GROWTH RATES OF PRIANGON CROSSBRED SHEEP AND SOME EFFECTS OF INTERNAL PARASITISM, IN THE LOWLANDS OF PAPUA NEW GUINEA

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ABSTRACT

*Priangon wethers, herded and grazed at low stocking rates, on Para grass (*Brachiaria mutica *(Forsk.) Stapf) pastures with a variety of legumes, in humid (1850 mm annual rainfall) and wet (4000 mm annual rainfall) lowlands, grew at 0.45 kg/week. Final liveweight of fat wethers was about 42 kg with carcasses of 23 kg. Under drier conditions, wethers set-stocked and grazing at high stocking rates on Buffel grass (*Cenchrus ciliaris *L.) with no legumes, grew more slowly and developed chronic hepatic intoxication possibly due to ingestion of dead grass contaminated with fungus. The response to drenching was small ($p < 0.05$) and occurred mainly in smaller younger animals.*

INTRODUCTION

The Priangon, a breed of tropical sheep from Java, has been present in Papua New Guinea (PNG) lowlands since 1880. Temperate breeds including Corriedales and Romney Marsh have been imported on several occasions before 1960 and crossed with Priangons. It is probable that most "Priangons" in PNG have a small amount of these temperate breeds in their genetic makeup. The sheep population has remained small, due partly to high mortalities caused by internal parasitism in set-stocked, but not free ranging, sheep. Holmes and Leche (1977) reported the performance of Priangon type sheep, free ranging in the drier lowlands and set stocked in the wet highlands.

This paper reports further studies on the performance of Priangon type sheep under different management systems and environmental conditions. One system involved set-stocking at a density sufficient to utilize pasture efficiently; sheep were not housed at night. The other system, used at two sites, simulated the situation which may develop in village sheep raising, with sheep housed at night and grazed over a large area at a low stocking rate, in a humid to wet tropical environment. The response to different drenching regimes was also measured.

MATERIALS AND METHODS

The experiment was a factorial design, with three sites and four drenching treatments.

Sites

(a) Erap Beef Cattle Research Centre in the "dry" lowlands at 100 m altitude: Sheep were set-stocked at 5 per hectare on a pure stand of "Nunbank" Buffel grass (*Cenchrus ciliaris* L.) and were not housed at night. Salt blocks were provided. Rainfall during the 12 months of the trial was 980 mm. This was considerably below the expected 1250 mm due to the non occurrence of the mid-year wet season. Consequently, the pasture available was considerably less than intended. The pasture was mature, not growing and of low palatability and quality during June-November 1976.

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(b) Bugandi High School, Lae in the very wet lowlands at 5 m altitude: Sheep were housed at night in a hut with a slatted floor and given free range over about 40 ha of low lying swampy country. Salt blocks were provided. The main pasture species were *Brachiaria mutica* (Forsk.) Stapf. and *Axonopus compressus* (Sw.) Beauv., *Calopogonium* sp., *Mimosa invisa* Martius ex Colla and *M. pudica* L. Rainfall averages 4000 mm/year, with the wettest period from June to August. There was always an abundance of green, growing pasture.

(c) Urimo, Sepik Plains Livestock Station in the humid lowlands at 200 m altitude: Rainfall is about 1850 mm annually, with at least 80 mm in each month. Humidity is usually very high. The sheep were housed at night and grazed 20 ha of *Brachiaria mutica* and *Stylosanthes guyanesis* (Aublet) Swartz in a young forestry plantation. There was always an abundance of green growing pasture. Since the area is known to be phosphorus deficient, a phosphorus supplement was provided.

Animals and treatments

At each site, 10 Priangon wethers of 6-12 months and 10 wethers of 12-18 months of age were divided into three groups of four and one group of eight, each group comprising half young wethers and half older wethers. The groups of four sheep were drenched at four, eight or twelve week intervals respectively while the groups of eight were not drenched. All sheep ran together to ensure a continuous parasitic challenge. The drench used was levamisole hydrochloride ("Nilverm" ICI) at the manufacturer's recommended dose rates.

The trial commenced in June 1976, at Erap and Bugandi and in September 1976 at Urimo, and was completed in June 1977.

Measurements

Every four weeks, all sheep were weighed off pasture and faecal samples were collected for counting of nematode eggs per gram of faeces (e.p.g.) using the McMaster flotation technique. Some samples of faeces from Erap and Urimo were cultured to permit identification of parasites. At Bugandi, sheep were slaughtered as fat animals. At Erap, where growth had been poor after December 1976, autopsy was performed on the eight slowest growing animals and the others were not slaughtered. No slaughter data were available from Urimo.

Data were analysed by standard statistical methods (Snedecor and Cochran 1967). Eggs per gram counts were transformed to square roots to normalise distributions.

RESULTS

Growth rate and parasite burden

At Erap, growth ceased after six months, at the onset of the wet season in December. At Bugandi, growth was rapid for nine months then almost ceased, averaging only 0.10 kg/week subsequently since most wethers were then fully grown. At Urimo, sheep grew continuously throughout the experiment. Growth rates were constant during these periods of rapid growth, despite climatic fluctuations and drenching. Rates were analysed over the period of rapid growth (*Table 1*). The fastest growth was recorded at Urimo ($p<0.01$), and growth was not closely related to differences in e.p.g. between sites. Differences in pasture quality and availability appear to have been more important than differences in parasite burden. At Erap, the legume-free pasture stopped growing during the mid-1976 drought; at Urimo and Bugandi, an abundance of green grass and legumes approached optimal grazing conditions for tropical sheep.

Drenched wethers out-performed untreated animals at all sites ($p<0.05$), although only marginally at Urimo. There was no difference between different frequencies of drenching. At Erap and Bugandi, the smaller younger wethers responded more to drenching ($p<0.05$) than larger animals which showed a non-significant response (*Table 2*).

Egg counts

At Erap, mean e.p.g. rose during the wet season, then declined from February to April and rose again in May at the onset of the mid year wet season. Since many of these wethers were sick and losing weight at this time, only values prior to December were analysed. Among untreated wethers at Bugandi and Urimo there was no regular seasonal pattern in e.p.g. although wide fluctuations occurred within individual animals and months (*Table 1*). The reduction in e.p.g. by drenching was highly significant ($p<0.001$) at all sites with small and inconsistent differences between different frequencies of treatment (*Table 1*). The correlation between e.p.g. and growth rate was not significant within any site or between sites.

Culture of a small number of faecal samples (*Table 3*) showed a significantly higher proportion of larvae of *Haemonchus* sp. ($p<0.05$) and *Cooperia* sp. ($p<0.001$) at Erap and significantly more *Trichostrongylus* sp. larvae ($p<0.001$) at Urimo.

Carcasses and autopsy findings

At slaughter, all wethers from Bugandi bar two undrenched small wethers produced commercially acceptable carcasses with adequate fat cover (*Table 2*). At autopsy, most of the wethers from Erap ranged from thin to emaciated and had gross cirrhosis of the liver. Histopathological examination revealed varying degrees of hepatic necrosis, fibrosis, fatty changes and focal abscessation, a picture indicative of a chronic intoxication with subsequent bacterial invasion.

DISCUSSION

At Urimo, Priangon wethers grew well with or without drenching, while sheep at Erap with the same e.p.g count res-

Table 1. — **Mean growth rates (kg/wk) and nematode eggs per gram (e.p.g.) of faeces of Priangon wethers grazed at three sites in the P.N.G. lowlands**

	Erap		Bugandi		Urimo		
	Not drenched	Drenched	Not drenched	Drenched	Not drenched	Drenched	S.E.M.
Period	2.6.1976 to	14.12.76	2.5.1976 to	8.3.1977	10.9.1976 to	20.6.1977	
Growth Kg/wk	.305	.374	.365	.466	.454	.476	.056
Mean e.p.g.	553	300	118	66	563	240	20
e.p.g. in							
June 1976	28	0	56	5	—	—	
July	422	87	45	5	—	—	
August	488	177	270	40	—	—	
September	400	32	N.S.	345	155	206	
October	48	0	8	5	780	818	
November	1250	803	230	90	410	24	
December	2575	303	100	27	468	364	
January 1977	1490	185	80	20	486	216	
February	570	11	180	42	856	202	
March	997	603	112	33	162	337	
April	728	137	30	173	107	90	
May	3060	1765	252	167	—	—	

N.S. No samples.

Table 2. — **Growth rates and carcass data for small (17.6 kg, 9 months old) and large (24.3 kg, 15 months old) Priangon wethers at Bugandi, either not drenched or drenched with levamisole**

		Growth rate kg/week	Age at slaughter (months)	Live weight (kg)	Carcass weight (kg)	Dressing %
Small wethers	Not drenched	.32[b]	21	31.0[a]	16.2[a]	54.6[a]
	Drenched	.54[a]	21	41.5[b]	22.7[b]	54.5[a]
Large wethers	Not drenched	.41[ab]	27	40.5[b]	22.3[b]	57.0[ab]
	Drenched	.40[ab]	27	42.7[b]	24.2[b]	58.8[b]
S.E.M.		.06		2.8	1.7	1.2

a,b Means in the same column with different superscripts are signficantly different.

Table 3. — **Proportions of parasites cultured from a limited number of faecal samples from two sites**

	Haemonchus %	*Trichostrongylus* %	*Cooperia* %
Erap (March 1977)	58.6[a]	7.0[a]	34.4[a]
Urimo: January 1977	43.0[ab]	57.0[b]	.0[c]
February 1977	3.5[b]	91.1[b]	3.4[bc]
April 1977	21.8[ab]	68.0[b]	10.2[b]

a,b,c Means in the same column with different superscripts are significantly different.

ponded to drenching by increased growth. The parasitic burden at Urimo may have been made up of less pathogenic nematodes than at Erap (*Table 3*). These few samples represent only a small proportion of the year, and no conclusions can be drawn from these data except that more detailed studies are needed of the species of parasites involved in infestation, since such great differences appeared between sites and months. Sheep at Bugandi had the lowest egg counts, yet the younger wethers showed a response to drenching, in reduction in egg numbers and increased growth rates. Under conditions of extensive grazing at low stocking rates, internal parasites were a minor problem for the Priangon.

The disease condition observed at Erap after December 1976 is consistent with a fungal intoxication, which might have some similarities to "facial eczema"; many sheep have been observed with skin lesions typical of that disease. A similar "facial eczema"-like condition has been noticed in sheep from other sites both in the highlands and lowlands and including Bugandi. The severest outbreaks in terms of skin lesions and mortalities have occurred at Erap, in sheep grazing Buffel grass pastures. The close grazing compelled by the shortage of feed resulted in the sheep consuming the dead grass in the base of the sward and this may have been contaminated with toxins of fungal origin especially after the onset of the wet season. The dead under-storey of pastures is often visibly infested by fungal growth. Although Erap is the driest of the three sites, it is still in the humid tropics; even on sunny days humidity is often above 60%, and some rain was recorded

(>1 mm) on at least seven days in the driest months of this trial, providing an environment favourable for fungal growth.

The growth rates recorded at Bugandi and Urimo are similar to those recorded for sheep grazing foothill country near Erap, and in the Eastern Highlands, where feed was not limiting and included a significant amount of legume, and sheep were penned at night (Holmes and Leche, 1977). Thus at four sites with very different environments, ranging from 3 m to 1600 m altitude, 1250 mm to 4000 mm rainfall and completely different pastures, Priangon wethers between six and 27 months old were capable of growing about 0.45 kg/week until reaching live weights of about 42 kg. Only at Erap itself did Priangons fail to achieve this growth rate. Both the occurrence of legumes, even if not palatable, and the presence of green feed at all times contribute to a high protein, high digestible energy diet, which would appear to be essential for sheep. The high rainfall, humidity and temperature were not deleterious to this breed of tropical sheep. A herding system covering large areas makes available a wide range of pasture plants and allows considerable scope for selective grazing. A low stocking rate can be maintained in many areas since much of PNG grasslands are not used for any agricultural purpose or are in fallow.

We conclude that internal parasites are a minor problem of Priangon sheep grazed at low stocking rates and penned at night even in hot, extremely wet environments. The sheep were capable of producing satisfactory growth rates and adequate carcass finish under these conditions. More intensive set-stocking on Buffel grass pastures resulted in poor growth rates and a hepatic intoxication, suspected of being of fungal origin.

ACKNOWLEDGEMENTS

We wish to acknowledge the assistance of staff and students at Bugandi High School and the staff of the Sepik Plains Livestock Station, Urimo, in looking after the sheep. Dr. I. Owen and Dr. J.D. Humphrey, of the D.P.I. National Veterinary Laboratory, Kila Kila, performed the parasitological and pathological examinations, respectively.

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