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Ethno-veterinary control of parasites, management and role of village chickens in rural households of Centane district in the Eastern Cape, South Africa

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Abstract Mwale and Masika 2009 Ethno-veterinary control of parasites, management and role of village chickens in rural households of Centane district in the Eastern Cape, South Africa. Tropical Animal Health and Production. Village chickens contribute significantly towards rural livelihood in the African continent through the provision of animal protein, income and socio-cultural uses. However, village chickens are susceptible to parasite infestation. Due to limitations of using western drugs to control these parasites, farmers resort to the use of ethno-veterinary medicine (EVM). However, there is dearth of information on EVM use in chickens. Therefore, the objective of the current study was to document various EVM practices used in controlling gastro-intestinal parasites in village chickens. Stratified random sampling was used to select 62 chicken farmers that were interviewed using a structured questionnaire About 70 and 96.7% of farmers provided housing and water for their chickens respectively whereas the rest did not. The chief role of chickens was meat provision (91.7%). Most households (86%) reported parasite problems in chickens, particularly gastro-intestinal parasites. Eighty-three percent of the interviewed respondents use medicinal plants to control both internal and external parasites in chickens. Use of plants increased with parasite incidences ($r=0.347$; $P<0.01$). Mainly gastro-intestinal parasites were problematic and were largely controlled by medicinal plants. Further research on pharmacological properties, safety and efficacy of these plants is important for improved chicken productivity and hence rural livelihood.

Keywords Gastro-intestinal parasites · Management · Medicinal plants · Rural farmers · Village chickens

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Introduction

Village chicken (*Gallus domesticus*) production has been practiced throughout the African continent by rural communities for many generations (Guèye 2002). According to Guèye (2002) chickens in the rural areas constitute more than 80% of the African continent's poultry flock. These local chickens remain predominant in African villages (van Marle-Köster et al. 2008), despite the introduction of exotic breeds, because farmers have not been able to afford the high input requirement of introduced breeds (Safalaoh and Sankhulani 2004). Village chickens contribute signifi-

cantly towards the livelihood of the rural households particularly in South Africa where the greater population (43%) lives in rural areas (Swatson et al. 2001).

Village chickens are adapted to the harsh socio-economic and climatic conditions prevalent in the rural areas (Swatson et al. 2001). They contribute significantly to food security, poverty reduction and promotion of gender equality, especially in disadvantaged groups and less favoured areas of rural Africa (Guèye 2002; Sonaiya 2007). They also contribute to the economic, religious and socio-cultural considerations of the resource-poor rural communities (Mafu and Masika 2003; Mack et al. 2005). Chickens are not labour intensive, can be kept as a sideline enterprise and require less land resource. Nonetheless, little has been done regarding the role of village chickens in South Africa, therefore this warrants investigation.

Despite the high economic potential of these chickens to the rural sector, they are kept in limited numbers. This is mainly attributed to their slow growth rate and poor egg production (Phiri et al. 2007), high predation, mortality rates and most importantly susceptibility to parasites (Mungube et al. 2008). Village chickens are generally kept under free-range management (Muchadeyi et al. 2007), but their nutrition is occasionally supplemented with cracked grains and/or maize bran (Muchadeyi et al. 2004). This type of production system is associated with sub-optimal management of diseases and parasites, and therefore predisposes chickens to most importantly infestation with gastro-intestinal parasites (Swatson et al. 2002). Endo-parasitic infestation cause anaemia and markedly impedes chicken productivity thereby undermining chickens' valuable contribution towards rural livelihood.

Endo-parasites can be controlled through proper use of anthelminthics; however they are associated with a number of limitations. Underdosing of anthelminthics can lead to ineffective use (Mwale et al. 2005). Rural farmers may not use western drugs due to poor access because of distance, exorbitant prices, residual effects of drugs in meat, and parasite resistance to drugs. The repeated use of anti-parasitic drugs inevitably leads to the development of resistance in the target organisms, and this systematically occurs within approximately ten years following the introduction of the chemicals to the market (Brown 2007). As a result farmers have resorted to the use of traditional means, to control parasites in chickens (Mwamachi et al. 2003; Anthony et al. 2005). Therefore; there is a need to document and validate the alternative control measures that resource poor village chicken producers can use.

A possible alternative would be Ethno-veterinary medicine (EVM), which is the use of medicinal plants, surgical techniques and traditional management practices to prevent and treat a spectrum of livestock diseases (Mathius-Mundy and McCorkle 1989). The practice covers people's knowledge, skills, methods, practices and beliefs about the care of their animals (Mathius-Mundy and McCorkle 1989), and through trial and error, using their own indigenous knowledge farmers incorporate use of western medicine and at times in combination with EVM. It can play a significant role in grassroots development, which seeks to empower people by enhancing the use of their own knowledge and resources. The practice is presumed to lead to improved rural poultry health and productivity in developing countries (Guèye 1997). However, there is little if any documentation of the different ethno-veterinary methods used by rural households to control gastro-intestinal parasites of village chickens in the Eastern Cape Province of South Africa. The aim of this study was to document the various EVM practices that are used by resource-poor rural farmers to control gastro-intestinal parasites in village chickens.

Methodology

Study site

A baseline questionnaire survey was conducted in two villages: Qolora-by-sea (32° 38.63 S and 028° 24.36 E; Elevation 50 m) and Nontshinga (32° 29.65 S and 028° 17.80 E; Elevation 476 m) in Centane district which is in the Umnquma local municipality of the Amathole district Municipality. This area forms part of the coastal Eastern Cape which is characterised by high regular rainfall throughout the year (700–1000 mm/annum) with most rains occurring in spring and summer months (October to March) particularly in the lowland coastal belt, extending 30 to 60 km inland (Eastern Cape Development Cooperation Website, ECDC 2007). The district is very humid experiencing cool sub-tropical conditions above sea level. The

average summer minimum temperatures range from 19–23°C and the maximum range is 28–31°C. In winter, the average minimum temperature is 7°C while the maximum temperature is 21°C. The climatic conditions vary between coastal and inland environments, with conditions ranging from more extreme inland temperatures to the milder temperatures and higher rainfall of the coastal areas. Centane district is one of the poorest areas in the Eastern Cape Province (Eastern Cape Development Cooperation Website, ECDC 2007) and constitute the impoverished former homeland areas, Transkei and Ciskei, created by apartheid. However, the area is conducive for farming paving way for socio-economic improvement (Eastern Cape Development Cooperation Website, ECDC 2007). The rural farmers in the area practice diversified farming with women owning chickens and pigs while men are responsible with livestock species such as goats, sheep and cattle. However, by the time of the study, all the pigs had been slaughtered due to the outbreak of the African swine fever.

Sampling procedure

Stratified random sampling technique was used to select 62 households that were interviewed. The surveyed households were chosen by the researcher with the help of the local extension officers. Centane district was stratified into wards and villages from whence households were randomly selected. Two wards (ward 1 and ward 29) were selected at random and from these wards 2 villages were subsequently selected randomly. The chosen 2 villages had significant number of households farming with chickens. Only chicken farmers (both males and females) were selected randomly from these households and interviewed.

Data collection

A total of 100 structured questionnaires were randomly distributed into the 2 villages for collecting data in May 2007. Three male trained enumerators the University of Fort Hare (two) and Centane district Agricultural Extension Services (one) assisted the researcher (female) to administer the questionnaires. Informal and formal interviews were conducted with 28 and 26 farmers in Qolora-by sea and Nontshinga village, respectively and four key informants in each village. The key informants were retired livestock specialists, village councillors and herbalists. Information from key informants was used for quality control with that from other chicken farmers. The data was collected from chicken farmers. The information collected included: demography, livestock inventory, ownership of village chickens, role of chickens, occurrence of parasites and perceived parasite problem, housing of chickens and chicken parasites management practices. Parasite management practices data included the one using the traditional medicine if any, and one responsible with the care of the chickens and decision making regarding the care and use of chickens. Data on various ethno-veterinary practices used, medicinal plants used, the parts used preparation and application method was collected.

Data analyses

The Wilcoxon rank-sum test was computed using the Statistical Analyses System (Statistical Analytical Systems, SAS 2005) and the rest of the analyses was performed using the Statistical Package for the Social Sciences version 8 (The Statistical Package for the Social Sciences, SPSS 1999). Descriptive statistics and cross tabulations were computed. Chi-square and correlation coefficient values were computed to determine the relationships and degree of association between occurrence of parasites and use of ethno-veterinary medicine; farmer's educational background and use of EVM, and use of EVM and farmer's age and/or period engaged in EVM practices. Since the data was discrete non-parametric tests Kendall's rank test and Wilcoxon rank-sum test were used to rank the medicinal plants (and determine their importance to the farmers) used by chicken farmers in controlling gastro-intestinal parasites and to compute the differences in the use of medicinal plants between villages, respectively.

Results

Socio-demography

The majority of households were male headed (56.7%). The household size varied within and between villages; however the highest household size

was 5 in both villages, with a range of 1–9. The majority of respondents (96.2%) had never been trained in poultry production. The education background of the majority of farmers (65%) was grade R, primary level and junior secondary level, and a few did tertiary training. Most of the respondents (84%) were not employed but depended on old age pension (56.5%), and various government grants (40%) as their main sources of income.

Livestock inventory

Fifty percent of the farmers had cattle, with herd sizes ranging from 2 (3.2%) to 22 (1.6%) per household. Only one farmer (1.6%) had 26 sheep while 43.5% of the respondents had goats; ranging from 1 (1.6%) goat per household to 22 (1.6%). The majority of the respondents (93.5%) of which 83.9% were women, owned chickens with an average flock size of 16 (±2.1 S.E.M) birds per household. In the 3 years prior to the study (2004–2006), the farmers used on average an ox or a goat per year for ceremonies, and not chickens. Instead chickens were mainly used for home consumption; however few farmers (28%) sold their chickens at prices ranging between US$ 2.86 (R7=1 US$) and US$ 8.57.

Importance of chickens

Chickens were mainly used for meat whereby most respondents (91.7%) regarded chicken meat as very important in their households. According to the farmers it was not important (49.0%) to sell chickens, because they valued chicken meat most. Eggs seemed to play a minor role in the livelihoods of the respondents; to 30.4% of the chicken farmers eggs were important whereas the majority (70%) regarded them not important to their families. A similar proportion felt that it was not necessary to sell eggs. The majority of the chicken farmers (96.6%) reported that they do not use their chickens for appeasement. The farmers (84.1%) also reported that chickens were not used during ceremonies. A total of 35.1% of the respondents use chicken droppings as manure. Use of chickens as gift was ranked as not important (39.6%), and chickens were neither used as a sign of wealth (83.8%) nor for investment (60.9%).

Chicken management

The management aspects were similar in the two villages ($P>0.05$) where the study was undertaken so results are combined for the two villages. However, where differences were noted the results are presented separately for each village.

The majority of the farmers (93.4%) supplemented their chickens with yellow maize grain, whilst a few (3.3%) supplemented with maize and rice and 3.3% supplemented with bought-in/commercial feed. Most (96.7%) of the rural farmers provided their chickens with water and the rest left them to fend for themselves. Water was obtained from various sources: dams (3.3%), streams (47.5%) and boreholes (45.9%). Generally, in the majority of cases (95.1%) the water was regarded to be of good quality. The majority (70%) of farmers provided housing for their chickens whereas the rest did not. Out of the chicken farmers (30%) that did not provide housing for their chickens, 66.7% were from Nontshinga village and 33.3% were from Qolora by-sea. Most (88.1%) farmers used roofed housing, built using wooden poles (83.3%) or a combination of poles and corrugated iron sheets (40%). Most management aspects were similar except for water sources where Nontshinga farmers used dam and stream water, while Qolora by-sea chicken farmers solely used borehole (taped) water. The other difference is of housing where most chicken farmers in Nontshinga did not provide housing for their chickens.

Occurrence of parasites

The majority of farmers (86%) reported that they had problems with chicken parasites. Of the farmers who faced chicken parasite problems 49% were from Qolora by-sea while 51% were from Nontshinga village. The main problematic parasites were helminths (35.5%) followed by external parasites (25.8%) and a combination of helminths and external parasites (16.1%). However, 22.6% of the respondents regarded predation by hawks and eagles to be a major problem than parasites. Of the farmers who reported the problem of gastro-intestinal parasites, 59.1% were from Qolora by-sea and 40.9% were from Nontshinga village. Majority (80%) of the farmers reported of the mortality of their chickens. Parasites were perceived to be the main contributor to chicken mortality (51.6%),

whereas 34% of respondents alleged parasites to cause reduced growth rate and egg production.

Control of parasites in village chickens

A range of ethno-veterinary practices are used to control parasites. These include medicinal plants (83.3% of the interviewed respondents) for the control of both internal and external parasites (Table 1), and snuff (33.3%) for the control of internal parasites. Jeyes fluid (16.7%) and insecticidal chalk (33.3%) are used to control external parasites. However, some farmers use more than one of the above mentioned EVM practices but not in combination. Snuff was mixed with water and drenched to chickens for the control of internal parasites. Jeyes fluid and insecticidal chalk were applied directly onto chickens for the control of external parasites. A few respondents (1.6%) used ash (dusting of chickens), used oil, paraffin, soil and cow-dung for the control of external parasites. About 32% of the farmers use traditional practices to control the most problematic (internal) parasites in chickens while 17.7% farmers use both traditional and western drugs (Fig. 1).

Table 1 shows the medicinal plants that are used by the respondents; *Aloe ferox* was mostly used (48.4%). The majority of farmers (96.7%) claimed that *aloe* is the most effective medicinal plant in controlling gastro-intestinal parasites. Table 2 shows the ranking medicinal plants that are used for controlling gastro-intestinal parasites only as they were reported the most problematic parasites. *Aloe ferox* was ranked highest in both villages ($P<0.05$). As indicated in Table 2, *A. ferox* had a Kendall rank of 2.37 and

Table 1 Medicinal plants used by rural Eastern Cape farmers to control parasites in village chickens

Scientific name	Medicinal plant used		Farmers using plants (%)	Part of plant used	Parasite controlled	Age of chicken treated	Preparation Method
	Common name	Xhosa name					
Aloe ferox Mill.	Bitter aloe or red aloe	Ikhala	48.4	leaf	Internal	All ages	Chop leaves and mix with cold water or boil the mixture before giving birds as drinking water
Helichrysum splendidum (Thunb.) Less.	Cape gold	Impepho	6.5	leaf	External	All ages or laying hens	Burnt to ash, the smoke will drive away parasites and the ash placed in incubators where there are incubating hens
Agave sisalana Perrine ex Engelm.	Sisal	Iralibhomu	3.2	leaf	Internal	All ages	Cut and mix the whole plant with cold water or boil and cool the plant before giving birds to drink
Centella asiatica	River pumpkin	Iphuzi	1.6	Tuber/ root	Internal	All ages	Cut and boil the whole plant, cool and allow the chickens to drink
Xysmalobium undulatum L. R. (Br.)	Uzara/ Bitterwortel	Intsema	1.6	Tuber/ root	Internal	All ages	Cut and boil the whole plant, cool decoction and allow the chickens to drink
Gunnera perpensa L.	Butter cup	Iphuzi lomlambo/ Igangashane	1.6	leaf	Internal	All ages	Chop the leaves and add cold water then give birds to drink
Millettia grandis (E.Mey.) Skeels	Umzimbeet	Umtiza	1.6	leaf	Internal	All ages	Soak the leaves in cold water then give birds to drink
Lippia javanica (Burm.f.) Spreng	Lemon bush	Inzinziniba	1.6	leaf	External	All ages	Burn the whole plant to ash, the smoke will drive away parasites
Tagetes minuta L.	Tall khaki weed/ Mexican marigold	Unukayo	1.6	leaf	External	laying hens	Put the plant where there are parasites or in a hatchery

Centella asiatica had 3.76 indicating that *A. ferox* is more important to the farmers than *C. asiatica* (The lower the rank the more important the plant is). Of the families that used medicinal plants 55.9% are male headed while 44.1% are female headed. Use of these medicinal plants increased with parasite incidences ($r=0.347$; $P<0.01$). However, there was no relationship between farmer's level of education and use of medicinal plants ($P>0.05$). There was also no association between farmer's training in poultry husbandry and use of herbal plants ($P>0.05$).

The respondents had used medicinal plants for variable periods which ranged from one year (1.6%) to more than 20 years (16.1%). The majority got the knowledge from their elders (50%). About 90% of the chicken producers reported that they taught their children on how to use medicinal plants. There was a positive correlation relationship between use of medicinal plants and the time period that the farmer was engaged in medicinal plant use ($r=0.643$; $P<0.01$). The farmers use medicinal plants because they are easy to use (62.5%), cheap (12.5%), available all the time (12.5%) and the place they are found is accessible (6.3%) and have no side effects (6.3%). According to the rural farmers' perception, plants are effective (96.9%) and have invisible side effects (84%) in comparison with western drugs. However, 28.6% of the farmers alleged that extension officers discourage use of medicinal plants while 57.1% had no problem with the practice. All the farmers were not aware of any plants that they use which have become scarce and were of the opinion that using medicinal plants has no negative impact on the environment.

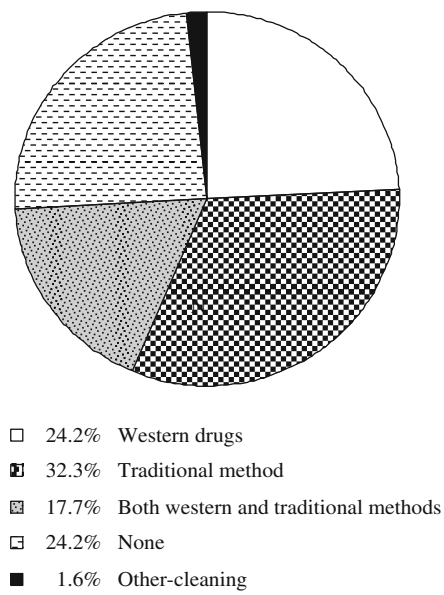

Fig. 1 The proportion of various methods used by rural farmers to control gastro-intestinal parasites in village chickens at Centane district, Eastern Cape Province, South Africa

Discussion

The majority of households owned chickens; and this is in agreement with Dlamini (2002), and the flock size was concurrent with Muchenje et al. (2000) who reported of an average flock size of 20 birds per household. This indicates that at least every household owns a chicken and that chickens play a crucial role in the livelihoods of rural farmers in the Eastern Cape. However, a reasonable number (50%) of farmers also owned cattle and goats, which are used in ceremonies and sold to generate income since chickens were essentially kept for the provision of meat for home consumption. Chickens were owned mainly by women like in other African countries, this concurs with earlier studies by Halima et al. (2007), who found out that chickens are generally considered livestock species of women and children whether in male-headed or female-headed households. Also this affirms the fact in earlier assertion (Kitalyi 1998) that chickens address the gender issues which is important in rural development, because surveys in a number of African countries have reported gender plurality in ownership, management and decision-making of resources.

The main role of chickens was that of providing a source of meat as also reported in other studies conducted in Southern Africa (Dlamini 2002; Muchadeyi et al. 2007; Mapiye et al. 2008). Unlike cattle, chickens are not kept as a sign of wealth (Musemwa et al. 2008). In contrast with the previous studies by Naidoo (2000) in North-eastern KwaZulu-Natal province and Swatson et al. (2001) in KwaZulu-Natal where chickens are mainly used in rituals, in Centane farmers do not use chickens for rituals. Instead, goats were the ones essentially used for ceremonies. In the current study detailed information on the ritual uses of chickens were not collected since the majority of the farmers (84.1%) had reported that they do not use chickens for ritual purposes. However,

further studies regarding this need to be conducted in order to compare with other regions.

The findings of this study were not in agreement with Naidoo (2000) and Guèye (2001) who affirmed that village chickens contribute to cash of the resource-poor rural communities. Our results showed that farmers considered cash from other livestock species more important, and chickens were mainly considered the chief source of meat for consumption. This could be attributed to the fact that it is easier to kill a bird for consumption than cattle, and considering its size, it would not present difficulties of storing it. Since Centane is the poorest district in the Province, farmers might consider reserving chickens for family consumption rather than selling; and can only keep. In addition, rural famers' main goal for keeping chickens is for food security and insurance in case of emergence (Mapiye et al. 2008), and not selling. Although farmers easily sell their chickens among themselves or to the cities if there is need of cash, nevertheless, marketing of chickens might be a constraint and it warrants investigation.

Most of the birds were left to scavenge and were supplemented mainly with maize grain, as observed in similar studies in South Africa (Dlamini 2002), Zimbabwe (Muchadeyi et al. 2004) and Ethiopia (Halima et al. 2007); however in most cases they were provided with clean water. Provision of housing for the birds for use mainly during the night was in agreement with Dlamini (2002) and Muchadeyi et al. (2004). However; the type of housing material (zinc metal) used for constructing the chicken fowls and overcrowding could have led to increased temperatures in the housing thereby inducing heat stress in birds leading to the reported chicken mortality of 51.6%. High mortality rates of chickens could be attributed also to the time of releasing birds in the morning (mid-morning) particularly in summer season where temperatures quickly rise during the day thereby inducing heat stress in chickens and hence death. In Nontshinga most chickens were not supplemented thus high chicken mortality was probably a result of poor nutrition. However, farmers attributed chicken mortality to predation by hawks and eagles, and parasite infestation mainly. Reports of high predation by hawks and eagles, especially in Nontshinga where some households did not provide shelter for the chickens is in agreement with previous studies (Dlamini 2002). However, the causes of mortality are not known, it is thus, imperative for the veterinary extension officers to conduct post mortems in order to determine chicken mortality causes.

Gastro-intestinal parasites were reported to be more problematic than external parasites, which was also the case in a previous study by (Njunga 2003). The major contributing factor to the high prevalence of internal parasite infestation is the type of production system which is basically a free ranging, low-in put low-output that allows the chickens to easily pick up infections (Swatson 2003). According to Muchadeyi et al. 2007, in extensive management systems where chickens have access to outdoor areas, and not confined, they have a greater diversity of parasite infestations.

The wide use of medicinal plants especially *Aloe ferox* to control helminths was because these plants were perceived to be effective, easy to use and without any side effects. *Aloe ferox* was also reported for controlling poultry diseases and internal parasites in chickens and other livestock, scab in sheep and tick-borne diseases in ruminants (Dold and Cocks 2001), as a laxative (Steenkamp and Stewart 2007) and for controlling ticks in cattle (Moyo and Masika 2009). Masika and Afolayan (2002) reported of the use of *A. ferox* for the control of tick-borne diseases and helminthiasis in livestock in the Eastern Cape, and *Helichrysum species* for the control of foot rot and *Lippia javanica* for the control of tick-borne diseases. *Tagetes minuta* was also reported by Moyo and Masika (2009) to control ticks in cattle in the Eastern Cape, whereas in the current study it was used for controlling any external parasite in village chickens. Medicinal plants were used despite the fact that the households were male-headed or female-headed therefore use of plants was not affected by decision makers (head of households). The report that children are aware of medicinal plants and that they got the knowledge from their elders is in agreement with Mwale et al. (2005) who noted that the knowledge of using medicinal plants is passed on from generation to generation. Verbal transfer of information has the fear that with time information might be lost therefore documentation of such information is crucial. However, researchers faced a challenge where certain plants were given the same local names by the farmers for instance *Centella asiatica* and *Gunnera perpensa L.* Therefore, the

researchers relied on the scientific identification of the plnets by the botanists.

A positive correlation relationship between use of medicinal plants and chicken occurrence of parasite is an indication that as parasites become more problematic, more plants are used to control these parasites. Farmer perception was that most extension officers were indifferent in the utilisation of plants; this could be ascribed to the fact that the officers were not directly involved in issues of ethno-veterinary practices. In addition EVM is not part of the curriculum at Agricultural colleges therefore extension officers cannot promote issues that they are not knowledgeable of. The opinion by farmers that use of medicinal plants has no adverse environmental impact is in agreement with the findings of Shanley and Luz (2003). However, this has to be validated, and this can only be true if plants are used sustainably in addition to the fact that mostly the apex is used, like with *G. perpensa,* leaving the underground meristem to regenerate always. Also, if medicinal plants conservation issues and establishment of herbal gardens are adhered to.

Dissemination of information concerning EVM could possibly increase the use of these commonly used plants. However, this may lead to the extinction of some species if the rate of use is higher than the rate of regeneration. Depending on factors that include location, type of plant, how readily the plant regenerates, part of the plant used, intensity of use and if the plant can be cultivated, EVM use can cause serious negative impact on the environmental. It is, therefore, imperative to detail the study of each medicinal plant used and how it is used in order to educate the farmers on how best to use the plant and to put in place appropriate conservative measures.

Conclusion

The chief role of chickens in the livelihoods of the rural farmers in the study area was provision of meat for home consumption. Gastro-intestinal parasites were reported to be the most important constraint to village chicken production. Medicinal plants were commonly used for the control of these parasites. The main medicinal plant used for controlling these parasites in chickens was *Aloe ferox*. However, the safety and efficacy of medicinal plants needs to be assessed, as well as the the prevalence of gastro-intestinal parasites in village chickens. Also, further research is required on the evaluation of the anti-inflammatory and analgesic activities of the plants and the determination of any possible nutritional benefits of these medicinal plants as some nutrients tend to boost the immunity of animals thereby enhancing healing, and if the animal receives balanced nutrients it stand high chance of resisting the effect of helminths infestation.

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