - 56.54 51.91 \pm 1.08 \\ Bajra straw (12) 5.70 - 7.10 6.31 \pm 0.20 41.53 - 47.12 45.41 \pm 1.10 \\ Maize straw (12) 6.03 - 7.36 6.40 \pm 0.19 45.45 - 49.01 47.44 \pm 0.92 \\ Sugarcane tops (12) 5.50 - 6.80 6.10 \pm 0.14 44.13 - 45.99 43.61 \pm 0.84 \\ Groundnut straw (12) 7.56 - 9.01 8.93 \pm 0.12 56.45 - 60.12 58.62 \pm 0.88 \\ Masoor straw (12) 5.43 - 6.92 6.29 \pm 0.05 40.15 - 46.65 42.99 \pm 0.70 \\ Rice husk (15) 4.15 - 4.62 4.48 \pm 0.15 18.85 - 25.13 22.33 \pm 0.87 \\ Rice housk (15) 7.17 - 7.53 7.33 \pm 0.04 46.47 - 50.09 47.92 \pm 0.43 \\ Hedge lucerne (9) 6.13 - 6.71 6.52 \pm 0.03 41.50 - 45.69 43.86 \pm 0.46 \\ Butterfly pea (9) 6.93 - 7.55 7.24 \pm 0.04 45.47 - 50.25 47.52 \pm 0.43 \\ Hedge lucerne (9) 6.33 - 7.54 7.24 \pm 0.04 45.47 - 50.25 47.52 \pm 0.46 \\ Butterfly pea (9) 6.50 - 7.68 6.97 \pm 0.07 45.01 - 51.31 47.49 \pm 0.72 \\ Strato (9) 6.30 - 7.86 6.85 \pm 0.06 47.99 \pm 0.54 \\ Strato (9) 6.30 - 7.86 6.85 \pm 0.06 47.50.06 47.99 \pm 0.54 \\ Strato (9) 6.30 - 7.68 6.60 \pm 0.04 43.93 - 47.07 45.54 \pm 0.34 \\ Para grass (9) 6.30 - 6.89 6.60 \pm 0.04 43.93 - 47.07 45.54 \pm 0.34 \\ Para grass (9) 7.92 - 8.60 8.20 \pm 0.05 52.60 - 56.24 54.13 \pm 0.52 \\ Congo signal grass (9) 7.92 - 8.60 8.20 \pm 0.05 52.60 - 56.24 54.13 \pm 0.52 \\ Congo signal grass (9) 7.92 - 8.60 8.20 \pm 0.05 52.60 - 56.24 54.13 \pm 0.52 \\ Congo signal grass (9) 7.92 - 8.60 8.20 \pm 0.03 53.73 - 56.65 55.21 \pm 0.28 \\ Blue panic grass (9) 7.31 - 7.87 7.55 \pm 0.04 43.35 - 52.33 50.62 \pm 0.33 \\ Hybrid Napier bajra CO3 (9) 6.72 - 7.57 7.13 \pm 0.03 46.75 - 50.16 48.34 \pm 0.52 \\ Congo signal grass (9) 7.31 - 7.87 7.55 \pm 0.04 43.35 - 52.33 50.62 \pm 0.33 \\ Hybrid Napier bajra CO1 (9) 6.92 - 8.09 7.46 \pm 0.08 41.89 - 48.85 44.69 \pm 0.81 \\ Para grass (9) 7.31 - 7.87 7.55 \pm 0.04 43.73 - 55.55 53.34 \pm 0.52 \\ Hybrid Napier bajra CO1 (9) 7.69 - 8.47 8.40 \pm 0.11 52.52 - 57.70 55.20 \pm 0.59 \\ $	Wheat straw (25)	5.40 - 6.90	6.25 ± 0.10	40.03 - 46.52	44.56 ± 0.54	
Bajra straw (12)5.707.106.31 ± 0.2041.5347.1245.41 ± 1.10Maize straw (12)6.03-7.366.40 ± 0.1945.45-49.0147.44 ± 0.92Sugarcane tops (12)5.50-6.806.10 ± 0.1444.13-45.9943.61 ± 0.84Groundnut straw (12)7.56-9.018.93 ± 0.1256.45-60.1258.62 ± 0.88Masoor straw (12)5.43-6.926.29 ± 0.0540.15-46.6542.99 ± 0.70Rice husk (15)4.15-4.624.48 ± 0.1518.85-25.1322.23 ± 0.83Green roughagesBamboo leaves (30)4.38-5.955.05 ± 0.0933.61-42.037.23 ± 0.47Rice bean (9)7.17-7.537.33 ± 0.0446.47-50.0947.92 ± 0.43Hedge lucerne (9)6.13-6.716.52 ± 0.0341.50-45.6643.86 ± 0.46Stylo (9)7.30-8.847.92 ± 0.1049.29-54.7151.99 ± 0.67Nandi grass (9)6.50-7.686.87 ± 0.0745.01-51.3147.49 ± 0.72Stratro (9)6.30-6.896.60 ± 0.0443.93-47.0745.54 ± 0.34Rhobes grass (9)5.92-7.226.44 ± 0.0841.89-48.8544.69 ± 0.81Para grass (9)7.92-8.608.20 ± 0.0552.06-56.2454.13 ± 0.52Congo signal grass (9)7.31-7.877.55 ± 0.0449.35-52.3350.62 ± 0.36Dhaman grass (9)5.35-5.925.70 ± 0.0333.73-56.6555.21 ± 0.28Blue panic grass (9)7.31-7.877.35 ± 0.0447.27-53.50 <td< td=""><td>Jowar straw (20)</td><td>7.03 - 8.48</td><td>8.14 ± 0.23</td><td>46.37 - 56.54</td><td>51.91 ± 1.08</td></td<>	Jowar straw (20)	7.03 - 8.48	8.14 ± 0.23	46.37 - 56.54	51.91 ± 1.08	
Maize straw (12)6.03 - 7.366.40 \pm 0.1945.45 - 49.0147.44 \pm 0.92Sugarcane tops (12)5.50 - 6.806.10 \pm 0.1444.13 - 45.9943.61 \pm 0.84Groundnut straw (12)5.43 - 6.926.29 \pm 0.0540.15 - 46.6542.99 \pm 0.70Rice husk (15)4.15 - 4.624.48 \pm 0.1518.85 - 25.1322.23 \pm 0.83 <i>Green roughages</i> 7.17 - 7.537.33 \pm 0.0446.47 - 50.0947.92 \pm 0.43Hedge lucerne (9)6.13 - 6.716.52 \pm 0.0341.50 - 45.6943.86 \pm 0.47Rice bean (9)7.17 - 7.537.24 \pm 0.0445.47 - 50.2547.52 \pm 0.43Hedge lucerne (9)6.33 - 7.557.24 \pm 0.0445.47 - 50.2547.52 \pm 0.46Style (9)7.30 - 8.847.92 \pm 0.1042.92 - 54.7151.99 \pm 0.67Nandi grass (9)6.50 - 7.686.85 \pm 0.0646.45 - 50.0647.99 \pm 0.53Green panic grass (9)6.33 - 7.447.12 \pm 0.0346.75 - 50.0647.99 \pm 0.54Green panic grass (9)6.33 - 7.447.12 \pm 0.0346.75 - 50.0647.99 \pm 0.54Green panic grass (9)6.32 - 7.226.44 \pm 0.0841.89 - 48.8544.69 \pm 0.81Para grass (9)7.92 - 8.608.20 \pm 0.0552.60 - 56.2454.13 \pm 0.52Congo signal grass (9)7.31 - 7.877.55 \pm 0.0449.35 - 52.3350.62 \pm 0.36Hybrid Napier bajra CO1 (9)6.92 - 7.457.13 \pm 0.0446.20 - 50.1048.36 \pm 0.43Hybrid Napier bajra PBN2 30 (9)7.40 - 8.478.15	Bajra straw (12)	5.70 - 7.10	6.31 ± 0.20	41.53 - 47.12	45.41 ± 1.10	
Sugarcane tops (12)5.50 - 6.806.10 \pm 0.1444.13 - 45.9943.61 \pm 0.88Groundnut straw (12)7.56 - 9.018.93 \pm 0.1256.45 - 60.1258.62 \pm 0.88Masoor straw (12)5.43 - 6.926.29 \pm 0.0540.15 - 46.6542.99 \pm 0.70Rice husk (15)4.15 - 4.624.48 \pm 0.1518.85 - 25.1322.23 \pm 0.83Green roughages	Maize straw (12)	6.03 - 7.36	6.40 ± 0.19	45.45 - 49.01	47.44 ± 0.92	
Groundnut straw (12)7.56 - 9.01 8.93 ± 0.12 $5.645 - 60.12$ 58.62 ± 0.88 Masoor straw (12) $5.43 - 6.92$ 6.29 ± 0.05 $40.15 - 46.65$ 42.99 ± 0.70 Rice husk (15) $4.15 - 4.62$ 4.48 ± 0.15 $18.85 - 25.13$ 22.23 ± 0.83 <i>Green roughages</i> $7.17 - 7.53$ 7.33 ± 0.04 $46.47 - 50.09$ 47.92 ± 0.43 Hedge lucerne (9) $6.13 - 6.71$ 6.52 ± 0.03 $41.50 - 45.69$ 43.86 ± 0.46 Butterfly pea (9) $6.93 - 7.55$ 7.24 ± 0.04 $45.47 - 50.25$ 47.52 ± 0.46 Nandi grass (9) $6.50 - 7.68$ 6.97 ± 0.07 $45.01 - 51.31$ 47.49 ± 0.72 Siratro (9) $6.53 - 7.74$ 7.12 ± 0.03 $46.75 - 50.06$ 48.31 ± 0.33 Guinea grass (9) $6.30 - 7.88$ 6.97 ± 0.07 $45.01 - 51.31$ 47.49 ± 0.72 Siratro (9) $6.30 - 6.89$ 6.60 ± 0.04 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92 - 7.22$ 6.44 ± 0.08 $41.89 - 48.85$ 44.69 ± 0.81 Para grass (9) $7.31 - 7.87$ 7.55 ± 0.04 $49.35 - 52.33$ 50.62 ± 0.36 Congo signal grass (9) $7.31 - 7.87$ 7.55 ± 0.04 $49.35 - 52.33$ 50.62 ± 0.33 Hybrid Napier bajra CO1 (9) $6.92 - 8.09$ 7.46 ± 0.08 $47.2 - 53.50$ 50.1 ± 0.28 Hybrid Napier bajra CO3 (9) $7.2 - 8.67$ 7.13 ± 0.04 $46.20 - 50.10$ 48.36 ± 0.43 Hybrid Napier bajra RD3 (9) $7.69 - 8.47$ 8.15 ± 0.33 $51.37 - 5.55$ 53.83 ± 0.32 Hyb	Sugarcane tops (12)	5.50 - 6.80	6.10 ± 0.14	44.13 - 45.99	43.61 ± 0.84	
Masoor straw (12) $5.43 - 6.92$ 6.29 ± 0.05 $40.15 - 46.65$ 42.99 ± 0.70 Rice husk (15) $4.15 - 4.62$ 4.48 ± 0.15 $18.85 \cdot 25.13$ 22.23 ± 0.83 Bamboo leaves (30) $4.38 - 5.95$ 5.05 ± 0.09 $33.61 - 42.0$ 37.23 ± 0.47 Rice bean (9) $7.17 - 7.53$ 7.33 ± 0.04 $46.47 - 50.09$ 47.92 ± 0.43 Hedge lucerne (9) $6.13 - 6.71$ 6.52 ± 0.03 $41.50 - 45.69$ 43.86 ± 0.46 Butterfly pea (9) $6.93 - 7.55$ 7.24 ± 0.04 $45.47 - 50.25$ 47.52 ± 0.46 Style (9) $7.30 - 8.84$ 7.92 ± 0.10 $49.29 - 54.71$ 51.99 ± 0.67 Nandi grass (9) $6.50 - 7.68$ 6.87 ± 0.06 $46.45 - 50.06$ 47.99 ± 0.54 Green panic grass (9) $6.33 - 7.44$ 7.12 ± 0.03 $46.75 - 50.06$ 48.31 ± 0.33 Guinea grass (9) $6.30 - 6.89$ 6.60 ± 0.04 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $7.92 - 8.60$ 8.20 ± 0.05 $52.60 - 56.24$ 54.13 ± 0.52 Congo signal grass (9) $7.31 - 7.87$ 7.55 ± 0.04 $49.35 - 52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13 - 8.67$ 8.40 ± 0.03 $53.73 - 56.65$ 55.21 ± 0.28 Blue panic grass (9) $6.32 - 7.45$ 7.13 ± 0.04 $46.20 - 50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92 - 8.09$ 7.46 ± 0.08 $47.27 - 53.50$ 50.13 ± 0.84 Hybrid Napier bajra PBN23 (9) $7.69 - 8.47$ 8.15 ± 0.33 $51.37 - 55.5$ 53.83 ± 0.32	Groundnut straw (12)	7.56 - 9.01	8.93 ± 0.12	56.45 - 60.12	58.62 ± 0.88	
Rice husk (15) $4.15 - 4.62$ 4.48 ± 0.15 $18.85 - 25.13$ 22.23 ± 0.83 Green roughages 3 2 23 ± 0.47 $33.61 - 42.0$ 37.23 ± 0.47 Rice bean (9) $7.17 - 7.53$ 7.33 ± 0.04 $46.47 - 50.09$ 47.92 ± 0.43 Hedge lucerne (9) $6.13 - 6.71$ 6.52 ± 0.03 $41.50 - 45.69$ 43.86 ± 0.46 Butterfly pea (9) $6.93 - 7.55$ 7.24 ± 0.04 $45.47 - 50.25$ 47.52 ± 0.46 Stylo (9) $7.30 - 8.84$ 7.92 ± 0.10 $49.29 - 54.71$ 51.99 ± 0.67 Nandi grass (9) $6.50 - 7.68$ 6.97 ± 0.07 $45.01 - 51.31$ 47.49 ± 0.72 Green panic grass (9) $6.33 - 7.44$ 7.12 ± 0.03 $46.75 - 50.06$ 48.31 ± 0.33 Guine grass (9) $6.30 - 6.89$ 6.60 ± 0.04 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92 - 7.22$ 6.44 ± 0.08 $41.89 - 48.85$ 44.69 ± 0.81 Para grass (9) $7.92 - 8.60$ 8.20 ± 0.05 $5.26 - 56.24$ $51.13 - 55.23$ Congo signal grass (9) $7.31 - 7.87$ 7.55 ± 0.04 $49.35 - 52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13 - 8.67$ 8.40 ± 0.03 $53.73 - 56.65$ 55.21 ± 0.28 Dhaman grass (9) $5.32 - 5.92$ 5.70 ± 0.03 $38.84 - 41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72 - 7.45$ 7.13 ± 0.04 $46.20 - 50.10$ 48.36 ± 0.43 Hybrid Napier bajra PBN233 (9) $7.69 - 8.47$ 8.15 ± 0.33 $51.37 - 55.55$ 53.83 ± 0.32 Hybrid Na	Masoor straw (12)	5.43 - 6.92	6.29 ± 0.05	40.15 - 46.65	42.99 ± 0.70	
Another the transformation of tra	Rice husk (15)	4.15 - 4.62	4.48 ± 0.15	18.85 - 25.13	22.23 ± 0.83	
Bamboo leaves (30) $4.38-5.95$ 5.05 ± 0.09 $33.61-42.0$ 37.23 ± 0.47 Rice bean (9) $7.17-7.53$ 7.33 ± 0.04 $46.47-50.09$ 47.92 ± 0.43 Hedge lucerne (9) $6.13-6.71$ 6.52 ± 0.03 $41.50-45.69$ 43.86 ± 0.46 Butterfly pea (9) $6.93-7.55$ 7.24 ± 0.04 $45.47-50.25$ 47.52 ± 0.46 Style (9) $7.30-8.84$ 7.92 ± 0.10 $49.29-54.71$ 51.99 ± 0.67 Nandi grass (9) $6.50-7.68$ 6.87 ± 0.06 $46.45-50.06$ 47.99 ± 0.54 Green panic grass (9) $6.33-7.44$ 7.12 ± 0.03 $46.75-50.06$ 48.31 ± 0.33 Guine grass (9) $6.30-6.89$ 6.60 ± 0.04 $43.93-47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92-7.22$ 6.44 ± 0.08 $41.89-48.85$ 44.69 ± 0.81 Para grass (9) $7.92-8.60$ 8.20 ± 0.05 $52.60-56.24$ 54.13 ± 0.52 Congo signal grass (9) $7.31-7.87$ 7.55 ± 0.04 $49.33-52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13-8.67$ 8.40 ± 0.03 $53.73-56.65$ 52.21 ± 0.28 Blue panic grass (9) $5.35-5.92$ 5.70 ± 0.03 $38.84-41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.37 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN23 (9) $7.20-8.08$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN23 (9) $7.69-8.47$ </td <td>Green roughages</td> <td></td> <td></td> <td></td> <td></td>	Green roughages					
Rice beam (9)1.10<	Bamboo leaves (30)	4 38-5 95	5.05 ± 0.09	33 61-42 0	3723 ± 047	
IncorrectionInternationInternationHedge lucerne(9)6.13-6.716.52 \pm 0.0341.50-45.6943.86 \pm 0.46Butterfly pea (9)6.93-7.557.24 \pm 0.0445.47-50.2547.52 \pm 0.46Stylo (9)7.30-8.847.92 \pm 0.1049.29-54.7151.99 \pm 0.67Nandi grass (9)6.50-7.686.97 \pm 0.0745.01-51.3147.49 \pm 0.72Green panic grass (9)6.33-7.447.12 \pm 0.0346.75-50.0648.31 \pm 0.33Guine grass (9)6.30-6.896.00 \pm 0.0443.93-47.0745.54 \pm 0.34Rhodes grass (9)5.92-7.226.44 \pm 0.0841.89-48.8544.69 \pm 0.81Para grass (9)7.92-8.608.20 \pm 0.0552.60-56.2454.13 \pm 0.52Congo signal grass (9)7.31-7.877.55 \pm 0.0449.35-52.3350.62 \pm 0.36Dhaman grass (9)8.13-8.678.40 \pm 0.0353.73-56.6555.21 \pm 0.28Dhaman grass (9)5.35-5.925.70 \pm 0.0338.84-41.8840.72 \pm 0.33Hybrid Napier bajra CO3 (9)6.72-7.457.13 \pm 0.0446.20-50.1048.36 \pm 0.43Hybrid Napier bajra PBN233 (9)6.99-7.667.30 \pm 0.0447.61-51.2349.30 \pm 0.37Hybrid Napier bajra PBN233 (9)7.69-8.478.15 \pm 0.3351.37-55.5553.83 \pm 0.3351.37-55.5553.83 \pm 0.32Hybrid Napier bajra PBN231 (9)6.80-9.417.41 \pm 0.2646.62-60.6149.90 \pm 1.39Hybrid Napier bajra PBN231 (9)7.09-8.878.40 \pm 0.1152.52-57.70 <td< td=""><td>Rice bean (9)</td><td>7 17-7 53</td><td>733 ± 0.04</td><td>46 47-50 09</td><td>47.92 ± 0.43</td></td<>	Rice bean (9)	7 17-7 53	733 ± 0.04	46 47-50 09	47.92 ± 0.43	
Inclusion (b)0.190.190.110.12 ± 0.0011.0011.0012.00Butterfly pea (9)6.93–7.557.24 ± 0.0445.47–50.2547.52 ± 0.46Stylo (9)7.30–8.847.92 ± 0.1049.29–54.7151.99 ± 0.67Nandi grass (9)6.50–7.686.85 ± 0.0646.45–50.0647.99 ± 0.54Green panic grass (9)6.33–7.447.12 ± 0.0346.75–50.0648.31 ± 0.33Guinea grass (9)6.30–6.896.60 ± 0.0443.93–47.0745.54 ± 0.34Rhodes grass (9)5.92–7.226.44 ± 0.0841.89–48.8544.69 ± 0.81Para grass (9)7.92–8.608.20 ± 0.0552.60–56.2454.13 ± 0.52Congo signal grass (9)7.31–7.877.55 ± 0.0449.35–52.3350.62 ± 0.36Dhaman grass (9)8.13–8.678.40 ± 0.0353.73–56.6555.21 ± 0.28Blue panic grass (9)5.35–5.925.70 ± 0.0338.84–41.8840.72 ± 0.33Hybrid Napier bajra CO3 (9)6.72–7.457.13 ± 0.0446.20–50.1048.36 ± 0.43Hybrid Napier bajra PBN23 (9)7.667.30 ± 0.0447.61–51.2349.30 ± 0.37Hybrid Napier bajra PBN23 (9)7.21–8.027.55 ± 0.0848.79–53.1550.61 ± 0.44Hybrid Napier bajra PBN23 (9)7.21–8.027.55 ± 0.0848.79–53.1550.61 ± 0.44Hybrid Napier bajra RBC 2 (9)7.03 – 8.087.33 ± 0.1147.86–53.4850.53 ± 0.59Cowpea EC 4216 (9)7.20–8.107.71 ± 0.1248.6–56.7653.17 ± 0.98Cowpea EC 4216 (9) <td>Hedge lucerne (9)</td> <td>6 13-6 71</td> <td>652 ± 0.03</td> <td>41 50-45 69</td> <td>43.86 ± 0.46</td>	Hedge lucerne (9)	6 13-6 71	652 ± 0.03	41 50-45 69	43.86 ± 0.46	
Butterity perform $6.50 - 7.63$ 7.92 ± 0.10 $49.29 - 54.71$ 51.99 ± 0.67 Nandi grass (9) $6.50 - 7.68$ 6.87 ± 0.07 $45.01 - 51.31$ 47.49 ± 0.72 Siratro (9) $6.50 - 7.68$ 6.85 ± 0.06 $46.45 - 50.06$ 47.99 ± 0.54 Green panic grass (9) $6.33 - 7.44$ 7.12 ± 0.03 $46.75 - 50.06$ 48.31 ± 0.33 Guinea grass (9) $6.30 - 6.89$ 6.60 ± 0.04 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92 - 7.22$ 6.44 ± 0.08 $41.89 - 48.85$ 44.69 ± 0.81 Para grass (9) $7.92 - 8.60$ 8.20 ± 0.05 $52.60 - 56.24$ 54.13 ± 0.52 Congo signal grass (9) $7.31 - 7.87$ 7.55 ± 0.04 $49.35 - 52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13 - 8.67$ 8.40 ± 0.03 $53.73 - 56.65$ 55.21 ± 0.28 Blue panic grass (9) $5.35 - 5.92$ 5.70 ± 0.03 $38.84 - 41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72 - 7.45$ 7.13 ± 0.04 $46.20 - 50.10$ 48.36 ± 0.43 Hybrid Napier bajra PBN233 (9) $6.99 - 7.66$ 7.30 ± 0.04 $47.61 - 51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN231 (9) $6.80 - 9.41$ 7.41 ± 0.26 $46.62 - 60.61$ 49.90 ± 1.39 Hybrid Napier bajra CO4 (9) $7.90 - 8.87$ 8.40 ± 0.11 $52.52 - 57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20 - 8.10$ 7.71 ± 0.12 $48.76 - 53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.19 - 8.69$ 8.02 ± 0.18 $48.68 - 56.76$ <	Butterfly nea (9)	6.93_7.55	7.24 ± 0.03	45 47-50 25	47.52 ± 0.46	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Style (9)	7 30-8 84	7.24 ± 0.04 7.92 ± 0.10	49 29-54 71	51.99 ± 0.67	
Name grass (9) $0.30-7.08$ $0.9710.07$ $4.301-7.131$ 47.49 ± 0.72 Siratro (9) $6.50-7.68$ 6.85 ± 0.06 $46.45-50.06$ 47.99 ± 0.54 Green panic grass (9) $6.33-7.44$ 7.12 ± 0.03 $46.75-50.06$ 48.31 ± 0.33 Guinea grass (9) $5.92-7.22$ 6.44 ± 0.08 $41.89-48.85$ 44.69 ± 0.81 Para grass (9) $7.92-8.60$ 8.20 ± 0.05 $52.60-56.24$ 54.13 ± 0.52 Congo signal grass (9) $7.31-7.87$ 7.55 ± 0.04 $49.35-52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13-8.67$ 8.40 ± 0.03 $53.73-56.65$ 55.21 ± 0.28 Blue panic grass (9) $5.35-5.92$ 5.70 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra RBC 2 (9) $7.03-8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra RBC 2 (9) $7.03-8.08$ 7.53 ± 0.11 $47.86-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.9-25.36$ 50.53 ± 0.59 Cowpea EC 4216 (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13	Nandi grass (0)	6 50 7 68	6.07 ± 0.07	45 01 51 31	47.40 ± 0.72	
Shalo (9) $0.50 - 1.06$ 0.63 ± 0.00 $40.4 - 50.00$ 47.99 ± 0.34 Green panic grass (9) $6.33 - 7.44$ 7.12 ± 0.03 $46.75 - 50.06$ 48.31 ± 0.33 Guinea grass (9) $6.30 - 6.89$ 6.60 ± 0.04 $43.93 - 47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92 - 7.22$ 6.44 ± 0.08 $41.89 - 48.85$ 44.69 ± 0.81 Para grass (9) $7.92 - 8.60$ 8.20 ± 0.05 $52.60 - 56.24$ 54.13 ± 0.52 Congo signal grass (9) $7.31 - 7.87$ 7.55 ± 0.04 $49.35 - 52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13 - 8.67$ 8.40 ± 0.03 $53.73 - 56.65$ 55.21 ± 0.28 Blue panic grass (9) $5.35 - 5.92$ 5.70 ± 0.03 $38.84 - 41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO1 (9) $6.92 - 8.09$ 7.46 ± 0.08 $47.27 - 53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $6.99 - 7.66$ 7.30 ± 0.04 $47.61 - 51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN231 (9) $7.69 - 8.47$ 8.15 ± 0.33 $51.37 - 55.5$ 53.83 ± 0.32 Hybrid Napier bajra PBN2 (9) $7.21 - 8.02$ 7.55 ± 0.08 $48.79 - 53.15$ 50.61 ± 0.44 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86 - 53.48$ 50.53 ± 0.59 Hybrid Napier bajra PBN231 (9) $6.80 - 9.41$ 7.41 ± 0.26 $46.62 - 60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86 - 53.48$ 50.53 ± 0.59 Cowpea EC 4216 (9) $7.20 - 8.10$ $7.12 - 8.$	Siratro (0)	6 50 7 68	6.97 ± 0.07	45.01-51.51	47.49 ± 0.72	
Order paire grass (9) $0.35-7.44$ 7.12 ± 0.03 $40.75-0.00$ 43.31 ± 0.33 Guinea grass (9) $6.30-6.89$ 6.60 ± 0.04 $43.93-47.07$ 45.54 ± 0.34 Rhodes grass (9) $5.92-7.22$ 6.44 ± 0.08 $41.89-48.85$ 44.69 ± 0.81 Para grass (9) $7.92-8.60$ 8.20 ± 0.05 $52.60-56.24$ 54.13 ± 0.52 Congo signal grass (9) $7.31-7.87$ 7.55 ± 0.04 $49.35-52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13-8.67$ 8.40 ± 0.03 $53.73-56.65$ 55.21 ± 0.28 Blue panic grass (9) $5.35-5.92$ 5.70 ± 0.03 $38.84-41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN233 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra RBC 2 (9) $7.00-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mus	Green nanie gross (0)	6 22 7 44	0.85 ± 0.00 7 12 ± 0.02	46.75 50.06	47.99 ± 0.04	
Guinea grass (9) $6.30-0.89$ 6.00 ± 0.04 $4.3.9-47.07$ 45.34 ± 0.34 Rhodes grass (9) $5.92-7.22$ 6.44 ± 0.08 $41.89-48.85$ 44.69 ± 0.81 Para grass (9) $7.92-8.60$ 8.20 ± 0.05 $52.60-56.24$ 54.13 ± 0.52 Congo signal grass (9) $7.31-7.87$ 7.55 ± 0.04 $49.35-52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13-8.67$ 8.40 ± 0.03 $53.73-56.65$ 55.21 ± 0.28 Blue panic grass (9) $5.35-5.92$ 5.70 ± 0.03 $38.84-41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN233 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66	Cuince grass (9)	6 20 6 80	7.12 ± 0.03	40.75-50.00	40.31 ± 0.33	
Rhodes grass (9) $3.92-7.22$ 0.44 ± 0.08 $41.89-48.63$ 44.69 ± 0.81 Para grass (9) $7.92-8.60$ 8.20 ± 0.05 $52.60-56.24$ 54.13 ± 0.52 Congo signal grass (9) $7.31-7.87$ 7.55 ± 0.04 $49.35-52.33$ 50.62 ± 0.32 Dhaman grass (9) $8.13-8.67$ 8.40 ± 0.03 $53.73-56.65$ 55.21 ± 0.28 Blue panic grass (9) $5.35-5.92$ 5.70 ± 0.03 $38.84-41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ $50.53 \pm 0.53 \pm 0.59$ Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Bhadaa grass (9)	5.02.7.22	0.00 ± 0.04	45.95-47.07	43.34 ± 0.34	
Parta grass (9) $1.92-6.00$ 8.20 ± 0.03 $52.00-30.24$ 54.13 ± 0.32 Congo signal grass (9) $7.31-7.87$ 7.55 ± 0.04 $49.35-52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13-8.67$ 8.40 ± 0.03 $53.73-56.65$ 55.21 ± 0.28 Blue paric grass (9) $5.35-5.92$ 5.70 ± 0.03 $38.84-41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra RBC 2 (9) $7.02-8.10$ 7.11 ± 0.12 $48.76-53.59$ 51.44 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Ribbers grass (9)	7.02.8.60	0.44 ± 0.08	41.09-40.03	44.09 ± 0.81	
Congo signal grass (9) $7.31-7.87$ 7.35 ± 0.04 $49.35-52.33$ 50.62 ± 0.36 Dhaman grass (9) $8.13-8.67$ 8.40 ± 0.03 $53.73-56.65$ 55.21 ± 0.28 Blue panic grass (9) $5.35-5.92$ 5.70 ± 0.03 $38.84-41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN233 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN231 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra RBC 2 (9) $7.03-8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Para grass (9)	7.92-8.00	8.20 ± 0.03	32.00-30.24	54.15 ± 0.32	
Dhaman grass (9) $8.13-8.67$ 8.40 ± 0.03 $53.73-56.65$ 55.21 ± 0.28 Blue panic grass (9) $5.35-5.92$ 5.70 ± 0.03 $38.84-41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN83 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ $50.53 \pm 0.59 \pm 0.59$ Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Congo signal grass (9)	/.31-/.8/	7.55± 0.04	49.35-52.33	50.62 ± 0.36	
Blue panic grass (9) $5.35-5.92$ 5.70 ± 0.03 $38.84-41.88$ 40.72 ± 0.33 Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN83 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Dhaman grass (9)	8.13-8.67	8.40 ± 0.03	53.73-56.65	55.21 ± 0.28	
Hybrid Napier bajra CO3 (9) $6.72-7.45$ 7.13 ± 0.04 $46.20-50.10$ 48.36 ± 0.43 Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN83 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Blue panic grass (9)	5.35-5.92	5.70 ± 0.03	38.84-41.88	40.72 ± 0.33	
Hybrid Napier bajra CO1 (9) $6.92-8.09$ 7.46 ± 0.08 $47.27-53.50$ 50.13 ± 0.81 Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN83 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Hybrid Napier bajra CO3 (9)	6.72-7.45	7.13 ± 0.04	46.20-50.10	48.36 ± 0.43	
Hybrid Napier bajra PBN233 (9) $6.99-7.66$ 7.30 ± 0.04 $47.61-51.23$ 49.30 ± 0.37 Hybrid Napier bajra PBN83 (9) $7.69-8.47$ 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Hybrid Napier bajra CO1 (9)	6.92-8.09	7.46 ± 0.08	47.27-53.50	50.13 ± 0.81	
Hybrid Napier bajra PBN83 (9)7.69–8.47 8.15 ± 0.33 $51.37-55.55$ 53.83 ± 0.32 Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Hybrid Napier bajra PBN233 (9)	6.99–7.66	7.30 ± 0.04	47.61-51.23	49.30 ± 0.37	
Hybrid Napier bajra PBN2 (9) $7.21-8.02$ 7.55 ± 0.08 $48.79-53.15$ 50.61 ± 0.44 Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Hybrid Napier bajra PBN83 (9)	7.69-8.47	8.15 ± 0.33	51.37-55.55	53.83 ± 0.32	
Hybrid Napier bajra PBN231 (9) $6.80-9.41$ 7.41 ± 0.26 $46.62-60.61$ 49.90 ± 1.39 Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86-53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO ₄ (9) $7.90-8.87$ 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20-8.10$ 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Hybrid Napier bajra PBN2 (9)	7.21-8.02	7.55 ± 0.08	48.79–53.15	50.61 ± 0.44	
Hybrid Napier bajra RBC 2 (9) $7.03 - 8.08$ 7.53 ± 0.11 $47.86 - 53.48$ 50.53 ± 0.59 Hybrid Napier bajra CO4 (9) $7.90 - 8.87$ 8.40 ± 0.11 $52.52 - 57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9) $7.20 - 8.10$ 7.71 ± 0.12 $48.76 - 53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05 - 7.87$ 7.53 ± 0.08 $47.92 - 52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19 - 8.69$ 8.02 ± 0.18 $48.68 - 56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14 - 8.92$ 8.24 ± 0.12 $51.66 - 57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63 - 9.74$ 9.15 ± 0.13 $56.42 - 62.38$ 59.24 ± 0.70	Hybrid Napier bajra PBN231 (9)	6.80-9.41	7.41 ± 0.26	46.62-60.61	49.90 ± 1.39	
Hybrid Napier bajra CO_4 (9)7.90-8.87 8.40 ± 0.11 $52.52-57.70$ 55.20 ± 0.59 Cowpea EC 4216 (9)7.20-8.10 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9)7.05-7.87 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9)7.19-8.69 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9)7.14-8.92 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Hybrid Napier bajra RBC 2 (9)	7.03 - 8.08	7.53 ± 0.11	47.86-53.48	50.53 ± 0.59	
Cowpea EC 4216 (9)7.20-8.10 7.71 ± 0.12 $48.76-53.59$ 51.48 ± 0.64 Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Hybrid Napier bajra $CO_4(9)$	7.90-8.87	8.40 ± 0.11	52.52-57.70	55.20 ± 0.59	
Guinea grass CO2 (9) $7.05-7.87$ 7.53 ± 0.08 $47.92-52.36$ 50.53 ± 0.44 Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Cowpea EC 4216 (9)	7.20-8.10	7.71 ± 0.12	48.76-53.59	51.48 ± 0.64	
Hybrid sorghum (9) $7.19-8.69$ 8.02 ± 0.18 $48.68-56.76$ 53.17 ± 0.98 Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Guinea grass CO2 (9)	7.05-7.87	7.53 ± 0.08	47.92-52.36	50.53 ± 0.44	
Sugar beet (9) $7.14-8.92$ 8.24 ± 0.12 $51.66-57.98$ 54.31 ± 0.66 Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Hybrid sorghum (9)	7.19-8.69	8.02 ± 0.18	48.68-56.76	53.17 ± 0.98	
Mustard-Chinese cabbage (9) $8.63-9.74$ 9.15 ± 0.13 $56.42-62.38$ 59.24 ± 0.70	Sugar beet (9)	7.14-8.92	8.24 ± 0.12	51.66-57.98	54.31 ± 0.66	
	Mustard-Chinese cabbage (9)	8.63-9.74	9.15 ± 0.13	56.42-62.38	59.24 ± 0.70	
Mustard (9) $8.12-9.12$ 8.76 ± 0.13 $53.68-59.03$ 57.10 ± 0.69	Mustard (9)	8.12-9.12	8.76 ± 0.13	53.68-59.03	57.10 ± 0.69	

*Figures in parenthesis indicate number of samples.

It is concluded based on the present study that maize, groundnut straw and mustard Chinese cabbage had highest ME and TDN values in concentrate, dry and green roughages, respectively. The crude protein and energy values of various feed resources may be referred while formulating balanced ration for the animals, for a particular level of milk production and physiological status.

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