

***Rhipicephalus (Boophilus) microplus* Ticks (Family Ixodidae) in Goats Raised in a Small Private Farm in San Jose del Monte, Bulacan, Central Luzon, Philippines**

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This study was carried out to ascertain tick infestation of goats (*Capra aegagrus hircus*) grown in a small private farm in San Jose del Monte, Bulacan, Central Luzon, Philippines. Prevalence of infestation was assessed based on ticks collected, soaked in Boardman's solution, and fixed in EtOH with glycerol. Ticks were evaluated as per their developmental stages and gender, and were identified as *Rhipicephalus (Boophilus) microplus*. Prevalence was 62.5% with an average mean intensity of eight ticks/goat. Throughout the study, male goats had higher mean intensity (6-11 ticks/goat) compared to females (4-7 ticks/goat).

Key words: Bulacan, goats, *Rhipicephalus (Boophilus) microplus*, ticks

INTRODUCTION

Ticks are hematophagous ectoparasitic arthropods and can transmit deadly viral, bacterial, and parasitic diseases. Worldwide, *Rhipicephalus (Boophilus)* spp., *Ixodes* spp., and *Hyalomma* spp. infest livestock and domestic animals (Mehlhorn 2008; Schroder & Reilly 2013). In the Philippines, there are documented evidence of the presence of tick-borne protozoan parasites in cattle and water buffaloes with *Babesia* spp. and *A. marginale* (Dumag & Reyes 1960; Molina & Montenegro 1997; Padilla et al. 2006; Foronda et al. 2010; Ybañez et al. 2013); horses with *Babesia* parasites confirmed through detection of antibodies to *B. caballi* and/or *B. equi* using immuno-chromatographic test (ICT) (Cruz-Flores et al. 2010), and found polymerase chain reaction (Yu et al. 2013). The use of ICT has also revealed the presence of anti-*B. gibsoni* antibodies in *Rhipicephalus* ticks-infested dogs (Cruz-Flores et al. 2008). Tongson and colleagues

(1981) examined 1305 goats from different areas in the Philippines and found that these possessed different kinds of arthropods: lice, mites, and the *R. B. microplus* tick.

MATERIALS AND METHODS

Goats examined were raised in a private farm in San Jose del Monte in Bulacan, Central Luzon, Philippines. The farmland, a former orchard, is predominated by trees and large swathes of long grasses are present that cover most of the grounds. The farmland lies fallow, with only the family of the caretaker using a small portion of the grounds as their homestead. As the farmland has been allowed to grow wild, there is no uniform crop being grown, and – other than the goats – the only other animals on the property are two dogs. These dogs were allowed to leave the property and roam the surrounding area. The single herd had 18 goats initially (13 females; five males) aged two months to six years old. The caretakers were not aware

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of the breed of their goats, and allowed them unrestricted movement in the farm, grazing as they went. These were neither de-ticked nor given any medications or vitamins.

Ticks were collected in Jun, Jul, and Sep, at environmental temperatures recorded between 27° C and 32° C. Ticks were plucked by hand and placed in individual stoppered vials containing Boardman's solution (17% EtOH + 3% ether) for 24 h to prevent the legs from curling and obscuring tick abdomens, which are essential in the identification of species. Ticks were then fixed in 80% EtOH + 5% glycerol and then microscopically examined.

Percent infestation was determined based on the number of goats infested over 18 goats examined, while mean intensity was calculated using the number of ticks collected over the number of goats infested. Percent infestation and mean intensity were compared across the three collection periods, as well as between male and female goats.

RESULTS

Of the initial herd of 13 females and five male goats, two males and one female goat were lost to disease and culling by the third collection. Infestation was highest in Jul (87.0%) and lowest in Sep, and infestation was higher in male goats (66.7-100%) relative to female goats (Table 1).

Table 1. Prevalence of tick infestation in goats across three collections.

Collection Period	# Goats examined (% infestation)		
	♀	♂	Over-all infested (%)
I	13 (61.5)	5 (100)	72.2
II	12 (83.3)	3 (100)	87
III	12 (16.7)	3 (66.7)	27.7
Total	20 (54.1)	10 (90.9)	30 (62.5)

Table 2. Summary of the number of ticks collected according to their developmental forms.

Collection Period	Developmental Stages				Total tick (%)
	Larvae	Nymphs	Female	Male	
I	2	62	21	14	99 (47.8)
II	3	81	4	0	88 (42.5)
III	0	12	5	3	20 (9.7)
Total (%)	5 (2.4)	155 (74.9)	30 (14.5)	17 (8.2)	207

Ticks were found all over the goats' bodies but predominated in the abdominal region, especially in the genitals of males and the udders of females. Over the course of the three collection periods, a total of 207 ticks were isolated from 18 goats, with higher mean intensity in male goats (6-11 ticks/goat) compared with females (4-7 ticks/goat). Larvae isolated comprised only 2.4% of the specimens, majority of the ticks were nymphs at 74.9%, while adult ticks comprised 22.7% of the remaining total population.

Taxonomic Classification of Tick Specimens

Collected ticks were identified as ixodids (Family Ixodidae) characterized as possessing distinct sclerotized dorsal body shield. Using a dichotomous key of Sonenshine and Roe (2013) as a reference, tick specimens were identified as genus *Rhipicephalus (Boophilus)*, and using information from Walker and colleagues (2007), the species was determined to be *Rhipicephalus (Boophilus) microplus*.

DISCUSSION

Goat infestation with ticks between 15.8% and 77.3% had been reported in Middle Eastern nations like Turkey (Yukari & Umar 2002) and Iran (Sofizadeh et al. 2014). In the Philippines, the infestation of arthropods and *Boophilus microplus* ticks was documented in goats (Tongson et al. 1981), and cattle in Cebu, Visayas were found to be infested with *R. (B.) microplus* (Ybañez et al. 2013). Stray dogs in Dasmariñas, Cavite, Luzon were predominantly infested with *Rhipicephalus* ticks (48.5%) and *Boophilus* ticks (Cruz-Flores et al. 2008) has been documented; however, the findings of 62.5% tick infestation of goats at San Jose del Monte, Bulacan, Luzon may be the first account in the country. The relative tick density/mean intensity noted agrees with earlier reports in goats ranging 7.4-8 ticks/goat in Zimbabwe (Hove et al. 2008). Goats are known to be both reservoir hosts for *R. (Boophilus) microplus* in cattle in South America and South Africa (Daemon et al. 1998; Nyangiwe & Horak 2007; De Matos et al. 2008), as well as primary hosts in Mozambique (De Matos et al., 2009).

Abeba (2004) had asserted that *Rhipicephalus (Boophilus)* spp. show no preferred predilection sites. Nuñez and colleagues (1985) and Schroder and Reilly (2013), however, contested that the male genitalia and female udders have closer contact with foliage during grazing and ambulation, and these then serve as ideal attachment sites for larvae and detachment points for female adults about to lay eggs. This substantiates the dominance of localization of ticks in the abdominal

regions, particularly in the male genitalia and the udder in females of ticks in the present study. Despite fewer male goats present in the pool, male goats had higher mean intensity. This finding corroborates higher infestation rates in cattle infested with various ixodid ticks (Musa et al. 2014; Eyo et al. 2014).

More *R. (B.) microplus* nymphs (74.9%) were pooled relative to adults and larvae. This nymphal stage dominance can be explained by the natural life cycle of *Rhipicephalus (B.) microplus* that requires only a single host species to complete – and 2-3 weeks or longer to complete its nymphal development – depending on the available requirements for ecdysis, such as amount of blood fed, humidity, and temperature (Nuñez et al. 1987). The inclement weather with torrential rain and thunderstorms in Luzon during 1-8 Aug 2012 – coupled with drop in temperature (Habagat of 2012) – may have influenced slower rate of development, thus elucidating the dominance of nymphs recorded in goats during the collection period.

In conclusion, a goat herd in San Jose del Monte, Bulacan was found to have an average prevalence of tick infestation of 62.5% across three months of collection, where male goats possessed a higher average mean intensity (9) to female goats (3). Ticks were identified as *Rhipicephalus (Boophilus) microplus*.

Future studies should cover larger host populations of goats grown in different areas/regions, with ticks to be removed with the use of fine forceps or a Tick Twister to preserve the mouthparts of the specimens. The study should be performed across a longer collection period supported with combined biological, morphological, and molecular facets of the study. It is also recommended that the clinical data of the goat herd be collected as well, to determine whether these goats possess symptoms of tick-borne diseases and/or tick infestation.

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