

# Original Research Article

## Comparison of direct smear, floatation and sedimentation methods for the diagnosis of intestinal parasites of goats and sheep in Gombe, Northeastern Nigeria

### ABSTRACT

**Aim:** This study was carried out to compare the diagnostic efficiency of direct smear, floatation, and sedimentation methods for intestinal parasites in order to come out with a simple, precise and affordable method.

**Study Design:** Cross-sectional study was used where faecal samples on indigenous goats and sheep were used. A total number of 120 samples were collected from the intestinal tract of goats and sheep slaughtered. 60 faecal samples were collected from each of the two ruminants accompanied by identification using masking tape on each polythene bag. Parameters such as age and sex of the dogs were observed.

**Place and duration of study:** The study was conducted in Gombe township abattoir where small ruminants are mostly slaughtered without inspection from April to June, 2016.

**Methodology:** Direct smear using normal saline preparation, Sedimentation method and Floatation method were used for identification of parasites.

**Result:** Out of the 120 faecal samples examined, 97(80.8%) were positive for parasitic infections. The sensitivity indicated that Floatation techniques had the highest percentage of 50%, followed by Sedimentation with 36.6% and direct smear had the least with 13.4%.

**Conclusion:** The sensitivity of the three methods indicated that Floatation method is the best and even far better when compared to the conventional Direct smear. We therefore recommend the use of floatation method for easier and more authentic results.

**Keywords:** Direct smear; floatation; sedimentation; parasite; ruminants; Gombe.

*Contributions, Consent (where applicable), Ethical approval (where applicable), and References plus figures and/or tables.)*

### 1. INTRODUCTION

Organisms that live on other organisms (referred to as their host) and benefit from these organisms for all or part of their lifecycle and metabolic requirements are called parasites. [5] Parasitic diseases caused by intestinal parasite are a major health problem in livestock in the developing countries. Majority of these infections with parasites results in malnutrition, loss of appetite, emaciation, diarrhea, gastrointestinal pain, and even the eventual death of the animals [1] [4].

To diagnose gastro-intestinal parasites of ruminants, the parasites or their eggs/larvae must be recovered from the digestive tract of the animal or from faecal material [8]. In the course

**Comment [D1]:** Comparative study using different methods for diagnosis of intestinal parasites of goats and sheep in Gombe, Northeastern Nigeria

**Comment [WU2]:** The modification is welcomed and adopted.

**Comment [D3]:** Is there any study on dogs??!!!!

**Comment [WU4]:** That was a mistake, it is suppose to be goats and sheep not dogs. I have taken notice of the correction.

**Comment [D5]:** It should be [1]

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of ascertaining the actual parasite responsible for any infection associated with the intestinal tract, faecal examination is the basis for diagnosis. The techniques commonly used for faecal examination among others as direct smear, Baerman technique, nigrosine methylene blue, floatation and sedimentation techniques. They are all aimed at detecting the rate of infections of the animals [8] Direct smear method is useful for the observation of motile protozoans, trophozoites and the examination of cellular exudates, but is not recommended solely for the routine examination of suspected parasitic infections even though it is quick to prepare, and is less expensive when compared with the floatation and sedimentation methods [2]. Hence only a small particle of faeces can be examined and thereby giving limited efficiency as the only shortcoming of the direct smear technique. The floatation method gave the best concentration since they collect all parasitic elements on the surface of the dilution fluid. All floatation techniques take advantage of the difference in buoyancy of parasites [6]. If some faeces are suspended in water, the egg and solid faecal particles will settle out allowing the supernatant to be decanted. In general, techniques based on the floatation principle work well for nematodes and cestode eggs but fail to float some trematode eggs and distort certain nematode larvae beyond recognition [3].

Sedimentation technique is often used as a qualitative method and is not very reliable in estimating the intensity of an infection partly due to the need for a certain skill in removing the eggs from the solution. However, the method is especially useful because it allows rapid examination of the relatively large amount of faeces and hence is searching enough to detect quite low grade infection. This study presents diagnostic techniques within the reach of most laboratories to identify and quantify parasite infections from the examination of faecal material. Internal parasites are a significant threat facing today's small ruminant producers. Problems associated with parasites, particularly those of the gastrointestinal tract of sheep and goats can cause irreversible damage or even death to the animal, reduced performance and economic loss for the producer. Animals that are overburdened with parasites can be hindered in their reproductive performance, experience reduced growth rates, and become less productive overall, whether their purpose be meat, fiber, or milk. Against this background, the aim of this study is to compare the diagnostic efficiency of the above three methods for intestinal parasites in order to effectively control disease in animals. It is of utmost importance to have an ideal technique to both animal scientists and the people which is simple, with a view of getting accuracy, simplicity, and cost effectiveness.

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## 2. MATERIAL AND METHODS

### 2.1 study design

The study was conducted in Gombe township abattoir where small ruminants are mostly slaughtered without inspection. Gombe town is the capital of Gombe State in North eastern Nigeria. Gombe town lies between latitude 10°08'1N and 11°24'1E and longitude 11°02'1N and 11°18'1E while Gombe State lies between Latitude 9°30'1 and 12°30'1N and Longitude 8°45'1 and 11°45'1E. The State covers a land area of 20,265 sq. km, with a topography that is mainly mountainous, undulating and hilly, with flat open plains. The climate is warm, with temperatures not exceeding 30°C from March to May, in which March to May are the hottest months. Average daily temperatures are 34°C in April and 27°C in August. The area experiences two seasons; the rainy season, from April to October and dry season, from November to March. Annual average rainfall ranges between 850 to 1000 mm. The relative humidity ranges from 70 to 80% in August and decreases to about 15 to 20% in December. The natural vegetation is typically that of the Guinea Savanna grassland with

some concentration of woodlands. This provides enough grazing land and pasture for cattle rearing. Gombe State is predominantly an agrarian state with more than 80% of the population engaged in agricultural production. Cereals such as groundnut, maize, guinea corn, millet and cowpea are predominantly grown in the area and provide enough fodder for the animals. The projected population is about 2,755,387, a majority of which are the Fulani people whose major occupation is cattle rearing.

A total number of 120 samples were collected from the intestinal tract of goats and sheep slaughtered. 60 faecal samples of 5g each were collected from each of the two ruminants accompanied by identification using masking tape on each polythene bag. The number and sex of each animal was recorded on the individual faecal sample polythene. The faecal samples were carefully preserved in flask containing ice packs and transported to helminthology laboratory, of the National Veterinary Research Institute, NVRI Vom, Plateau state. Each sample was subject to direct smear, floatation and sedimentation methods respectively as described by [22].

### 3. RESULTS AND DISCUSSION

#### 3.1 Results

Out of the 120 samples examined, 97(80.8) were positive for parasitic infection. The total number of parasites ova or cyst detected by each method and the distribution of the parasites in the two ruminant's specie was determined as shown in Table 1. The modified direct smear had 24(20%), sedimentation method 69(57.4%) and floatation method 90(75%).

**Table 1:** The total number of parasites detected by the methods and their distribution in the two ruminant's specie.

Parasites	Directs Smear		Sedimentation		Floatation	
	Sheep	Goat	Sheep	Goat	Sheep	Goat
<b>Coccidia</b>	10	9	12	21	20	27
<b>Oocyst</b>						
<b>Strongyle</b>	1	3	12	19	17	27
<b>Eggs</b>						
<b>Strongyle</b>	0	2	0	1	0	2
<b>Larva</b>						
<b>Fasciola</b>	0	0	0	3	0	0
<b>Eggs</b>						
<b>Total</b>	11(5.9)	14(7.5)	24(12.9)	44(23.7)	37(19.9)	56(30.1)
	(13.4)		(36.6)		(50)	

Numbers in bracket represent percentages

**Table 2: Number and types of parasites detected**

Parasites	Sheep	Goats
Coccidia Oocyst	25	33
Strongyle Eggs	17	29
Strongyle Larva	0	5
Fasciola Eggs	0	3
Total	42(37.5)	70(62.5)

Numbers in bracket represent percentages

### 3.1.1 Sensitivity

The sensitivity of the methods was calculated similar to that of [7]. For each method, sensitivity equals to total number of eggs or cyst in all positive sample / total number of positive samples (Table 3). Flootation method had the highest 38.3, followed by sedimentation with 23.1 while the modified direct smear had the lowest 0.9.

**Table 3: Sensitivity of the various diagnostic techniques in detecting eggs of parasites**

Parasites	No.	Eggs/cyst in	Eggs/cyst in	Eggs/cyst	Direct	Sediment	Floatati
	positive	positive	positive	in positive	smear	ation	on
	samples	sample	sample	sample	Method	Method	Method
		Direct	Sedimentatio	Floatation	(Sensitivity	(Sensitivit	(Sensiti
		smear	n Method	Method	)	y)	vity)
		Method					
Coccidia	46	17	363	971	0.4	7.9	21.1
Oocyst							
Strongyle	43	4	332	723	0.1	7.7	16.8
eggs							
Strongyloi	5	2	1	2	0.4	0.2	0.4
des							
Fasciola	3	0	22	0	0	7.3	0
eggs							
Total	97	23	718	1696	0.9	23.1	38.3

The following are the figures of eggs of parasites detected in the various methods used for the study;



Fig. 1. Coccidia Oocyst



Fig. 2. Larvae of strongyloides



Fig. 3. strongyle eggs

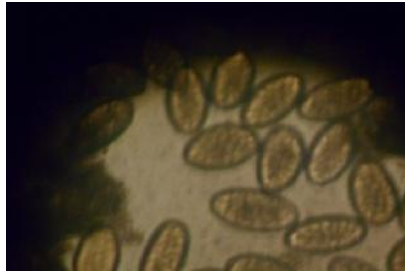


Fig. 4. Fasciola eggs

### 3.2 Discussion

More parasites were isolated through Flootation method because of the specific gravity of saturated salt solution (NaCl) used for this technique was favorable for the specie of parasites isolated which agree with the findings of [8] who reported that nematode and cestode eggs float in a liquid with a specific gravity of between 1.10 and 1.20. The least number of parasites isolated through direct smear technique may be due to the fact that small amount of the faeces were used [7]. It was also stated that this is unlikely to be rewarding except in a fairly heavy infection. Though a good number of parasites were isolated through sedimentation technique (which favors eggs that do not float well because of the hypertonic effects exerted by the flotation solution). Thus, this research, detected Fasciola eggs which have heavy and operculated eggs. However the fact that the study was carried out during the short wet season may account for the less detection, since incidence of Fascioliasis is high during and just after the rainy season as reported by [16] and [20]. The research revealed that goats had the highest infection with 70(54.5%) followed by the sheep with 42(35%). This agrees with the reports of [19]; [18]; [17] and [21] who all reported higher prevalence rate in goats. It was reported by [21] that the immune antibodies in sheep enabled it to throw off its worm burden and also prevented further infection by immobilizing the larvae in the gastrointestinal mucosa. However it is contrary to the reports of [9] and [10] in Ethiopia, [11] in Kenya, [12] in Nigeria and [14] in Pakistan. The possible explanation of higher prevalence in sheep might be the fact that sheep usually graze very close to the soil which might be helpful in the acquisition of more infective larvae of helminthes from the contaminated herbage. On the other hand, goats browse on shrubs and small trees where translation of infective larvae to such a height seems to be impossible. The sensitivity of the three methods was calculated similar to [7] which revealed floatation method to have the highest sensitivity of 38.3 which agrees with the findings of [13] in United states-Texas, who all recorded that the concentration by flotation methods were more sensitive in intestinal parasitic diagnosis, followed by sedimentation with 23.1 and direct smear with 1.1, but the advantage of the later is to provide a quick diagnosis of a heavily infected specimen, to check organism motility and to diagnose parasites that may be lost in concentration techniques [15].

### 4. CONCLUSION

Even though the floatation and sedimentation techniques were weighed down with some short comings like cost of running the test, which involves centrifuge, constant electric supply, a well-ventilated work space, adequate water supply, a standard light microscope and reagents (which are expensive as such), but still are reserved as the best methods for diagnosing intestinal parasites in resource poor countries like Nigeria where a variety of non-microscopic methods for diagnosing intestinal parasites is unaffordable. Such non-

**Comment [D11]:** Needs more recent references and should be more deep

**Comment [WU12]:** There were limited work done on this aspect of comparative studies as at the time of this work. Most work done are not similar to this, very few literatures are available and mostly not recent.

microscopic methods include antigen detection in faeces and direct fluorescent antibody methods. Therefore, Floatation and Sedimentation methods should be adopted for routine faecal examination since it exposes a higher percentage of infection missed by direct smear method, which is the implemented method by veterinary diagnostic clinics in developing countries (e.g. Nigeria). This will pave a way in reducing the prevalence of intestinal parasites especially in goats resulting from misdiagnosis.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## ETHICAL APPROVAL (WHERE EVER APPLICABLE)

Ethical approval was obtained from the management of the Gombe township abattoir.

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