

***In vitro* study of the anthelmintic effects of ethanolic extracts of *Bosciasenegalensis* (Pers) Lam. Ex Poir. (Capparaceae) plant used as antiparasitic in Azawagh area in Niger**

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Abstract: In view of the resistance developed by helminths with regard to synthetic anthelmintics available and the high cost of these, the search for other alternatives becomes essential. In this work, the vermifugal properties of ethanolic extract of *Bosciasenegalensis* (Pers) Lam. Ex Poir. (Capparaceae) roots and leaves are evaluated *in vitro* on adult worms (*Ascaridiagalli*) of approximately equal sizes. Three different concentrations (2g/L, 5g/L and 10g/L) were studied. The phytochemical screening revealed the presence of saponins, steroids and terpenoids in both roots and leaves. Flavonoids were present only in leaves and alkaloids were present only in roots extract. All extracts showed vermifugal activity with 100% inhibition of motility before 24 hours. Compared with the negative control (NaCl 0.9%) which gives 100% inhibition of motility, after 72 hours, these extracts are significantly effective ($p < 0.05$). The extracts of *Bosciasenegalensis* possess a vermifugal activity. This activity is non dose-dependant. These results confirm the traditional uses of *B. Senegalensis* as dewormer.

Keywords: vermifugal, *Bosciasenegalensis*, *Ascaridiagalli*, Azawagh, Niger.

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I. Introduction

Among the parasites of the digestive tract of vertebrates are the helminths which are responsible of pathologies known as helminthosis. Globally, it is estimated that two billion people are infected with gastrointestinal nematodes (Kumar et al., 2014). In the livestock sector, helminthosis lead to high economic losses due to reduced fertility, reduced food intake and mortality parasitized animals (Zeryehum, 2012).

The control of these diseases is based on the use of synthetic anthelmintic drugs. Unfortunately, there are several shortcomings in the use of these drugs. These products are expensive and are still not available. Added to this is the ecotoxicity, of these drugs (Lehman et al., 2012). But the serious disadvantage of using manufactured drugs have become the resistance phenomena derived from their employment on a large scale for long periods (Hafsi et al., 2012).

The use of medicinal plants with anthelmintic potential is presented as an alternative means of controlling helminthosis. Several plants have been studied for their vermifugal properties, such as *Newbouldialaervis* and *Zanthoxylumzanthoxyloides* (Azando et al., 2011), *Salvadorapersica* (Garba et al., 2017), *Anogeissusleiocarpus* and *Danielliaoliveri* (Kabore et al., 2009). The aim of this study is to evaluate *in vitro* the anthelmintic activity of the ethanolic extracts of *Bosciasenegalensis* (Capparaceae) on adults worms (*Ascaridiagalli*), dominant poultry nematode in Niger (Idi et al., 2001; Tager-Kagan et al., 1992). This plant is known for its many therapeutic properties. According to Mahmoud et al. (2012) leaves have hypoglycemic activity due to glucocapparins and are used against intestinal parasites, pruritus and other eyes infections. Morgan et al. (2014) have shown that the leaves contain choline, stachydrine, sterols, β -sitosterol, campesterol, stigmasterols, glucocapparins, glucosinolates, bosenegalosite A, lasianthionoside A, syrigine, austroside, terpenes and nitrogen bases. In Niger, it is used in the treatment of several types of diseases mainly bacterial and parasitic infections of the gastrointestinal sphere in humans and animals (Chaibou, 2018; Soumaila and al., 2017; Wezel, 2002).

II. Materials And Method

Preparation of extracts

The leaves and roots of *Bosciasenegalensis* (Pers) Lam. Ex Poir. (Capparaceae) were harvested during the month of January 2019 in the region of Niamey (Niger). The identification of the plant was made in the department of biology (faculty of science and technology of the university AbdouMoumouni of Niamey). These different parts have been separately washed, dried at room temperature (37°C) and then powdered. .

Fifty grams of powder was macerated in 500 mL of ethanol for 48 hours. The various macerates were filtered and concentrated using a rotavapor. Then for each extract by dissolving in 0.9% NaCl solution (medium survival worms), 25mL of solutions (2g/L, 5g/L and 10 g/L) were obtained. The extraction yields have been determined by the following formula:

$$\text{Yield} = \frac{\text{mass of extract}}{\text{mass of powder}} \times 100$$

Phytochemical screening

The phytochemical screening was carried out according to the standard phytochemical screening protocol (Bekro et al., 2007; Bruneton, 1999). The compounds sought are the alkaloids, tannins, saponins, flavonoids, quinones, steroids and terpenoids.

Anthelmintic activity evaluation

Adult *Ascaridiagalli* worms from freshly slaughtered poultry intestines at the Harobanda (Niamey) poultry market were kept in 0.9% NaCl solution and divided into five batches including a negative control receiving only the survival medium (0.9% NaCl), a positive control receiving a solution of levamisole (1g / L) and the last three batches have been treated with plant extracts in concentrations of 2 g/L, 5g/L and 10 g/L . Each batch contains six worms. The number of dead worms has been notified every two hours. The death of a worm is characterized by a lack of mobility even if it is shaken. Worms considered dead are put in distilled water to confirm their deaths (Balqis et al., 2017; Husori et al., 2008; Karumari et al., 2014; Syed et al., 2013). The test was repeated three times. Origin 6.0 software was used to calculate means and variances, and Microsoft Excel software was used to generate the illustration graphics. The dose-response effect was determined by considering the statistical level of significance $p < 0.05$.

III. Results And Discussion

Extract yields

The yield is higher with extracts of roots (24.84 %) than the leaves extracts (10.44 %).

Phytochemical screening

The results of phytochemical screening are reported in Table I. Tannins and quinones are absent in the two parts. Saponins, steroids and terpenoids are present in both organs.

Tableau I:Phytochemical screening results

Parts	Phytochemical compounds						
	Alcaloids M	D	Tannins	Flavonoids	Saponins	Quinones	Steroids - terpenoids
Leaves	-	-	-	+	+	-	+
Roots	+	+	-	-	+	-	+

M: Mayer; D: Dragendoorf;+:Presence; - : Absence

Anthelmintic activity

The anthelmintic activity evaluation test reveals the nematicidal potential of the plant parts involved. Table II shows the nematicidal effect of the ethanolic extract of the roots and leaves on *Ascaridiagalli* adult worms. Inhibition of the motility of the worms is observed before 24 hours of contact with the extracts. The effects are observed from 2 hours of contact for high concentrations (table II and graph) and from 6 hours for low concentrations.

Tableau II:Anthelmintic activity test result

Parts	Conc (g/L)	Percentageof dead worms (%)											
		0h	2h	4h	6h	8h	10h	12h	16h	18h	20h	22h	24h
Leaves	2	0	0	0	16	33	50	50	60	80	80	100	100
	5	0	0	16	33	50	60	80	80	100	100	100	100
	10	0	16	33	50	60	100	100	100	100	100	100	100
Roots	2	0	0	16	33	33	50	60	80	80	100	100	100
	5	0	16	33	50	50	60	80	100	100	100	100	100
	10	0	16	50	50	80	80	100	100	100	100	100	100
Levamisole	1	0	100	100	100	100	100	100	100	100	100	100	100

Indeed, for a concentration of 2g / L, there is an inhibition of 16% after 6 hours of exposure, 50% after10 hours and 100% after22 hours with leaves extracts. For roots, an inhibition of 16% is observed after4 hours of exposure, 50% after10 hours and 100% after20 hours of exposure.

For a concentration of 5g / L, an inhibition of 16% is observed after4 hours of exposure, 50% after8 hours and 100% after18 hours with the leaves extract. For roots, an inhibition of 16% is observed after2h, 50% after6h and 100% after16h of exposure.

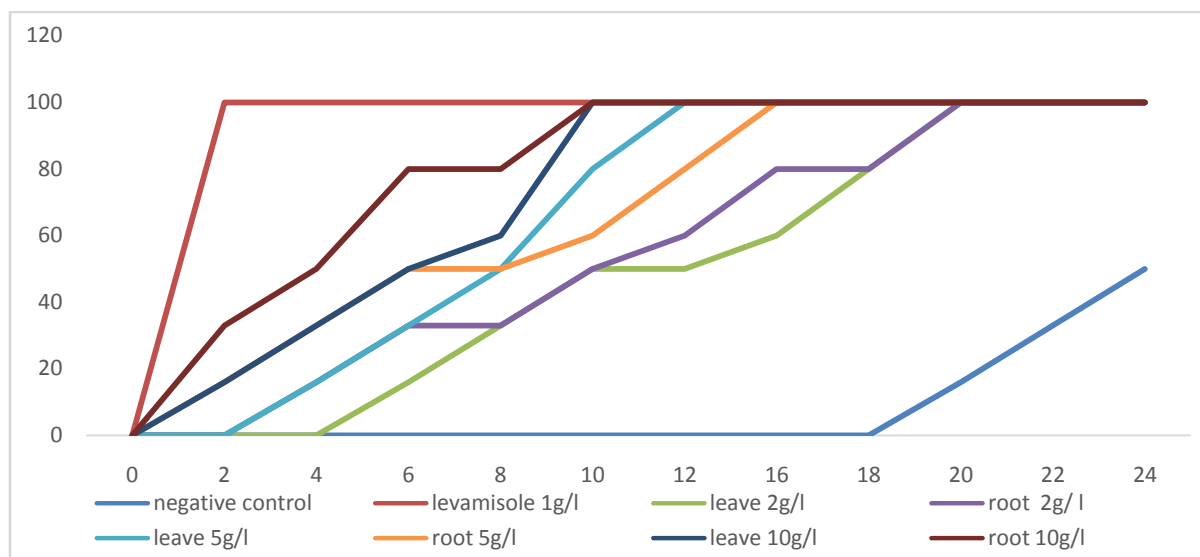
For a concentration of 10g / L, we observe an inhibition of 16% after2 hours of exposure, 50% after6 hours and 100% after10 hours with the leaves extract. For roots, an inhibition of 16% is observed after2h, 50% after6h and 100% after12h of exposure. There is no significant difference between the effects of the different organs used in the plant ($p > 0.05$). Similarly, there is a non-significant difference between the doses tested for the same part ($p > 0.05$). There is also a non-significant difference between the extracts (10g / L) and levamisole ($p > 0.05$).

Phytochemical screening has shown the phytochemical composition of the two parts studied. These results are similar from those of Awe et al. (2015) who showed also tannins in the leaves, butdifferent from those of Aliyu et al. (2008) who showed the presence of tannins in the roots. This could be explained by a difference in several parameters such as the stage of development of the plants at the time of harvest, the conditions linked to the site of harvest, the harvest season, soil type (Hamid et al., 2018) .

Tests of the evaluation of anthelmintic activity of the various extracts showed the efficacy of the organs (leaves and roots) of *B. senegalensis* on *A. galli*. They are more effective than extracts of the barks of *Acacia oxyphylla* on *A. galli* having higher times : 78.86 hours \pm 0.79, 76.47 hours \pm 0.82 at the concentrations of 5mg / mL and 10mg / mL respectively (Kohlring, 2008).

Several studies have shown the efficacy of plants against *A. galli*(Deore et al., 2009;Piyush et al., 2013; Sundeep et al., 2010). These plants owe their biological properties to their chemical compositions. The phytochemical screening carried out in this study made it possible to highlight in the roots of alkaloids, saponins, steroids and terpenoids and then in the leaves of flavonoids, saponins, steroids and terpenoids. These compounds may be responsible for the anthelmintic properties of *B. senegalensis*.

Various studies have shown the effect of these compounds on parasitic worms.Thus, polyphenols may be responsible for anthelmintic activity (Bizimenyera et al., 2005). The flavonoids could be responsible for anthelmintic properties of plants (Paolini et al., 2003) by inhibiting oxidative phosphorylation of helminths (Ongoka et al., 2012). In addition, they bind to a glycoprotein, collagen, which plays the protective role of the parasite's cuticle. This fixation induces damage to the cuticle, followed by death of the helminth (Vidyadhar et al., 2010). Alkaloids could also be responsible of anthelmintic activity of roots extracts (Fall et al., 2007; Chagas et al., 2008). The saponins would also have an anthelmintic effect by destabilization of the membranes and increase in the permeability of the cells, which will cause the turgor of the cells and their bursting (Aharoni et al., 2005; Ademola et al., 2009).



Graph: percentage of adult worm inhibition after 24 hours of exposure to different concentrations of *B. senegalensis* ethanolic extract.

IV. Conclusion

Ethanolic extracts from the leaves and roots of *B. senegalensis* have shown nematicidal activity on *A. galli*. The effects observed with these extracts confirm the uses in traditional medicine of *B. senegalensis* as a dewormer. This plant is a potential candidate in the development of improved phytochemicals. Further studies will be carried out to isolate the compound (s) responsible for this activity. This study contributes to the valorization of Niger medicinal plants.

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