

Identification of Poisonous Plants and Their Toxic Effects on Livestock in and Around Bako District, West Showa Zone of Oromia Regional State, Western Ethiopia

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Abstract

Poisonous plants are one of the causes of livestock health problems all over the world and bring significant economic loss. Therefore, a cross-sectional study was conducted in and around Bako district West Showa Zone of Oromia regional state, Western Ethiopia from November to May 2016 with the objective of identifying poisonous plants and their toxic effect in the study area. In order to put the objective into practice, structured questionnaires were developed and 153 individuals (139 livestock owners and 14 animal health practitioners) were interviewed on voluntary basis. The study revealed that 122(87.8%) of livestock owners and 14(100%) of animal health practitioner complained the presence of plant poisoning on livestock in the study area. Similarly, 37 plants were identified as having poisoning effect on livestock, among which *Trifolium hybridum*, *Sorghum bicola*, *Amaranthus spp*, *Datura stramonium* and *Plantago lanceolata* had the highest botanical frequency. According to the result of survey, agricultural expansion, drought, soil erosion and overgrazing predispose the livestock to plant poisoning. In the same way, almost all of the livestock were managed by extensive type of production system which allows them to browse poisonous perennial herbs on the fields. On the other hand, the livestock were poisoned by leaves and other parts of the identified poisonous plants through ingestion or contact. In conclusion, from the current study, high numbers of poisonous plants were obtained in the study area. Hence, the livestock health in the area is at high risk of exposure to these toxic plants and therefore the government should intervene to create awareness among the community about the effects of these plants and for further phytochemical and toxicological studies and possibly pharmacological activity.

Keywords: Botanical frequency, Ethiopia, livestock, Poisonous plants, structured questionnaire

1. Introduction

Plants add a touch of color and fragrance to our daily lives. They also inject an element of anger in our lives and they cannot move to escape their predators. So all, plants have other means of protecting themselves from the herbivores. Some plants have physical defenses such as thorns. But others contain some toxin. Chemical defenses of plants against consumption by herbivores are determined by non nutrient compounds such as fiber, lignin, cellulose, toxicants or essential oils and other volatile substances. Some volatile substances are overtly toxic; others are merely unpleasant (Radwan, 1974).

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 (Mugera, 1970).

Even though many of the medical substances produced by plants, some of them have been reported as toxic (Botha and Penrith, 2009; Gilbert, 2012). Plants may cause toxic effects or even death as a result of accidental exposure by skin contact/absorption, eye exposure and inhalation or accidental ingestion of the plant parts (seed, fruit, root, etc.) while owners usually does not even suspect their toxic nature (Slaughter *et al.*, 2012; Tamilselvan *et al.*, 2014).

Plants affect animals in many ways although symptoms and lesions differ depending on the amount of the plant consumed. The common symptoms however include chronic illness debilitation, decreased weight gain, abortion, abdominal discomfort, salivation, congenital defects, photosensitization and sudden death can occur without the presentation of clinical signs (Botha and Penrith, 2008).

Correctly and rapidly diagnosing a plant poisoning is often extremely difficult. In many cases, initial clinical signs are non-specific (such as diarrhea) and post-mortem lesions may be absent. However, diagnosis of plant poisoning of livestock depends on the history, clinical syndrome observed, post-mortem lesions, evidence that plants have been grazed, and remains of toxic plants in the gastro intestinal tract. In addition, specialized veterinary toxicology laboratories may provide testing for plant toxins and should be consulted. Thus, the best way to support a diagnosis of a plant poisoning is to confirm the presence of a toxic plant in the animal's environment, and to confirm that the plant has been ingested (Puschner, 2008).

Awareness of poisonous plants growing in a certain geographical region and their associated clinical signs are instrumental in making a diagnosis and initiate treatment (Kaufmann, 1986). It is important to establish an accurate diagnosis in order to provide adequate treatment to affected animals, carefully and accurately assess the potential for the transfer of toxins into edible products and prevent further exposures. Most importantly, recognition of poisonous plants in hay or forage may help prevent plant poisonings in animals (Filigenzi and Puschner, 2005).

In Ethiopia, to this date, most of the available information about poisonous plants is case reports. Thus, it is virgin (neglected) area for interested researchers to fill available gaps regarding paucity of information on the effects of poisonous plants on livestock. Therefore, the objective of this study was:

- ❖ To identify different poisonous plants and their toxic effects on livestock in and around the study area.

2. Literature Review

2.1 Poisonous Plants

Plants comprise the third largest category of poisons known around the world. They form a major part of livestock feed, thus toxicosis in animals consuming these plants can be expected. It is also known that poisonous plants constitute a major cause of economic loss in livestock industry since the days of early settlement (Clarke and Clarke, 1977). Poisonous plants are widely distributed all over the world and used for different purpose such as hunting, fishing and treating various diseases (Al-Quran, 2005). These plants used in folk medicine in treating human ailments and animal diseases are considered poisonous and the beneficial effects often occur at lower doses whereas overdose can induce poisoning (Botha and Penrith, 2008). The poisonous part of plants may be bark, roots, latex, leaves, shoots, seeds and in some cases whole plants. Poisonous effects are due to production of substances such as alkaloids, glucosides picrotoxins, resins, saponins, tannins, toxalbumins in the parts of plants, many of which are harmful to humans and animals life, at under certain conditions (Katewa *et al*, 2007).

A common characteristic of several poisonous plants is a disagreeable taste that ordinarily discourages livestock from grazing them. Some species of poisonous plants are poisonous only at certain stage of growth. Most of the people not familiar with plants found in and around their environment that might be potentially harmful if ingested, injected, contact through the skin and most plants cause poisoning in animals only when they are accidentally eaten. The knowledge of these poisonous plants is passed on from one generation to another through local and elderly people. This knowledge is a very important for providing general awareness and toxicological research (Huai and Xu, 2000).

2.2 Factors Affecting Severity of Poisonous Plants

It may be found that many plants in the pastures that are considered poisonous yet, the problems that they pose never seen. This is because the severity of plant poisonings is generally influenced by many factors including: the chemical nature of the toxin amount and time period of the toxin eaten, parts of the plant eaten, the general condition and stage of maturity of the plant, environmental conditions in which the plant is growing, species of the animal, and the age, size, sex and general condition of the animal, plant species (Mac and Maureen, 1996). Plant species (all plants absorb nitrates, but plants such as the sorghums, small grains, corn, turnips, rape, kochia, orchard grass, pigweed, lambs quarter and soybeans are more likely than other plants to accumulate nitrates in toxic levels). Plant parts (the entire plant (as in the case of Johnson grass) or only certain parts of plants (as in the case of a corns and buds of oak trees) may accumulate poisons to a lethal level) (John, 1984).

2.3 Animal Health and Economic Impacts Associated with Plant Poisoning

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 which include physical upset, loss of productivity and death. According to research in conducted in the USA, plant Poisoning causes 3.7% of all deaths annually (NAHMS, 1997). Therefore, even though plants have vital nutritious importance and providing the normal atmospheric oxygen, it will cause life threatening effect if it is toxic (Radeleff, 1964).

2.4 Ecologic and Climatic Condition of Ethiopia

Ethiopia is gifted with unique habitats that provide safe place for many endemic species of plants which is due to diversified climatic and soil condition of the country. There are three traditionally recognized agro-ecological zones (*Kola, Woina-dega Dega*) in Ethiopia. These ecological zones influence the distribution of various species of plants and animals (Mekonnen, 1994). Ethiopian people especially farmers and traditional animal healers have been using different plants to treat their livestock diseases for generations which might have been affected livestock health due to their improper usage (Martin, 1995).

2.5 Treatment of Poisoned Livestock by Toxic Plants

Plant poisoning is mostly an emergency and needs to be managed immediately with proper measures using specific anti dotes whenever possible. . However, in majority of poisoning cases treatment with an antidote is not possible due to lack of confirmative diagnosis. In acute poisonings first of all truly emergency phases should be managed to improve condition of the animal by providing appropriate supportive care to ensure its survival (Freehand and Janzen 1974). For this reason, focus on prompt removal or the neutralization of poison whilst maintaining vital function of the body restoring respiration by giving artificial respiration and/ or drugs acting on cardiovascular system, CNS stimulants, emetics etc. depending on the clinical state of the patient or animal until slow acting and specific treatment is instituted (Satish, 2002)

Treatment of poisoning are of two types: specific treatment which includes antidote, is given when there is confirmatory diagnosis of the poisoning. Antidotes are therapeutic agents that have a specific action against the activity or effect of toxicant. Al though no classification scheme is available, anti dotes can be broadly classified as chemical or pharmacologic antidotes.

Chemical antidotes specifically interact with or neutralize toxicants. In some cases, antidotes need to be compounded by the veterinarian or a compounding pharmacy. This is particularly true for large animal antidotes such as CaNa₂EDTA (Post and Keller, 2000).

2.6 Control and Prevention of Plant Poisoning

The key to preventing problems with poisonous plants is proper identification and avoidance of these plants. Examination of pasture, hay fields, road sides and fence rows poisonous plants has paramount significance. In a drought year or a year when a feed is short, taking extra precaution and looking for these plants in new areas planned for grazing or haying (Roger *et al.*, 2007).

Livestock under condition of adequate feed will avoid most poisonous plants. However, when feed is short, plants normally avoided become a tempting source of feed that ends up in poisoning of live stocks. Good range management is one of the effective ways to combat the danger of plant poisoning in the area. A healthy and well-managed pasture is the best way to prevent weed infestations. Fencing off infested areas and eradication by uprooting may also be effective (Agaie, 2007).

3. Materials and Methods

3.1. Study Area

The study was conducted from November 2015 to May 2016 in and around Bako district, Western Showa Zone of Oromia regional state, Western Ethiopia. The district is located at 258 Km west of Addis Ababa. It lies between 90° 60' and 37°09'E longitude and on the altitude of 16500M above sea level. The mean annual rain fall is 1210 mm. The rainy period ranges from April to October. It has a warm humid climate with, mean minimum, mean maximum and average temperature of 132°c, 279 °c and 210 °c respectively.

Its relative humidity reaches 62.9% per day. About 60% of the soil is reddish brown with slightly acidic reaction. The farming system at the area is crop-livestock mixed farming. The number of livestock population of the area was, cattle in head (141393), sheep (12880), goat (14641), horse (3795), mule (1054) and donkey (8668) (BTWAORD, 2015).

3.2 Study Population

The target study populations were voluntary animal owners and animal health practitioners. A total of 139 of animal owners and 14 animal health practitioners were interviewed by employing closer approaches to collect important data relevant to the study.

3.3 Study Design and Sampling Methods

A cross-sectional study design was used to interview voluntary animal owners and animal health practitioners. For this study, structured questionnaire were designed to collect information related to plant poisoning on livestock in the study area. Questionnaire survey was carried out on the selected individuals by interviewing voluntary animal owners, and animal health practitioners. Livestock owners and animal health professionals were randomly selected for the interview. . Among other districts of west showa zone, the Bako district was purposefully selected by taking into consideration of factors as distance of the area from west showa zone leading to absence of any conducted research concerning plant poisoning and a variety of plant vegetation cover in the area.

3.4 Study Methodology

The Study was conducted through questionnaire surveys designed for livestock owners and animal health professionals. A total of 153 individuals were interviewed from the district by applying face to face approach. The structured questionnaire was used to collect information related to toxic plants to livestock and its associated

risk factors such as agricultural expansion, drought, over grazing and soil erosion. The plants were collected with their local name from surrounding forests and other sites where the plant is found with the interviewed individuals. The botanic (scientific) names of the complained and collected poisonous plants were obtained from National Herbarium of Biology Department, Natural Science Faculty of Wollega University through consultation.

3.5 Data Management and Analysis

After the data about suspected poisonous plants to livestock were collected through structured questionnaire, they were stored in the Microsoft Excel spread sheet 2007. . Before the analysis of the coded data it was filtered. Finally, it was analyzed through SPSS Version 20. Lastly by applying descriptive statistics, the frequencies were calculated.

4. Results

In this study, a total of 153 individuals were interviewed, of which 139 individuals were livestock owners and 14 individuals were animal health practitioners by employing structured questionnaire. Out of interviewed interviewee, 122 individuals complained the presence of poisonous plants in the study area where as 17 individuals had no information about the presence of these plants in that study area. Similarly, all of interviewed animal health practitioners informed the presence of these toxic plants (Table 1). During the present study, a total of 37 plants were identified which have poisonous effects on livestock by interviewed individuals. Among these plants *Trifolium hybridum* (9.4%), *Sorghum bicola*(7.9%), *Amaranthus spp*(6.5%),*Datura Stramonium*(4.3%) and *Plantago lanceolata*(4.3%) were the most frequently complained toxic plants (Table 2).

According to the result of current study, livestock were mainly poisoned through contact and/or ingestion of leaves (51.1%) and other parts of the poisonous plants which account for 34.5% (stem, seed and fruit). On the other hand, livestock were predisposed to these toxic plants due to agricultural expansion (29.5%), drought (22.3%), soil erosion (8.6%) and overgrazing (3.6%). The results were summarized by the following tables:

Table 1: Summary of number respondents on poisonous plants in the study area

| Group interviewed | Number interviewed | Number of informants | |
|-----------------------------|--------------------|--|---|
| | | Have information about poisonous plant | Have no information about poisonous plant |
| Livestock owners | 139 | 122(87.8%) | 17(12.2%) |
| Animal health practitioners | 14 | 14(100%) | 0 |
| Total | 153 | 136(88.9%) | 17(11.1%) |

Table 2: Summary of the identified poisonous plants according to their botanical and local (Oromic) name, poisonous parts, susceptible species and harmful effects

| Botanic name | Local name(Afaan Oromo) | Botanic frequency | Poisonous part(s) | Susceptible species of animal | Harmful effects of Toxic plant |
|------------------------------|-------------------------|-------------------|-------------------|-------------------------------|--|
| <i>Nicotina tabaccum</i> | Tamboo | 2 | Leaf | All animals | Abortion, birth defects, staggering weakness |
| <i>Hordium vulgare</i> | Garbuu | 2 | Leaf, stem | All animals | Oral irritation and abscessation |
| <i>Glossypium spp</i> | Jirbii | 1 | Other parts | Bovines | Vomiting, diarrhea |
| <i>Bambusa vulgaris</i> | Leemmana | 1 | Leaf | Bovine, Caprine, Ovines | paresis of the tongue, depression, ataxia, and incoordination. |
| <i>Arisaema eunaephyllum</i> | Boqollo warabessa | 3 | Other parts | Bovines, Caprines | Respiratory distress, trebling, coma, death |
| <i>Datura stramonium</i> | Asangira | 6 | All parts | Bovines | Pupils dilate, thirst, dry and burning skin |
| <i>Guizotia scabra</i> | Tuufu gurracha | 4 | Leaf | Bovines | Neurologic signs |
| <i>Curly dock</i> | Baala warante | 2 | Other parts | Caprines | Restlessness |

(Table 2 Cont...d)

| <i>Amaranthus spp</i> | Raafuu | 9 | Leaf | Bovine, Caprine | Ovine, | Bloating, anorexia |
|--------------------------------|-------------|----|---------------|-----------------|---------|--|
| <i>Plantago lanceolata</i> | Qorxobi | 6 | Leaf and stem | Bovine, Ovine | | Bloating, diarrhea |
| <i>Trifolium hybridum</i> | Sidisa | 13 | Leaf and stem | Bovine, Ovine | | Bloating, diarrhea |
| <i>Prunus africana</i> | Hoomii | 4 | Leaf | Caprine, Ovine | Bovine, | Diarrhea, loss of appetite, depression |
| <i>Snowdina polystarchia</i> | Muujja | 5 | Leaf stem | Bovine, Ovine | | Bloating, colic, diarrhea |
| <i>Sorghum bicola</i> | Misinga | 11 | Leaf | Bovine, Ovine | | Bloating, dyspnea |
| <i>Rumex crispus</i> | Koshoshi | 1 | Leaf | Ovine, Bovine | | Respiratory distress, depression |
| <i>Ranunculus sardous</i> | Balalaga | 3 | Leaf, stem | Ovines | | Oral and gastro entestinal irritation |
| <i>Urtica doca</i> | Gurgube | 9 | Leaf, stem | All animals | | Skin burn |
| <i>Solanium carolinense</i> | Hiddi | 2 | Other parts | Ovine, Bovine | | Diarrhea, loss of appetite, depression |
| <i>Solanum spp</i> | Dinnicha | 3 | Other parts | Bovines | | Depression, salivation, diarrhea |
| <i>Lycopersicon esculentum</i> | Timatima | 2 | Leaf and stem | Bovines | | Salivation, abdominal pain, anorexia |
| <i>Malus sylvestris</i> | Appiilii | 1 | Leaf | Ovines, Equines | | Vomiting, breathing difficulty, stomach pain |
| <i>Allium spp</i> | Qulubi dima | 1 | All parts | All animals | | Diarrhea, ataxia, weakness, coma |

(Table 2 Cont...d)

| | | | | | | |
|------------------------------|----------------|---|---------------|--------------------------|--------|---|
| <i>Ricinus cumunus</i> | Qobbo | 5 | All parts | Bovine, Ovine | | Weakness, salivation, diarrhea, mydriasis, teeth grinding |
| <i>Giradinia bollossa</i> | Doobbii | 3 | Leaf and stem | All animals | | Restlessness and irritation |
| <i>Acacia abynica</i> | Kichu laaftoo | 1 | Leaf | Bovines, Caprines | | Bloating |
| <i>Sesbaniya exaltata</i> | Sasbaniya | 2 | Other parts | All animals | | Walking stiffly, Diarrhea, Hemorrhaging |
| <i>Pteridium aquilinum</i> | Tirimi | 4 | All parts | Bovine equine | | In coordination, nervousness, Anemia |
| <i>Lantana camara</i> | Akayi simbira | 2 | All parts | Bovine | | Photosensitization |
| <i>Persea americana</i> | Avokaadoo | 2 | Leaf | Caprine, Ovine | | Mastitis, heart failure |
| <i>Hyparrhenia rufa</i> | Sarmalle | 2 | Leaf, stem | Bovines | | Sub mandibular swelling, weight loss |
| <i>Phytolacae dodecandra</i> | Handoode | 2 | Other parts | All animals | | Diarrhea, salivation, depression |
| <i>Albatia schimperiana</i> | Mukarba | 1 | Leaf | Caprines, Ovines | | Abdominal pain, depression, reduced appetite |
| <i>Solanium nigrum</i> | Hawiti saroota | 2 | All parts | Bovines, Ovines | | Constipation diarrhea, salivation |
| <i>Medico sativa</i> | Alfalfaa | 5 | Leaf, stem | Bovines, ovines, equines | | Bloating, diarrhea |
| <i>Conium maculatum</i> | Waanjabi | 3 | All parts | Bovine, Caprine | Ovine, | Diarrhea, ataxia, salivation, coma |
| <i>Tagets spp</i> | Awalmidagsitu | 1 | All parts | Ovines, Caprines | | Skin irritation |
| <i>Nerium spp</i> | Holaandari | 1 | All parts | Equines, Bovines | | Depression, salivation, weakness |

The present study also shown that almost all livestock were managed under extensive management system (76.3%) whereas (0.7%) of livestock were intensively managed (Table 5).

Table 3: Summary of management systems practiced in the study area

| S/N ^a | Management system | Number interviewed | Number of informants |
|------------------|-------------------|--------------------|----------------------|
| 1 | Intensive | 153 | 1(0.7%) |
| 2 | Sem-intensive | 153 | 15(10.8%) |
| 3 | Extensive | 153 | 106(76.3%) |

5. Discussions

The current study showed that phytotoxicity is one of the causes of ill health in livestock in the study area. Out of 153 interviewed individuals (139 of livestock owners and 14 animal health professionals), 87.8% of livestock owners and 100% animal health professionals informed that plant poisoning is posing significant livestock health problems in the area. According to information collected from the respondents, the condition is provoked by scarcity of forage supply due to different reasons such as agricultural expansion, drought, soil erosion, over grazing which force animals to browse perennial shrubs and bushes while most of these perennial plants have been known to contain toxic secondary metabolites and the result of this study was in agreement with the study findings reported in the Sokoto state, Nigeria (Ebbo *et al.*, 2003, Onyeyili *et al.*, 1996) by sharing similar risk factors and also with research finding reported from in the North Central America (Martison *et al.*, 2006).

In this study, 37 plants having toxic effect to livestock were identified. Of these, *Trifolium hybridum*(13), *Sorghum bicola*(11), *Amaranthus spp*(9), *Datura Stramonium*(6) and *Plantago lanceolata*(6) were the most frequently complained toxic plants. Some of the plants identified in this study were similar to those plants identified in and around Nekemte town in which *Sorghum bicolar*(26), *Medicago burweed*(19), *Snowdenia polystachia*(12), *Grass* species, *Pteridium aquilinum*(10 and *Amaranthus spp*(3) were the most frequently complained poisonous plants (Abraham *et al.*, 2015). However, there was also variation in the distribution and variety of many poisonous plants in both Nekemte town and Bako district. The differences might be due to various plants grow in different geographical areas that have different edaphic and climatic factors. These factors also contribute to the variations in the chemical compositions of different poisonous plants in different areas. In the same manner, the variation might also be due to differences in the level of information about these plants in the community from which the information was collected (Dereje *et al.*, 2014).

According to data obtained from different published literatures, most of the currently identified poisonous plants have worldwide importance. For instance, *Medico sativa* is phytotoxic plant containing phytoestrogen which is responsible for the reproductive disorders in addition to bloating and other related effects to poisoned animals in the study area. Similar harmful effect of this poisonous plant was also reported in Colombia (Seguin, 2000 and Munro, 2009).

The livestock poisoning due to nitrate accumulators such as *Conium maculatum* and *Sorghum bicola* is not only important in the study area, but also they posed serious livestock health problem somewhere else. The current study revealed that, an increase in the degree of livestock poisoning by these toxic plants is correlated with factors such as drought which was agreed with the findings reported in USA (NCR, 1972, Galey *et al.*, 1992 and Panter *et al.*, 1988). Similarly, the importance of *Trifolium spp*, *Ricinus cumunus* and *Acacia spp* as causes of livestock poisoning have been published in the different literatures (Munro, 2009). *Pterididium aquilinum* (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 (Radostits, 2007) and it has also been reported elsewhere (Radeleff, 1964).

The results of current study also indicated that livestock production in the study area was mostly extensive type with a very low population of animals kept under intensive production systems. Land used for extensive grazing cattle contains complex mixes of native and invasive plants which may increase the risk of exposure to toxic plants, many of which have not been identified and characterized to avoid livestock exposure and this finding was in agreement with study result reported by (Tokarnia *et al.*, 2002) in Brazil.

6. Conclusion and Recommendations

In general, based on the results of present study, it is possible to conclude that, plant poisoning was one of the livestock health problems in and around the Bako district. Out of the 37 identified poisonous plants, *Trifolium hybridum*, *Sorghum bicola*, *Amaranthus spp*, *Datura Stramonium* and *Plantago lanceolata* were the most commonly incriminated poisonous plants in the study area. The predisposing factors for the occurrence of plant poisoning were identified as agricultural expansion, drought, soil erosion and overgrazing during the study.

Depending on the result of present study, the following recommendations were forwarded:

- ❖ Preventing livestock from grazing the pasture infested by poisonous plants.
- ❖ During drought season providing livestock with sufficient feeds to avoid the exposure to plant poisoning while searching for feeds.
- ❖ Hay and other feed stuffs should be carefully inspected for contamination with potentially toxic weeds

before feeding.

- ❖ Livestock owners should be advised to remove the toxic plants from the pasture land.
- ❖ Awareness creation should be made among the community on the practice of intensive livestock management system to minimize exposure of plant poisoning on the field.
- ❖ During early spring season, livestock owners should give due attention to the area where their livestock graze because many poisonous plants grow and appear on the grazing field in this season.
- ❖ It is recommended that detailed investigation should be performed to know the epidemiology of the poisonings caused by plants.

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