ISSN: 2456-2912
VET 2023; 8(4): 100-107

www.veterinarypaper.com
Received: 20-04-2023
Accepted: 23-05-2023

Tianhoun Denté Fidèle
1. Laboratoire de Biologie et Santé Animales du Département Production Animale / Centre National de la Recherche Scientifique et Technologique / Institut de l'Environnement et de Recherches Agricoles, 04 BP 8465 Ouagadougou 04, Burkina Faso
2. Laboratoire de Recherches et d'Enseignements en Santé et Biotechnologies Animales / Ecole Doctorale Sciences Naturelles et Agronomie / Université Nazi Boni, 01 BP 1091 Bobo-Dioulasso 01, Burkina Faso

Meda Nãg-Tiéro Roland
Laboratoire de Recherches et d'Enseignements en Santé et Biotechnologies Animales / Ecole Doctorale Sciences Naturelles et Agronomie / Université Nazi Boni, 01 BP 1091 Bobo-Dioulasso 01, Burkina Faso

Konate Almamy
Laboratoire de Biologie et Santé Animales du Département Production Animale / Centre National de la Recherche Scientifique et Technologique / Institut de l'Environnement et de Recherches Agricoles, 04 BP 8465 Ouagadougou 04, Burkina Faso

Kabore Adama
Laboratoire de Biologie et Santé Animales du Département Production Animale / Centre National de la Recherche Scientifique et Technologique / Institut de l'Environnement et de Recherches Agricoles, 04 BP 8465 Ouagadougou 04, Burkina Faso

Tamboura H Hamidou
Laboratoire de Biologie et Santé Animales du Département Production Animale / Centre National de la Recherche Scientifique et Technologique / Institut de l'Environnement et de Recherches Agricoles, 04 BP 8465 Ouagadougou 04, Burkina Faso

Belem Adrien Marie Gaston
Institut du Développement Rural / Université Nazi Boni, 01 BP 1091 Bobo-Dioulasso 01, Burkina Faso

Corresponding Author:
Tianhoun Denté Fidèle
1. Laboratoire de Biologie et Santé Animales du Département Production Animale / Centre National de la Recherche Scientifique et Technologique / Institut de l'Environnement et de Recherches Agricoles, 04 BP 8465 Ouagadougou 04, Burkina Faso
2. Laboratoire de Recherches et d'Enseignements en Santé et Biotechnologies Animales / Ecole Doctorale Sciences Naturelles et Agronomie / Université Nazi Boni, 01 BP 1091 Bobo-Dioulasso 01, Burkina Faso

Ethnoveterinary study on livestock practices and the use of medicinal plants against gastrointestinal parasites of small ruminants in the BWA community in Burkina Faso

Tianhoun Denté Fidèle, Meda Nãg-Tiéro Roland, Konate Almamy, Kabore Adama, Tamboura H Hamidou and Belem Adrien Marie Gaston

DOI: https://doi.org/10.22271/veterinary.2023.v8.i4b.575

Abstract
The rearing of small ruminants is widespread in Burkina Faso and is an important source of income for communities. The present study carried out is a contribution to the knowledge of local knowledge and to the valuation of the recipes of the traditional veterinary pharmacopoeia. The study aimed to identify the farming practices of small ruminants in the Bwa community and to identify the traditional remedies used against gastrointestinal parasites. It took the form of semi-structured interviews with 121 randomly selected breeders from the community. The results obtained showed that breeders have a good perception of animal pathologies, in particular gastrointestinal strongyloses (31.1%) and, faced with these, 26.45% resort to medicinal plants with an anthelmintic effect. A total of 32 recipes formulated from medicinal plants have been identified, the most used plants of which are *Combretum micranthum* G. Don (12.5%) and *Sarcocephalus latifolius* (Sm.) Bruce (12.5%). The main reasons given for the adoption of traditional veterinary medicine were the effectiveness of traditional remedies (40.6%), the high cost of modern drugs (28.1%) and the absence of a veterinary agent at the right time. (18.7%). For a development of these means of management of gastrointestinal parasitosis by the Bwa community, studies to evaluate the anthelmintic efficacy and toxicity tests are necessary.

Keywords: Small ruminants, digestive parasites, ethnobotanical and veterinary survey, Bwa community, Burkina Faso

Introduction
In Burkina Faso, the livestock sector ranks second after agriculture and is practiced by nearly 85% of households (MRA, 2015) [20]. Apart from its social and economic role, livestock farming contributes to the fight against food and nutritional insecurity of populations by providing products of high nutritional value (MRA, 2015) [20]. The national herd is important, especially that of small ruminants which is composed of 9,277,746 sheep and 13,891,447 goats. (MRA, 2015) [20]. Despite all this importance, the breeding of these animals faces many difficulties that limit its development. Among these difficulties, pathologies occupy a prominent place. Among these pathologies, gastrointestinal parasitoses are the most widespread and contribute to slowing down the weight growth of animals and making them less productive (Poppi and Sykes, 1990; Kaboré, 2009) [23, 13-15]. Various parasites are at the origin of these gastrointestinal pathologies and *Haemonchus contortus* is among the most dominant in Burkina Faso (Belem *et al*., 2005a; Belem *et al*., 2005b) [4, 5]. To deal with these diseases, breeders generally use synthetic chemical anthelmintics, the costs of which are often out of reach and the misuse leads to resistance phenomena within the digestive parasites of animals (Hoste *et al*., 2018) [11]. However, in rural areas there are alternatives through the use of plants with anthelmintic properties (Kaboré *et al*., 2007) [13]. This endogenous knowledge needs to be valued in order to sustainably boost local development because it is currently being lost in Burkina Faso (CAPES, 2006) [7].
It is in this context that the present study was initiated to understand (i) the breeding practices of small ruminants by the Bwa community in Burkina Faso and (ii) the use of medicinal plants with anthelmintic effect to treat sick animals in order to promote their local animal health knowledge in the country.

Materials and Methods

Study environment

The study took place from October to December 2020 in 32 villages of the Bwa community randomly sampled in four provinces (Mouhoun, Kossi, Banwa and the Balés) of the Boucle du Mouhoun region and one province (Tuy) of the Hauts Bassins region (figure 1). This territory of the Bwa community is limited to the North and West by the Republic of Mali, to the South by the South-West region and to the East by the Center-West region. The climate is of the Sudano-Sahelian type with three sectors: the sub-Sahelian sector in the north with an average annual rainfall of 550 to 750 mm, the north-Sudanian sector in the center, with an average annual rainfall of 700 to 900 mm and the South Sudanese sector to the south, with an average annual rainfall of 1000 to 1100 mm. The territory has two seasons, namely a dry season which lasts about 7 to 9 months and a rainy season which lasts 3 to 5 months depending on the climatic sectors described above. The whole of the territory, in particular the region of the Boucle du Mouhoun, is part of the watershed of the Mouhoun with the Mouhoun river which is a permanent watercourse crossing the region for nearly 280 kilometers. The plant formations are made up of shrub-steppe in the north, tree steppe and savannah in the south, shrub-to-tree savannah in the center and tree-to-wooded savannah with gallery forests along the watercourses.

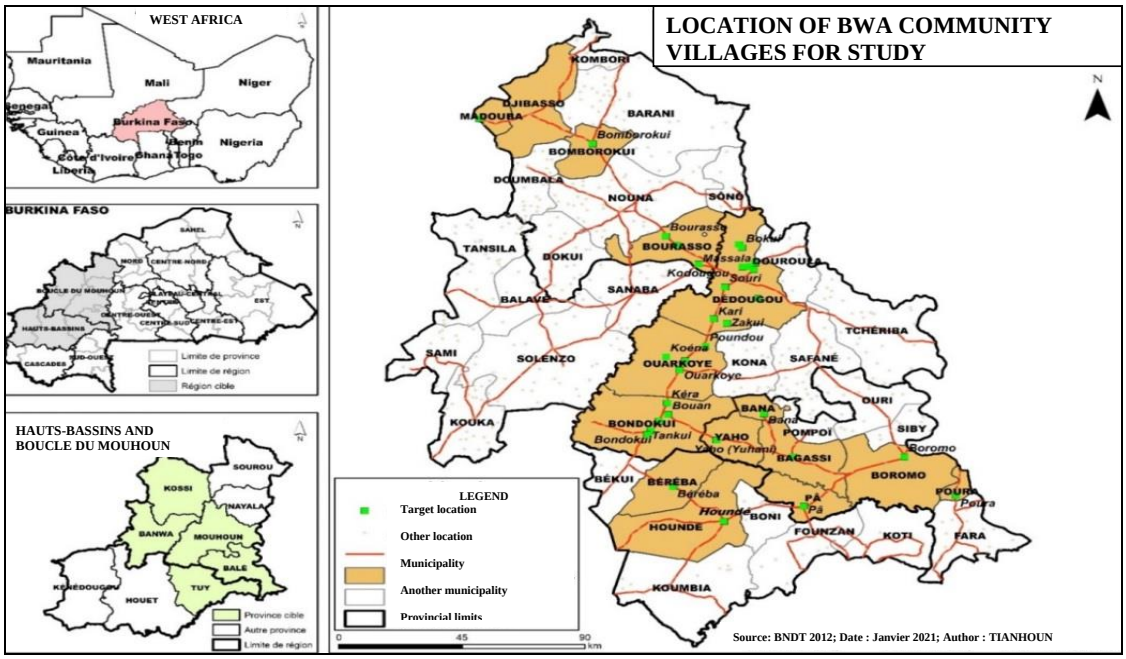

Fig 1: Location of target villages of Bwaba producers in the study

Materials

For the survey, the following equipment was used:

- A survey sheet to collect information from sampled Bwaba producers using closed questionnaires to obtain precise answers;
- A notepad and a pen for taking notes;
- A digital camera for taking photos;
- Plastic bags, a machete and a marker for collecting samples of the medicinal plants cited by some respondents in order to facilitate their identification.

Methods

Veterinary and ethnobotanical surveys have been piped of randomly with 121 small ruminant breeders from the villages of the Bwa community using the technique of semi-structured interviews using a survey sheet. The villages were selected based on (i) accessibility and (ii) the availability of breeders open to innovations in animal production techniques. The information collected focused on the socio-economic characteristics of the breeder, the breeding practices of small ruminants, the production constraints, the care applied to small ruminants, the medicinal plants used in the treatment of diseases of small ruminants in veterinary medicine. Traditional methods of preparation and administration of these treatments. To this end, the approach described by Tamboura (2006) [25] and adapted by Kaboré (2009) [13-15] was adopted to conduct the administration of the survey sheets. It consisted of two stages, namely:

- The preparatory stage, which consisted of confirming/validating the survey form drawn up through a pre-test with a few producers and gathering the material necessary to conduct the various surveys in the targeted villages;
- The field stage, which consisted of collecting the information sought from the administration of the survey sheets drawn up.

  During the field phase, the interviews were preceded by the presentation of the objectives of the study to the chiefs of the various villages in order to have their agreement and also the identity of the breeders of small ruminants in their village. Following the interviews, samples of the medicinal plants mentioned by the producers surveyed were collected. The taxonomic identification was carried out thanks to the herbarium of the public structures in charge of water and forests.

Statistical analyzes

The data collected was analyzed, codified and entered with the statistical utility of Excel 2016 of Windows 10. Then, they allowed the calculations of averages and frequency of the parameters measured with the software Stat View for Windows (version 4.57). The reported frequencies give the number of quotes in relation to all respondents, the same respondent being able to give several answers in the same situation.

Results

Respondents' characteristics and farming practices

121 Bwaba producers composed of 103 men (85.1%) and 18 women (14.9%) were interviewed. They were mainly made up of agropastoralists (95%) and breeders (5%) whose average age was 46 ± 1.2 years, including 45 ± 1.3 years for men and 48 ± 3.6 years for women. Among these producers, 52.9% speak and write French fluently while others are literate in Bwamu (17.4%) and Dioula (4.1%).

The species of small ruminants reared by the respondents are sheep and goats with an average number per breeder of 12.8±1.4 and 9.6±0.7 respectively. The breeds of small ruminants raised by the Bwa community are the local breed (91.41%) and the mixed breed (8.59 %) whose reasons for the choice are presented in Figure 2.

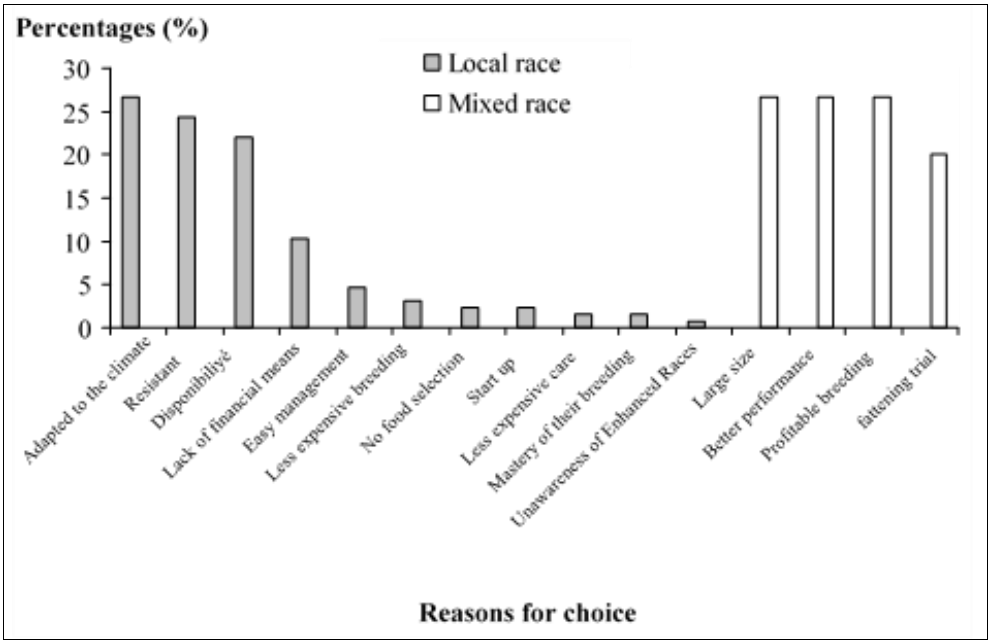

Fig 2: Reasons for choosing the breed of small ruminants by the Bwaba producers in the study.

The methods of animal management by the breeders surveyed are based on the exploitation of pasture (50.3%), stalling with stakes (43%) and stalling in enclosures (6.7%).

Feeding is based on the use of natural fodder (45.5%) consisting of grass and hay, agricultural by-products (ABS) in particular crop residues (31.1%), by-products agro-industrial products (SPAI) such as cotton cake and dry brewers' spent grain (19.1%) and sometimes cultivated fodder (4.3%) such as fodder sorghum and mucuna.

The rearing of small ruminants by the Bwa community faces major constraints, the most important of which are food (43.7%) and health (39.9%) (Figure 3). Associated with these constraints are the problem of drinking water for animals (4.3%), urbanization (4.3%), theft (3.4%), and the inadequacy of habitat (2.4%), the effects of climate change (1%) and poverty (1%).

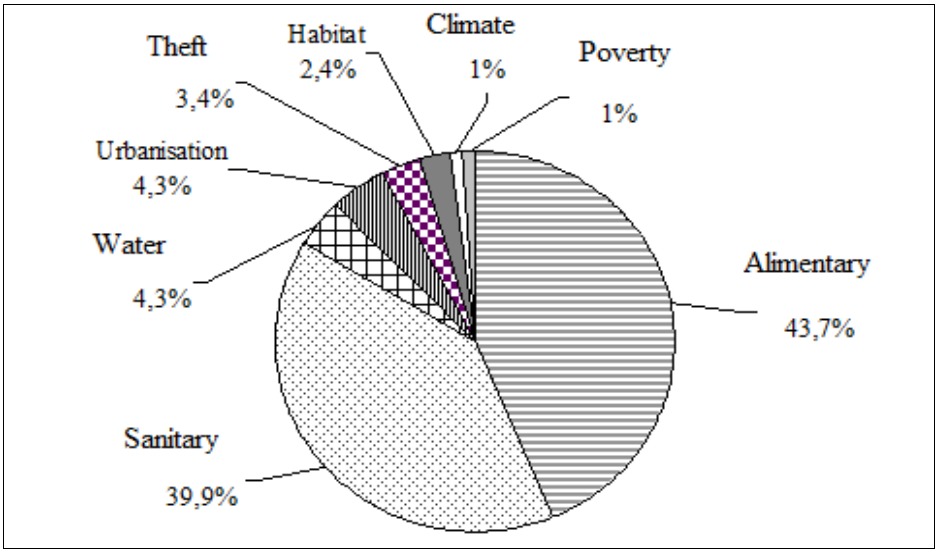

Fig 3: Breeding constraints of small ruminants by the Bwaba community of the study

Diseases of small ruminants

The producers surveyed have a good perception of small ruminant diseases and are able to identify them in their own way based on the clinical signs presented by the sick animal. All of these signs are listed in Table 1, which shows that the most cited are anorexia (22.2%), diarrhea (14.2%), pitted hair (12.96 %), weight loss (6.48%) and dull hair (6.17%).

Table 1: Clinical signs/symptoms of a sick animal according to the producers surveyed

Clinical signs (quote frequencies)
Anorexia (22.22), diarrhea (14.20), pitted hair (12.96), weight loss (6.48), appearance of the coat (6.17), general appearance of the animal (4.01), Difficult gait (4.94), Prostration (3.70), Lazy gait (3.40), Runny nose (3.40), Runny eyes (2.78), Cough (2.78), Inadequate watering (1.54), Mouth discharge (1.54), Attitude (1.23), Sad look (0.93), Bloating (0.93), Low production (0.93), Fever (0.93), Droopy Ears (0.93), Drowsiness (0.62), Eye Appearance (0.62), Labored Breathing (0.62), Dejection (0.31), Weak Animal (0.31), Ulcerated Mouth (0.31), Difficult whelping (0.31), No bellowing (0.31), Permanent standing position (0.31), Dark urine (0.31).

Based on the experiences of the producers surveyed and the comparison with the diseases known in modern medicine from the clinical signs listed, Figure 4 presents the diseases encountered by the Bwa community in the breeding of small ruminants. These are, in order of importance, internal parasitoses (31.1%), trypanosomoses (29%), pasteurellosis (17.6%), external parasitoses (7.1%), respiratory infections (3, 7%), sheep pox (3.7%), Peste des Petits Ruminants (3%), foot-and-mouth disease (2%), footrot (1%), anthrax (0.6%), ocular pathologies (0.6%) and bloat (0.3%). These diseases occur most often in the winter period (50% of the producers surveyed) and sometimes in the dry season (18.2%).

For the producers in the study, gastrointestinal strongylosis remains the most widespread internal parasitosis, especially in the winter season (59.57%). Their diagnosis of the pathology is based on the identification of clinical signs, the most dominant of which are diarrhea (25%), the presence of worms in the faeces (21.79%), anorexia (18.21%) and weight loss (18.21%). Within the Bwa community, these gastrointestinal parasitoses have various local names, namely *Simbwa* (45%), *Soumbwa* (44.19%), *Gninibwa* (6.98%) and *Mimininba* (3.88%).

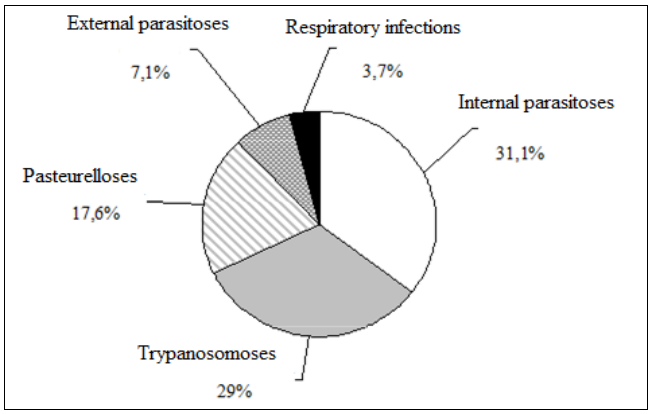

Fig 4: Diseases encountered by the Bwa community in the breeding of small ruminants

Methods of treatment of gastrointestinal parasites

For the management of gastrointestinal parasitosis in sick animals, the producers surveyed use modern (73.55%) and traditional (26.45%) treatment methods using medicinal plants with an anthelmintic effect.

Use of conventional anthelmintics

The main conventional anthelmintics used by the breeders surveyed are shown in Figure 5. The most important are Kelaphen (37.11%), Kelanthic (20.13%), ivermectin (16.35%) and Benzal 300 mg (12.58%). These anthelmintics are obtained directly from veterinary agents who are present in certain municipalities in the study regions or indirectly from retailers during market days.

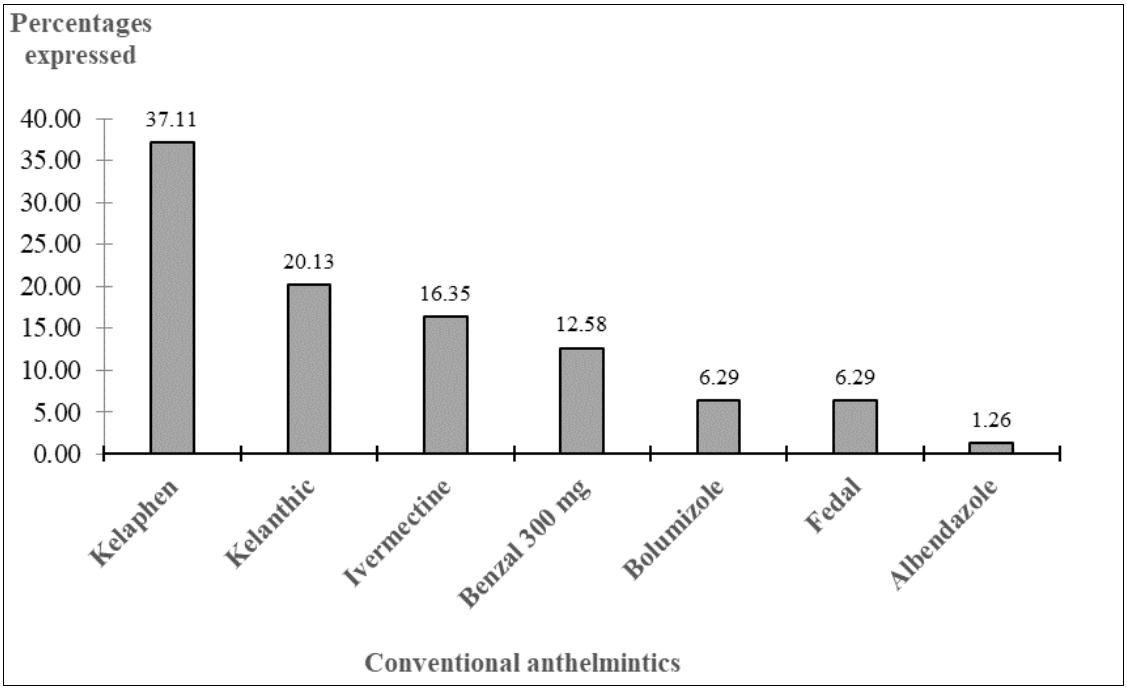

Fig 5: Main conventional anthelmintics used by surveyed farmers.

Use of medicinal plants

The use of traditional veterinary medicine to fight against gastrointestinal parasitosis in small ruminants is motivated by several reasons mentioned by the producers surveyed (figure 6). These are, in order of importance, the effectiveness of traditional remedies (40.6%), the high cost of modern drugs (28.1%), the absence of a veterinary agent at the right time (18.7%), animal mortalities following the use of certain modern products (6.2%), the absence of a veterinary service (3.1%) and the sometimes non-mastery of the use of modern drugs (3, 1%).

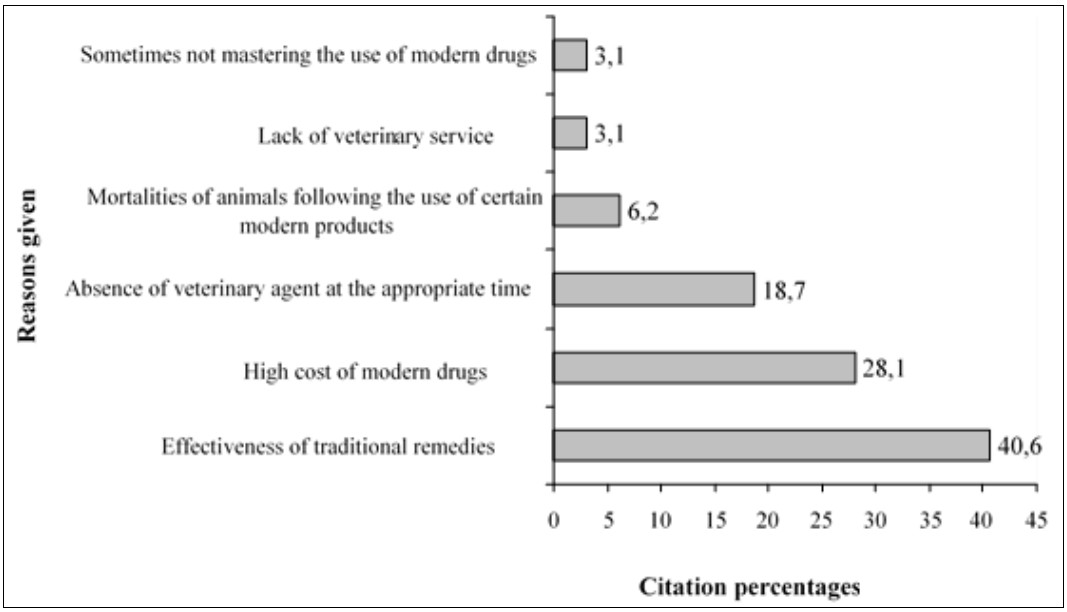

Fig 6: Reasons mentioned by the producers surveyed for the practice of traditional medicine in the treatment of gastrointestinal parasitosis in small ruminants.

A total of thirty-two (32) traditional herbal remedies were stated by the producers of the study to combat gastrointestinal parasitosis (Table 2). These medicinal plants with an anthelmintic effect consist essentially of plants belonging to fourteen (14) botanical families, the most important of which are the *Combretaceae* (21.88%), the *Caesalpiniaceae* (15.63%) and the *Rubiaceae* (12.5%) (figure 7).

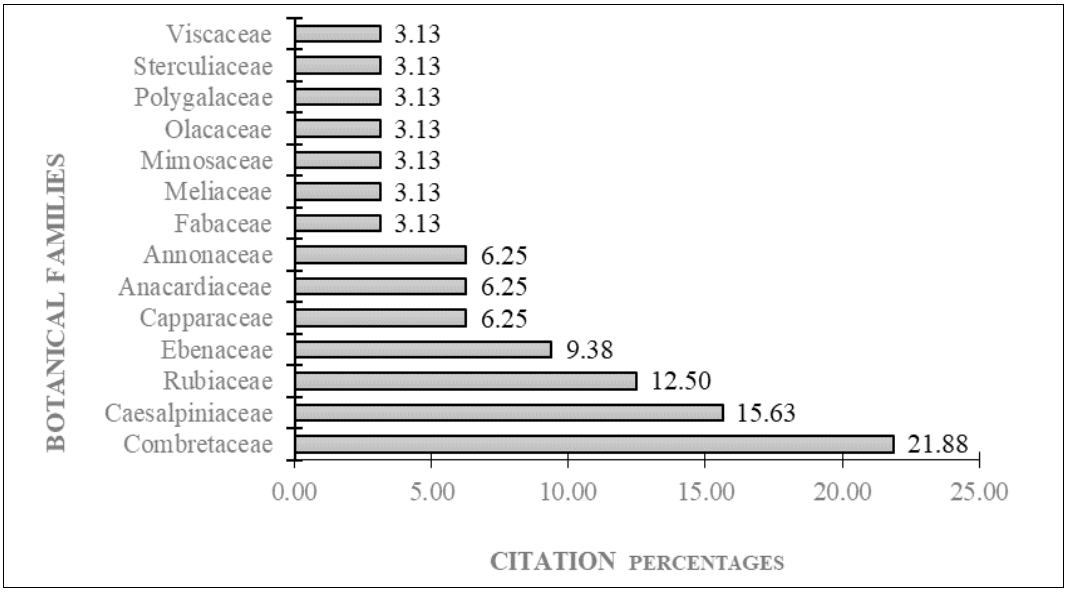

Fig 7: Botanical families of plants with an anthelmintic effect used by the producers surveyed

The species of medicinal plants with an anthelmintic effect most used by the producers in the study are *Combretum micranthum* G. Don (12.5%) and *Sarcocephalus latifolius* (Sm.) Bruce (12.5%). The main organs of medicinal plants used to prepare traditional remedies are the leaves (59.38%), the fruits (15.63%), the bark (12.5%) and the root (12.5%). These parts are prepared alone (75%) or in association with other organs (25%). The methods of preparation of the inventoried remedies are decoction (53.1%), maceration (21.9%), powder (12.5%) and direct consumption of fruits or leaves (12.5%). The remedies are prepared following a certain hygiene to avoid contamination. When it is a solution, the liquid obtained is filtered using a piece of clean cloth before being administered to the animal. The administration of the preparations to sick animals is essentially done orally (100%) for a period of at least three (03) days to one (01) week. The quantities to be administered are variable and depend on the forms of the preparations.

Table 2: Traditional recipes indicated by respondents in the management of gastrointestinal parasitosis

Bwamu name	Scientific name	Family	Part used	Methods of preparation, administration and duration of treatment
Bokinhou	*Annona senegalensis* Pers.	Annonaceae	Leaves	Maceration, *per os* once a day for 4 days
	Annona senegalensis Pers.		Fruits	Maceration, *per os* once a day for 2 days
Bodire	*Ximenia americana* L.	Olacaceae	Leaves	Maceration, *per os* once a day for 3 days

Dembwe	*Cassia sieberiana* DC.	Caesalpiniaceae	Leaves	Decoction, *orally* once every 3 days for 2 weeks
	Cassia sieberiana DC.		Fruits	Decoction, *orally* once every 3 days for 2 weeks
Peemu	*Khaya senegalensis* (Desv) A. Juss.	Meliaceae	Bark	Powder mixed with bran in consumption once a day for 1 week
Borango	*Combretum micranthum* G. Don	Combretaceae	Leaves	Decoction, *orally* once a day for 1 week
	Combretum micranthum G. Don		Leaves	Decoction, *orally* twice a day for 6 days
	Combretum micranthum G. Don		Leaves	Decoction, *orally* once a day for 3 days
	Combretum micranthum G. Don		Leaves	Decoction, *orally* twice a day for 1 week
Mwakougourou / Kofrare	*Detarium microcarpum* Guill. & Perr.	Caesalpiniaceae	Bark	Powder mixed with salt in consumption 5 days to renew 1 week later
	Detarium microcarpum Guill. & Perr.		Sheet	Powder mixed with salt in consumption 4 days to renew 1 week later
Koho	*Sarcocephalus latifolius* (Sm.) Bruce	Rubiaceae	Root	Decoction, *orally* 1 glass of tea once a day for 2 days
	Sarcocephalus latifolius (Sm.) Bruce		Root	Maceration, *per os* 1 glass of tea once a day for 2 days
	Sarcocephalus latifolius (Sm.) Bruce		Bark	Decoction, *per os* 1 glass of tea twice a day for 1 day
	Sarcocephalus latifolius (Sm.) Bruce		Bark	Maceration, *per os* 1 glass of tea once a day for 3 days
Kanmini	*Anogeissus leiocarpus* (DC.) Guill. & Perr	Combretaceae	Leaves	Decoction, *orally* once a day for 6 days
Gouesse / Ninchi / Tchiiyomou	*Pteleopsis suberosa* Eng & Diels		Leaves	Decoction, *orally* twice a day for 6 days
Tuabonno	*Cadaba farinosa* Forssk.	Capparaceae	Leaves	Decoction, *orally* once a day for 3 days
Bodiro	*Sclerocarya birrea* (A. Rich.) Hochst .	Anacardiaceae	Root	Maceration, *per os* twice a day morning and evening for 5 days
	Sclerocarya birrea (A. Rich.) Hochst .		Fruits	Direct consumption, once a day morning and evening for 5 days
Mohkinhou	*Diospyros mespiliformis* Hochst . ex A.DC.	Ebenaceae	Roots	Decoction, *orally* once a day for 5 days
	Diospyros mespiliformis Hochst . ex A.DC.		Leaves	Decoction, *orally* once a day for 4 days
	Diospyros mespiliformis Hochst . ex A.DC.		Fruits	Direct consumption, once a day morning and evening for 5 days
Dankanahou	*Afzelia africana* S.m. _	Caesalpiniaceae	Leaves	Direct consumption, once a day morning and evening for 6 days
Souahiri	*Guiera senegalensis* JF Gmel .	Combretaceae	Leaves	Decoction, *orally* once a day for 4 days
Kagahodouan	*Viscum album* L.	Viscaceae	Leaves	Decoction, *per os* twice a day morning and evening for 3 days
Kounkanba	*Waltheria indica* L.	Sterculiaceae	Leaves	Decoction, *orally* once a day for 3 days
Donko	*Boscia senegalensis* (Pers.) Lam . ex Poir .	Capparaceae	Leaves	Maceration, *per os* 3 times a day for 3 days
Kagaho	*Acacia nilotica* (L.) Willd . ex Del.	Mimosaceae	Fruits	Powder mixed with bran in consumption once a day for 5 days
Koro	*Securidaca longipedunculata* Fres .	Polygalaceae	Leaves	Decoction, *orally* once a day for 6 days
Monaco	*Pterocarpus erinaceus* Pear.	Fabaceae	Leaves	Direct consumption, twice a day for 1 week

Discussion

The inadequate use of conventional anthelmintics has led to resistance phenomena within nematode populations and the ineffectiveness of certain synthetic molecules in small ruminant farms. To overcome this problem and contribute to the improvement of ruminant production by promoting endogenous veterinary medicine practices, this study was undertaken. The aim was to understand (i) the breeding practices of small ruminants by the Bwa community in Burkina Faso and (ii) list the recipes based on medicinal plants with an anthelmintic effect used to treat sick animals.

The study took place in certain localities in the Boucle du Mouhoun and Hauts-Bassins regions. These localities are where the Bwaba communities reside. A total of 121 Bwaba herders were interviewed, including 103 men (85.12%) and 18 women (14.88%). The presence of women among the respondents shows that the breeding of small ruminants is practiced by the entire population without distinction of sex. The predominance of the male sex (85.12%) observed in the population surveyed testifies to the first place that belongs to them in the exercise of professions within our societies, women being rather occupied with household chores.

The producers interviewed were mainly agro-pastoralists (95.04%) and breeders (4.96%). The dominance of the combination of agricultural and livestock activities is due to the fact that the Bwaba by nature have agriculture as their main activity. With the integration of societies, they gradually associated livestock farming with their source of income. The results obtained indicated that the average age of respondents is 46 $\pm$1.2 years. One could then think that the practice of breeding and the use of veterinary herbal medicine are linked to a certain maturity and experience in the field. These results are close to the age structures (47$\pm$11 years) presented by Kumwimba *et al*. (2017) [18].

Among the breeders surveyed, 52.89% speak and write French fluently while others are literate in Bwamu (17.36%) and Dioula (4.13%). The average level of education of the Bwa community (52.89%) would be due to the place that the colonizer had in the Bwa country with the creation of schools and to the strength of the Catholic mission of the "White Fathers". These results are similar to those of Kumwimba *et al*. (2017) [18] for whom the level of literacy of these Africans surveyed in Congo was higher than 50%. On the other hand, in Burkina Faso Tamboura *et al*. (1998) [26] stated during their study that only 5% of their respondents knew how to read and write French and for Kaboré *et al*. (2007) [14] during surveys in the Mossi plateau, no producer was literate. This difference could be explained by the diversity of educational needs from one population to another.

The ethnobotanical interviews carried out made it possible to identify 32 medicinal recipes used by breeders in the management of gastrointestinal Parasitosis in the breeding of small ruminants within the Bwa community surveyed. The listed plant species are divided into 14 botanical families, the most important of which are the *Combretaceae* (21.88%), the *Caesalpiniaceae* (15.63%) and the *Rubiaceae* (12.5%). This importance of use could be explained by the characteristics of the species of these families. Among these families, the species *Combretum micranthum* G. Don (12.5%) and *Sarcocephalus latifolius* (12.5%) were identified as the medicinal plants with anthelmintic effect most used by the Bwa community in the study. These plants probably have the most anthelmintic properties which are linked to the various chemical substances they contain such as phenolic compounds and flavonoids (Bonnet *et al*., 2006; Hounzangbe-Adote *et al*., 2008; Monolaraki, 2011) [6, 12, 19]. The anthelmintic efficacy evaluation studies carried out by Tianhoun *et al*. (2020) [27] on *Caesalpiniaceae* such as *Cassia alata* (L) Roxb. support this hypothesis. Moreover, in the West African sub-region, some of the plants cited by Bwaba herders have already been the subject of anthelmintic studies or recognized as having anthelmintic properties by other communities during ethnobotanical surveys (Table 3). This could mean that the breeders of the Bwa community have a perfect knowledge of veterinary herbal medicine.

The leaves (59.38%), fruits (15.63%), bark (12.5%) and root (12.5%) are the main organs of medicinal plants used to prepare traditional remedies. These parts are most of the time

prepared alone (75%) or associated with other organs (25%). The use of these parts is certainly linked to the fact that they contain bioactive molecules of anthelmintic interest. Similar results reported the predominance's of using leaves (Belayneh *et al*., 2012; Giday and Teklehaymanot, 2013; Kumwimba *et al*. ., 2017) [3, 10, 18], barks and roots (Atakpama *et al*., 2015; Kumwimba *et al*., 2017; Zabouh *et al*., 2018) [1, 18, 29] in traditional African veterinary medicine. Also, Robes (2007) [24] in his study on tropical veterinary medicinal plants found that a diversity of plant organs are used with a dominance of leaves, roots and barks in the preparation of medicinal recipes. However, for Atakpama *et al*. (2015) [1] the misuse of the bark and root of plants poses a threat to the survival and sustainability of medicinal plants.

The methods of preparation of the remedies identified in our study are decoction (53.1%), maceration (21.9%), powder (12.5%) and direct consumption of fruits or leaves (12.5 %) with oral administration (100%). These observations corroborate those of Kaboré *et al*. (2007) [14] who, following an ethnobotanical survey in the central plateau, found that the preparation of decoction and oral administration constitute one of the methods most used by rural traditional healers in Burkina Faso. Also, Kumwimba *et al*. (2017) [18] found that the most used methods of preparing traditional dewormers are maceration (52.1%), decoction (25.7%) or grinding (22.7%) with essentially oral administration (96.7%) in their study on plants used against goat diseases in the territory of Kalemie and Moba (DRC). On the other hand, for Garba *et al*. (2019) [31], maceration (85%) is the most dominant method of preparation in the study of medicinal plants used in the treatment of digestive parasitosis in small ruminants (ovines) in southwestern Niger.

The main reasons mentioned by the breeders surveyed in the study for using traditional veterinary medicine in the fight against gastrointestinal parasitosis in small ruminants are the effectiveness of traditional remedies (40.6%), the high cost of drugs modern (28.1%) and the absence of a veterinary agent at the right time (18.7%). These reasons are probably linked to the situation faced by the farmer, but also to his personal experience (Kaboré *et al*., 2007) [14]. Also, some producers surveyed found that conventional anthelmintics such as those mentioned in the study (Kelaphen, Kelanthic, Ivermectin and Benzal) lead to more and more resistance in the population of gastrointestinal parasites and therefore their inefficiencies. For Fajimi and Taiwo (2005) [8] and Kaboré *et al*. (2007) [14], the increase in the prices of synthetic molecules by clinics and veterinary pharmacies could be an additional reason for the use of veterinary phytotherapy.

The symptoms described by the producers surveyed during the interviews carried out reveal that they have a good perception of animal pathologies and also of their period of appearance. Among the pathologies encountered by producers, gastrointestinal parasites remain a major concern. Their diagnosis is based on the identification of clinical signs such as diarrhea (25%), the presence of worms in the faeces (21.79%), anorexia (18.21%) and weight loss (18.21 %). These observations collected in the study agree well with the scientific conclusions of Oussou *et al*. (2019) [22] who noted that diarrhea and weight loss were the major clinical symptoms of small ruminant diseases in Côte d'Ivoire.

Table 3: Plants with an anthelmintic effect that have been tested or cited

Medicinal plants	Parts used	Animal species	Tests carried out	Parasites tested	Tested/ quoted	References	Country
Cassia sieberina DC.	Leaves	small ruminants	*In vitro*	*Haemonchus*	Tested	Traoré *et al*., 2017 [28]	Burkina Faso
Khaya senegalensis (Desv.) A. Juss.	Leaves	Sheep	*In-vitro + in-vivo*	*Haemonchus*	Tested	Awohouedji *et al*., 2013 [2]	Benin
Combretum micranthum G. Don	Barks	Sheep	*Investigations*	Helminths	quoted	Garba *et al*., 2019 [31]	Niger
Sarcocephalus latifolius (Sm.) Bruce	Leaves	Ruminants	*Investigations*	Helminths	quoted	Ogni *et al*., 2014 [21]	Benin
Anogeissus leiocarpus (DC.) Guill. & Perr.	Leaves	Sheep	*In vitro*	*Haemonchus*	Tested	Kaboré *et al*., 2009 [13-15]	Burkina Faso
Ptelopsis suberosa Engl. & Diels	Leaves	Ruminants	*Investigations*	Helminths	quoted	Ogni *et al*., 2014 [21]	Benin
Sclerocarya birrea (A. Rich.) Hochst.	Leaves	Sheep	*In vitro*	*Haemonchus*	Tested	Hounzangbe-Adote *et al*., 2012 [12]	Benin
Afzelia africana Sm.	Leaves	small ruminants	*In vitro*	*Haemonchus*	Tested	Koffi Yao *et al*., 2018 [16]	Côte d'Ivoire
Guiera senegalensis J.F. Gmel.	Leaves	small ruminants	*In vitro*	*Haemonchus*	Tested	Traoré *et al*., 2017 [28]	Burkina Faso
Boscia senegalensis (Pers.) Lam. ex Poir.	Leaves	Sheep	Investigations	Helminths	quoted	Garba *et al*., 2019 [31]	Niger
Acacia nilotica (L.) Willd. ex Del.	Leaves	Sheep	*In vitro*	Helminths	Tested	Zabré *et al*., 2017 [30]	Burkina Faso
Securidaca longipedunculata Fres.	Roots and bark	Ruminants	*In vitro*	*Haemonchus*	Tested	Koné *et al*., 2005 [17]	Côte d'Ivoire
Pterocarpus erinaceus Poir.	Leaves	small ruminants	*In vitro*	*Haemonchus*	Tested	Koffi Yao *et al*., 2018 [16]	Côte d'Ivoire

Conclusion

This ethnobotanical and veterinary study conducted in the Bwa country of Burkina Faso is a first. It made it possible to understand the breeding practices of small ruminants in this community and their perceptions of animal pathologies in general and gastrointestinal strongyloses of small ruminants in particular. The results obtained confirm that the Bwaba herders have a mastery of animal diseases and have recipes based on plant parts for the management of gastrointestinal parasites. This constitutes an enormous potential to be exploited as an alternative to modern veterinary medicine, which shows its weaknesses through the inefficiency or poor use of synthetic molecules (which causes more and more resistance phenomena within parasite populations) and through the unavailability of veterinarians at the appropriate time or the inaccessibility to synthetic veterinary drugs. In addition, for the preservation of biological diversity and the endogenous know-how of the community, individual or collective botanical gardens could be set up. A proposal for an improved traditional herbal medicine based on traditional recipes could be considered to relieve farmers.

Acknowledgements

The authors would like to thank the Laboratory of Biology and Animal Health (LaBioSa) of INERA Saria station for accepting to carry out the activities presented in this manuscript as well as the Projet d'Appui à l'Enseignement Supérieur (PAES) with which we have benefit from funding for the conduct of all research work.

References

1. Atakpama W, Batawila K, Gnamkoulamba A, Akpagana K. Quantitative approach of *Sterculia setigera* Del. (Sterculiaceae) ethnobotanical uses among rural communities in Togo (West Africa). Ethnobotany Research & Applications. 2015;14:065-080.
2. Awohouedji DY, Lesse P, Houinato M, Hounzangbe-Adote S. Medicinal Forage Present in the Natural Pasture in Bénin: Review Article. J Anim. Prod. Adv. 2013;3(11):301-310.
3. Belayneh A, Asfaw Z, Demissew S, Bussa NF. Medical plants and use by pastoral and agro-pastoral communities

in Erer Valley of Babile Wereda, Eastern Ethiopia. Journal of Ethnobiology and Ethnomedecine. 2012;8(1):42.
4. Belem AMG, Kaboré A, Bessin R. Gastro-intestinal helminths of sheep in the central, eastern and northern parts of Burkina Faso. Bull. Anim. Health. Prod. Afr. 2005a;53:13-23.
5. Belem AMG, Kaboré A, Bessin R. Variations saisonnières des helminthes gastro-intestinaux chez la chèvre du plateau central du Burkina Faso. Revue Elev. Méd. Vét. Pays trop. 2005b;58(1-2):37-43.
6. Bonnet L, Amason J, Baum R, Marles R, Camara F, Traoré A. Etude ethno pharmacologique traditionnelle de quelques plantes médicinales anthelminthiques de la Haute-Guinée (république de Guinée). Revue de médecine et pharmacopée africaine; c2006. p. 49-64.
7. CAPES (Centre d'Analyse des Politiques Economiques et Sociales). Etat des lieux des savoirs locaux au Burkina Faso. Inventaire des bonnes pratiques et propositions pour leur contribution au développement. Ouagadougou, Burkina Faso; c2006, 448.
8. Fajimi AK, Taiwo AA. Herbal remedies in animal parasitic diseases in Nigeria: a review. African Journal of Biotechnology. 2005;4(4):303-307.
9. Ullah S, Ullah R, Shakir L, Ullah R. Cheek list of ethno botanical plants of tehsil colony, Samarbagh, District Dir lower, Khyber Pakhtunkhwa Pakistan. Int. J Agric. Nutr. 2021;3(1):41-49.
DOI: 10.33545/26646064.2021.v3.i1a.63
10. Giday M, Teklehaymanot T. Ethnobotanical study of plants used in management of livestock health problems by Afar people of Ada'ar District, Afar Regional State, Ethiopia. Journal of Ethno biology and Ethno Medecine. 2013;9(1):8.
11. Hoste H, Torres Acosta F, Sotiraki S, Houzangbe Adote S, Kabore A, Costa Jr L, *et al*. Des plantes contenant des tannins condensés: un modèle d'alicament pour gérer les vers parasites en élevages des petits ruminants. Innov. Agrono. 2018;66:19-29.
12. Hounzangbé-Adoté MS, Attakpa EY, Zinsou E, Hounkpe V, Hoste H. Effets antiparasitaires de la graine de papaye sur les strongles gastro-intestinaux de petits ruminants au Sud-Bénin. Bulletin de la Recherche Agronomique du Bénin. 2008;60:13-8.
13. Kaboré A. Activité anthelminthique de deux plantes tropicales testées *in vitro* et *in vivo* sur les strongles gastro-intestinaux des ovins de races Mossi du Burkina Faso. Thèse de Doctorat Unique de l'Université Polytechnique de Bobo-Dioulasso, Burkina Faso; c2009. p. 144.
14. Kabore A, Tamboura HH, Belem AM, Traore A. Traitements ethno-vétérinaires des parasitoses digestives des petits ruminants dans le plateau central du Burkina Faso. International Journal of Biological and Chemical Sciences. 2007;1(3):297-304.
15. Kaboré A, Belem AMG, Tamboura HH, Traore A, Sawadogo L. *In vitro* anthelmintic effect of two medicinal plants (*Anogeissus leiocarpus* and *Daniellia oliveri*) on *Haemonchus contortus*, an abosomal nematode of sheep in Burkina Faso. African Journal of Biotechnology, 2009;8(18):4690-4695.
16. Koffi Yao M, Kossonou Yao K, Kouamé AGK, N'Guessan J, Bakayoko A, Tra Bi FH, *et al*. Activité anthelminthique *in vitro* et teneurs en tanins et flavonoïdes de huit plantes fourragères utilisées en élevage des petits ruminants en Côte d'Ivoire. European Scientific Journal. 2018;14(15):1857-7881.
17. Koné MW, Kamanzi AK, Traoré D, Betschart B. Anthelmintic activity of medicinal plants used in Northern Côte d'Ivoire against intestinal helminthiasis. Pharmaceutical Biology. 2005;43(1):72-78.
18. Kumwimba LRT, Abaysande WL, Kikumbi KB, Mbayo KM, Ngoy KE, Lumbu SJB. Quelques plantes utilisées contre des maladies des chèvres dans les territoires de Kalemie et de Moba (RDC). Livestock Research dor Rural Development ; c2017, 29(3).
19. Manolaraki F. Propriétés anthelminthiques du sainfoin (*Onobrychis viciifolia*): Analyse des facteurs de variations et du rôle des composés phénoliques impliqués. Thèse doc. Vétérin. Universit de Toulouse ; c2011, 185.
20. MRA (Ministère des Ressources Animales). Annuaires des statistiques de l'élevage 2014. Ouagadougou, Burkina Faso; c2015, 177.
21. Ogni CA, Kpodekon MT, Dassou HG, Boko CK, Koutinhouin BG, Dougnon JT, *et al*. Inventaire ethno-pharmacologique des plantes utilisées dans le traitement des pathologies parasitaires dans les élevages extensifs et semi-intensifs du Bénin. Int. J Biol. Chem. Sci. 2014;8(3):1089-1102.
22. Oussou KA, Karamoko Y, Blé YC, Zouh Bi ZF. Symptômes pathologiques observés dans les élevages de chèvres Naines au Centre de la Cote d'Ivoire. European Scientific Journal. 2019;15(9):597-607.
23. Poppi DP, Sykes AR. The effect of endoparasitism on host nutrition-the implications for nutrient manipulation. Proceed New Zealand Soc. Animal Prod. 1990;50:237-242.
24. Robes M. Les plantes médicinales vétérinaires tropicales. Limon, Paris-Québec; c2007, 345.
25. Tamboura HH. Activité biologique des extraits aqueux de *Holarrhena floribunda* (G. Don) Durand & Schinz (Apocynaceae) : Etude des effets de type hormonale mâle chez le rat. Doctorat d'Etat *es* Sciences Biologiques Appliquées, Université de Ouagadougou; c2006, 176.
26. Tamboura HH, Kaboré H, Yaméogo SM. Ethnomédecine vétérinaire et pharmacopée traditionnelle dans le plateau central du Burkina Faso: cas de la province Passoré. Biotechnnol. Agron. Soc. Environ. 1998;2(3):181-191.
27. Tianhoun DF, Meda RNT, Konaté A, Kaboré A, Tamboura HH, Belem AMG. Phytochemical screening and *in vitro* anthelmintic activity of *Cassia alata* (L) roxb. on *Haemonchus contortus* of small ruminants in Burkina Faso. J Adv. Parasitol. 2020;7(3):14-19.
28. Traoré A, Ouedraogo S, Belemsilga MB, Kaboré A, Guissou IP. Phytochemical analysis and ovicidal activity of *Cassia sieberiana, Guiera senegalensis* and *Excoecaria grahamii* extracts. African Journal of Pharmacy and Pharmacology. 2017;11(44):554-560.
29. Zabouh KW, Atakpama W, Tittikpinan K, Akpavi S, Batawila K, Akpagana K. Plantes utilisées en ethnomédecine vétérinaire dans la région des savanes du Togo. J Rech. Sci. Univ. Lomé (Togo). 2018;20(3):51-68.
30. Zabré G, Kaboré A, Bayala B, Katiki LM, Costa Junior LM, Tamboura HH, *et al*. Compared in vitro anthelmintic effects of *Acacia nilotica* and *Acacia raddiana* from the desert area. Parasite. 2017;24(44):11.
31. Garba ARI, Adakal H, Abasse T, Koudouvo K, Karim S, Akourki A, *et al*. Etudes ethnobotaniques des plantes utilisées dans le traitement des parasitoses digestives des petits ruminants (ovins) dans le Sud-Ouest du Niger; c2019.