

Use of Herbal Plants in Poultry Health Management in the Mushagashe Small-Scale Commercial Farming Area in Zimbabwe

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ABSTRACT

For poor smallholder farmers in Zimbabwe, conventional drugs have become very expensive and an out-of-reach resource for the health management of chickens. A diagnostic survey was undertaken in the Mushagashe district in Zimbabwe to determine the extent of the usage of *Aloe vera* and *Aloe spicata* in the health management of chickens. A total of 103 structured questionnaires were distributed to randomly selected farmers who owned chickens. Avian coccidiosis was found to be prevalent in chickens (90.5%). The other major poultry diseases reported were Marek's disease (100%), fowl typhoid (50.5%), Newcastle disease (42.1%), and fowl coryza, in order of occurrence. *A vera* and *A spicata* were the predominantly used plant species for chicken health management. Other ethnoveterinary drugs that were used include *Lycopersicon esculentum*, *Myrothamnus*

flabellifolius, *Lannea stullmannii*, *Ficus burkei*, *Sarcostemma viminale*, *Capsicum annum*, and soot. Use of *A vera* and *A spicata* was not affected by age, residence, level of education, or religion of the farmer ($P > 0.05$). Males (64%) used the *A vera* and *A spicata* more than females (36%). No side effects of using *Aloe* species herbs were reported. *A vera* and *A spicata* leaves were generally fresh and used only when birds looked unhealthy, went off feed, or blood was seen in their droppings. The leaves were harvested, cleaned with water, and crushed before they were mixed with drinking water for chickens. The medicated water was offered to all birds until they showed signs of good health. In addition to their use in chickens, the herbs were also used for the treatment of diseases in cattle, sheep, goats, and human beings. This is an indication that ethnoveterinary medicine is of great importance in the smallholder sector of Zimbabwe. It is increasingly gaining recognition at the expense of conventional drugs, as it is readily accessible, inexpensive, and apparently effective.

INTRODUCTION

Herbal medicines have always been a form of therapy for livestock among resource-poor smallholder farmers.¹ There is, however, little documentation of the use of ethnoveterinary medicines, as many researchers and health practitioners view these practices as backward. Documentation of herbal plants is necessary because they are likely to be more important in the future, especially given the escalating costs of drugs and the focus on organic products in most developing countries. In addition, with the development of resistance of pathogens to drugs, ethnoveterinary medicine might be the route to take since herbs tend to be broad spectrum.

Examples of herbs used to treat livestock diseases in rural areas are *Boswellia serata* (frankincense), *Adansonia digitata* (baobab lemonade), *Adenium multiflorum* (impala lily), *Aloe spicata*, *Aloe vera* (burn plant), *Cussonia arborea* (Chibwabwa/Chipombola), *Cycnium adonense* (the ink plant), *Cyperus articulatus* (jointed flatsedge), and *Allium sativum* (garlic).² Of these, *Aloe* species is arguably the most important, as it is found in many geographical regions and is believed to be effective against a wide range of diseases and ailments. It is used both in livestock and humans. The herb has several pharmacological properties: it is antibacterial, antifungal, antivenin, and has immunological properties. *A. vera* consists primarily of water (995 g/kg), protein (25 g/kg), and polysaccharides.³ The polysaccharides include pectins, hemicelluloses, glucomannans, and acetylated mannans, which are generally called acemannan and mannose derivatives, of which mannose-6-phosphate is the major sugar component. These acemann sugars are responsible for the boosting of immunity, hence *A. vera* has a wide range of uses.

A. vera is also widely used for the external treatment of minor wounds, skin irritations including burns, bruises and abrasions, and general inflammatory skin disorders.⁴ It has anti-allergy and anti-

inflammatory properties because of glycoproteins and anthraquinones, which block the regeneration of thromboxanes and bradykinin, and also inhibit and break down bradykinin. In rural areas, a mixture of *A. vera* and engine oil (lubricant) is used to heal wounds. *A. vera* is a perennial herb that originates in the tropics and therefore is readily accessible and inexpensive.⁵ This survey was therefore undertaken to establish the usage of traditional herbs in poultry health management.

MATERIALS AND METHODS

Study Site

A diagnostic survey was carried out in Masvingo, Zimbabwe, in the Mushagashe small-scale commercial farming area. The area is known as a common site for *A. vera* and *A. spicata* use. Mushagashe lies at 19° 55'S and 30° 50'E, and is about 1000 m above sea level. The mean annual temperature ranges between 20°C and 25°C. The area is situated in agro-ecological Region IV, where annual rainfall is about 600 mm and occasionally experiences droughts during the rainy season. Rainfall occurs mostly between November and April. The soils are sandy-loam and of moderate fertility. The farmers practice mixed crop-livestock farming systems. All the farmers kept village chickens and a few farmers engaged in small-scale commercial poultry production using imported and crossbred chickens. Chickens are mainly marketed locally.

Data Collection

A total of 150 structured questionnaires were administered to chicken farmers in January 2004. Of these, 47 questionnaires were not completed. Five trained enumerators from the Mushagashe Agricultural Research and Extension Services administered the questionnaires. The main aspects captured in the questionnaire included household demography, classes and flock size of chickens, feeds and feeding management, health management, and the use of herbal plants in poultry management.

Statistical Analyses

Frequencies of household demographic distributions, the use of *Aloe*, and major disease problems were computed using the SPSS Base 10 Statistical Package for the Social Sciences (SPSS, Inc., Cary, NC, USA). The association between religion, sex, head of households' level of education, and use of *A vera* were computed using the chi-square test.

RESULTS

The majority of the farmers were Christians (52.0%). The level of education in the Mushagashe area was generally low and only 1% of the farmers had secondary education, whereas 27.6% achieved primary level (Figure 1). Of the farmers that were interviewed, 92.7% were resident on the farm. As shown in Table 1, farmers in the Mushagashe area owned several species of livestock. Twelve percent of the farmers kept commercial meat-type chickens (broilers), 85% had indigenous chickens, and 3 % had crossbred chickens.

All broilers were intensively managed. They were fed in confinement from 1 day old until slaughter time, while crossbred birds were semi-intensively managed. The intensively managed birds were kept in a deep litter house from 1 day old until slaughter. Semi-intensively managed birds were allowed to move out of the chicken house into a chicken run every morning, giving them limited access to scavenge for extra food. Birds kept under the free-range system

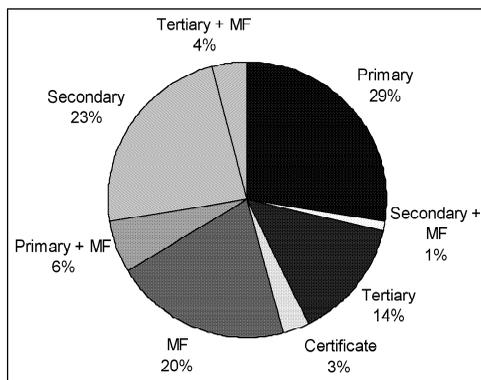


Figure 1. Distribution of small-scale farmers in the Mushagashe, Zimbabwe, farming area, according to level of education. MF is a farm apprentice program in which students work under the supervision of Agricultural Research and Extension Services officials to eventually become certified farmers or certified farm managers.[†]

[†]Primary: completed 7 years of education; secondary: completed at least 9 years of education; tertiary: have some skilled post-secondary training.

received very little feed, if any, and relied mostly on scavenging for their feed requirements. Only 5.2% of indigenous chickens were kept under intensive management, 57.3% under semi-intensive management, and 37.5% under free-range management.

The major poultry diseases reported in Mushagashe were, in order of occurrence, Marek's disease (100%), coccidiosis (90.5%), fowl typhoid (50.5%), Newcastle disease (42.1%), and fowl coryza. A total of 45.7% of the farmers indicated that they used only traditional methods to treat their flocks, 3.3% indicated that they used com-

Table 1. Livestock Herd Size for Farmers in the Mushagashe, Zimbabwe, Area

Class of Livestock	Mean (\pm SE) Herd Size	No. of Farmers*	Percentage of Livestock Ownership (%)
Cattle	18.7 \pm 0.92	101	98.06
Sheep	3.5 \pm 0.68	13	12.62
Goats	8.0 \pm 0.90	41	39.81
Donkeys	3.8 \pm 0.49	9	8.74
Turkeys	3.8 \pm 0.97	9	8.74
Commercial chickens	36.6 \pm 18.72	14	13.60
Indigenous chickens	21.8 \pm 1.60	97	94.17
Crossbred chickens	4.7 \pm 1.45	3	2.91

*Indicates the number of farmers interviewed out of a total of 103 completed questionnaires; SE, standard error.

Table 2. Common Herbs Used in the Mushagashe, Zimbabwe, Area and the Proportion of Farmers Using Each of the Herbs for Specific Diseases in Chickens

Herb	Vernacular Name	Diseases Treated	Proportion (%)
<i>Aloe vera</i> and <i>Aloe spicata</i>	Gavakava	Coccidiosis, fowl typhoid, Newcastle disease	62.0 10.4 6.7
<i>Lycopersicon esculentum</i>	Tomato leaves	Eye problem	0.7
<i>Myrothamnus flabellifolius</i>	Mufandichimuka	Coccidiosis	1.5
<i>Lannea stullmannii</i>	Musosoti	Coccidiosis, prophylactic measure against poultry disease	0.7
<i>Ficus burkei</i> (Wild fig)	Mutechani/ Murovamhuru	Coccidiosis	0.7
<i>Sarcostemma viminale</i> (Milk rope)	Rusungwe/ Nyakadombo	Gastrointestinal problems	0.7
<i>Capsicum annum</i> (Pepper)	Mhiripiri	Coccidiosis	6.0
<i>Parinaria curatellifolia</i>	Muchakata	Coccidiosis, Fowl typhoid	2.2 0.7
<i>Albizia gummisera</i> and <i>Albizia adianthifolia</i>	Mucherenje/ Muwora	Coccidiosis	5.2
Soot	Chin'ai	Coccidiosis	1.5
Combination of any of the above-mentioned herbs			23.1

mercial methods, and 51.1% used both methods. Common herbs used were *A vera*, *A spicata*, *Lycopersicon esculentum*, *Myrothamnus flabellifolius*, *Lannea stullmannii*, *Ficus burkei*, *Sarcostemma viminale*, *Capsicum annum*, *Parinaria curatellifolia*, *Albizia gummisera*, *Albizia adianthifolia*, and soot (Table 2). A total of 38.0% of the farmers vaccinated their chickens against coccidiosis using Coccivac-B (Schering-Plough Animal Health Corp., Kenilworth, NJ, USA), 33.7% favored prophylaxis treatment, while 21.7% preferred biosecurity measures including footbaths and vermin control. *A vera* was ranked as the most commonly used ethnoveterinary medicine (98.8%), for both poultry and in other classes of livestock. Most farmers viewed *A vera* as important (98.8%) and therefore relied on it as an agent against avian coccidiosis. The use of *A vera* and *A spicata* was related to the prevalence of disease ($\chi^2 = 10.132$; $P < 0.05$).

Sex of the head of household was associated with use of *A vera* and *A spicata* (χ^2

= 3.930; $P < 0.05$), with more male heads of households (64%) using *Aloe* than females (36%). There was, however, no relationship between the age of the head of household and use of *Aloe* to treat coccidiosis in chickens ($P > 0.05$). Also, the household head's level of education was not associated with the use of *A vera* and *A spicata* ($P > 0.05$). Use of aloe to treat coccidiosis in chickens was not influenced by whether the head of the household resided on the farm or not ($P > 0.05$).

The frequency of use of *Aloe* herbs was highest on farms where there had been frequent outbreaks of poultry coccidiosis ($P < 0.05$). In cases of a suspected coccidiosis attack, *A vera* and *A spicata* were given to both healthy and sick birds. The herbs were given to any type of chicken; however, the majority of the farmers used *Aloe* on the indigenous breeds (62.6%). The *Aloe* treatments were reported to enhance recovery of the birds even if treatment was delayed. Assurance of a sick bird's recovery after it had been given the herb varied from farmer

to farmer, with 40.9% of the farmers reporting disappearance of coccidiosis symptoms as an indication of recovery. Signs of recovery were bird alertness (19.4%), bird movement (15.1%), normal feeding behavior (23.7%), and disappearance of a green coloring of the feces (1.1%). Chickens had different recovery times after treatment, with some chickens reported to recover within 24 hours, but the majority recovered within days (72.0%). However, a few recovered only within weeks (4.3%). There was a relationship between the period of recovery and the frequency of the coccidiosis attack ($\chi^2 = 10.078$; $P < 0.05$).

All the farmers reported that *A vera* and *A spicata* were easy to use and readily available all year round. For 54.7% of the farmers, the use of *Aloe* was seasonal, with the most frequent time of use being from November to January and also from May to October. The majority used it all year round (45.3%). The majority also indicated that *Aloe* had no side effects if used to treat poultry coccidiosis (98.9%). It was also reported that *Aloe* could be used to treat human beings (80.9%).

Almost all the *Aloe* used in the study area was collected from the wild (94.7%), with the remaining 5.3% being grown by the farmers to save as flower hedges as well as to provide medication for both humans and livestock. The majority of farmers used fresh aloe (77.3%) while the remainder stored the aloe for later use. *Aloe* to be stored was first chopped and then put into a container. Generally, *Aloe* was not preserved for later use (77.3%); however, there were some farmers who could preserve *Aloe* (22.7%) by chopping the leaves and storing them in a container. Others would store the raw leaves in a safe cool place, but the *Aloe* could remain usable for weeks.

The majority of the farmers got information regarding the use and efficacy of *Aloe* from their grandparents (85.4%). Only 2.1% of the farmers reported that extension officers informed them how to use the herbs. It

was also considered important to teach the use of the *Aloe* to young people at workshops (98.9%). However, the farmers felt that the use of *Aloe* could safely be taught to young people and at workshops, as long as its effectiveness and the actual active ingredients were validated ($P < 0.05$). The efficacy of *Aloe* in comparison with other herbs was reported to be generally good (49.5%), and approximately 40% of farmers reported that *Aloe* plants were comparable to commercial coccidiostatic medications.

DISCUSSION

The household demographic distribution indicated that there were more males than females farming with chickens and using *A vera* and *A spicata* at the Mushagashe small-scale commercial area. This supports the fact that, in most African societies, males are the heads of the households.⁶ Traditional medicines are widely used in the smallholder sectors, and the use of the *A vera* and *A spicata* plants was not influenced by farmers' religion and level of education—factors that are perceived to affect use of traditional medicine in the smallholder sectors.⁷ The observation that farmers possessed different species of livestock is typical of most smallholder systems, where farmers do not concentrate on one type of livestock. Figuratively speaking, each smallholder farmer could have goats and chickens as sideline enterprises, while cattle and crop production systems are major enterprises.⁸ This is done mainly to spread the risk and to take advantage of the natural interrelationships between different livestock species. For instance, poultry manure can be fed to cattle, pig feces can be used in aquaculture, and animal blood can be used for making meal for cattle.

Given that most indigenous chickens were mainly farmed under semi-intensive and extensive types of management, the high prevalence of coccidiosis could be due to the type of feed that the chickens were offered. These chickens were given home-grown crops, which did not contain coc-

ciodiostats, thereby facilitating chickens' susceptibility to infestation of the *Coccidia* parasite. Considering that commercial drugs are expensive and unaffordable to most farmers and that coccidiosis was prevalent, farmers were left with no choice but to rely on traditional medicines. In this instance, *A vera* and *A spicata* were perceived as a convenient, more reliable, and cheaper source of medication.

The finding that the herbs were reported to produce acceptable results is in agreement with previous findings that *A vera* treatment was accompanied by quick recovery from ailments.⁹ The finding that the herb was used for any chicken breed, more so the hardy indigenous breeds, and that chickens quickly recovered within days of treatment, is in agreement with authors who reported *A vera* to have various components likely to have therapeutic functions.¹⁰ Treated birds were reported to recover within 7 days post-treatment.

The observation that *A vera* and *A spicata* could be used to treat diseases other than coccidiosis, as well as in other livestock species, is in agreement with the report by Grindlay and Reynolds that *Aloe* is also useful in treating burns and wounds.¹⁰ Judgment about recovery after treatment for coccidiosis was subjective, depending on the farmer's knowledge of the birds' normal behavior, normal color of their droppings, appearance of their plumage, and a variety of other observations. This also increases the chances that most farmers misdiagnose coccidiosis or confuse it with other diseases that lead to similar symptoms, leading to questions about the effectiveness of *A vera* and *A spicata*.

Most farmers used *A vera* and *A spicata* against a wide range of diseases, including avian coccidiosis. Among the range of herbs used by farmers, the highest ranking for the *Aloe* indicates its importance. Of the many *Aloe* species found in Zimbabwe, *A vera* and *A spicata* are the most common in the Mushagashe area. There is a need to further characterize these species to isolate the active ingredients responsible for the control

of coccidiosis in chickens. *Aloe* plants were easily used and readily available all year round, which is in agreement with Otto, who stated that ethnoveterinary medicines are easily accessed, familiar, locally available, and cheap.⁷ This is also in agreement with the report by Haller that *A vera* is a drug for all seasons, which therefore implies that farmers are not limited in when they use this plant.¹¹ However, some farmers had monthly (seasonal) preferences regarding the use of the herbs, as the chemical constituents may vary with season and agroecological region. During the dry period the herbs apparently become more concentrated with anthraquinones, thereby becoming more effective as healing agents. The statement that there were no side effects in chickens caused by the herbs supports the fact that the plants can be safely used internally or externally.^{12,13}

The finding that age of the farmer did significantly affect usage of *Aloe* herbs suggests that the technology is well accepted in the community. There is therefore a need to preserve this invaluable and sustainable form of indigenous knowledge within the local communities. This can be achieved through conducting workshops, farmer meetings, and field days.¹⁴ Although the findings of our study show that the older generation informally taught younger generations about the herbs, a justification remains for the standardization of ethnoveterinary medicine data, thereby encouraging sustainability and conservation of these plants. The importance and efficacy of *Aloe* species as perceived by the smallholder farmers calls for the setting up of a formal way of informing farmers about the beneficial aspects of the herbs.

Aloe vera acts like a broad-spectrum antibiotic remedy. Ibrahim et al. supported this fact by asserting that a single herb could be used in treating several diseases in different types of livestock.¹⁴ Davis et al. reported that no adverse effects have been reported in over 20 years of usage of *Aloe* species.⁵ This is in agreement with the finding that the herbs could work in conjunction with con-

ventional drugs with no adverse effects. *A vera* and *A spicata* could therefore be easily and safely grown at homesteads for easy access and availability. This fact was supported by Croom and Walker, who reported the maintenance of one or more *Aloe* plants readily at home because of *Aloe* gel's reputation as a folk remedy for burns and wounds.¹⁵

Farmers in this study reported no side effects in using *Aloe*, while some researchers have cited the presence of side effects, which are mainly only outwardly perceived.⁴ However, as in the case of many other ethnoveterinary medicines, the efficacy of *Aloe* still remains uncertain, and some potentially active constituents are still undefined.³ Also, Lev and Amar reported a flourishing and well-developed trade in traditional drugs, indicating that further studies should be carried out for validation of the herbs before their commercialization.¹⁶ The fact that the herbs were being used, despite the fact that chickens were vaccinated or not, whether other health management aspects such as prophylaxis and biosecurity were done to guard against avian coccidiosis, supports the view that *Aloe* can potentially replace coccidiostats if evidence supports the action.

Since *A vera* and *A spicata* are easy to use and readily available all year round, there were no apparent efforts made to preserve the plant. Preservation is also difficult as deterioration may occur due to oxidation. In addition, they were generally not preserved for later use because they could stay viable and fresh for 2 months. The finding that more males used the herbs further supports the idea that males head most families or make decisions. However, the use of the herbs was not affected by age or level of education, as the level of education was generally low. Although the effectiveness of *A vera* and *A spicata* in treating and controlling coccidiosis is not known, the herbs are used by smallholder farmers as ethnoveterinary plant products with recognized medicinal properties, and the herbs are far more accessible to villagers than medications

used in Western veterinary treatments. This is in agreement with Tipakorn that ethnoveterinary medicines are locally available and culturally acceptable alternatives to Western- equivalent medications.¹⁷ Moreover, they can be collected at no cost and are easy to obtain.

CONCLUSION

The study revealed that smallholder farmers widely use herbal plants for poultry health management, particularly *A vera* and *A spicata*, which are widely used to treat and control coccidiosis in chickens. In addition, *Aloe* species can be used as prophylactic agents against other diseases in chickens. They can, therefore, be used as anticoccidial dosage in poultry feeds, but there is a need for validation of the therapeutic function and effectiveness of the *Aloe* plants before their commercial application.

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REFERENCES

1. Ernst E. Harmless herbs: a review of the recent literature. *Am J Med.* 1998;104:170-178.
2. Gueye FHE. Diseases in village chickens: control through ethno-veterinary medicine. *Centre for Research and Information on Low-External-Input and Sustainable Agriculture (ILEIA) Newsletter.* 2000;13:20-21.
3. Waller GR, Mangiafico S, Ritchey CR. A chemical investigation of *Aloe barbadensis* (Miller). *Proc Okla Acad Sci.* 1978;58:69-76.
4. Hegggers JP, Pelley RP, Robson MC. Beneficial effects of *Aloe* in wound healing. *Phytother Res.* 1993;7:548-552.
5. Davis RH, Didonato JJ, Johnson RW, Stewart CB. *Aloe vera*, hydrocortisone and sterol influence on wound healing, tensile strength and anti-inflammation. *J Am Ped Med Assn.* 1994;84:614-621.
6. Chimonyo M, Kusina NT, Hamudikuwanda H, Nyoni O. Land use and usage of cattle for draught power in a smallholder crop-livestock farming system in Zimbabwe. *J Appl Sci S Africa.* 1999;5:111-121.

7. Otto F. Ethno-veterinary medicine: an alternative for livestock development. In: Eschborn M, ed. *Livestock and Fisheries*. Proceedings of Deutsche Gesellschaft Fur Technische Zusammenarbeit (GTZ) Workshop. Lilongwe, Malawi;1997:45–49.
8. Losada H, Pealing R, Cortes J, Vieyra J. The keeping of poultry and pigs in the backyard of the urbanized areas of Iztapalapa (east of Mexico City) as a proposal for sustainable production. *Livestock Res Rural Devel*. 1997;9:1–9.
9. Maybaum G. *Using Aloe vera*. Holistic Bird Newsletter. 2003:10–15.
10. Grindlay D, Reynolds T. The *Aloe vera* phenomenon: a review of the properties and modern uses of the leaf parenchyma gel. *J Ethnopharmacol*. 1986;16:117–151.
11. Haller JS. A drug for all seasons: medical and pharmacological history of *Aloe*. *Bull NY Acad Med*. 1990;66:647–659.
12. Gueye FHE. Ethno-veterinary medicine against poultry diseases in African villages. *World Poultry Sci J*. 1999;55:187–198.
13. Mathias E. How can ethnoveterinary medicine be used in field projects? *Indigenous Knowl Devel Mon*. 1996;4:6–7.
14. Ibrahim MA, Nwude N, Ogunsusi RA, Aliu YO. Screening West African plants for anthelmintic activity. *Intern Livestock Centre in Africa Bull*. 1984;17:19–23.
15. Croom EM, Walker L. 1995. Botanicals in the pharmacy: new life for old remedies. *Drug Topics*. 1995;139:84–93.
16. Lev E, Amar Z. Ethno-pharmacological survey of traditional drugs sold in Israel at the end of the 20th Century. *J Ethnopharmacol*. 2000;72:191–205.
17. Tipakorn N. *Effects of Andrographis paniculata on performance, mortality and coccidiosis in broiler chickens* [doctoral thesis]. Institute of Animal Physiology and Animal Nutrition, Georg-August-University, Göttingen, Germany, 2002.