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A field trial of production and financial consequences of helminthosis control in sheep production in Ethiopia

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Abstract

We used a partial-budget analysis to evaluate profitability of different management strategies of three genotypes of sheep in a $2 \times 2 \times 3$ factorial experiment conducted at Debre Berhan research station in the central highlands of Ethiopia. This involved two anthelmintic-treatment levels (treated vs. non-treated), two supplementary nutrition levels (protein–energy supplementation yes/no) and three genotypes: indigenous Menz ($n = 40$), 50% Awassi × 50% Menz crosses ($n = 38$) and 75% Awassi × 25% Menz crosses ($n = 31$). All sheep were exposed to natural sub-clinical helminthosis challenge. Supplemented sheep were offered a concentrate mix daily on an individual basis. Anthelmintic-treated sheep were drenched with fenbendazole against nematodes and with triclabendazole against trematodes. Data were collected during the experimental period (for 10 months from ~1 year of age) on feed intake, live weight, eggs per gram (EPG) of faeces, packed-cell volume (PCV), wool weight, and adult-worm burden. Actual market input and output prices were recorded. Supplemented sheep had significantly higher marginal profit (MP) per sheep than non-supplemented sheep (ETB[1] 33 vs. 4). Likewise, anthelmintic treated sheep performed significantly better than their non-treated contemporaries (MP = ETB 28 vs. 8). The 75% Awassi crosses were least profitable.

Keywords: Sheep; Helminthosis control; Economics; Breeding strategies; Genetic resistance

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[1] Ethiopian Birr (ETB) 1.00 = US $ 0.1157 OR ETB 8.64 = US $ 1.00.

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1. Introduction

Helminthosis is important in a broad range of agro-climatic zones in sub-Saharan Africa and is a major constraint to small ruminant production in Ethiopia (Haile et al., 2002a; Tibbo, 2000).

Control measures against internal parasites include the use of anthelmintics (Waller, 1997; Awa et al., 2000; Sissay et al., 2006), controlled grazing (Waller, 2006), biological control using micro-fungi which destroy nematodes (Larsen, 1999; Chandrawathani et al., 2003; Waller, 2006), exploitation of genetic variation in host resistance to endoparasites (Baker et al., 1998; Rege et al., 2002), and improved nutrition to aid immunity development (Gibson, 1963).

Comprehensive reviews of the economic benefits of parasite control (Hawkins, 1993) and associated productivity estimates have been reported (Bosman et al., 1997; Lesnoff et al., 2000). Biological efficiency might not translate to economic efficiency due to the high cost of protein sources (Haile et al., 2004). In Ethiopian highlands, crossbreeding of indigenous Menz sheep with exotic Awassi sheep to increase growth and wool production (by distributing 75% Awassi × 25% Menz crossbred rams, which was in progress since early 1980s) had problems of high mortality of the distributed rams (Rummel et al., 2005). Farmers and extension agents associated this problem with susceptibility of the crossbreds to internal parasites. We investigated the profitability of anthelmintic treatment and supplementary nutrition, and the differential responses of indigenous Menz and its crosses with Awassi (50% and 75%) sheep grazed under natural sub-clinical helminthosis (Tembely et al., 1998; Rege et al., 2002) challenge in Debre Berhan, Ethiopia.

2. Materials and methods

2.1. Study area and animals

Our study was conducted between March 2000 and February 2001 at the Debre Berhan Agricultural Research Centre, located in the Ethiopian highlands at 2780 m above sea level and 130 km northeast of the capital, Addis Ababa. The climate is characterised by a biannual rainfall (average annual rainfall was 950 mm during the study period), a long dry season, and relatively cool temperature (average minimum range from 2.5 to 8.4 °C and maximum range of 17.6–22.5 °C). A total of 109 weaner lambs of indigenous Menz ($n = 40$), 50% Awassi × 50% Menz ($n = 38$), and 75% Awassi × 25% Menz ($n = 31$) were used (Table 1). The Menz sheep (Galal,

Table 1
Initial age and live weight of 109 lambs at Debre Berhan as of March 2000

Factors	No. of lambs	Initial age (months)			Initial weight (kg)		
		LSM	S.E.	*P*-value	LSM	S.E.	*P*-value
Genotype				0.003			<0.001
Menz	40	12.3[b]	0.3		16.7[b]	0.5	
50% crosses	38	13.7[a]	0.3		17.8[b]	0.5	
75% crosses	31	12.8[b]	0.4		23.5[a]	0.5	
Sex				<0.001			0.364
Female	47	12.0	0.3		19.1	0.4	
Male	62	13.9	0.2		19.6	0.4	
Genotype × sex		24.8		<0.001	1.7		0.181

Means with different letters ([a,b]) in a column are different at indicated *p*-value.