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OUTBREAKS OF PESTE DES PETITS RUMINANTS IN VILLAGE GOAT FLOCKS IN NIGERIA

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SUMMARY

Peste des petits ruminants (PPR) is a major disease constraint of goat production in Nigeria. Investigation of three outbreaks in village goat populations in south-west Nigeria showed overall attack rates of 42·4%, 13·7% and 37·1% and case fatality rates of 86·9%, 41% and 63·9% respectively. Statistically significant differences were observed between attack rates in different age groups in each of the outbreaks. Based on the mortalities suffered the estimated average loss per goat in each of the three outbreaks was N9·15, N1·36 and N5·84 respectively. On the assumption that a goat population is subjected to an outbreak of the disease every five years these estimates would indicate that an annual sum ranging from N1·83 per goat at the highest level of loss and N0·27 per goat at the lowest level of loss could be profitably spent in the successful prevention of the disease.

INTRODUCTION

Peste des petits ruminants (PPR), otherwise known as "kata" or pneumoenteritis complex, is a viral disease of economic importance among sheep and goats in Nigeria being probably the major cause of goat mortality in the country (Akerejola, Schillhorn van Veen and Njoku, 1979). The disease appears to be most prevalent in Southern Nigeria with a higher incidence in the rainy season (Whitney, Scott and Hill, 1967). This paper describes an investigation into the effect of PPR outbreaks on the health and productivity of selected village goat populations in south-west Nigeria.

MATERIALS AND METHODS

This investigation formed part of an interdisciplinary study being conducted on the health and productivity of village goats by a team from the International Livestock Centre for Africa (ILCA). The study was conducted in two different ecological areas of south-west Nigeria; in an area of rainforest around the town of Badeku and in an area of derived savanna near the large village of Eruwa. In both study areas goats from selected villages were individually identified and monitored as to their health and productivity through a series of weekly visits by members of the team over a period of 18 months. In addition a veterinary assistant was stationed permanently in each area in order to record data on births, deaths, slaughters, sales, transfers and monthly weights. Disease investigations primarily involved weekly clinical examination of sick animals and post-mortems of dead animals whenever possible. This close monitoring of the goat populations allowed a relatively accurate assessment to be made of the extent and severity of a series of PPR outbreaks and the degree of financial loss involved.

RESULTS

During the monitoring period two outbreaks of PPR occurred in certain of the selected villages around Eruwa together with a further outbreak in some of the

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TABLE I

Age and sex distribution of PPR among goats during an outbreak in four villages in the Badeku area

	Age (months) and sex groups										
	0–4		5–8		9–12		13–24		25+		
	M	F	M	F	M	F	M	F	M	F	Total
Population at start of outbreak	10	14	8	13	4	19	5	22	0	49	144
Number affected	8	4	6	10	3	8	3	4	0	15	61
Number dead	8	3	4	9	2	7	3	4	0	13	53
Attack rate (%)	80·0	28·6	75·0	76·9	75·0	42·1	60·0	18·2	0	30·6	
All sexes	50·0		76·2		47·8		25·9		30·6		42·4
Case fatality rate (%)	100·0	75·0	66·7	90·0	66·7	87·5	100·0	100·0	0	86·7	
All sexes	91·7		81·2		81·8		100·0		86·7		86·9

villages around Badeku. The PPR outbreak in the forest zone (Badeku) occurred in the dry "harmattan" period, between early November and December 1978. It involved goats in four villages of approximately four to 10 households each all located within a radius of 1 km of one another. An outbreak of the disease was first suspected when goats in one of the villages started exhibiting signs of pyrexia, serous oculonasal discharge, coughing, respiratory distress and diarrhoea. Dehydration, emaciation and death followed in most cases. Post-mortem examination showed erosions in the mouth, congestion of the lungs and the pulmonary and mesenteric lymph nodes and hyperaemia of the mucosae of the small and large intestines with characteristic "zebra striping" of the mucosa at the ileo-caecal junction in many instances. Tissue samples submitted to the National Veterinary Research Institute at Vom and the Department of Veterinary Pathology at the University of Ibadan revealed the presence of PPR virus in this and the subsequent outbreaks.

Within three weeks the disease spread to the other three villages. Table I details the course of the outbreak. The overall attack rate was 42·2% and all age groups of goats were affected. Chi-square analysis revealed that there was a significant difference ($P<0·01$) between attack rates in the different age groups with animals in the five to eight months age group being the worst affected. There was, however, no significant difference ($P>0·05$) in the case fatality rates between age groups. Chi-square analysis using Yates Correction Factor showed that within age groups there was no significant difference ($P>0·05$) in attack rates between sexes with the exception of the under five months age group ($P<0·05$).

The first outbreak of PPR in the derived savanna zone villages occurred between January and March 1979 and also during the dry "harmattan" season. New Eruwa village where the outbreak occurred is made up of approximately 100 households. The clinical signs of the disease and the subsequent post-mortem findings were similar to those observed in the Badeku outbreak. Details of the outbreak are given in Table II. In general the goat population seems to have been less affected than at Badeku. The overall attack rate was 13·7% and there was a significant difference in attack rates ($P<0·01$) between age groups. Although the 13 to 24 month age group was the worst affected the attack rate experienced (35·5%) was still relatively low. In this and the following outbreak the numbers of fatalities were too small to permit statistical analysis of case fatality rates.

The second outbreak in the derived savanna zone again occurred in the dry season between November 1979 and January 1980. The village affected (Olukosi)

TABLE II

Age and sex distribution of PPR among goats during an outbreak at New Eruwa in the Eruwa area

	Age (months) and sex groups										
	0–4		5–8		9–12		13–24		25+		
	M	F	M	F	M	F	M	F	M	F	Total
Population at start of outbreak	23	66	19	31	6	19	3	31	0	87	285
Number affected	0	4	6	4	2	6	0	12	0	5	39
Number dead	0	2	4	3	1	1	0	3	0	2	16
Attack rate (%)	0	6·1	31·6	12·9	33·3	31·6	0	38.7	0	5·7	
All sexes	4·5		20·0		32·0		35·5		5·7		13·7
Case fatality rate (%)	0	50·0	66·7	75·0	50·0	16·7	0	25·0	0	40·0	
All sexes	50·0		70·0		25·0		25·0		40·0		41·0

consists of approximately 35 households. Clinical and post-mortem findings were similar to the previous investigated outbreaks. The overall attack rate was 37·1% (Table III). As in the other outbreaks there was a significant difference ($P<0·05$) in attack rates between age groups. Young goats between five and eight months old had the highest attack rate.

In the following estimation only those financial losses due to mortality caused by PPR were considered. No attempt has been made to assess the effect of the disease on the productivity of affected but recovered goats. The parameters used were the mortality rates experienced by different age and sex groups and the unit values of the animals in these groups calculated from their market price per kg liveweight. The average rural market price per kg liveweight. The average rural market price per kg liveweight for goats in south-west Nigeria as derived by Okali and Upton (1984) is N2·05 for males and N2·51 for females (where N0·74=£1). The average liveweights of animals in the different age/sex categories were determined during the course of the study (Opasina, 1984). Three age groups were considered: under five, five to 12 and over 12 months. In the first category the estimated mean liveweight was 3·8 kg for the males and 3·7 kg for the females. Amongst the five to 12 months group the estimated mean liveweight was 7·7 kg for both sexes. In the adult male group over 12

TABLE III

Age and sex distribution of PPR among goats during an outbreak at Olukosi in the Eruwa Area

	Age (months) and sex groups										
	0–4		5–8		9–12		13–24		25+		
	M	F	M	F	M	F	M	F	M	F	Total
Population at start of outbreak	8	12	6	3	8	22	1	12	0	25	97
Number affected	1	1	4	1	5	10	0	5	0	9	36
Number dead	0	1	4	1	4	6	0	2	0	5	23
Attack rate (%)	12·5	8·3	66·7	33·3	62·5	45·2	0	41·7	0	36·0	
All sexes	10·0		55·6		50·0		38·5		36·0		37·1
Case fatality rate (%)	0	50·0	100·0	100·0	80·0	60·0	0	40·0	0	55·6	
All sexes	50·0		100·0		66·7		40·0		55·6		63·9

TABLE IV

Estimation of the average cost per mortality due to PPR in three outbreaks

Age/sex category (months)	Average weight in category (kg)	Market price per kg live-weight in Naira	Estimated value of individual animal in Naira	Percentage of total deaths in category	Weighted value of mortality in Naira
(a) Badeku					
Male					
0–4	3·8	2·05	7·79	15·1	1·18
5–12	7·7	2·05	15·78	11·3	1·78
13+	16·0	2·05	32·80	5·7	1·87
Female					
0–4	3·7	2·51	9·29	5·7	0·53
5–12	7·7	2·51	19·33	30·2	5·84
13+	16·9	2·51	42·42	32·1	13·65
Average cost per mortality					24·85
(b) New Eruwa					
Male					
0–4	3·8	2·05	7·79	–	–
5–12	7·7	2·05	15·78	31·3	4·94
13+	16·0	2·05	32·80	–	–
Female					
0–4	3·7	2·51	9·29	12·5	1·16
5–12	7·7	2·51	19·33	25·0	4·83
13+	16·9	2·51	42·42	31·3	13·28
Average cost per mortality					24·21
(c) Olukosi					
Male					
0–4	3·8	2·05	7·79	–	–
5–12	7·7	2·05	15·78	34·8	5·49
13+	16·0	2·05	32·80	–	–
Female					
0–4	3·7	2·51	9·29	4·3	0·40
5–12	7·7	2·51	19·33	30·4	5·87
13+	16·9	2·51	42·42	30·4	12·89
Average cost per mortality					24·65

months of age the estimated average liveweight was 16 kg and among the adult females 16·9 kg.

The weighted value of losses was obtained from the product of the market price of each age category and the percentage of the total deaths due to PPR occurring in that category (Table IV). The sum of these values gave the average cost of a mortality. In the Badeku outbreak this was N24·85 and the total loss due to mortality was N24·85×53=N1,317·05. Similar calculations for the New Eruwa and Olukosi outbreaks revealed an average cost of mortality of N24·21 and N24·65 and a total loss of N387·26 and N566·95 respectively.

DISCUSSION

In this study all three PPR outbreaks occurred in the dry season especially during the "harmattan" period. Although the disease is known to occur throughout the year most outbreaks have been reported as occurring during the rainy season (Durojaiye,

1983). The outbreaks varied markedly in their severity. The most severe was that involving the Badeku area where both the highest attack rate (42·4%) and the highest case fatality rate (86·9%) occurred. In contrast the outbreak at New Eruwa was relatively mild with a low attack rate (13·7%) and a relatively low mortality rate (41%) in affected animals. These differences may have been due to differences in virulence of the infecting virus strains. There appears to have been no recent history of a prior outbreak in New Eruwa which might have resulted in recovered animals and a consequent partially immune population.

The disease as observed in this study affected all the age groups of goats with the animals at the post-weaning age of between five and eight months being the worst affected in the Badeku and Olukosi outbreaks. This is in agreement with the observations made by Obi (1982) who reported a similar situation in an outbreak at Abadina village in south-west Nigeria. In the New Eruwa outbreak animals in the nine to 24 months age groups were the most seriously affected. In this latter outbreak both the overall attack rate and the attack rates in the 25 month plus (5·7%) and the 0–4 months (4·5%) age groups were much lower than those in the equivalent age groups in the other two outbreaks.

In assessing the extent of the losses due to PPR mortalities in goats much depends on the determination of the market value of animals. Although Okali and Upton (1984) reported no price premium for heavier animals, healthy breeding females are generally not sold in the market and therefore the value of this class of animal has probably been slightly underestimated. Conversely newborn and young unweaned goats, if sold at all, would fetch a very low price so that these animals' value has probably been overestimated.

An estimate of the average loss per goat due to mortality caused by PPR can be arrived at by dividing the total loss due to mortalities in each outbreak by the total number of goats present at the start of each outbreak. This gives an average loss of N9·15 per goat for Badeku, N1·36 for New Eruwa and N5·84 for Olukosi. Assuming an outbreak every five years the sums that could profitably be spent annually on the successful prevention of the disease would range from N1·83 to N0·27 per goat depending on the loss assumptions used.

The frequency of PPR outbreaks among the village goat flocks in south-west Nigeria has not been determined with any degree of accuracy but the consensus of opinion of those goat owners interviewed in the study areas was that outbreaks of the disease occurred at intervals of approximately five years.

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FOYERS DE PESTE DES PETITS RUMINANTS DANS DES TROUPEAUX DE CHEVRES VILLAGEOISES EN NIGERIA

Résumé – La Peste des petits ruminants (PPR) est une contrainte pathologique majeure de la production caprine en Nigéria. Les investigations menées dans trois foyers de populations de chèvres villageoises dans le Sud-Est du Nigéria ont montré un pourcentage global d'incidence de 42,4%, 13,7% et 37,1%, avec des pertes de 86,9%, 41% et 63,9% respectivement. Dans chacun des foyers, des différences statistiquement significatives ont été observées quant à l'incidence de la maladie en fonction des différents groupes d'âge. Basé sur les mortalités enregistrées, l'estimation des pertes moyennes par chèvre dans chacun des trois foyers a été respectivement de N9.15, N1.36 et N5.84. Dans l'hypothèse où la population caprine est sujette à une attaque de la maladie tous les cinq ans, ces estimations indiquent qu'une somme située entre N1.83 par chèvre pour le niveau le plus bas pourrait être utilement dépensée pour une prévention de la maladie.

BROTES DE PESTE DE PEQUENOS RUMIANTES EN CABRAS DE VILLORRIO EN NIGERIA

Resumen – La peste de pequeños rumiantes (PPR) es una de las enfermedades que más pérdidas económicas ocasiona a las explotaciones de cabras en Nigeria. Se investigaron tres brotes de la enfermedad en al Suroccidente del país, encontrandose una rata general de ataque de 42·4%, 13·7% y 37·1%, con una rata de fetalidad de 86·9%, 41% y 63·9% respectivamente. Se observaron diferencias estadisticas signficativas entre ratas de ataque, en los diferentes groupos y de acuerdo a la edad, en cada uno de los brotes. Con base en la mortalidad sufrida, la pérdida promedio estimada por cabra en cada uno de los tres brotes fue N9.15, N1.36 y N5.84 respectivamente. Asumiendo que una población de cabras está sujeta a sufrir un brote de la enfermedad cada cinco años, los estimativos indicarían que una suma anual de N1.83 por cabra como máximo de pérdida, y de N0.27 por cabra como mínimo, podría gastarse rentablemente en la prevención de la enfermedad.