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Assessment of Plant and Chemical Poisoning In Livestock in Central Ethiopia

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Abstract

The survey was conducted with the objective of assessing potentially poisonous plants and chemicals in and around Adama town, Central Ethiopia. Three types of structured questionnaires were developed and 118 individuals (93 livestock owners, 11 animal health practitioners and 14 factories managers) were interviewed on voluntary basis. The result of this assessment indicated that 71(76.3%) of livestock owners and 10(90.9%) of animal health practitioner complained presence of plant poisoning on livestock in the study area. Similarly 31 plants were identified as having poisoning effect on livestock among which Rhizophoraceae, Sorghum bicolar, Parthenium hysterophorus, and Medicago polymorpha had the highest botanical frequency. On the other hand, 22(23.7%) livestock owners and 1(9.1%) animal health practitioners observed chemical toxicosis, respectively. About two individuals of (14.2%) interviewed factories managers received complaints of chemical toxicosis of livestock due to inappropriate disposal of their wastes. Food shortage 48%, nutritional deficiency 10.4% and due to excess consumption 8.1% were identified as major risk factors which predispose livestock in and around Adama town to poisonous plants and toxic chemicals. Therefore, further study on complained poisonous plants and toxic chemicals in the study area, and institution of pertaining control and prevention method is strongly recommended.

Keywords: Livestock owners; Animal health practitioners; Poisonous plant; Toxic chemical; Toxicosis.

Introduction

Livestock are facing various life threatening hazards notably infectious (parasitic, bacterial, viral, protozoal, fungal) and non-infectious like metabolic diseases, poisoning and other miscellaneous origin. Ethiopian people especially farmers and traditional animal healers have been using traditional methods to treat both human and their livestock diseases for generations. Traditional medicine is still widely practiced in areas where modern health care services are limited [1]. Traditional animal healers can use plant parts like seeds to treat cattle with abdominal distension, leaves for different treatment of diseases and other parts of the plants [1,2]. Though Ethiopia is rich in its flora of about many species of vascular plants, only few of the families of flowering plants are clemency used are known to have medicinal properties. Ethiopia also possesses three traditionally recognized agro climatic zones. These are Kola (a hot zone of 500-1500 m above sea level), Weina Dega (intermediate Zone of 1500 m and 2500 m), and Dega (a cold zone usually cited as being 250 m above sea level). These ecological zones have favorable to various species of plants and animals. Apart from the globally listed ones, therefore, some factors are inherent in Ethiopia to contribute to phytotoxicity [3].

A variety of poisonous plants have caused extensive losses to the livestock industry in many parts of the world mainly east Africa including Ethiopia since the days of early settlement. They are still significant problems in numerous areas. Poisonous plants produce their toxic effects after being ingested and/or absorbed by animals [4] which include physical upset, loss of productivity and death. Therefore, even though plants have vital nutritious and providing the normal atmospheric oxygen, it will cause life threatening if it is toxic. In addition to this, some chemicals which are in natural environment i.e. soil, water or industrial origin also may be toxic to livestock. But there are also some chemicals, macro and micro minerals, which living things cannot survive without them; in other side their absence causes abnormality of one of or total body structure or disturbance in health situation of an individual [5]. Ingestion or contact with some industrial products or by-products disposed on grazing area cause physical upset or death of an individual [6].

Plant poisoning is due to either accidental ingestion of material eaten along with grass or willful consumption of poisonous plants when pasture is dry while most poisonous plants remain green all the year round. It is also more likely to occur in animals which have been moved from one part of the country to another. New importations are unfamiliar with the strange ingestion of their fresh surrounding. Acclimatization in herbivores animals induces a sense of discrimination between edible and non-edible parts [7].

The current practices of using pesticides and herbicides in agriculture resulted in world-wide increase in food production and provision of abundant food for human [8]. However, a number of persistent problem concerning the safety of pesticides remain with us and new problems arises from time to time. Because of these problems, and increasing tendency to use pesticides as additives in the protection of cereals in storage from infesting insects, a regulatory body is essential. Thus, it requires a subsequent storage and treatment step which also includes appropriate measures for minimization of contamination and losses [9].

Numerous factors influence the action of poisonous substances which include: route of absorption; the dose, the physical and chemical nature of the poison; whether exposure to poison is single or repeated;

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the species, body size, sex, and general health state of animal; and chemical factors such as particle size, solubility, toxicity, absorption and excretion rate, affinity for body tissues or fluids, interaction with other drugs, and lacking development of metabolic pathway. Liver or kidney insufficiency may enhance toxicity due to poor metabolism or slow excretion of toxicants. Alteration in gastrointestinal PH can change the ionization of drug or chemicals and influence their absorption; presence or absence of food in the stomach affects the toxicity of certain compounds [10]. Overgrazing of pastures and ranges probably the greatest factor in causing losses from poisonous plants. The danger of overgrazing is always greatly increased in periods of moisture deficiencies that reduce forage production [4]. However, plant poisoning essentially is a local problem occurring in areas where poisonous plants may form a large proportion of the herbage species available to grazing animals. Poisonous plants are often naturally refused by animals (may have repulsive smell or contain highly irritant juices) and are eaten only when other herbage pastures is scarce [11].

Generally, the materials causing intoxication in animals also may be classified as naturally-occurring or man-made. The former includes mycotoxins, poisonous plants, snake venom, insects, minerals and these often become hazardous only when human intervention allows animals to access to them whereas the second (i.e. man- made toxic agents) includes industrial products, like insecticides, herbicides and others. As there is no syndrome due to poisonous substance that cannot also be produced by some other causative agent, the diagnosis of poisoning is not an easy task and cannot be based on any single observation. The chemical characteristic of plants constituent is of at most importance. Moreover, laboratory analysis of part of plant or detection of toxic substances in the animal's tissue leads to diagnosis of doubtful cases. In general, in Ethiopia a number of plant species are found in which some have medicinal value without having toxic effect on animal [12] and some have very toxic even at small dose. Besides, there are also chemicals which result in loss of production and even death on animals grazing in the field which are very toxic to animal [13]. Hence, the loss incurred by phytotoxicity and chemical toxicosis is likely to be significant. Therefore, it is imperative to bring to the attention of all professionals the effects of poisonous plants on animal health and productivity [14]. Therefore, the present study is designed to assess potentially poisonous plants and toxic chemicals to livestock in and around Adama town.

Materials and Methods

Study area

The study was conducted from November 2008 to May 2009 in and around Adama town, East Showa Zone of Oromia regional state, central Ethiopia. Adama is located at 95 km south east of Addis Ababa at 39.1 0N and 8.31 0E at elevation of 1770 meter above sea level and receives an annual rainfall ranging from 400mm to 800 mm; the temperature range is 13.9 °C to 27 °C [15]. The peri-urban area of the city is featured by mixed livestock-crop production where livestock plays an important role.

Study population

The target study population was voluntary animal owners, animal health practitioners and factories Managers. A total of 118 individuals were interviewed in which convenience method was employed.

Study design

Questionnaire survey was carried out by interviewing voluntary animal owners, animal health practitioners and factories' managers. For this study, structured questionnaire was designed to collect information related to plant and chemical poisoning in livestock in the study area.

Data storage and statistical analysis

The information that was gathered through questionnaire survey of suspected toxic plants and chemicals was entered to Microsoft Excel program. To identify the scientific names of the complained poisonous plants the National Herbarium of Biology Department of Science Faculty, Addis Ababa University was consulted. The data was analyzed by descriptive statistics using SPSS version 20.

Results

A total of 118 individuals were interviewed (93 livestock owners, 11 animal health practitioners and 14 factories' managers) using structured questionnaires. This assessment revealed that 76.3% of livestock owners and 90.9% of animal health practitioners observed plant poisoning in livestock. However, only 23.7% of livestock owners and 9.1% of animal health practitioners complained presence of chemical poisoning in livestock in the area (Table 1).

A total of 31 plants were complained having poisonous effect on livestock by livestock owners and animal health practitioners (Table 2). Among these plants Rhizophoraceae, Medicago polymorpha, Sarghum bicolar, Parthenium hysterophorus and Trifolium burchellianum were the most frequently complained toxic plants (Table 3). This study also showed that gastrointestinal upsets: salivation, bloating, inappetance and weakness are among the frequently manifested signs by poisoned livestock. Bovine species is the most frequently poisoned livestock followed by ovine and caprine whereas horse and camel were the least (Table 2).

This survey also revealed that the toxic parts of 58%, 19.4%, 16.1% and 6.5% of suspected poisonous plants are leaf, whole part, flower and seed and fruit, respectively (Table 4). There were no plants with stem or root toxic. This study indicated that food shortage is the primary predisposing factor followed by nutritional deficiency and excessive consumption (Table 5). The current study also indicated the presence of toxic chemicals which threaten the health of livestock in and around Adama town (Table 6).

Out of 93 interviewed livestock owners, 42.81 % indicated that toxic chemicals were acquired from contaminated water and 57.1% acquired from contaminated pasture by chemicals sprayed on crops and wastes of factories. 0.1% of chemical poisoning was acquired from unknown sources. The result from the interviewed factories' managers revealed that their means of waste disposal for more than 80 % of tanneries were in their own disposal sites, whereas, 20% of them release wastes in to water bodies in the vicinity. Fifty percent of flora cultures dispose flower propagation to their own restricted place where livestock have no access to it and 25% of them dispose in to pits prepared for this

Group of interviewed	Number interviewed	No. of respondent observed	
		Plant poisoning (%)	Chemical poisoning (%)
Livestock owners	93	71(76.3%)	22(23.7%)
Animal Health practitioners	11	10(90.9%)	1(9.1%)
Factors' managers	14	0	2 (14.2%)
Total	118	81 (68.6%)	25 (21.2%)

%: Percent

Table 1: A summary of plant and chemical poisoning.

Afaan Oromo/Amharic	Scientific Name	Toxicosis	Species affected
Tilloo/Alma	*Rhizophoraceae*	Bloating, Colic	Bovine
Farmasiisa	*Parthenium hysterophorus*	Salivation, Sour Milk	Bovine & Shoats
Hamakitaa	*Medicago polymorpha*	Bloating Colic	Bovine
Hasangira	*Trifolium burchellianum*	Depression, Erection of Hair, Bloating	Bovine
Rafu	*Amaranthus spps*	Bloating Anorexia	Bovine Ovine
Qemida	*Helinus mystacinus*	Bloating And Colic	Bovine
NA	*Lantana camara*	Photosensitization	Bovine
Sidissa	*Medicago burweed (Eng)*	Bloating And Colic	Bovine, Ovine
Kumutu	NA	Bloating	Bovine, Ovine
Menkera	NA	Crying Loudly	Bovine
Philosophy (Eng)	NA	Weakness	Camel
Bira (Kesso)	NA	Bloody Urine	Bovine
Bala gebisa	NA	Bloating & Anuria	Bovine
Kecho	NA	Excessive Nasal Discharge, Diahorroea	Ovine, Caprine
Banda	NA	Loss Of Body Condition	Ovine
Shoke	NA	Diahorroea	Bovine, Ovine, Horse
Finchanloni	NA	Bloating, Colic	Bovine
Bala dima	NA	Bloating	Bovine
Birecha	*Tarminalia brawni*	Progressive Weight Loss	Bovine
Kobo	*Ricinuscomiunis*	Salivation, Colic, Bloating	Bovine
Lafto	*Acacia*	Bloating	Bovine, Caprine
NA	*Bracken fern*	Bloody Urine	Bovine
Zenegada	*Sorghum bicolour*	Bloating, Salivation	Bovine
Babalii/Sembelit	*Hyparrheniarufa* and *other spp.*	Submandibular Swelling, Weight Loss	Bovine
Kumunchitii/Kirinchit	*Tribulusterestris*	Inappitance and Weakness	Bovine
Sarido	*Poaceae spps*	Bloating	Caprine
Kertatimee	*Osyrido carpus*	Bloating and Colic	Bovine, Caprine
Kara kankabu	*Xanthium spinosum*	Bloating	Bovine
NA	*Medicago Sativa*	Bloating & Diahorroea	Bovine
Gosamarga	Eragrastic spps	Bloating	Bovine
Mujja	Snowdina, Polystarch	Bloating	All domestic Animals

NA: Not available; Eng: English

Table 2: Summary of complained poisonous plants with their local and scientific names, manifested signs and affected species.

Name of the plant	Botanical Frequency	Veterinary Frequency	Exposure
Rhizophoraceae	11	Bloating (7)	Single
Sorghum bicolar	9	Colic (3), Salivation(2), Bloating (5)	Single
Partheniumhysterophorus	8	Salivation(4), Sour milk (4)	Repeated
Medicago polymorha	8	Bloating(5), Colic (3)	Single
Trifolium burchellianum	6	Depression (2), Erection of hair(4), Bloating (4)	Single
Bracken fern	5	Bloody urine (5)	Repeated
Ricinus commiunis	5	Bloating (4) , Salivation (5)	Single/ Repeated
Amranthus spp	3	Bloating (2), Anorexia (1)	Single
Helinus mystacinus	3	Bloating and colic	Single
Lantana camara	3	Photosensitization	Repeated
Birra (kesso)	3	Bloody Urine	Single
Hyparrheniarufa and other species	3	Submandibular swelling, weight loss	Repeated
Acacia spps	2	Bloating (2)	Single
Poaceae spp	2	Bloating and colic	Single
Snowdina polystarch	2	Bloating	Single
Banda	2	Loss of body condition (2)	Single
Shoke	2	Diarrhea	Repeated
Medicago burweed	1	Bloating and colic (1)	Single
Menkera	1	Crying loudly (1)	Repeated
Philosophy (Eng)	1	Weakness (1)	Repeated
Bala gebis	1	Bloating, anuria (1)	Single
Kecho	1	Excessive nasal discharge & diarrhea (1)	Single
Bala dimakankore	1	Bloating (1)	Single
Kebu (Red leaf with thorn)	1	Bloody urine	Single
Terminaliabrowni	1	Progressive weight loss (1)	Single

FinchanLooni	1	Bloating and colic (1)	Single
TribulusTerestris	1	Inappetance	Repeated
Osyrido carpus	1	Bloating and grunting	Single
Xanthium spinosum	1	Bloating	Single
Midicago sativa	1	Bloating and diarrhea	Single
Eragrastic spps	1	Bloating	Single /Repeated

Table 3: Summary of complained poisonous plants with their botanical and veterinary frequency and frequency of exposure.

Seed and Fruit	Leaves	Leaves	Whole part
- Amaranthus spps - Xanthium spinosum	- *Terminalia browni* - *Ricinus commiunis* - *Lantana camara* - *Acacia* - *Hyparrheniarufa and other spps* - *Sorghum biclor* - *Medicago polymorpha with other spp* - *Spino pods* - *Philosophy* - *Birra* - *Bala gebisa* - *Kecho* - *Baladimakan* - *Kara kabu* - *Kumutu* - *Menkera* - *Osyridocarpus* - *Medicago sativa* - *Tribulusterestris* - *Helinus mystacinus*	- Rhizophoraceae - Parthenium hysterophorus - Bracken fern - Poaceae spps - Banda	- Medicago brueweed [Eng] - Snowdinapolystarch - Eragrastuc spps - Shoke - Finchanlooni - Trifolium burchellianum

Table 4: Toxic parts of suspected poisonous plants.

purpose.

Out of 14 interviewed factories, 85.5% said as no complain on livestock poisoning but 14.2% of them revealed the presence of complaint on their chemicals wastes, by-products disposed to grazing land or through river but they tried on the way of corrective measure to minimize it. The common toxic chemicals being complained, species of animals mostly affected and the frequency of each poisoning observed are displayed in table 6.

Discussion

The results of the present study showed that both phytopoisoning and chemical toxicosis are among causes of ill health in livestock. Out of 93 interviewed individuals 76.3% and 23.6% of livestock owners responded that poisonous plants and chemicals, respectively pose health problems in their livestock in the study area. Similarly, 90.9% and 9.1% of animal health practitioners in the area revealed the occurrence of plant poisoning and various chemical toxicosis, respectively. The results in general have shown that toxic plants and chemicals are causing significant animal health problems in and around Adama town. The chemical toxicants can also pose serious human health complication if they accumulate in the edible organs of the animals. The situation was aggravated by prevailing feed shortage, clean drinking water and inappropriate chemical waste disposal from factories. Feed shortage can force animals to browse perennial shrubs and bushes while most of these perennial plants have been known to contain toxic secondary metabolites [16,17]. Shortage of water made the animals to drink river water contaminated with chemical waste effluent from various factories in the area.

In this study 31 plants having toxic effect to livestock were identified. Rhizophoraceae, Medicago polymorpha, Sarghum bicolar, Parthenium hysterophorus and Trifolium burchellianum were the most frequently complained plants. Various plants grow in different areas that have different edaphic and climatic factors. These factors also contribute

Predisposing factors	Total number interviewed	Number of respondent who identified major risk factors which predispose livestock to poisoning plants (%)
Food shortage	104	48%
Nutritional deficiency	104	10.4%
Excess consumption	104	8.1%
Unknown reasons	104	28.3%

Table 5: Summary of predisposing factors to poisoning plants in the study area.

Toxic chemicals	Poisoned species	Frequency
Burned oil, Naphthalene	All species	1
Sulfuric acid	Bovine, Caprine	2
Limestone	All species	3
Soda ash	All species	3
Fluoride	Bovine	3
Herbicides	Bovine	3
Tannery wastes	Bovine, most but all species	5

Table 6: Summary of questionnaire survey on toxic chemicals being complained, species affected and the frequency of each observed.

to the chemical compositions of plants which account for existence of different toxic plants in different geographical areas. However, some of the plants recorded in this study were reported to have similar effect on livestock elsewhere. For instance Amaranthus retroflexus (Red root) has been known to cause poisoning of cattle in Iran [18]. Medicago sativa was also reported to have caused poisoning of livestock in many countries. These plants have already been confirmed to contain nitrate in their tissues [19,20]. Similarly, the importance of Trifolium spps, Accacia and Sorghum species as causes of livestock poisoning have been published [19]. Bracken fern is also widely distributed in many parts of the world. In Ethiopia, its existence and importance as a cause of enzootic hematuria has been previously shown in different regions [17,19] and it has also been reported elsewhere [4,19].

Generally, as many literatures state as well as information obtained from this study, toxic plants may grow together with forage plants and are therefore readily accessible to grazing animals. Under normal conditions only a few toxic plants can be considered sufficiently palatable. But during shortage of pasture and forage they may be forced to browse these toxic plants.

The present study has also shown that toxic chemicals especially those of waste disposal from various factories and herbicides are causing problems in animals. The livestock owners', animal health practitioners and factory managers all are aware of the toxic effect of chemicals on livestock health. The study showed that animals get chemical toxicants either from grazing pasture or from water. For instance, the use of weed-killers and pesticides has enormously increased at present. These chemicals have been known to cause serious health problems in livestock [21].

In conclusion, the results of the present study show that herbal poisoning and chemical toxicities are among important causes of health problems in and around Adama. Rhizophoraceae, Medicago polymorpha, Sorghum bicolar, Parthenium hysterophorus and Trifolium burchellianum were the most commonly incriminated toxic plants. Similarly, various chemicals mainly herbicides and pesticides, and factory effluents were shown to cause ill health in livestock. Shortage of pasture and drinking water, and mismanagement of the chemicals are among the predisposing factors to toxicosis in the area. Therefore, it is recommended that detailed investigation should be performed to know the epidemiology of the poisonings caused by plants and chemicals; livestock owners should be advised to remove the toxic plants from the pasture land; experimental studies should be carried out to substantiate the empirical knowledge of plant poisonings; animal health practitioners and factory managers should take necessary measures to reduce the chances of poisonings; and government and non-governmental organizations should focus on pasture and water development to minimize risk of poisonings.

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Author contributions

Contributed to designing the methodology: Dereje A, Tariku J, Teshale S and Ashenafi F. Contributed to collecting materials: Dereje A. Contributed to correcting the methodology and checking up for collected materials: Dereje A, Tariku J, Teshale S, Ashenafi F and Takele B. Writing the first draft of the manuscript: Dereje A. Contributed to writing the manuscript: Dereje A, Tariku J, Teshale S, Ashenafi F and Takele B. Reviewing the manuscript to be ready for publication: Takele B. Agree with the manuscript results and conclusions: Dereje A, Tariku J, Teshale S, Ashenafi F and Takele B.

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