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Animal Breeding and Husbandry in the Tropics and
Subtropics

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Animal health management in a llama
breeding project in Ayopaya, Bolivia.
Parasitological survey

Master Thesis

presented by

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7. SUMMARY

Due to the unique adaptation of llamas to high altitude conditions, llama husbandry plays a very important role on the living strategy of inhabitants of the Bolivian Andean regions. Those animals not only provide high quality protein, fuel, fertilizer, fiber and leather to the householders, but are also used as packing animals and play an important role in the spiritual and cultural life of Andean people. Among the factors limiting the llama production, one of the most important is the existence of parasitic diseases. Nevertheless their importance, little information concerning the type of parasites that affect llama flocks and its patterns of presentation is available. Therefore, the aim of the present study was to obtain accurate information on the situation of parasitic diseases in llama flocks in the Bolivian highland region. The determination of which kinds of parasites occur in the study area, the prevalence of infested animals, the impact of diseases on local llama keepers as well as the preventive and treatments measures used in the study region were the specific objectives to be attended.

The study was carried out in five indigenous communities located in the Cordillera Oriental, in the Ayopaya Province of Cochabamba, Bolivia. For the study three different phases were considered: a parasitological surveys including external and internal parasites; the realization of individual interviews and; a participatory diagnosis of the health problems observed by llama keepers. For the parasitological survey 200 free-ranging llamas from five communities and 80 alpacas from two communities were sampled. Three age categories, foals (<1 year), young animals (1-2 years) and adult animals (>2 years), were considered. A visual examination of the external coat, and the realisation of the flatation and McMaster laboratory analysis were used for the determination of the llama and alpaca parasites.

The parasitological survey carried out revealed the presence of two types of ectoparasites: lice and mites. The observed prevalence of lousiness in llamas was 71% compared to only 34% in alpacas. The disease was reported to be present along the whole year long, with an increase of the prevalence and severity during the dry and colder season (from April until October). No differences were observed for the lice infestation in llamas for the three age groups considered. Mites were observed in 50% of the sampled llamas and 38% of the examined alpacas, and their prevalence was reported to be more important during the rainy season. Llama foals presented significantly lower mange infestation than young and adult llamas. In alpacas, the evaluation of the infestation of both ectoparasites in the different age categories showed that foals were significantly less infested than the other age categories considered.

Occysts from the *Eimeria* sp. were found in 88% of the analysed llama faecal samples, with a significantly higher prevalence in foals compared to the adult llama group. No significant differences were observed between the prevalence of coccidiosis in the five study communities. In alpacas, the prevalence of *Eimeria* was 86% and, at the $p < 0.05$ considered, the alpaca foals were significantly more infested than the young and adult

alpacas. No significant differences were observed in the prevalence of coccidiosis in alpacas from the different study communities.

Three species of gastrointestinal nematodes were identified in the llama faecal samples: *Trichostrongylus* spp. (30%), *Nematodirus* spp. (25%) and *Lamanema* spp. (19%). Eggs from other non-identified nematodes had a prevalence of 12%. The evaluation of the prevalence of nematodes in the five study communities showed a lower infestation rate in the Milluni community, but not significant differences were observed. The comparison of the prevalence of nematodes in the different age groups showed that adult llamas were significantly less infested than young llamas and adult llamas. The survey performed in alpacas showed the presence of the same parasite species detected in llamas, but in different proportions: 20% for *Nematodirus* spp., 10% for *Lamanema* spp. and only 3% for *Trichostrongylus* spp. The prevalence of nematodes eggs in llamas (60%) was higher than the one observed in alpacas (26%). No significant differences were observed between the alpacas sampled in the different communities. Alpaca foals were significantly more infested by nematodes than the other age groups.

The prevalence of cestodes in llamas was 15% and the only species identified were *Moniezia* spp. The Milluni community presented significantly lower prevalence of cestodes compared to the other communities. Concerning the prevalence of *Moniezia* in the different age categories, the adults group were significantly less infested than young and adult llamas ($p < 0.05$). In alpacas, the cestodes prevalence was similar to the one observed in llamas. The alpacas from the Milluni community presented significantly higher infestation rates than the animals from the Cajas-Calientes community.

The differences detected in the prevalence of ecto- and endoparasites between the different sampled communities were attributed to different management and environmental conditions.

The inspection of 10 llamas slaughtered in the Calientes community determined a sarcocystiosis prevalence of 50%. No hydatid cysts were detected in the observed carcasses.