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A comparison of body biometry traits of Munjal and Muzaffarnagri sheep under field conditions

DINESH KUMAR YADAV[1], ANAND JAIN[2], GURMEJ SINGH[3], REENA ARORA[4] and S BHATIA[5]

National Bureau of Animal Genetic Resources, Karnal, Haryana 132 001 India

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Munjal and Muzaffarnagri are amongst the heaviest sheep breeds maintained primarily for mutton production in the Northwestern semi-arid zone of India. The former inhabits pockets of Punjab and Haryana states (Yadav *et al*. 2010), whereas, the latter is restricted to Muzaffarnagar district of Uttar Pradesh (Kumar *et al.* 2006). Muzaffarnagri is a descript and well recognized sheep breed whereas Munjal's recognition status is still wanting. These sheep are well adapted to the agro-climatic conditions and are integrated to the agricultural farming systems of their respective habitat. In addition to this, the reproductive efficiency of the ewes and growth rate in lambs is promising in both the sheep breeds/populations (Basuthakur 1988, Mason 1988, Singh 1995). Poonia (2008) reported Munjal sheep to be considerably more remunerative due to its earlier maturity, faster growth and shorter lambing interval as compared to Magra, Malpura and Muzaffarnagri sheep breeds under organized farm conditions. In spite of these favorable traits, the security of both the breeds is threatened due to an alarming decrease in their population size (Kumar *et al.* 2006, Yadav *et al.* 2010a). However, detailed conservation strategies of Munjal and Muzaffarnagri sheep have been delineated (Kumar *et al.* 2006, Yadav *et al.* 2010a).

Documentation of existing genetic resources, including the description of the population phenotypic characteristics, cultural importance and genetic uniqueness is one of the main areas of the livestock conservation activities (Ruane 1999, Duchev and Groeneveld 2006).

The first phase of characterization involves the

Table 1. Body biometry traits and their significance values (sex- and breed- wise)

Body trait	Breed	Female (n_1, 152; n_2, 241)		p-value	Male(n_1, 42; n_2, 53)		p-value
		Mean	S.E.		Mean	S.E.	
Body length (cm)	Munjal	75.60	0.3334	0.000#	83.64	0.8471	0.006*
	Muzaffarnagri	73.54	0.2961		80.32	0.8081	
Height at withers (cm)	Munjal	73.24	0.2461	0.093#	80.38	0.6892	0.761*
	Muzaffarnagri	73.60	0.2521		80.68	0.6755	
Chest girth (cm)	Munjal	83.78	0.3898	0.000*	91.76	0.7332	0.000*
	Muzaffarnagri	78.51	0.2897		84.32	0.8076	
Paunch girth (cm)	Munjal	86.90	0.4715	0.000*	94.33	0.9485	0.000*
	Muzaffarnagri	79.33	0.3694		84.51	0.9138	
Ear length(cm)	Munjal	18.47	0.4900	0.000#	18.81	0.9772	0.004#
	Muzaffarnagri	18.34	0.1268		19.49	0.2820	
Tail length(cm)	Munjal	42.02	0.6756	0.000#	47.90	1.6311	0.000*
	Muzaffarnagri	49.77	0.3844		55.49	1.0757	
Body weight (kg)	Munjal	43.95	0.5069	0.000#	60.05	1.5490	0.000*
	Muzaffarnagri	39.61	0.3822		50.21	1.4652	

n_1, number of Munjal sheep; n_2, number of Muzaffarnagri sheep; *p-value corresponding to independent two sample t-test;# p-value corresponding to independent two sample Mann-Whitney U- test; at α=0.05, we reject the null hypothesis if P-value ≤ 0.05

Present address: [1,4]Senior Scientist, [2,5]Principal Scientist, [3]Principal Scientist (Retd.) (dkyadav66@gmail.com, anand_nbagr @rediffmail.com, gurmejsingh.gs@gmail.com, rejagati @yahoo.co.in, bhatias11@yahoo.com).

Table 2. Body biometry traits and their significance values (sex, age and breed wise)

Body trait	Breed	Age, 2T						Age, 4T					
		Female (n_1, 19; n_2, 47)		p-value	Male (n_1, 6; n_2, 23)		p-value	Female (n_1,19; n_2, 71)		p-value	Male (n_1, 8; n_2, 14)		p-value
		Mean	S.E.		Mean	S.E.		Mean	S.E.		Mean	S.E.	
Body length (cm)	Munjal	74.05	0.7588	0.067*	77.66	2.6915	0.822*	75.26	0.7408	0.033#	81.12	2.1165	0.795*
	Muzaffarnagri	72.06	0.6040		77.08	1.1103		72.90	0.6435		80.57	1.0468	
Height at withers (cm)	Munjal	72.52	0.7737	0.491*	75.83	1.7591	0.395*	73.53	0.7147	0.493#	80.00	2.0441	0.569*
	Muzaffarnagri	71.85	0.5346		77.56	0.9150		73.42	0.5400		81.14	0.9426	
Chest girth (cm)	Munjal	80.36	1.1244	0.000#	85.50	1.8398	0.039*	84.158	1.0902	0.000*	91.62	1.1943	0.002*
	Muzaffarnagri	75.36	0.5742		80.82	0.9873		78.11	0.5049		84.14	1.3862	
Paunch girth (cm)	Munjal	83.84	1.4085	0.000*	92.00	2.4765	0.000*	86.74	1.1312	0.000*	94.50	1.7217	0.000*
	Muzaffarnagri	76.13	0.7341		81.08	1.1810		79.00	0.6743		84.50	1.0522	
Ear length (cm)	Munjal	17.16	0.5633	0.089#	17.50	1.2041	0.199*	19.10	1.8510	0.234#	20.37	3.1449	0.334#
	Muzaffarnagri	18.11	0.2968		19.30	0.2842		18.14	0.2547		19.85	0.7021	
Tail length (cm)	Munjal	44.74	1.1768	0.003*	45.83	5.3067	0.263*	43.89	1.9284	0.001#	43.00	3.6400	0.003#
	Muzaffarnagri	49.79	0.9398		52.65	1.4427		49.26	0.7313		55.42	1.9121	
Body weight (kg)	Munjal	38.47	1.4855	0.029*	49.83	3.4968	0.124*	44.84	1.5825	0.000*	60.00	3.8405	0.036#
	Muzaffarnagri	35.11	0.7525		43.69	1.7529		39.16	0.6394		50.35	2.3987	
Body trait	Breed	Age, 6T						Age, 8T					
		Female (n_1, 36; n_2, 57)		p-value	Male (n_1, 5; n_2, 9)		p-value	Female (n_1, 78; n_2, 66)		p-value	Male (n_1, 23; n_2, 7)		p-value
		Mean	S.E.		Mean	S.E.		Mean	S.E.		Mean	S.E.	
Body length (cm)	Munjal	73.86	0.9104	0.921*	86.80	1.1576	0.930#	76.85	0.3747	0.001#	85.39	0.8382	0.922*
	Muzaffarnagri	73.96	0.5154		84.11	1.9549		74.89	0.5096		85.57	1.8107	
Height at withers (cm)	Munjal	72.83	0.5956	0.020*	86.40	2.1587	0.215*	73.53	0.2996	0.176#	80.39	0.4252	0.000*
	Muzaffarnagri	74.45	0.3934		83.33	1.2802		74.27	0.4573		86.57	0.7190	
Chest girth (cm)	Munjal	82.53	0.7564	0.000*	95.40	2.7313	0.004*	85.08	0.5021	0.000*	92.65	0.7375	0.445*
	Muzaffarnagri	78.93	0.4668		88.11	0.4231		80.83	0.5583		91.28	2.1349	
Paunch girth (cm)	Munjal	85.94	0.9461	0.000#	98.60	3.7363	0.019*	88.12	0.6491	0.000*	93.95	1.2518	0.221*
	Muzaffarnagri	80.00	0.6227		88.77	1.7855		81.39	0.7529		90.28	3.4414	
Ear length (cm)	Munjal	20.33	1.3651	0.142#	18.00	1.2649	0.378*	17.78	0.5291	0.000#	18.78	1.3930	0.101#
	Muzaffarnagri	18.75	0.2006		19.33	0.8333		18.36	0.2524		19.57	0.9221	
Tail length (cm)	Munjal	38.05	1.7968	0.000#	50.20	4.3289	0.110*	42.73	0.8008	0.000#	49.65	2.1344	0.016*
	Muzaffarnagri	50.38	0.7420		59.00	2.9580		49.75	0.7128		60.43	2.9829	
Body weight (kg)	Munjal	44.55	1.1022	0.003*	71.40	4.6754	0.003*	44.78	0.5918	0.006#	60.26	1.5593	0.366*
	Muzaffarnagri	40.75	0.5439		56.33	1.7717		42.30	0.7971		63.43	3.6243	

n_1, number of Munjal sheep; n_2, number of Muzaffarnagri sheep; *p-value corresponding to independent two sample t-test; # p-value corresponding to independent two sample Mann-Whitney U- test; at α=0.05, we reject the null hypothesis if p-value ≤0.05

identification of populations based on morphological descriptors (Gizaw *et al*. 2007). Phenotypic comparisons can provide a reasonable representation of genetic differences among populations to an extent. Body measurement can also be used routinely in weight estimation and selection programmes based on its utility in determining breed evolution trends (Sarti *et al*. 2003, Riva *et al*. 2004, Araujo *et al*. 2006). Phenotypic information, if complemented with genetic analyses could serve as basis for designing appropriate conservation, breeding and selection strategies. As the phenotypic and genetic characterization of both these breeds/populations have been completed (Arora and Bhatia 2004, Kumar *et al.* 2006, Kushwah *et al.* 1999, Yadav *et al.* 2010, 2011), it is worth comparing the two breeds/populations for their body biometry differences. The information would be helpful in setting conservation priorities as well as breeding and selection programmes.

This paper used data collected from the farmers' flock in the breeding tract of Munjal and Muzaffarnagri sheep. Morphological measurements (body weight, body length, height at withers, chest girth, paunch girth, ear length and tail length) on 42 rams and 152 ewes from 32 flocks of Munjal and 53 rams and 241 ewes of Muzaffarnagri sheep from 36 flocks were recorded. The body weights were recorded with a weighing machine and the morphometric traits with a measuring tape after making the animal stand squarely on an even ground. The measurements were taken by same individual in order to avoid inter-individual error. The age of the animal was recorded from its dentition and varied from two teeth to eight teeth, resulting into formation of 4 age groups (2T, 4T, 6T and 8T). The hypothesis under test was that the mean body biometry traits of Munjal sheep do not differ significantly from their counterparts in Muzaffarnagri sheep. At α=0.05 (level of significance), we reject the null hypothesis if P value d" 0.05. To test normal-distribution of two independent samples, the data were subject to Shapiro-Wilk test (1965). For the traits exhibiting normal distribution, the mean differences between traits were tested by two independent sample t-test (SPSS, Ver. 13.0). For the traits exhibiting non–normality, Mann-Whitney (1947) U- test was used.

The mean differences between morphometric traits were examined by taking all the animals of a particular sex within a breed/population (Table 1) and by grouping the animals according to their age (Table 2). The two breeds/populations differed significantly (P<0.05) with respect to body weight and all other physical traits except height at withers. The differences were found significant over the sexes. The mean body weight of Munjal rams and ewes was higher than Muzaffarnagri rams and ewes. Similar results were observed in body length, chest girth and paunch girth. But tail length in Muzaffarnagri sheep was significantly (P<0.05) longer than that of Munjal sheep.

Age-wise analysis of morphometric traits indicated that body weight of Munjal ewes was significantly higher than Muzaffarnagri ewes in all four age groups (Table 2). The body weight of Munjal rams was significantly higher than Muzaffarnagri rams in 4T and 6T age groups, whereas the differences were non-significant in 2T and 8T age groups. The possible reasons could be small sample size and large variation in body biometry of rams as ascribed to their selection and managemental differences varying from farmer to farmer. The differences in body length were non-significant in both rams and ewes except that the Munjal ewes had significantly higher body length in 4T and 8T age groups. Similarly, the differences in height at withers were nonsignificant except that Muzaffarnagri ewes in 6T age group and rams in 8T age group had significantly higher values than their counterparts in Munjal breed. Chest girth and paunch girth were significantly higher (P<0.05) in Munjal sheep in all the 4 age groups except that the differences were nonsignificant in 8T rams. The differences in ear length were nonsignificant in all the 4 age groups except that it was significantly higher in 8T Muzaffarnagri ewes as compared to their Munjal counterparts. The tail was significantly longer in Muzaffarnagri animals except that the differences were non-significant in 2T and 6T age groups of rams.

It is observed that in Munjal sheep maximum weight is attained almost at the four-teeth stage whereas in Muzaffarnagri sheep it is attained at the age of eight-teeth. Almost similar growth pattern was also observed in other morphometric traits like chest girth, paunch girth and height at withers. These findings indicated that growth in Munjal sheep is faster than Muzaffarnagri sheep. Poonia (2008) also reported similar results under organized farm conditions. Being heaviest sheep, both Munjal and Muzaffarnagri, have their own importance in their respective socio-economic milieu. Their dwindling population and dilution in breed purity as also reflected by their genetic analysis (Arora and Bhatia 2004, Yadav *et al*. 2011) warrants their immediate conservation (Kumar *et al.* 2006, Yadav *et al.* 2010a). The present information complemented with phenotypic and genetic analyses (Arora and Bhatia 2004, Kumar *et al.* 2006, Yadav *et al*. 2010a, Yadav *et al*. 2011, Yadav *et al*. 2011a) may serve as basis for designing appropriate conservation, breeding and selection strategies of these mutton sheep breeds/populations of India. However, a comparative study on mutton quality parameters of these sheep breeds/ populations may also serve critical input in setting out conservation priority amongst them.

SUMMARY

The study revealed that body biometry traits of Munjal sheep are significantly different and higher than their counterparts in Muzaffarnagri sheep. A significant difference of around 4 kg and 10 kg live body weight in ewes and rams respectively observed between the two sheep breeds/ populations renders Munjal a heavier mutton producing sheep

than Muzaffarnagri under field conditions. Non significant differences were observed in height at withers of both the sheep breeds/populations, indicating that this trait cannot be used in discriminating the animals belonging to Munjal and Muzaffarnagri sheep. Paunch girth, Chest girth and tail length were significantly different in overall data as well as in different age groups which highlights their importance in discriminating animals belonging to these two breeds/ populations at morphological level. The study indicated that growth in Munjal sheep is faster than Muzaffarnagri sheep which also support to the findings of Poonia (2008) under intensive management conditions.

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