COMPARATIVE STUDIES ON THE PERFORMANCE OF SAHIWAL AND THEIR CROSS-BREDS FROM HOLSTEIN FRIESIAN AND JERSEY UNDER PAKISTAN CONDITIONS

2. Digestibility of various feed nutrients in heifers.

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A study was conducted to assess the digestibility of various feed nutrients by the Sahiwal and crossbred heifers kept at the Livestock Experiment Station, University of Agriculture, Faisalabad. Crossbred heifers were obtained by inseminating Sahiwal cows with the imported semen of Holstein Friesian and Jersey bulls. Three animals each of purebred Sahiwal, Sahiwal × Jersey, and Sahiwal × Holstein Friesian of the comparable age were fed *ad libitum*, a mixed balanced ration that contained 14.3 per cent crude protein and 66.7 per cent of the total digestible nutrients, along with 10 kg of green chopped maize per animal. Digestibility trial of five days duration indicated that there was no difference in the digestibility of various feed nutrients by the different types of animals. The digestion coefficients among the crossbreds were slightly higher than purebred Sahiwals during hot dry summer months, thereby indicating the superiority of halfbreds over the purebred Sahiwal heifers. Digestibility coefficients for crude protein and crude fibre were : 72.24 and 66.81 for Sahiwals; 76.28 and 68.86 for Sahiwal × Holstein; 78.40 and 70.46 for Sahiwal × Jersey; respectively.

INTRODUCTION

The genetic constitution coupled with the environments plays an important role in the ability of the animal to consume and utilize the available feed nutrients to the optimum level. An earlier study on purebred Sahiwal and their crossbred heifers from Holstein Friesian and Jersey bulls revealed better growth rate, feed consumption and feed conversion among the crossbreds compared to the purebred Sahiwal heifers (Saleh *et al.*, 1979). Amongst the crossbreds, the Sahiwal × Holstein Friesian cross was much better for daily weight gains and feed efficiency, but Sahiwal × Jersey cross showed much less variation and performed better under climatic stress caused by hot dry season. The present study was conducted to assess the digestibility of various nutrients in feeds and fodder by the Sahiwal and their crossbred heifers being raised at the Livestock Experiment Station, University of Agriculture, Faisalabad under the financial assistance of USDA, PL-480 Research Programme.

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MATERIALS AND METHODS

Three heifers each of purebred Sahiwal, Sahiwal × Jersey, and Sahiwal × Holstein Friesian of the comparable age were selected during May, 1976, to study the digestibility of various feed nutrients. Before and during the digestion trial, these animals were fed *ad libitum*, a mixture of a balanced ration that contained 14.3 per cent crude protein (CP), and 66.7 per cent Total Digestible Nutrients (TDN). The components of this mixed ration were: cotton seed cake, 29 parts; wheat bran, 20 parts; molasses, 30 parts; wheat straw, 20 parts; bone meal and common salt 0.5 part each. Mixed ration was offered during morning and evening in individual feeding troughs alongwith 10 kg of chopped green maize to each animal at mid day. The water was offered to the experimental animals at least four times a day.

The data for daily feed consumption and faeces voided were maintained for each animal for a period of five days. The faecal samples were collected daily for each animal and were thoroughly mixed to draw a composite sample for further analysis. Similarly composite samples of green fodder as well as the mixed ration were taken. These samples were analyzed for their composition i.e., per cent Moisture, Crude Protein (CP), Ether Extract (EE), Crude Fibre (CF) and total ash contents by usual analytical techniques (A.O.A.C., 1970). Dry Matter (DM) and Nitrogen Free Extracts (NFE) were determined by substraction. The digestibility coefficients of these nutrients were calculated as the per cent difference of amount consumed and voided in the faeces. Data collected for all these parameters were subjected to the analysis of variance (Snedecor, 1962) for the significance of differences in various types of heifers.

RESULTS AND DISCUSSION

The amount of feed consumed and faecal material voided, on the average, by different types of heifers during the digestibility trial have been presented in Table 1. The amount of mixed ration and green fodder consumed per day were higher among the Sahiwal × Holstein Friesian heifers. They consumed on the average, 8.16 ± 0.19 kg of mixed ration, and 3.59 ± 0.25 kg of green fodder per day. The Sahiwal heifers were the lowest with regards to the consumption of these feed components. The Sahiwal × Jersey heifers were better in feed intake than purebred Sahiwals, but were ranked lower than Sahiwal × Holstein Friesian heifers. The faecal material voided per day, by purebred Sahiwal, Sahiwal × Jersey and Sahiwal × Holstein Friesian heifers averaged 9.28 ± 0.36, 9.93 ± 0.38 and 13.20 ± 0.41 kg, respectively.

Table 1. *Amount of feed consumed and faecal material voided by different types of heifers during digestibility trial.*

Type of heifers	Av. mixed ration consumption/day (kg)	Av. green fodder consumption/day (kg)	Av. faecal material voided/day (kg)
Sahiwal	6.05±0.41	2.81±0.31	9.28±0.36
Sahiwal × Jersey	7.12±0.36	3.13±0.25	9.93±0.38
Sahiwal × Holstein Friesian	8.16±0.19	3.59±0.25	13.20±0.41

The proximate composition of the feed consumed and the faecal material voided by different types of experimental animals is presented in Table 2. Mixed ration contained 83.20 per cent of dry matter, whereas it was only 24.20 per cent in green roughage. On dry matter basis, the mixed ration had higher percentage of crude protein, crude fibre, ether extracts and total ash contents than that of green fodder. Nitrogen free extracts were more in green fodder than the mixed ration. The proximate components of the faecal material voided by different types of heifers were approximately of the same magnitude. The dry matter percentage varied from 22.80 to 24.30 in the faeces of various groups of heifers. The crude protein was slightly higher (12.95 per cent) amongst the Sahiwal × Holstein Friesian heifers' faecal material, but crude fibres were in greater fraction in purebred Sahiwal heifers' dung than other types of females.

Table 2. *Proximate composition of the feed consumed and faecal material voided by different types of experimental animals (dry matter basis).*

Component	Mixed ration	Green fodder	*Faecal material of*		
			Sahiwal	Sahiwal × Jersey	Sahiwal × HF.
Dry matter (%)	83.20	24.20	24.60	24.30	22.80
Crude protein (%)	22.75	10.50	11.95	12.66	12.95
Crude fibre (%)	2.63	2.20	2.52	2.09	2.25
Ether extract (%)	17.71	12.87	14.13	14.24	13.69
Total ash (%)	15.62	10.83	13.00	14.00	12.30
Nitrogen free extract (%)	41.29	63.60	58.40	57.01	58.81

The percentage of ether extract and total ash contents was higher in the faecal samples of Sahiwal × Jersey heifers. The nitrogen free extracts were in greater proportion (58.81 per cent) in the faecal samples obtained from the heifers of Sahiwal × Holstein Friesian.

1. *Digestibility of Dry Matter.* The analysis of the data pertaining to the amount of dry matter consumed in the form of mixed ration and the green fodder, and that of amount voided in the faeces indicated the highest digestibility (63.88 per cent) of this factor amongst the Sahiwal × Jersey heifers. Average digestion coefficients for dry matter were 60.92 and 59.73 per cent in Sahiwal × Holstein Friesian and purebred Sahiwal heifers, respectively (Table 3). The analysis of variance, however, indicated these differences to be non-significant statistically (Table 4).

Table 3. *Digestibility coefficients of various feed nutrients in different types of experimental heifers.*

Nutrient	*Mean Digestion Coefficient (%) in*		
	Sahiwal	Sahiwal × Jersey	Sahiwal × HF.
Dry matter	59.73	63.88	60.92
Crude protein	72.24	78.40	76.28
Crude fibre	66.81	70.46	68.86
Ether extract	60.56	70.89	66.55
Nitrogen free extract	46.49	52.47	47.52

Table 4. *Analysis of variance for data on digestibility coefficient of various feed nutrients in different types of experimental heifers.*

Source of variation	D.F.	*Mean Squares of*				
		Dry matter	Crude protein	Crude fibre	Ether extract	Nitrogen free extract
Between types of heifers	2	13.69NS	29.33NS	10.04NS	80.66*	30.65NS
Within types of heifers	6	9.35	27.86	5.84	8.67	19.70

*Significant ($P<0.05$) NS Non-significant

2. *Digestibility of Crude Protein.* The digestibility of crude protein amongst different groups of animals varied from 72.24 to 78.40 per cent (Table 3). The highest value was amongst the Sahiwal × Jersey heifers, but the lowest value was recorded in purebred Sahiwals. The analysis of variance revealed non-significant differences for the digestibility of crude protein in different groups of hiefers under experiment (Table 4).

3. *Digestibility of Crude Fibre.* The per cent digestibility of crude fibre is presented in Table 3. On examination, the Sahiwal × Jersey heifers showed the highest digestion coefficient (70.46 per cent). The values were 68.86 and 66.81 per cent in Sahiwal × Holstein Friesian and purebred Sahiwal heifers, respectively indicating rather poor digestibility of crude fibres among the purebreds. These differences were, however, of no significance statistically (Table 4).

4. *Digestibility of Ether Extract.* As given in Table 3, the digestion coefficients of ether extract in different groups of heifers ranged from 60.56 to 70.89 per cent. The highest and the lowest values were for Sahiwal × Jersey and purebred Sahiwal heifers, respectively. The mean digestion coefficient for this nutrient in Sahiwal × Holstein Friesian heifers was 66.55 per cent. Statistical analysis revealed significant ($P<0.05$) differences in ether extract digestion between various types of heifers. Duncan's multiple range test (Duncan, 1955) showed significant differences between the means of Sahiwals and Shiwal × Jersey heifers. All other combinations between the mean values of different types, however, showed non-significant differences.

5. *Digestibility of Nitrogen Free Extracts.* Like other feed nutrients, the digestibility of the nitrogen free extracts was also higher among the Sahiwal × Jersey heifers. The digestion coefficient in these animals was 52.47 per cent. Next to these were the heifers obtained by inseminating Sahiwal cows with the semen of Holstein Friesian bulls. The purebred Sahiwal heifers had the lowest digestibility coefficient (46.49 per cent) for this nutrient. The differences when judged by the analysis of variance technique were, however, found to be non-significant (Table 4).

The results of the digestibility trial indicated that there was no difference in the digestibility of various feed nutrients by different types of animals. The digestion coefficients among the crossbreds were slightly higher than purebred Sahiwal under adverse climatic conditions, thereby, indicating the superiority of halfbreds over the purebred Sahiwal heifers. Sasvari (1964) also compared

production characteristics and feed utilization of Hungarian Red Pied × Jersey with those of purebred Hungarian Red Pied cows, and concluded that purebred were 20 per cent less efficient than crossbreds in feed utilization. Digestibility coefficients for dry matter, crude protein, crude fibre and ether extract as reported by Sial (1974) among the Sahiwal heifers, fed *ad libitum*, were 68, 73, 63 and 73, respectively.

It was also inferred that the seasonal influences for digestibility under hot environment were more pronounced among the Holstein Friesian crossbreds than Jersey crossbreds. Digestion coefficients were slightly better in Sahiwal × Jersey crossbreds than those of Sahiwal × Holstein crossbreds. Superior weight gain coupled with better feed efficiency as obtained in an earlier study (Saleh *et al.*, 1979) when reviewed in conjunction with the present findings pertaining to the slightly better digestion coefficients in crossbreds justify the crossbreeding programme.

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