

**SA 06. INTEGRATED CONTROL OF STRONGYLOSIS OF SMALL RUMINANTS IN THE HUMID TROPICS: A COMPONENT OF ANIMAL PRODUCTION SYSTEM THAT REQUIRED A PLURIDICISPLINARY APPROACH**

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**Resumen**

**Control integrado de la strongilosis en pequeños rumiantes en el trópico húmedo: un componente del sistema de producción animal que requiere un enfoque multidisciplinario**

Los principales resultados sobre nematodos Gastro-Intestinal (GI) en los pequeños rumiantes de French West Indies (FWI) fueron revisados. Este parásito es uno de los mayores factores limitantes para el desarrollo de la producción en los pequeños rumiantes. La gran resistencia a los antihelmínticos así como la prevalencia de estos parásitos requieren de planes integrales de control e implican llevar a cabo adecuados proyectos de investigación, en los cuales los nematodos GI sean considerados como un componente más del sistema de producción animal. En este artículo se resumen las investigaciones desarrolladas en Guadalupe y Martinica con un enfoque multidisciplinario, en términos de: interacción entre el parasitismo y la nutrición del hospedero, sistemas de manejo del pastoreo y resistencia genética.

**Palabras claves:** Parasitismo gastro-intestinal, control integral, sistema de producción en pastoreo, programas de mejora genética.

**Key words:** Internal parasitosis, integrated control, grazing production systems, genetic improvement programs.

**Introduction**

Internal parasitosis, mainly due to nematodes are well known to induce important economic losses in small ruminant production in tropical areas (Fabiyyi, 1987). In the French West Indies (F.W.I.), strongyloses are the more frequent diseases and became one of the main constraints in small ruminants production in the Caribbeans (Aumont *et al.*, 1997). Research works are generally conducted with a disciplinary approach in Latin America: veterinarians focus on parasitology whereas animal production scientists focus on breeding systems. However, there are now sufficient data that emphasized the need of a global approach to set up efficient plans of integrated control for animal production in sustainable systems (Donald, 1994). This paper reviews the main research results obtained in the F.W.I. on these parasitoses and describes the pluridisciplinary researches that are developed locally in the Animal Production Research Unit (APRU) to improve small ruminant grazing systems taking into account the inevitable gastro-intestinal (GI) nematodes, as a component of the production systems.

**Basic parasitological data in the West Indies.** The prevalence of gastro-intestinal strongyles in sheep and goats average 100 % in Guadeloupe and Martinique (Aumont *et al.*, 1996). *Haemonchus contortus* and *Trichostrongylus colubriformis* are the main parasites with high frequencies in worms populations: 34.1 % and 53.6 % respectively (Aumont *et al.*, 1997). Incidences of GI nematodes poorly depend on season and on the different regions of Guadeloupe (from the driest, 1200mm rainfall/year, to the rainiest 3500 mm/y) but season factors affect differently the worm and infective third stage larvae (L3) populations. Surveys in farms showed that complete cycle of *H. contortus* and *T. colubriformis* could be achieved all the year in each region. However, herbage mass, water availability (drought, irrigation, rainy or dewy water), season, genus of parasite (*Haemonchus* vs *Trichostrongylus*), and duration of dung survivability are important sources of variation of L3 density in herbage (Aumont et Gruner, 1989, Gruner *et al.*, 1989). More precise epidemiological data and experimental studies are required to estimate the animal production losses due to these parasitosis in the caribbeans. Williams (1990) claimed that economic losses due to strongylosis are higher than that of ticks in the West Indies. For example, preweaning mortality rate due to strongylosis average 40 % in goat breeds in Guadeloupe (Aumont *et al.*, 1997). Anthelmintic resistance of *Haemonchus* sp. and *Trichostrongylus* sp. are largely spread all over Guadeloupe and Martinique (Aumont *et al.*, 1997), as it has been mentioned for other countries in Latin America (Waller *et al.*, 1996).

**Integrated control of gastro-intestinal nematodes in small ruminants.** The Animal Production Research Unit of INRA has developed different systems for goat production at grazing. Ecological studies and animal production studies showed that L3 kinetics could be simulated with different models. Age of regrowth,

grazing duration, water factors, and stocking rate are the main sources of variation of infection risk (Aumont *et al.*, 1991). Recommendations were developed from this simulation approach and were extended to breeders organization in the F.W.I. Furthermore, the different experiment carried out in order to improve grazing system suggested that the infection by GI nematodes is one of the major causes of variations in animal production performances. For example, mixed grazing system of sheep and cattle together in intensive conditions, increased meat lambs growing rate and total meat production per hectare comparing to single species systems, because of a very marked decrease in the infection rate of lambs by *Haemonchus contortus* (Aumont *et al.*, 1995).

Resistance to gastro-intestinal nematodes can be used as an usual trait to improve animal production by genetic selection in sheep and goats (Mandonnet *et al.*, 1996 ; Woolaston and Baker, 1996). However, the expression of genetic resistance seems to largely depends on the environment.

Numerous studies support that important interactions exist between host nutrition, particularly nitrogen nutrition, and parasite patho-physiology: the influence of parasites on host feeding and metabolism, the effect of nutrition on the development and establishment of worm population and on the host-immune response (Coop and Holmes, 1996). It has been shown that nitrogen supplementation can improve immune response of gastro-intestinal mucosa to *Haemonchus contortus* in sheep (Abbott and Holmes, 1990). Diet supplementation might be able to overcome the zootechnical disturbances due to GI nematodes in the tropics both in sheep and goat for *Haemonchus* sp. or *Trichostrongylus* sp. (Knox and Stell, 1996). Nitrogen dietary supplementation can significantly interact with haemonchosis in genetically susceptible or resistant genotypes (Wallace *et al.*, 1995). Furthermore, the benefic effects of nitrogen supplementation on host resilience is more marked than in host resistance (Van Houtert and Sykes, 1996).

**Multidisciplinary research approach in the French West Indies.** All these results and facts strongly support that the control of gastro-intestinal nematodes in small ruminant requires a global approach, since anthelmintic resistance is more and more frequent. At the APRU, we have developed a research program for the optimization of grazing system in restraint areas, i.e. Guadeloupe and Martinique. Studies are focused on ruminant nutrition, feeding behaviour at grazing, animal production at grazing and gastrointestinal strongyloses. Research are conducted to set up feeding supplementation for better nutrition of animals but also to enhance animal immune response to internal parasites, mainly *Haemonchus*. Each new grazing system is studied in terms of animal production, of herbage kinetics and pasture production, and parasitologic implications for cattle, sheep and goat. Mixed animal species systems are particularly studied.

Diagnostic methods to monitor internal parasite linked to worm population and its fertility (automatic fecal eggs counts), abomasum lesions (seric pepsinogen) and immune response (fecal antibody, oesinophiles counts) are used in a program of breeding improvement of resistance to internal parasite in creole goats. These tools are developed so that they can be used in extension programs, i.e. at a lower economic cost but with reproducibility characteristic according to requirements of the animal breeding program. They are now used through a research network in various countries of Africa and the Caribbeans. Efficiency of some anthelmintics are studied particularly their interest related to their remanence and integration with grazing systems. Resistance and resilience to gastro-intestinal nematodes are studied in order to be included by breeders organization in breeding improving programs. Such integrated control required more data on the effects of strongylosis in terms of animal production, and economy of small ruminant systems in the humid tropics. One calls for network collaborative actions to build data base in an attempt of know how to integrate well-thought-out drenching plan, grazing management systems, feeding practices and breeding program in the rearing situations that be encountered in the Caribbeans and tropical latin America.

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