EFFECT OF TICKS Boophilus *microplus* INFESTATIONS ON MILK YIELD OF *Bos taurus/Bos indicus* CROSSES

R.L. Teodoro[1], A.M. Lemos[1] and F.E. Madalena[2]

[1]EMBRAPA, National Dairy Cattle Research Centre, Rua Eugenio do Nascimento, 610, 36.038-330 Juiz de Fora-MG, Brazil
[2]Department of Animal Science, School of Veterinary Sciences, Federal University of Minas Gerais, Cx.P. 567, 30161-970 Belo Horizonte-MG, Brazil

SUMMARY
To assess the effect of *Boophilus microplus* infestations on milk yield of 117 cows of three Holstein-Friesian (HF) x Guzera crossbred groups (F_1, 5/8 HF and ≥15/16 HF) were randomly allocated to two treatments during their whole lactation: infestation with tick larvae or spraying with acaricides. Burdens of *B. microplus* in the infested groups were estimated in 21, 28 and 65 standard semi-engorged female ticks per animal per day, respectively, for the three genotypes in the above order. Treatment effects were not significant ($P>0.34$) in the F_1 and 5/8 HF, but in the ≥15/16 HF infestation reduced yield by 26% from the mean of the sprayed group (2052 kg, $P<0.04$). The treatment x genotype interaction was statistically significant ($P<0.02$).
Keywords: *Bos taurus, Bos indicus, Boophilus microplus,* milk yield, tick resistance.

INTRODUCTION
Quantification of tick effects is required for a planned strategic control (Sutherst *et al.* 1979). These authors reviewed Australian reports on the effects of dipping on cattle growth rate and suggested that the *Boophilus microplus* tick damage would be the same for european breeds or zebu crosses at the same burden, although burden itself would vary due to differential mortality of parasitic larvae between crosses. Burdens increased exponentially in relation to the Holstein-Friesian fraction in crosses with Guzera (Lemos *et al.* 1985). On the other hand, O'Rourke (1982) could not detect tick damage in undipped zebus and Meltzer *et al.* (1995) found no effect of acaricide treatment on the weights of Mashona cows and calves, nor on reconception rates and gestation lengths of cows. However they reported that treated calves suckled lesser amount of milk, in an area infested with *Amblyoma hebreum*, *Cowdria ruminatum*, and other species. Woodward and Turner (1915) found small differences in milk and fat yields over a 140-day period for two groups of Jersey cows sprayed against or infested with *Margaropus annulatus* (at present *B. annulatus*).

The objective of this paper is to report on the differences in milk yield of cattle of three *Bos taurus/B. indicus* crossbred groups infested with *B. microplus* or sprayed with acaricides.

MATERIALS AND METHODS
A 28-month experiment was conducted in the Sta. Mônica Experimental Station,

Municipality of Valença, State of Rio de Janeiro. The area was naturally infested with *Boophilus microplus* and *Amblyomma cajennense*. Cows of three Holstein-Friesian (HF) x Guzera (Gu) crossbred groups (≥ 15/16 HF fraction, F_1 and 5/8 HF) were randomly assigned to each of two treatments (S = sprayed with acaricides and I = non-sprayed and artificially infested with *B. microplus* larvae) as they approached calving (all year round) to balance the three genetic group x treatment classes by calving date. Notwhistanding, some cows were dropped from the experiment due to lost teat, distokia and failure to let milk down. All cows were managed together as a single herd. Cows had been assembled four years earlier from different farms, so although they were kept together since, crossbred group differences may not be strictly attributed solely to genetic effects. Although the herd had been routinely sprayed with acaricides before the experiment, tick control was not complete and it may be assumed that animals had developed their potential resistance levels. Calves were artificially reared. Cows were milked twice a day in a herringbone parlour.

Treatment started immediately after calving and continued until the end of lactation. The S group was sprayed at irregular intervals, according to visual assessment of tick burdens. The average interval between sprayings was 15 days (range from 12 to 23). Acaracides (amitraz, coumaphos and decametrin) were changed periodically in order to reduce development of resistance to them by ticks. Cows in the I group were infested with nominal 20,000 *B. microplus* larvae (i.e., those developed from 1 g eggs cultured at 26°C and 95% relative humidity, Utech et al. 1978 a), placed in collars, at irregular intervals (mean = 7 days, 94% within 2 to 11 days), according to the availability of tick larvae and labour. Standard ticks (4.5 to 8 mm, Wharton and Utech, 1970) were counted on the right side of each animal on a single day at approximately monthly intervals. Total burdens were worked out from previous estimates of the proportions of ticks engorged on days 19 to 23 after infestation and were expressed as number of ticks per animal per day of lactation. Burdens of *A. cajennense* were directly estimated from the mean counts (only from females).

Counts of each tick species were transformed (2 x count + 1) for hypotheses tests. Analyses of variance of transformed counts, lactation milk yield and lactation length were performed. An initial model included the effects of year-trimester of calving, parity, crossbred group, treatment and group x tratment interaction. Further analyses were run within crossbred groups. The significance of treatment effects on the proportion of cows showing oestrous within 120 days from calving and on the proportion conceiving within 150 days from calving were assessed by chi-square tests.

RESULTS AND DISCUSSION

The crossbred group x treatment interaction on milk was statistically significant ($P<0.017$). Parity effects were not significant for any trait ($P>0.05$) and were disregarded in the analyses within crossbred groups.

It may be seen in Table 1 that estimated burdens of *B. microplus* were significantly higher in the I than in the S groups, while burdens of *A. cajennense* were not significantly different between treatments, as might be expected from the three host biology of the latter. The estimated burdens of *B. microplus* in the I groups corresponded to tick resistance values of 96.9, 95.2 and 87.8 % of larvae failing to engorge in the F_1, 5/8 HF and ≥ 15/16 HF genotypes, respectively. Although in agreement with published resistance figures for Friesian and for *Bos taurus x B. indicus* crosses (Utech *et al.* 1978 b) the crossbred groups may not be strictly comparable due to possible differences in farm of origin or in involuntary selection in the present farm. Genotypes ranked the same on burdens of both tick species. However, host resistance to *B. microplus* have not provided cross-resistance to other tick species and viceversa (Miranpur 1989).

Table 1. Estimated tick burdens and least squares means (LSM) for milk yield and lactation length of sprayed and infested cows/crossbred groups (se = standard error).

	Crossbred group					
	F_1		5/8 HF		≥15/16 HF	
Treatment	Sprayed	Infested	Sprayed	Infested	Sprayed	Infested
Number of cows	15	21	20	19	22	20
Boophilus microplus						
ticks/animal/day	0.3	21.8	1.5	27.6	4.3	65.4
Prob. difference [A]	0.0001		0.0001		0.001	
Amblyomma cajennense						
ticks/animal/day	0.4	0.4	15.9	16.8	60.4	36.5
Prob. difference [A]	0.379		0.758		0.141	
Milk yield, LSM, kg	1202	1356	1453	1515	2052	1523
se, kg	131	122	140	147	177	176
Prob. difference	0.342		0.753		0.038	
Lactation length, LSM,d	198	211	239	243	306	259
se,d	17	16	17	18	25	25
Prob. difference	0.547		0.865		0.180	

[A] Probability of difference among treatments (F-tests on transformed count).

The *B. microplus* infestation reduced milk yield of the infested ≥ 15/16 HFs by 529 kg or 26% of the sprayed group. This is larger than the 8% difference between infested and sprayed Jersey cows (P>0.46) estimated from Woodward and Turner's (1915) data but their treatments commenced in a later part of the lactation period. In the present study treatment effects were not significant in the F_1 and the 5/8 HF groups (Table 1). In fact, in these two genotypes the mean yield was slightly higher in the I group. Undesirable effects of acaricide treatment were also observed by Woodward and Turner (1915) and Meltzer *et al.* (1995). Stress associated with spraying might be a cause of reduced yield.

The proportions of cows showing oestrous within 120 days after calving were 0.81, 0.77 and 0.45 for the F_1, 5/8 HF and ≥ 15/16 HF groups, respectively. Corresponding proportions of cows conceiving within 150 days after calving were 0.39, 0.38 and 0.26. None of the chi-square values for treatment differences within group was significant (P>0.22) but the number of cows per cell was too low to detect differences in these all or none reproductive traits.

B.taurus/B. indicus crosses are required for economic dairy production under poor management (e.g. Madalena *et al.* 1990). It is concluded that tick resistance may be an important component of their superiority under heavy infestation situations.

ACKNOWLEDMENTS
The contributions of K. Utech and R.W. Hewetson during the planning of this experiment are gratefully acknowleged although all responsibility remains with the authors.

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