

## Anthelmintic effect of *Bromelia pinguin* on *Oesophagostomum columbianum* (Strongylidae: Chabertidae) in sheep



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### Efecto antihelmíntico de *Bromelia pinguin* sobre *Oesophagostomum columbianum* (Strongylida. Chabertidae) en ovejas

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**ABSTRACT:** The anthelmintic effect of the fruits and the extract of the plant *Bromelia pinguin* against the gastrointestinal helminth *Oesophagostomum columbianum* were evaluated. Sheep were divided into five groups of 10 animals each: an untreated control group, a control group treated with ivermectin (Ivomec, MSD) at a dose of 0.2 mg/kg and three groups that received the extract from the plant at the dose of 500 mg per animal, as well as the fruits of *B. pinguin* at doses of 10 and 15 fruits per animal. High levels of infestation were constant in the untreated control group during the entire time of the experiment. The efficacy rate of the plant in the helminths was high (100 %) with *B. pinguin* extract and with the fruits at 48 h after the treatments. Group 5 result was the highest (90.4 %) 25 days after treatment. The reduction of infestation varied ( $p < 0.01$ ) in each treated group after the administration of vegetable products.

**Key words:** antihelminth, *Bromelia pinguin*, *Oesophagostomum columbianum*.

**RESUMEN:** Se evaluaron el efecto antihelmíntico de los frutos y del extracto de la planta de *Bromelia pinguin* frente al helminto gastrointestinal *Oesophagostomum columbianum*. Las ovejas se dividieron en cinco grupos de 10 animales cada uno: un grupo de control no tratado, uno de control tratado con ivermectina (Ivomec, MSD) a una dosis de 0,2 mg/kg y tres grupos que recibieron el extracto de la planta a la dosis de 500 mg por animal, así como las frutas de *B. pinguin* en la dosis de 10 frutas por animal y en la dosis de 15 frutas por animal. Los niveles de infestación elevados fueron constantes en el grupo control no tratado durante todo el tiempo del experimento. La tasa de eficacia de la planta en los helmintos fue alta (100 %) con el extracto de *B. pinguin* y con las frutas a las 48 h después de los tratamientos. El resultado con el Grupo 5 fue el más alto (90,4 %) 25 días después del tratamiento. La reducción de la infestación varió ( $p < 0,01$ ) en cada grupo tratado después de la administración de los productos vegetales.

**Palabras clave:** antihelminto, *Bromelia pinguin*, *Oesophagostomum columbianum*.

### INTRODUCTION

The production of small ruminants in most semi-arid areas of Mexico is mainly due to the poor sanitary situation of the animals and the parasitism due to the gastro-intestinal strongyles having an important role in the health of the sheep (1). *Oesophagostomum columbianum* Curtice, 1890, caused different damages to the small ruminants (2,3). They have been the most important nematodes in the sheep in the region of Huichapan, Mexico (4,5).

The anthelmintic effect of some plant products has been published in different countries (6,7,8). The tropical plant *Bromelia pinguin* has been used as an anthelmintic and it has been successful on *Haemonchus contortus* in Cuba (9).

The objective of the present work was to know the anthelmintic effect of the fruits and the extract of the plant *Bromelia pinguin* on *Oesophagostomum columbianum* in sheep.

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## MATERIALS AND METHODS

### Materials

The fruits of the plant were collected and the pulp was separated from the peel. The pulp has been used naturally as an aqueous extract. The fruit extract has been obtained according to the methodology described by Marrero *et al.* (9).

### Parasitological and monitoring methods

Sheep were experimentally infected with 500 infective larvae of *O. columbianum*.

Up to 40 days, the animals were followed by a quantitative coproscopy. The number of eggs per gram of faeces (EPG) was determined, and in this way homogeneous pilot batches were constituted.

After the treatment, the quantitative coproscopy was carried out at 24 and 48 h. All along of the research, the animals were fed artificial grazings and received a food supplement.

EPG were quantified according to the of McMaster egg counting technique with a solution of Na Cl (density 1.2) to determine the effect of the treatments. At the 25<sup>th</sup> day after treatment, two sheep of every group were slaughtered to observe the presence of the parasites.

### Experimental device and treatments

The research was performed in the farm of the Universidad Nacional Autónoma, Xochimilco, in Mexico City, using 50 Creole sheep of 6 months of age belonging to the region Huichapan, all of them parasitized by *O. columbianum*.

Five groups of ten sheep each were conformed, managing the treatments in the different groups:

- The untreated control group (Group 1)
- The control group treated with ivermectin (Ivomec, MSD ND) at a dose of 0.2 mg/kg (Group 2)
- The group treated with *B. pinguin* extract at a dose of 500 mg per animal (Group 3)
- The group treated with *B. pinguin* fruits at a dose of 10 fruits per animal (Group 4)
- The group treated with *B. pinguin* fruits at a dose of 15 fruits per animal (Group 5)

### Analysis and calculation of the reduction percentage of EPG

The results were analyzed according to the method described by Ruiz-Ruiz *et al.* (10) which

allowed determining the reduction of EPG using the following formulae:

$$\left[ \frac{(N - n)}{N} \right] \times 100$$

N -averages of EPG to the n° day before the treatment.

n -averages of EPG to the n°day after the treatment.

Variance analyses were used to compare EPG averages.

The results are shown in the [Table 1](#). The elimination of the helminth eggs in the control group was constant all along the research. Ivermectin showed efficacy against *O. columbianum* at 100% from 48 h. A strong efficiency (100%) with *B. pinguin* extract and fruits was also observed 48 h post treatment. The results of the share 5, dealt with 15 fruits of the plant, were at the height of the forecasting. At this dose, a strong efficiency (90.4 p 100) was observed on the 25<sup>th</sup> day. EPG reduction varied in each treated group, from 48 h after the administration of the plant products.

No helminths were observed in sheep of Group 2. Groups 3, 4 and 5 only showed some adults (3 to 5) of the studied group, compared to the control group. The number *O. columbianum* adults observed in the control group ranged from 20 to 27.

The development of egg excretion in the days following the treatment and the results obtained among the slaughtered animals, where the elimination of a big part of the *O. columbianum* population was evident, indicated a good anthelmintic efficacy of *B. pinguin* products. Marrero *et al* (9) also found that treatments with plant products affected the excretion of *H. contortus* eggs and had an anthelmintic effect, even in adults.

According to Ruiz-Ruiz *et al.* (10), *B. pinguin* is a natural source of bioactive compounds with proven antibacterial action against *Echerichia. coli* and *Staphylococcus aureus* that could be related to the presence of enzymes, protease inhibitors, and peptides.

The anthelmintic activity of *B. pinguin* could be explained by the presence of pinguinin, a proteolytic enzyme with antiparasitic activity according to Montes *et al.* (11). The mechanisms of action of this enzyme could be explained by its

**Table 1.** Average reduction of *Oesophagostomum columbianum* eggs (% EPG) before and after the treatments with *Bromelia pinguin* fruits and extract / *Reducción de la media de huevecillos de Oesophagostomun columbianum* (% hpg) antes y después de los tratamientos con las frutas y el extracto de *Bromelia pinguin*.

	BEFORE/AFTER				
	24 h	24 h	48 h	7 days	25 days
Group 1 Control	12400	2200	2700	2200	2300
Group 2 Ivermectin	2300	300 (86.9)	0 (100)	0 (100)	0 (100)
Group 3* 500 mg per animal)	2300	1000 (56.5)	0 (100)	0 (100)	1000 (56.5)
Group 4* (10 fruits)	2700	1500 (44.4)	0 (100)	100 (96.2)	300 (88.8)
Group 5* (15 fruits)	2100	1300 (38)	0 (100)	0 (100)	200 (90.4)

Group1 and Group 2: Control group

\*Groups treated with *B. pinguin*

intervention in the inhibition of some metabolism phases, ATP production which causes the death of adult helminths, or by the intervention of the enzyme in the synthesis of proteins in the process of egg formation that helps to reduce EPG.

According to Nfi *et al.* (12), the antiparasitic inefficiency of some plant products in ruminants could be explained by the constant ingestion of infectious larvae found in the grass that maintains a level of parasite inside the host. In the case of *O. columbianum*, there is another important element regarding the strongyle having a biologic cycle with an internal larval phase in the intestinal mucous membrane, which can enter in hypobiosistation to persist for a long time under these conditions, without being affected by the antiparasitic product. Under this condition, the parasite continues the elimination of eggs. These biological characteristics hinder the success of chemical and herbal medicine.

In this study it is evident that *B. pinguin* could be used in the treatment of *O. Columbianum* at the dose of 15 fruits per animal, hence it is necessary to continue the study of the purification of the plant extract and its evaluation as antihelminth.

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The authors of this work declare no conflict of interest.

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