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SEROPREVALENCE OF BRUCELLOSIS IN SMALL RUMINANTS IN YOBE STATE, NIGERIA

Lawan Shettima K., Abdullahi, U. S. and Mbap, S. T.
Department of Animal Production,
Abubakar Tafawa Balewa University, Bauchi, Nigeria
Corresponding Author's E-mail: kachalla1171@gmail.com **Tel.:** 07036915298

ABSTRACT
A serological study was conducted between October, 2019 to February, 2020 to investigate the prevalence of Brucellosis in sheep and goats in Yobe State. A total of 415 serum samples were collected from three, randomly selected Local Government Areas of the three Senatorial Districts of the State. The samples were first subjected to Rose Bengal Plate Test (RBPT). Positive samples were further subjected to Serum Agglutination (SAT) and 2Mercapto-Ethanol (2ME) tests. For the Ovine species, the seroprevalence rates were 9.87, 3.61 and 1.68% for RBPT, SAT and 2ME, respectively. The corresponding rates for Caprine were 6.74, 1.44 and 1.68%. Generally, SAT followed by 2ME were better in discriminating between positive and negative animals and thus reducing the chances of false positive/negative. Chi square test was used to determine significance between proportions among species, breeds and sex within RBPT and, management within SAT were statistically significant ($P<0.05$). Yankasa (6.26%) had higher rate than Uda (3.61%) and Balami (0.42%). The rate of 5.78% for Red Sokoto was also higher than 0.03% for West African Dwarf. It is concluded that Brucellosis is a challenge to small ruminant production in the study area. To lower the occurrence of Brucellosis in the study area, more attention should be paid to Yankasa and Red Sokoto breeds.

Keywords: Agglutination, Blood, Brucella organism, Seroprevalence, Serum, 2Mercapto-Ethanol.

INTRODUCTION
Brucellosis is a chronic contagious and systemic bacterial disease caused by the genus *Brucella (*Awah-Nduku, 2018). It is a widespread infectious and zoonotic disease that affects a wide range of animals and human, especially in Nigeria (Kelkay, 2017). The disease is characterized by sterility, infertility, abortion, decreased milk production, orchitis and epididymitis (Cadmus, 2013). The disease in human is caused by ingestion of unpasteurized milk or undercooked meat from infected animals (Bezabih, 2014). Nigeria has an estimated 22.1 and 34.5 sheep and goats, respectively with Yobe State having approximately 2.6 and 3.4 million corresponding species (YSG, 2020). Sheep and goats in Nigeria contribute about 11 and 24 percent of the total meat supply in abattoir but the disease hinders efficient productivity (Omeru, 2002). The cases of abortion, stillbirth and retained placenta are very common among small ruminant farmers in the study area (Bezabih, 2004). This has resulted in low animal off-take and protein intake. Raising small ruminants is so imbedded into the culture of householders of Yobe State, such that anything that affects production impacts their livelihood (Yobe State Government [YSG] Prevalence Record of Brucellosis, 2020). The aim of this study was to determine the prevalence of brucellosis in small ruminants and its effects on species, breeds, sex, age, location and management system.

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MATERIALS AND METHOD

The Study Area

Yobe State is located in North Eastern part of Nigeria between latitude 11° 51^1 North and Longitude 13° 11^1 East, with a total area of 45,502square kilometers, and estimated population of 2,532,395 (Census, 2006). The study was conducted in three senatorial zones of Yobe State. The study was conducted in three senatorial zones of Yobe State. One local government area was selected from each senatorial zone namely: Fune, Jakusko and Tarmuwa were randomly selected for the study.

Sampling Techniques

Simple random sampling techniques were used for the entire population of the settled small ruminant's farm examined. The size was determine using sampling formula described by (Michael, 2005)

Sampling Formulae

$n = Z^2P(1-P) / d^2$

where;

n = Sample size

z = Critical value of normal distribution 1.96 at 95%

p = Expected prevalence (10%)

d = Desired absolute precision (0.5)

Blood Collection

The blood sample was collected via a jugular venipuncture of each ovine and caprine

Serological Test

The blood serum samples were tested using Rose Bengal Plate (RBPT), Serum Agglutination (SAT), and 2Mercapto-Ethanol (2ME) tests as described by Alton (1975) and Morgan (1967). The tests were conducted at Ahmadu Bello University Zaria, Department of Veterinary Public Health and Preventive Medicine in Bacterial Zoonosis Laboratory. Titer of 1:40 and above are considered positive for both SAT and 2ME were considered as diagnostic for brucellosis (Morgan *et al.*, 1967).

Data Analysis

The chi-square test was carried out on the data (SPSS Statistical package) to determine the significance of each factor considered. Level of significance was fixed at 5%.

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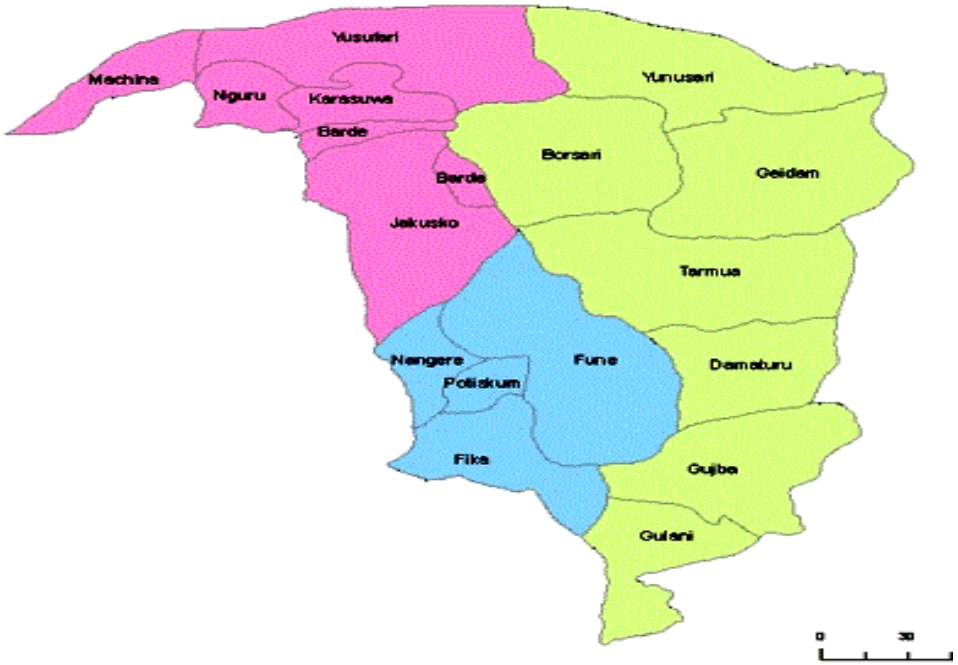

Plate I: *Map of Yobe State shown three political zones*

RESULTS AND DISCUSSION

Seroprevalence of Brucellosis by test and species

The results in Table 1 reveals ovine has the highest prevalent rate of 9.87%, 3.61%, and 1.68% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test respectively. This in line with the work of Agasthya *et al.* (2007) from Karnataka who recorded lower value of 9.46%, 4.45% and 3.64% in human using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test respectively. Similar to the finding of Bertu *et al.* (2010), 9.8% in small ruminant in Plateau *state*. However, Smith *et al.* (2007) recorded higher value of 10.50%, 7.32% and 5.88% in human brucellosis using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test, respectively.

Table 1: Seroprevalence of Brucellosis by test and species

		Positive					
Species	**No. examined**	**RBPT**	**(%)**	**SAT**	**(%)**	**2ME**	**(%)**
Ovine	216	41	9.87	15	3.61	7	1.68
Caprine	199	28	6.75	6	1.44	7	1.68
Total	415	69	16.6	21	5	14	3.3
$X^2 = 1.802^{NS}$; P = 0.179 and DF = 1							
$X^2 = 3.329^{NS}$; P = 0.068 and DF = 1							
$X^2 = 0.024^{NS}$; P = 0.876 and DF = 1							

In consonance to Table 1 results, Akbarmehr *et al.* (2011) recorded contrary to the result gotten goat has higher prevalent rate than sheep 5% and 4.18%. But did not go with the work of Buhari *et al.* (2020) who recorded 9.33% and 8.72% in sheep and goat. Also, Kanani *et al.* (2018) in unorganized farm sector recorded 23.70% and 15.99% in sheep and goats.

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Seroprevalence of Brucellosis in Ovine by Test and Breed

In Table 2, Yankasa breed has the highest prevalent value of 6.26%, 1.92% and 1.20% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test respectively. Did not agreed with the work of Buhari *et al.* (2020) who recorded 11.35% and 10.04% using Rose Bengal plate test and serum agglutination test, respectively. Followed by Uda with 3.61%, 1.68% and 0.48% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test, respectively. This totally disagreed with the work of Buhari *et al.* (2020) who recorded 0.0% and 7.14% using Rose Bengal plate test and serum agglutination test, respectively. The least value obtained from Balami 0.24%, 0% and 0% were recorded which did not correspond to the findings of Buhari *et al.* (2020) who recorded 9.09% and 0.0% using Rose Bengal plate test and serum agglutination test, respectively.

Table 2: Seroprevalence of Brucellosis in ovine by test and breed

		Positive					
Breed	**No. examined**	**RBPT**	**(%)**	**SAT**	**(%)**	**2ME**	**(%)**
Balami	22	1	0.24	0	0	0	0
Uda	52	15	3.61	7	1.68	2	0.48
Yankasa	142	26	6.26	8	1.92	5	1.20
Total	216	42	10.11	15	3.6	7	1.68
$X^2 = 6.169^{*}$; P = 0.046 and DF = 2							
$X^2 = 5.3437^{NS}$; P = 0.066 and DF = 2							
$X^2 = 0.0833^{NS}$; P = 0.659 and DF = 2							

Seroprevalence of Brucellosis by Caprine by Test and Breed

In Table 3, the highest seroprevalence rate was obtained from Red Sokoto breed of caprine with 5.78%, 1.20% and 1.68% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test, respectively. It does not in line with the findings of Buhari *et al.* (2020) who recorded 4.59% and 6.80% using Rose Bengal plate test and serum agglutination test, respectively. However lower value was obtained from West African dwarf 0.70%, 0.24% and 0% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test, respectively. It did not go with the findings of Buhari *et al.* (2020) who recorded 8.33% and 12.50% using Rose Bengal plate test and serum agglutination test, respectively.

Table 3: Seroprevalence of Brucellosis by caprine by test and breed

		Positive					
Caprine	**No. examined**	**RBPT**	**(%)**	**SAT**	**(%)**	**2ME**	**(%)**
Red Sokoto	192	24	5.78	5	1.20	7	1.68
W/A Dwarf	7	3	0.72	1	0.24	0	0
Total	199	27	6.51	6	1.44	7	1.68
$X^2 = 1.15^{NS}$; P = 0.284 and DF = 1							
$X^2 = 0.211^{NS}$; P = 0.646 and DF = 1							
$X^2 = 2.370^{NS}$; P = 0.124 and DF = 1							

Seroprevalence of Brucellosis in Ovine by Test and Sex

In Table 4, the female ovine has the highest prevalent rate compare to male with the value 8.43%, 3.37% and 0.96% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test respectively. The result corresponds to the work of Akbarmehr *et al.* (2011) who recorded 4.89% and 2.8% for female and male using Rose Bengal plate test respectively. It does not in line with the work of Junaidu *et al.*, (2008) who recorded 28.57%

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and 28.57% of Ram and 20.51% and 20.51% of Ewe using Rose Bengal plate test and serum agglutination test, respectively.

Table 4: Seroprevalence of Brucellosis in ovine by test and sex

			Positive				
Ovine	**No. examined**	**RBPT**	**(%)**	**SAT**	**(%)**	**2ME**	**(%)**
Male	48	9	2.16	1	0.24	3	0.72
Female	168	35	8.43	14	3.37	4	0.96
Total	216	44	10.59	15	3.61	7	1.68

$X^2 = 0.100^{NS}$; P = 0.752 and DF = 1
$X^2 = 2.257^{NS}$; P = 0.133 and DF = 1
$X^2 = 1.782^{NS}$; P = 0.182 and DF = 1

Seroprevalence of Brucellosis in Caprine by Test and Sex

In Table 5, the result also revealed that female caprine has the higher value compared to the male with prevalent rate of 5.06%, 1.20% and 1.68% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test, respectively. This go against the work of Junaidu *et al.* (2008) who recorded 47.36% and 36.8% of buck while 28.33% and 25.0% of Doe using Rose Bengal plate test and serum agglutination test, respectively. The result also goes with the work of Akbarmehr *et al.* (2011) who recorded 6.08% and 2.22% for female and male, respectively. It goes with finding of Mantur *et al.* (2007) who recorded 10.50%, 7.32% and 5.88% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test respectively. Also, in line with work of Sharma *et al.* (2006) recorded 5.45%, 6.3% and 2.7% using Rose Bengal plate test, serum agglutination test and 2mercapto ethanol test, respectively.

Table 5: Seroprevalence of Brucellosis in caprine by test and sex

			Positive				
Caprine	**No. examined**	**RBPT**	**(%)**	**SAT**	**(%)**	**2ME**	**(%)**
Male	49	4	0.96	1	0.24	0	0
Female	150	21	5.06	5	1.20	7	1.68
Total	199	25	6.02	6	1.44	7	1.68

$X^2 = 1.15^{NS}$; P = 0.284 and DF = 1
$X^2 = 0.211^{NS}$; P = 0.646 and DF = 1
$X^2 = 2.370^{NS}$; P = 0.124 and DF = 1

CONCLUSION AND RECOMMENDATIONS

Brucellosis is present in the study area and is a challenged to small ruminant's production. The disease affected both sexes of Ovine and Caprine, and all age groups. Balami breed of Ovine has the highest prevalent rate and Red Sokoto breed of goats.

More attention should be paid to ovine, females and animals over two years and the extensive management system than other categories. Moreover, the infected animal should be isolated and treated properly because the disease is easily transmitted by direct or indirect contact. Food material obtained from the infected animals should properly cooked before consumption. Finally, research that involve more species in the study area is also, recommended.

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