Safety and efficacy study for use of *Tanacetum vulgare* in sheep as a potential anthelmintic medication: histological assessment of digestive system

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INTRODUCTION

Anthelmintic resistance is a growing concern in small ruminants, therefore phytotherapeutic agents, including plant-based extracts, are being explored for their potential to control gastrointestinal nematodes. *Tanacetum vulgare* (tansy, Fig. 1) leaf extract has shown promising *in vitro* antiparasitic activity, warranting further evaluation of its efficacy and safety *in vivo.*

Fig. 1. Tanacetum vulgare (tansy).

OBJECTIVE

To assess the impact of *T. vulgare* leaf extract on histological alterations in the digestive tract organs and the intensity of gastrointestinal nematode infection in sheep.

M&M

Thirty 6 months old sheep were randomly assigned to five groups (n = 6/group):

- negative control (**Neg**; naturally infected, untreated)
- positive control (**Pos**; naturally infected, treated with levamisol)
- three experimental groups -- naturally infected and receiving *T. vulgare* leaf extract administered as a specifically designed intraruminal bolus (containing 2 different concentrations of tansy extract slowly released in rumen – **Bolus 1; Bolus 2**) or as **granules** added to feed daily.

After clinical study period (56 days) sheep were euthanized and histological samples collected from multiple gastrointestinal tract segments (forestomaches, abomasum, small intestine, large intestine, mesenteric lymph node, pancreas, liver, gall bladder).

A blinded semiquantitative histological assessment of H&E-stained tissue sections was performed. Scoring system was developed to evaluate presence of parasites (nematodes), inflammation, and lymphoid tissue alterations in the gastrointestinal tract (gastrointestinal lymphoid tissue [GALT] and mesenteric lymph nodes).

RESULTS

Impact of *T. vulgare* extract on nematode invasion intensity

- Nematode invasion was detected histologically in all experimental groups, including the Pos control group.
- The groups that received tansy extract showed a tendency towards lower nematode invasion intensity compared to the Neg control. However, the parasite count was not as low as in the positive control group (Fig. 2).
- Five of the 30 sheep had no nematodes detected histologically (2 sheep – Pos cntr; 2 – Bolus 1; 1 – granule group).

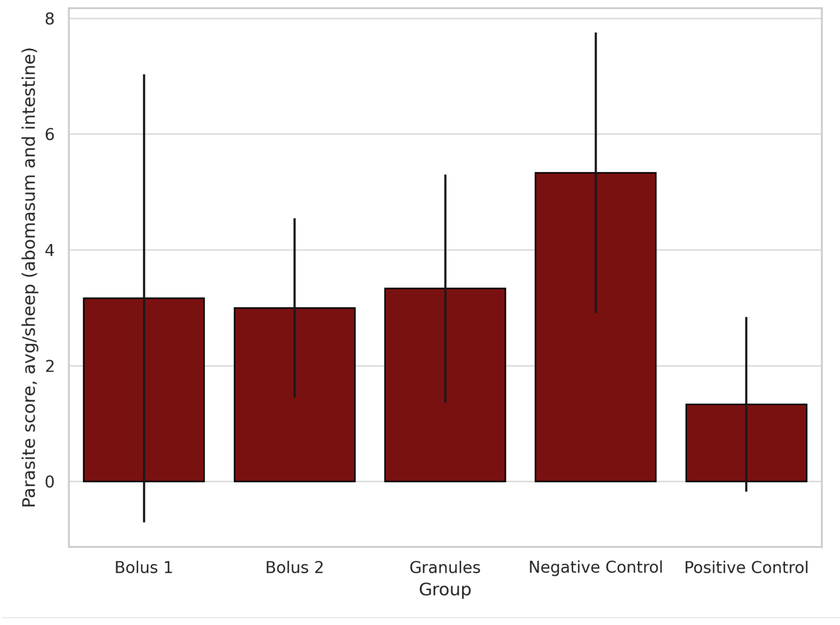


Fig. 2. Parasite invasion intensity score in GI tract of experimental sheep.
Neg cntr – no treatment; Pos cntr – levamisole trt.

Impact of *T. vulgare* extract on GI lymphoid tissues

- GALT hyperplasia was markedly and significantly increased in tansy extract groups compared to both control groups (Fig. 3, 4).
- Mesenteric lymph nodes in all groups showed follicular lymphoid tissue hyperplasia.
- In tansy extract groups paracortical hyperplasia was more frequently observed compared to controls.

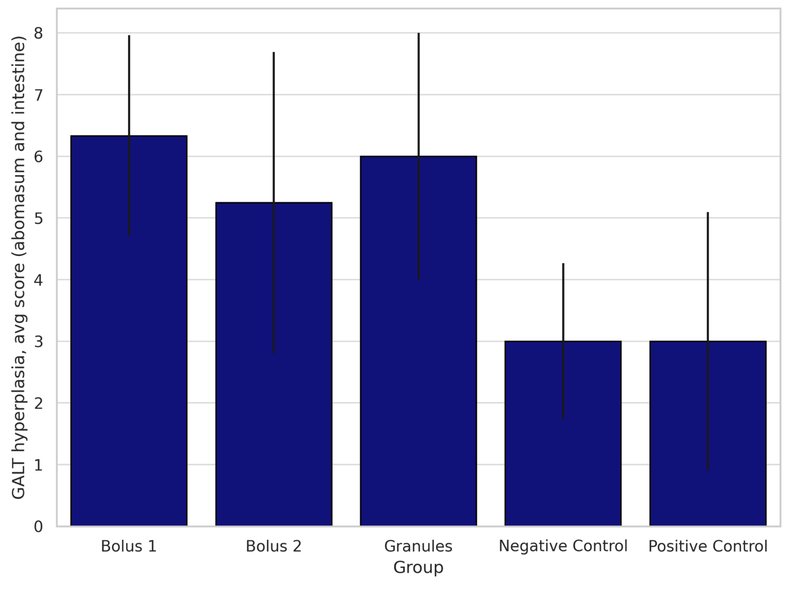
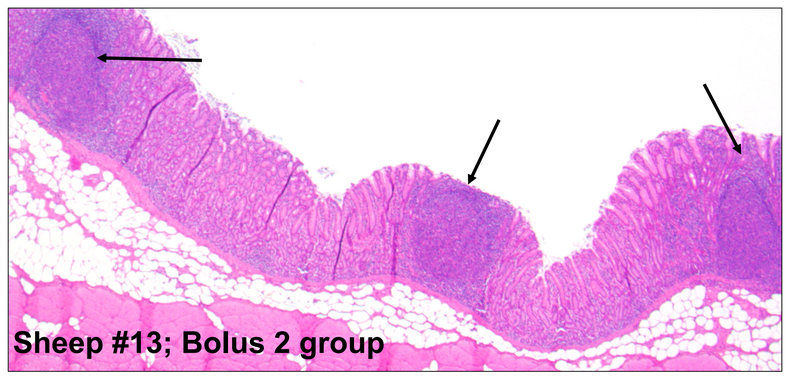


Fig. 3. GALT hyperplasia score in GI tract of experimental sheep.
Neg cntr – no treatment; Pos cntr – levamisole trt.



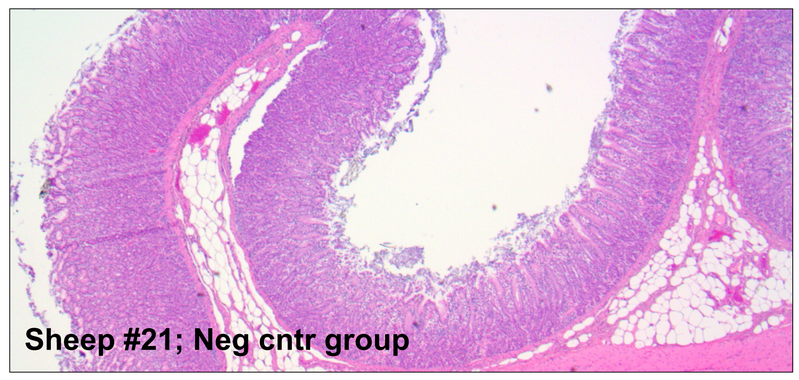


Fig. 4. H&E sections of abomasum. Note GALT hyperplasia in sheep from Bolus 2 group (black arrows).

Impact of *T. vulgare* extract on GI mucosal inflammation

- Mucosal inflammation scores were similar across all groups → no exacerbation due to extract administration and no correlation with parasite load.
- Statistically insignificant, slightly higher inflammation was noted in the abomasum of the granule group → possibly a mild local irritant effect from the granules.

Impact of *T. vulgare* extract on pancreas, liver, gall bladder

- No extract-associated pathological alterations were identified.

CONCLUSIONS

1. ***T. vulgare* leaf extract demonstrated partial anthelmintic activity against gastrointestinal nematodes in sheep, however its antiparasitic effect did not match that of conventional drugs.**

1. **Antiparasitic effect of *T. vulgare* extract was possibly mediated through stimulation of local mucosal immunity.**

1. **The absence of toxic histological effects and the observed immunomodulatory response support potential role of *T. vulgare* extract as a complementary therapeutic agent.**

Acknowledgement

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