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Efficacy of annual mugwort (*Artemisia annua*) powder on gastrointestinal nematodes in cattle

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Abstract

Parasitism remains a challenge in the effective and efficient management of ruminant livestock. Among the different approaches proposed for a better management of these different ruminant parasites, the present work carried out on the farm of the Faculty of Agronomic Sciences (FSA) located in Sékou, focused on the effectiveness of the annual mugwort powder (*Artemisia annua*) on gastrointestinal nematodes (Nematoda) of cattle. The coprological analyses were made at the Laboratory of Ethno pharmacology and Animal Health (LESA) in a population of eighteen (18) animals, divided in 2 groups with treatment and one without treatment.

The result after treatment showed that the *Artemisia annua* powder significantly reduced the excretion of nematode eggs. It is noted that the more the animals are infested the faster there is a decrease in egg excretion.

Keywords: *Artemisia annua*; Parasites; Nematoda; Cattle; Republic of Benin

1. Introduction

In Benin, cattle breeding is mainly based on the exploitation of pastures. Different parameters such as temperature, humidity, food, hygiene and diseases (viral, bacterial, fungal and parasitic), etc affect this practice. Its main consequence is parasitism, being the limiting factor of cattle breeding in countries with tropical climate [1, 2]). Indeed, parasites (internal and external) of cattle are the recurring problem of grazing animals. The most common symptoms of nematode infection are loss of appetite, mucosal inflammation, diarrhea, loss of body mass, and death [3, 4]. A high infection rate can lead to reduced food intake, loss of condition, tissue damage, weight loss, skin scaling, and ultimately death [5]. In addition to mortality, another major effect of high infection levels is decreased production in animals surviving the infection [4].

Commercially available anthelmintics have reduced the aggressiveness of the disease [6]. However, they are synthetic in nature [7]. Besides, many authors will note the scarcity and high cost of treatment products for these parasites with an increasing demand for natural production without drugs or chemicals [6, 8, and 9]. Also, repeated administration of anthelmintic drugs is necessary to treat internal parasites [10, 11].

In addition, some parasites have developed resistance to antiparasitic drugs. Due to these constraints, Artemisia appears in the local pharmacopoeia as an effective product in the fight against parasitic diseases in domestic animals

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[12], the treatment of cough and cold [13, 14], malaria and bilharzia (Artemisia herba-alba) and Haemonchus contortus infestation in goats [15].

Therefore, the present study proposes to evaluate the antiparasitic efficacy of *Artemisia annua* on cattle reared in extensive rearing system. Specifically, it analyzes the influence of *Artemisia annua* on bovine gastrointestinal parasites (nematodes).

2. Material and methods

The present study was conducted under the conditions of an extensive breeding system where the animals are taken to pasture during the day and return to the barn in the evening. The animals were kept in the breeding premises of the Faculty of Agricultural Sciences in the town Sekou (30 km from the capital, Cotonou) for a period of 4 months. It was carried out on 108 cattle resulting from the cross between the Borgou and Lagoon breeds. At the beginning of the experiment, a coprological analysis was carried out to evaluate the level of parasite excretion by the animals. This has allowed the reasonable constitution of homogeneous groups of animals (36 in total) according to the degree of infestation for a better evaluation of the variation after treatment.

2.1. Experimental conditions

The animals selected for the study were not isolated. In order to distinguish those animals in the herd, they were marked with a rope.

The coprological analyses were carried out in the Laboratory of Ethno pharmacology and Animal Health (LESA).

2.2. Experimental set up and treatment

The experimental set up was based on two factors: the use or not of *Artemisia annua* powder. To carry out this study, three groups of 12 animals in each of them were formed:

- Group 1 was composed of animals treated with Artemisia powder (T1) at a dose of 100 g per animal twice in a fortnight.
- Group 2 was composed of animals treated with Artemisia powder (T2) at a dose of 80 g per animal twice in a fortnight.
- Group 3 was made up of animals that had not received any treatment (T0) and thus represented the control group.

The *Artemisia annua* plant used for this study was harvested, chopped and then dried in the shade for a period of 21 days. In order to extract all the moisture from the plant and facilitate milling, the pre-dried plant was put in an oven for 24 hours. It was then crushed and powdered to make it easier for animals to take. The obtained powder is packaged in plastic bags to avoid their rewetting.

The treatment of the animals with the powder of *Artemisia annua* was done twice in two weeks.

To ensure the total uptake of the powder by the animals, it was diluted in a small amount of water and then directly administered to the animals.

2.3. Parasitological method and experimental monitoring

Quantitative coprological analyses were performed on 7 days before the beginning of treatment. These same analyses were repeated on 7, 14 and 21 days after treatment to see the evolution or decrease of nematode eggs in the feces. 3 different samples (S1, S2 and S3) in each animal for each test were used.

The observation of parasite eggs was done by the Mini-FLOTAC method. The Mini-FLOTAC is a new method developed by Cringoli et al. (2010). It has an upper part that is rotated for observation under a microscope. It leaves only a very thin film to observe, which greatly increases reading comfort. For this technique, 2 grams of tailings were taken and mixed with 18 ml of the flotation solution (NaCl), using a dilution ratio of 1:10. This solution was prepared in the Fill FLOTAC.

The Mini-FLOTAC technique was developed by Cringoli et al. (2010). In fact, this method is based on the use of the Fill-FLOTAC (collector allowing the homogenization of the droppings in the flotation liquid and the filtration of the homogenate) and the Mini-FLOTAC (reading disk with 2 compartments of 1 ml).

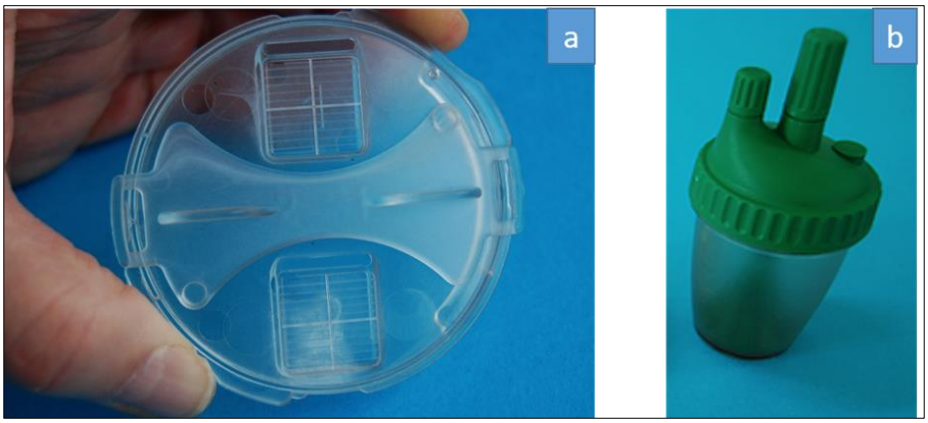

Figure 1 The Mini-FLOTAC (a) and the Fill-FLOTAC (b)

The mini FLOTAC is slightly tilted, giving then access to the first compartment which has been filled until a slight meniscus is formed. For the second counting compartment the process was repeated, swerving the receptacle until the reading disc was formed.

However, for the Analytical Sensitivity Calculation, one egg found is equivalent to 5 eggs per gram of residue (OPG). If no eggs are found, the residues contain 0 < 10 OPG.

OPG Mini FLOTAC = quantity of eggs found x 5.

2.4. Statistical analysis

For the realization of the statistical analyses two software were used. The software Excel 2016 was used as database for the recording of the data and the calculation of the averages as well as the standard deviations.

To study the normality of the physico-chemical parameters, the non-parametric test of Kruskal wallis was practiced.

3. Results

During all the period of the test there was the excretion of eggs of parasite. The *Artemisia annua* powder has had regressive effect on the parasites but could not totally eliminate the nematodes.

Descriptive analysis of the data is represented in table 1. The comparison of parasitism's results according to the treatments revealed a significant difference between the averages. This leads us to check the normality of the database variables.

About the initial OPG and OPG of the 3 control tests, the Krulkal wallis test shows that there is no significant difference between the treatments and the repetitions except for a difference noticed on the repetitions (p-values=0.01114) in the 1st control test.

The pairwise comparison analysis shows that there is a significant difference between the repetitions S3= 1296.33, S2= 538.33 and S1=511.45.

Table 1 OPG (eggs per gram) in the animals before (OPG initial) and after treatment on 7th, 14th and 21st day respectively (OPG control 1, 2, 3)

Groups	Samples	OPG initial	OPG control 1	OPG control 2	OPG control 3
T1 n=12	S1	389,17±31,50	319,17± 21,22	240,83± 8,5	196,67± 6,01
	S2	687,50±55,33	444,17±53,9	378,33± 18,06	318,33± 18,92
	S3	3250,00±652,24	1485±253	1031,67±117,82	703,33± 84,52
	M±m	1442,22±246,35	749,44±109,38	550,27±48,12	406,11±36,48
T2 n=12	S1	371,67±45,86	323,33± 23,79	294,17± 19,9	236,67± 16,91
	S2	722,50±53,89	506,67±30,76	377,5± 12,16	317,50± 11,88
	S3	2453,33±528,14	1156,67±294,4	554,17± 100,64	399,17± 61,96
	M±m	1182,5±209,3	662,22±116,31	408,61±44,45	317,78±30,25
T0 n=12	S1	310,83±23,07	903,33±31,87	1482,5± 98,14	1562,50± 92,08
	S2	709,17±52,27	1202,5±129,7	1886,67± 113,06	1950± 106,93
	S3	2081,67±386,45	2531,67± 395,98	3043,33± 412,77	3436,67± 566,41
	M±m	1033,89±153,93	1545,83±185,85	2137,5±208	2316,39±255,14

We also analyzed the dynamics of change in the average OPG in each group (graph 1)

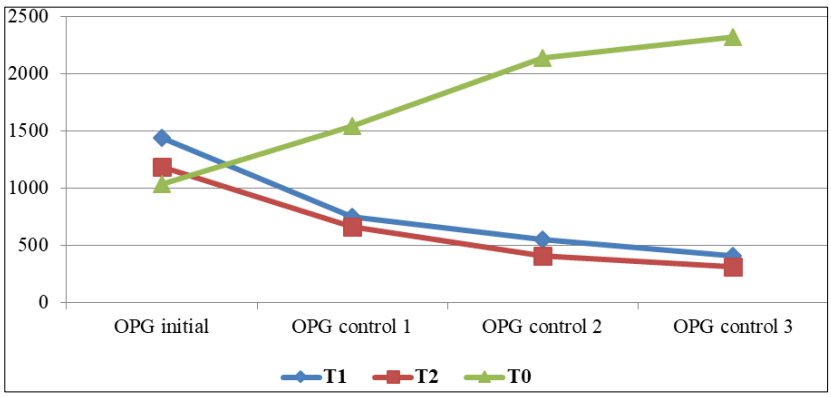

Figure 1 Dynamics of change in the average OPG in each group

There is evidence about the effectiveness of *Artemisia annua* powder on the excretions eggs and there was no significant difference between the treated groups. However it's necessary to emphasize that the treatment with 100 g showed more decrease in the excretions eggs between OPG initial and OPG control 1. Despite the approximately same OPG initial in the groups, OPG control 1 in T0 was 2 and 2, 33 times higher than in T1 and T2 respectively. At the same time OPG control 2 in T0 was 3,88 and 5,23 times higher than in T1 and T2 respectively, as well as OPG control 2 in T0 – 5,7 and 7,29 times higher than in T1 and T2 respectively.

4. Discussion

Qualitative microscopic examination of collected feces revealed gastrointestinal infestations in all the studied animals. This prevalence of gastrointestinal helminths would be related not only to the fact that the identified parasites are common in ruminants, but also to poor husbandry conditions and lack of veterinary monitoring [16]. In addition to this, in southern Benin, the highest parasite densities are observed during the wet season, and this study was conducted in the wet season.

Leaves have always been used as a life form against eggs, larvae and adult worms of gastrointestinal parasites compared to trees and shrubs. The predominance of leaves over other life forms could be attributed to their easy availability and high efficacy against various ailments compared to shrubs and trees [17]. Leaves are widely used in folk medicines all over the world and contain a large number of active compounds responsible for their high efficacy and, therefore, are preferred by scientists and traditional healers [18].

A positive effect was observed following the treatment of animals with *Artemisia annua* powder. It was noticed that the use of *Artemisia annua* powder at any dose caused a very pronounced decrease in nematodes levels. This decrease is more noticed when the parasite density is much higher. The more animals are infested, the more effective the powder is. The *Artemisia annua* powder did not eliminate all the nematodes. This could be explained by the loss of certain properties of the plant during its transformation into powder. Considering that the methods used for this transformation are very mechanical, a possible bad manipulation can be suspected. It has been noticed that the powder did not have an abrupt effect on the nematodes. The decrease in parasite load occurred over time but not all at once. These results are comparable to those of Ademola IO [19] on the use of Khaya senegalensis extract in the control of gastrointestinal parasites of Fulani sheep in Nigeria. The *Artemisia annua* powder has a parasitic load reduction effect over time. This is contrary to the study of Dereje Tadesse in 2009 [20] on the ovicidal and larvicidal activities of crude extracts of Maesa lanceolata and Plectra thus punctatus against Haemonchus contortus, in which the inhibition of eggs was done at 100% [20].

It is possible that *Artemisia annua* powder can over time have a total eliminating effect on parasites if the powder is obtained scrupulously, and in some better conditions than our study and if the research can identify the right dose per animal.

The anthelmintic activity demonstrated by *Artemisia annua* powder against gastrointestinal nematodes of cattle in this study has a significant importance considering the global emergence of anthelmintic resistance. Based on the results obtained in this study, it can be concluded that *Artemisia annua* powder showed significant anthelmintic activity at different concentrations. This plant is readily available in the south of the country, where it can be easily accessed by local farmers.

5. Conclusion

This study shows that the use of *Artemisia annua* powder has a positive effect on gastrointestinal nematodes in cattle.

Indeed, the two doses (80 g and 100 g) led to a reduction of the nematodes in cattle. However, it did not totally eliminate them. This would be due to a slight loss of efficiency during the treatment of the *Artemisia annua* powder.

Considering all the constraints of Beninese livestock farming, these results can be a source of hope for a better management of the health of domestic animals. However, there are some challenges to overcome before the large-scale use of annual mug wort in livestock production. These include the popularization of this species by making available seeds adapted to our agro ecological conditions.

Research needs to focus on the optimal dose and the frequency of administration in a year to avoid side effects that may occur.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

References

[1] Fabiyi. Production losses and control of helminths in ruminants of tropical region. International Journal for Parasitology. February 1987; 17(2): 435-442.

[2] Hounzangbe-Adote MS, Paolini V, Fouraste I, Moutairou K, Hoste H. *In vitro* effects of four tropical plants on three life-cycle stages of the parasitic nematode, Haemonchus contortus. Res Vet Sci. 2005; 78: 155-60.

[3] Hendrix CM. Introduction to the nematodes. In: Diagnostic Veterinary Parasitology. Hendrix CM (ed). 2nd ed. Times Mirror Company, United State of America, Mosby Inc. 1998; 12: 108-16.

[4] Hunter A. Animal health: General principles. Vol. 1. Netherlands, The tropical agriculturalist series, the Netherlands, Macmillan. 1996; 167.

[5] Bogish BJ, Cheng TC. Intestinal nematodes. In: Human parasitology. Bogish BJ, Cheng TC (eds). New York, Saunder College Publisher. 1990; 269-91.

[6] Eguale T, Tadese D, Giday M. *In vitro* anthelmintic activity of crude extracts of five medicinal plants against egg-hatch and larval development of Haemonchus contortus. J Ethnopharmacol. 2011; 137: 108-13.

[7] Pessoa LM, Morais SM, Bevilaqua, CML Luciano JHS. Anthelmintic activity of essential oil of Ocimum gratissimum Linn. And eugenol against Haemonchus contortus. Vet Parasitol. 2002; 109: 59-63.

[8] Githiori JB, Athanasiadou S, Thamsborg SM. Use of plants in novel approaches for control of Agastrointestinal helminths in livestock with emphasis on small ruminants. Vet Parasitol. 2006; 139: 308-320.

[9] Tsotetsi AM, Mbati PA. Parasitic helminths of veterinary importance in cattle, sheep and goats on communal farms in the north-eastern Free State, South Africa. Journal of South African Veterinary Association. 2003; 74(2): 45-48.

[10] Kamaraj C, Abdul Rahman A, Bagavan A, Abduz Zahir A, Elango G, Kandan P, Rajakumar G, Marimuthu S, Santhoshkumar T. Larvicidal efficacy of medicinal plant extracts against Anopheles stephensi and Culex quinquefasciatus (Diptera: Culicidae), Trop Biomed. Aug 2010; 27(2): 211-9.

[11] Ademola IO, Eloff JN. Anthelminthic activity of acetone extract and fractions of Vernonia amygdalinaagainst Haemonchus contortus eggs and larvae. Trop Anim Health Prod. 2011; 43: 521–527.

[12] Ba T. Effet de l'incorporation de la feuille d'armoise séchée dans la ration pour poulet de chair. Mémoire d'ingénieur agronome. 2015; 35.

[13] Lameck S. Chagonda, Christopher Makanda, Jean-Claude Chalchat,Essential Oils of Four Wild and Semi-Wild Plants from Zimbabwe: Colospermum mopane(Kirk ex Benth.) Kirk ex Leonard, Helichrysum splendidum (Thunb.) Less, Myrothamnus flabellifolia (Welw.) and Tagetes minuta L. Journal of Essential Oil Research. 1999; 11(5).

[14] JO Erhabor, R Komakech, Y Kang, M Tang, MG Matsabisa. Ethnopharmacological importance and medical applications of Myrothamnus flabellifolius Welw. (Myrothamnaceae)-A review. Journal of Ethno pharmacology. 2020; 252: 112576.

[15] Ali R, Rooman M, Mussarat S, Norin S, Ali S, Adnan M, Khan SN. A Systematic Review on Comparative Analysis, Toxicology, and Pharmacology of Medicinal Plants against Haemonchus contortus. Front. Pharmacol. 10 May 2021.

[16] Hoste H, Torres-Acosta F, Paolini V, Aguilar-Caballero AJ, Etter E, Le Frileux Y, Chartier C. et Broqua, C. Interactions between nutrition and gastrointestinal infections with parasitic nematodes in goats. Small Rum. Res. 2005b; 60(1- 2): 141-151.

[17] Ahmad H, Khan SM, Ghafoor S, Ali N. Ethnobotanical study of upper Siran. J. Herbs, Spices Med. Plants. 2009; 15(1): 86–97.

[18] Tariq A, Sadia S, Pan K, Ullah I, Mussarat S, Sun F, et al. A systematic review on ethno medicines of anti-cancer plants. Phytother. Res. 2017; 31(2): 202–264.

[19] Ademola IO, Faghemi BO, Idowu SO. Evaluation of the anthelmintic activity of Khaya senegalensis extract against gastrointestinal nematodes of sheep: *In vitro* and in vivo studies. Veterinary Parasitology. 2004; 122: 151-164.

[20] Tadesse D, Eguale T, Giday M, Mussa A. Ovicidal and larvicidal activity of crude extracts of Maesa lanceolata and Plectranthus punctatus against Haemonchus contortus. J Ethnopharmacol. 18 Mar 2009; 122(2): 240-4.