

A survey of ethno-veterinary practices adopted in the treatment of diseases of indigenous chickens in Kgatleng district, Botswana

E. Z. Mushi¹, M. G. Binta², R. G. Chabo¹ and S. Modipane¹

¹Botswana College of Agriculture, Private Bag 0027, Gaborone, Botswana

²National Veterinary Laboratory, Private Bag 0035, Gaborone, Botswana

E-mail: ezmushi@bca.bw

ABSTRACT

A survey questionnaire aimed at collecting knowledge on ethno-veterinary practices used in the treatment of diseases of indigenous chickens in order to lay a foundation for further scientific study and validation was conducted in Kgatleng district, Botswana. A total of 1280 indigenous chickens were found in 100 homesteads visited and the owners interviewed in different villages. The mean flock size was 12.80 ± 6.42 chickens per household. These backyard chickens were mainly kept for domestic consumption. The commonest diseases cited by the farmers were Newcastle disease (NCD), fowl pox and coccidiosis. A large number of the farmers (88%) relied on traditional herbal decoctions, one percent used conventional medicine, five percent combined herbal and conventional medicines for treating sick chickens while seven percent did not use any medication. *Aloe marlothii* Berger (Flat flowered aloe) and *Acacia tortilis subsp heterecantha* (Umbrella thorn) were used to treat chickens with NCD and coccidiosis. Other remedies used against NCD included infusions prepared from *Cassia abbreviata* (Long tail) and *Moraceae spp.* (Mulberry) leaves. An aqueous extract of *Diospyros lycoides* (Red star apple) leaves was used in the treatment of conjunctivitis. Wood ashes of *Peltophorum africanum* Sonder (Weeping wattle) and *Combretum imberbe* (Leadwood) mixed with either paraffin or "used" engine oil was used against fleas, lice and mites. Farmers had confidence in these remedies and considered them to be cheap and effective. Western treatments such as the use of antibiotics and vaccinations were not frequently used. While efforts should be made to conserve indigenous knowledge on medicinal plants to prevent fragmentation or loss, conduction of further studies is imperative in order to validate the presence of bioactive moieties in the decoctions from these plants. Keepers of indigenous chickens should be encouraged to seek veterinary assistance when the chickens are not well. Also the chickens should be vaccinated against Newcastle disease.

Keywords: Indigenous chickens, diseases, ethno-veterinary practices, Botswana

INTRODUCTION

As much as 65% of homesteads in Botswana keep a few chickens (*Gallus domesticus*) (Moreki, 2006). These chickens belong to the local breed popularly known as "Tswana" chickens also regarded as indigenous or rural family poultry. Chickens serve as a source of cheap animal protein for the rural poor in most parts of the world (Say, 1987). These chickens are left to scavenge for their food and water. Feed and mineral supplements are rarely given.

Traditional medicine is part of indigenous knowledge system of people globally from time immemorial (Iwin, 1994; Kansonja and Ansay, 1997). From time immemorial indigenous peoples of Southern Africa have used herbal remedies to treat livestock and humans (Hutchings, 1989). Traditional practices used to keep their animals healthy and productive, to treat and control diseases constitute ethno-veterinary medicine (Mathias-Mundy and McCorkle, 1969). Indigenous herbal medicines are used for treating livestock ailments although the

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efficacy of such medicines has been controversial. However, there is scanty information regarding the use of herbal medicines in treating chicken ailments.

Elsewhere in Southern Africa, small scale farmers use herbal remedies to treat livestock diseases (Cunningham and Zondi, 1991; Masika *et al.*, 1997; Dold and Cocks, 1999; 2001; Masika *et al.*, 2000; Van der Merwe *et al.*, 2001).

Currently, traditional medicine in Botswana forms part of national heritage and plays an important part in the development of modern medicine. The art of healing with plant medicines is empirical and is usually transferred by oral teaching but is facing rapid extinction. Furthermore, there is limited documentary evidence on the efficacy of these remedies particularly in chickens.

The main objective of the present study was to collect information through a structured questionnaire and interviews on ethno-veterinary practices among poultry owners in Kgatleng district, Botswana.

MATERIALS AND METHODS

Study area

The study was conducted in 10 villages of Kgatleng district in the South-eastern part of Botswana. (Table1). The vegetation in the district is predominantly of the savannah type with sparsely populated acacia species of trees. The district though has hot and wet summers, is periodically threatened by severe drought. The district enjoys mild summers with a mean temperature of 30⁰ C and cool, dry winters with a mean temperature of 18⁰ C. (Botswana Meteorological Services).

Methodology

Rapid rural appraisal methods were used (Beebe, 1995; Getchell *et al.*, 2002). Both qualitative and quantitative approaches were employed. Oral interviews were conducted

with randomly selected farmers keeping indigenous Tswana breed of chickens in different villages of Kgatleng district from May to July 2002. Oral interviews were conducted by the authors assisted by Veterinary technicians and extension agents acting as translators. Some traditional herbalists were also consulted. The investigation was centred on socio-economic profile of the farmer, animal husbandry practices, knowledge of animal health care, ethnoaetiology, ethnodiagnostics and treatment. Commonly used plants including common names, indications, preparation and mode of administration to chickens were obtained from chicken farmers.

Plant collection / Sources of herbal medicine

Plants were collected under the guidance of respondents. Staff at the Botswana museum did identification of plants. Specimens of each species were collected and pressed for preservation according to the methods by Fish (1999).

Farmer's profile

The chickens found in the homesteads were physically counted. The owners were interviewed about the management of these chickens using a questionnaire. During the interview, farmers were asked to state reason(s) why they kept indigenous chickens, the common diseases afflicting these Tswana breed of chickens, the disease control strategies adopted, prophylactic and therapeutic intervention by the farmers whenever there was a threat of disease.

Plant use

Data on the use of plants was analysed according to the criteria of Veterinary consistency as defined by Kansonia and Ansay, (1997) whether there was consistency when the same plant genus is used to treat the same disease condition. It was noted that

is were processed individually or mixed with other plants or products

Statistical analysis

Statistical analysis to calculate means and standard deviation was carried out based on Gomez and Gomez (1984).

Mode of action of plant

Five possible active principles and the probable mode of action were obtained from literature. In this way validation of some claims on the efficacy of the decoctions of the plants under study was concluded.

RESULTS AND DISCUSSION

A survey conducted from May 2001 to May 2001, total of 1280 indigenous chickens were found in the 100 households visited, giving a mean flock size of 8 ± 6.4 per household. The flock size reported in this study is almost comparable to the figure reported in rural parts of South Africa (Dreyer *et al.*, 1997). Some authors reported flock sizes ranging from 5 to 20 per household in Africa.

1. Age group distribution of chickens in respondents from each location in Kgatleng district.

	Hens	Cocks	Chicks	Totals
1	130	12	136	278
2	85	12	86	183
3	50	10	35	95
4	69	10	44	123
5	25	9	26	66
6	46	9	24	79
7	41	10	57	108
8	51	10	50	111
9	23	10	45	78
10	82	10	67	159
11	602	102	570	1280
12	6.0	1.02	5.70	12.80 ± 6.42

Figure 1 shows the age distribution of the chickens for each of the locations in Kgatleng district.

Kgatleng district visited in this study. The highest number of indigenous chickens was reported in Mochudi location, followed by Morwa. Hens constituted 47.0% of the total number of chickens kept by the respondents with most farmers keeping one cock. Chicks were fewer than hens. Generally there was only one cock per household

It was observed that most chickens were not housed and spent nights on tree or roof tops to avoid predators. Occasionally, supplementary feeding consisting of some grain was given but not commercial chicken feed. Ninety eight percent of the respondents were women above the age of 40. One percent (1%) were children above 10 years old, the rest, 1% were elderly men above 60 years. All the respondents kept backyard chickens for domestic consumption (Table 2). As in other African countries, chickens played a large social role (Kitalyi, 1996) even in a predominantly pastoral society like Botswana.

Table 2. Reasons cited by respondents for keeping indigenous chickens in Kgatleng district, Botswana

Reason	Percent of farmers
Family consumption	100
Source of income	53
Slaughter for visitors	61
Hobby	28
Other	35

From the description given by farmers on the clinical symptomatology, signs of disease and previous knowledge on the disease patterns, it was apparent that the commonest diseases were Newcastle disease, fowl pox, fowl typhoid, coccidiosis, external parasites and internal parasites. However, the perceived cause of disease was difficult to match with conventional disease. This observation concurs with findings of other workers who reported that NCD was the most prevalent disease of indigenous chickens in West Africa (Sa'idu *et al.*, 1994; Guèye, 1998) and in Kenya (Musime,

1992). In this investigation, only a few farmers vaccinated their chickens against NCD which often resulted in high chicken mortality.

Phytotherapeutics rather than zootherapeutics was practised by respondents to a semi- structured interview in the ten villages of Kgatleng district, Botswana. The results of the study showed that the majority of farmers used herbal remedies instead of conventional Veterinary drugs.(Table 3). Briefly, about 1% used conventional remedies, 88% herbal, 5% combined herbal and conventional, 7% did not treat chickens and the rest, 2% expressed ignorance about treatment of chickens.

It was noted that knowledge of herbal medicine was more common to the elderly respondents than children. Most young people though involved in the management of chickens had scanty knowledge about herbal remedies. None of the respondents knew the mode of action of the remedies and the scientific rationale for their use

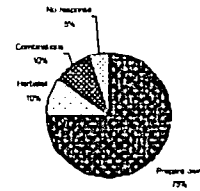
Table 3. Methods used by farmers to control chicken diseases, Kgatleng district, Botswana.

Control measure	% Farmers
Traditional	88
Vaccination	5
Combined (Traditional + Vaccination)	5
None	2

The type of plants collected for various remedies and mode of preparation and administration is summarised in Table 4. Almost all the farmers preferred collecting their own plants for treating their poultry (Figure 1), rather than relying on a herbalist. Similarly, as many as 75% of the respondents used their own herbal remedies, 10% enlist the work of a herbalist to prepare these remedies , 10% were found to combine conventional and herbal remedies. The rest, 5% did not respond to this question. Lack of knowledge about conventional remedies was cited as one of the reasons why some poultry

farmers continued using herbal remedies. The choice of herbal medicine was influenced by the nature of the ailment. The cost of conventional medicines was prohibitive for some resource limited homesteads. Plant remedies are easily accessed and cheaper. Even in well resourced homesteads indigenous chickens are regarded as inferior to cattle. Consequently, conventional medicines are only reserved for cattle and in some cases, sheep and goats.

Figure 1. Relative proportion of how poultry farmers obtained herbal medicines in Kgatleng district, Botswana.



Scientific and common names of the most commonly used remedies are summarised in Table 4. Traditional remedies such as *Aloe marlothii* Berger (Flat leafed aloe), *Acacia tortilis*, *shsp heterecantha* (Umbrella thorn), *Cassia abbreviata* and *Harpagophyllum procubens* (Devil’s claw) were widely used to treat NCD (Table 4). A common method of controlling external parasites such as fleas, lice and mites was by the use of wood ashes from *Peltophorum africanum*, Sonder (Weeping wattle) and *Combretum imberbe* (Leadwood) mixed with either paraffin or “used” engine oil. Pulverised leaves of *Pseudognaphalium lutea* soaked in water were used to treat eye infections in chickens. Although some chicken remedies were sold at Livestock advisory centres, the state

Veterinarians and field Animal Health technicians were not directly involved with the sale of products

Whereas ethno-veterinary practices are well documented for cattle among indigenous people of Southern Africa (Masika et al., 2000; Kansonja and Ansay, 1997; Mathias –Mundy and MacCorkle 1989; Van der Merwe et al., 2001; Luseba

and van der Merwe, 2006), there is a dearth of information on its use in the treatment of poultry diseases in the region. Elsewhere in Africa, a wide variety of ethno-veterinary practices have been used by poultry farmers to control NCD in village fowls (Guèye, 1999). In the present study, the farmers expressed confidence in the validity of these remedies

Table 4 Plants used to treat chickens for various ailments in Kgatleng district, Botswana

Family and botanical name	Common name	Indication	Plant part	Preparation
(Asphodelaceae) <i>Aloe marlothii</i> Berger	Flat leafed aloe	Fowl typhoid Newcastle Disease Coccidiosis Wound healing	Leaves	Crush leaves to obtain juice in water
<i>Acacia tortilis</i> subsp. Heterocantha (Fabaceae)	Umbrella thorn	Newcastle Disease	Leaves	Leaves in boiled water
<i>Cassia abbreviata</i>	Long tail	Worm infestation Newcastle Disease	Bark	Grind – Take the bark and soak in water overnight or boil, cool in sieve and place in chickens drinking water Infusion – Boiled water
<i>Harpagophytum procumbens</i> <i>Peltophorum africanum</i> , Sonder	Devil's claw Weeping wattle	Newcastle disease Mites, fleecce, External parasites	Leaves Burn the wood and collect ashes	Infusion – Boiled water Mix wood ashes with paraffin oil or used engine oil
(Combretaceae) (i) <i>Combretum imberbe</i> (ii) <i>Combretum paniculatum</i> <i>Pseudognaphalium lutea alba</i>	Lead wood	Mites, fleecce, External parasites	Bark and stem	Mix wood ashes with paraffin oil or used engine oil
<i>Pseudognaphalium lutea alba</i> Morus species	Mulberry	Eye infection Mites , fleas , External parasites	Leaves Latex from leaves	Soaked in water Pulverised leaves soaked in water and used as a shampoo
<i>Diospyros lycioides</i>	African chewing sticks Red star apple	Newcastle and fowl typhoid	Leaves	Oral administration of an aqueous extract of pulverised leaves

In the present study, leaves of a liliaceae, *Aloe marlothii*, Berger were immersed in cold water to prepare a decoction usually given to chickens suffering from NCD, fowl typhoid and coccidiosis. Phytochemical investigation of the leaf exudates of *Aloe marlothii* belonging to the family, Asphodelaceae contains anthrones and

chromones (Bisrat et al., 2000). However, the therapeutic use of these moieties is not known. Furthermore, neither tickicide (Spickett et al., 2006.) nor anti rickettsial (Naidoo et al., 2006) activity could be elicited by a decoction of pulverised leaves of this aloe. The use of this aloe to treat viral poultry diseases was questionable since

no virucidal activity has been associated with the extracts. Secondly, Newcastle disease was the commonest cause of chicken mortality. In other African countries, a decoction prepared from leaves of *Aloe spp.* is used to treat round worms in humans (Palgrave, 1991). It is possible that the healing property of the juice extract is attributed to its recognised soothing, demulcent and anti scarring properties in man (unpublished observations).

Ethnobotanical information obtained from methanol extracts of *Cassia abbreviata* showed significant activity against Gram negative and Gram-positive bacteria (Kambizi and Afolayan, 2001). This may perhaps account for the suppression of secondary bacterial infection sequel to a viral infection in chickens. In another investigation, the stem bark of *C. abbreviata* has been shown to contain histamine or a chemically related substance that lowers blood pressure in experimental animals (Parry *et al.*, 1992). Whereas anti plasmodium biologically active compounds have been detected in aqueous extracts of the plant, no virucidal activity has been demonstrated yet. The efficacy of the extract in the treatment of NCD may be doubtful. However, studies from Nigeria indicated leaves of *Cassia didymobotrya* had been used in the management of this disease (Guèye, 1998).

In this questionnaire, an infusion prepared from boiled roots of *Cassia abbreviata* Oliver, *subsp. beareana* was a popular remedy not only for NCD but also fowl typhoid both of which have a component of diarrhoea in their clinical presentation. According to some authors the plant has tonic and apparently analgaesic properties appreciated in traditional human medicine (Palgrave, 1991). Perhaps it is this tonic property that respondents were exploiting in alleviating the diarrhoeal symptoms commonly seen in NCD and fowl typhoid.

The use of this plant in the treatment of the latter disease has been validated by the observation that methanol extracts of *Cassia abbreviata* have inhibitory effects on both Gram negative and Gram positive bacteria (Kambizi and Afolayan, 2001).

In this investigation, an infusion prepared from the leaves of *Acacia tortilis subsp. heterecantha*, was also used in the management of NCD. Ironically, young leaves and pods of *A. tortilis* are suspected of causing prussic acid poisoning in livestock (Timberlake, 1980).

Studies conducted by Hagos *et al.*, (1987) described isolation of a smooth muscle relaxing 1,3 -diaryl-propan -2-ol derivatives from *A. tortilis*. It is possible that the beneficial effects of an extract from this plant may be attributed to this property.

It was claimed that ashes of *Peltophorum africanum*, (Fabaceae) Sonder and *Combretum imberbe* when mixed with paraffin or "used" engine oil could protect chickens from mites, lice and fleas. A decoction from a deciduous tree *Peltophorum africanum* (Fabaceae) widespread in S. Africa is known to contain flavonoid glycosides, flavonoid glucoside gallates, tannic acid and protease inhibitors (anti-trypsin and chymotrypsin) (El Sherbeiny *et al.*, 1977; Joubert, 1981). Oil is a documented conventional anti ectoparasitic agent in poultry whose mode of action is deprivation of oxygen. More recently, extracts from this tree have been shown to have anti parasitic activity (Bizimenyera *et al.*, 2006). The roots and bark of this tree are used to treat diarrhoea, fever, dysentery, sore throat, joint and back ache (Bizimenyera *et al.*, 2005).

Combretum imberbe (Combrataceae) is used widely in Africa inter alia for treating bacterial infections. The demonstration of anti microbial and anti-inflammatory activity of triterpenoids (Katerere *et al.*, 2003; Angh *et al.*, 2007); from pulverised

leaf extracts of *Combretum imberbe* (Combrataceae) validates its use in the treatment of fowl typhoid but not as an anti ectoparasitic agent as used by the respondents in this study.

In the present study, combination of various plant extract was not uncommon most probably working on the principle of ostentation. The respondents could not explain the rationale for using paraffin or used engine oil with ashes from these plants.

Harpagophytum procumbens, (Pedaliliaceae) commonly known as the "Devil's claw" has been used traditionally for the treatment of pain, fevers and dyspnoea in humans (Denner, 2007). Recently, it has become popular for the treatment of degenerative rheumatoid disorders and osteoarthritis and anti-inflammatory properties (Catelan *et al.*, 2006). Studies have yet to establish a clear mechanism of action; however, current research is focusing on pro-inflammatory mediators as well as on potential anti oxidant characteristics. In the present study, dried preparations were administered to chickens in their drinking water to treat NCD. Although no virucidal activity has been demonstrated, the anti oxidant properties of extracts from this plant has been demonstrated *in vitro* (Almeida *et al.*, 2007). The finding of anticonvulsant activity in aqueous extracts of the secondary root of *Harpagophytum procumbens*, (Mohammed and Ojewale, 2006) may give credence to its attempted use in the amelioration of nervous signs associated with NCD in chickens.

Pulverised leaves of the plant *Diospyros lycioides* (African chewing stick) have been shown to contain bioactive naphthalene glycosides, naphthoquinones and binaphthalenone glycosides with demonstrated oral anti bacterial activity against streptococcus species and *Staphylococcus aureus* (Li *et al.*, 1998; Cai *et al.*, 2000). It was speculated that the

beneficial effects of this extract may have been attributed to antimicrobial activity against secondary bacterial infection an aftermath of a viral infection such as NCD. The direct inhibitory effect on *Salmonella* species in chickens has yet to be demonstrated.

Latex of mulberry (Moreaceae) has been shown to contain sugar-mimic alkaloids, which are potent inhibitory glycosidases, sugar metabolising enzymes, which interfere with sugar metabolism and cysteine proteases (Kotaro *et al.*, 2006). These bioactive moieties have demonstrated pesticide properties and have been exploited by the respondents in repelling ectoparasites in chickens.

Despite phyto prophylactic and therapeutic intervention, there have been outbreaks of NCD and other poultry diseases which have incurred heavy mortalities on chicken populations in Kgateng district. It is therefore imperative that local chickens are vaccinated against the common poultry diseases mainly NCD since none of the decoctions have been shown to possess specific anti viral properties. Also, the use of scientifically proved Western antibiotics to treat bacterial poultry diseases should be advocated since bacterial diseases in chickens still occur. Ironically as discussed some of these herbal decoctions may contain toxic levels of tannic acid as in the "weeping wattle" and prussic acid as in *Acacia spp.*

Further veterinary validation of extracts from these plants needs to be done in chickens since most of the validation has been extrapolated from human studies. The interviews clearly showed that farmers had confidence in the efficacy of these herbal remedies perhaps for lack of a better option or due to lack of knowledge about conventional medicines, lack of affordability and availability in rural communities. Failure of the farmers to use conventional means of poultry disease control could result

in unprecedented heavy mortalities due to the seasonality of these plants in these locations due to seasonal availability of these plants. Other authors in Southern Africa have cited affordability and availability of conventional remedies as some of the constraints on the use of conventional medicines by rural communities (Gehring *et al.*, 2002). A similar situation may have been pertaining at the time of this study. Other remedies used by respondents in this study in treating chickens against ticks included "used" engine oil either alone or in combination with any conventional acaricides.

There may be public health implications since the mode of excretion from the chicken's body and the residue levels in poultry meat and eggs are not known. Since the active principles and the margin of safety of these orally administered concoctions is not known, regulation of the dosage and administration becomes erratic and hazardous. Since affordability, availability and lack of knowledge about

conventional medicines were some of the factors that encouraged farmers to resort to herbal medicines these should be minimised.

It is therefore imperative that further studies are conducted for experimental validation to confirm the presence of bioactive compounds in these traditional remedies to assure a more sustainable use of these natural resources as advocated by Fourie *et al.*, (1992). Since traditional ethnobotanical knowledge may be lost with the demise of the older generation, efforts should be made to conserve and disseminate this knowledge as part of national heritage.

It is recommended that poultry farmers should send sick chickens to the veterinary office for treatment because the efficacy of these herbal remedies has not been established. Secondly chickens should be vaccinated against Newcastle disease.

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