

## Survey of Toxic Plants in Livestock at Horro Guduru Wollega Zone, Western Ethiopia

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### Abstract

The survey was conducted from December 2013 up to April 2014 with the objective of assessing potentially poisonous plants in and around Horro Guduru Wollega, Western Ethiopia. A total of 354 Volunteer individuals (248 livestock owners, 69 animal health practitioners and 37 traditional healers) were interviewed using separately structured questionnaires. In this study 24 toxic plant species were identified and documented during the period in the study areas. The major problems that expose the livestock to the toxic plants as complained by study participants were predisposing factors like shortage of feed (55.6%) and nutritional deficiency (24.3%). The animals are usually poisoned at the end of rainy season (58.2%) and during the dry season (24%). The most common plant parts that cause toxicosis to the livestock were whole and leaf. Among the toxic plants *Medicago burweed* (39.9%), *Prunus africana* (16.9%), *Plantago lanceolata* (14.1%), *Braken fren* (10.1%) and *Snowdina, polystarch* (9.3%) were the most frequently complained toxic plants in the study areas. The majority of the toxic plants that cause toxicosis to the livestock were by single exposure and bovine species were found to be susceptible poisoned animals. The present survey indicates the existence of high toxic plant in the area that needs interventions to reduce livestock exposure and further research to determine the toxicogenic ingredients of the plants.

**Keywords:** Livestock, Livestock Owners, Toxicosis, Toxic Plants, Western Ethiopia

### Introduction

Toxic plants affecting both large and small animals are a major concern for the practicing veterinarian and livestock producer in every country. In countries with higher plant biodiversity, the number of problematic toxic plants may be greater. Plant biodiversity in Ethiopia is very high, as there are about 7,000 species of vascular plants in Ethiopia in native and naturalized (Berenal *et al.*, 2006). No country in Africa enjoys as great a diversification of geology, land forms, soils, and climate as Ethiopia. There are more than forty five vegetation types where forests, savannas, woodlands, steppes and grasslands comprise 75% of the vegetation cover. As a result, Ethiopia (Somalia and Socotra included) possesses one of the richest floras in Africa, with no less than 7,000 species of Pteridophytes and Spermatophytes. Much of this floristic wealth is reflected in the fact that Ethiopia is one of the primary centers of origin of many of the world's cultivated crops, e.g. , wheat, barley, teff, coffee, peas, okra, sorghum, millets, lentils. The flora is 35% endemic and is an independent floristic region closely allied to the flora of tropical East Africa and Central Africa. A part from the globally listed ones therefore, some factors are inherent to Ethiopia contribute to phytotoxicity (Yehenew, 1994).

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 (Radeleff, 1964) 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 (Peattie *et al.*, 1983). Plant poisoning is due to either accidental ingestion of material eaten along with grass or obstinate consumption of poisonous plants when pasture is dry while most poisonous plants remain green all throughout the year. 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).

Numerous factors influence the action of poisonous substances which include: route of absorption; the dose, the physical and chemical nature of the poison; frequency of exposure to poison, 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. 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 (Radeleff, 1964). 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 (Durairaj, 2012).

Some Plants are sophisticated enough to penetrate the skin of the victim mechanically and then introduce a poisonous chemical. The result is an immediate burning sensation of the skin. The best known representatives of this kind are the Stinging Nettles and their close relatives in all parts of the world. Most mechanically-chemically acting plants belong to the botanical families Urticaceae and Euphorbiaceae, some of them being much more powerful than the Stinging Nettle. Under an electron microscope, fragile hollow needles are visible, with nettle cells at the base, filled with liquid poison. Ethiopians possess an extensive knowledge of poisonous plants and the art of preparing poisons from diverse sources. When touched, a needle breaks off, leaving an oblique tip, which can enter the human skin like a syringe and release the poison. A variety of poisonous plants have caused extensive losses to the livestock industry in many parts of the world mainly East Africa including our country 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 (Radeleff, 1970; Frohne and Pfander, 1984).

In most parts of Ethiopia, traditionally plants are used for the treatment of animals. But the main problem is the dose, the route, and the activate ingredients are not well known. Because of this poisoning of plants will occur in animals which consequently results in physical up set, loss of productivity and death. Therefore, even though plants have vital nutritious and providing the normal atmospheric oxygen, it well cause life threatening if it toxic. In addition to this, some chemicals which are in natural environment i.e. soil, water or industrial origin also may be toxic to animal [9].

However, information on toxic plants in Ethiopia is scarce. Further, it is not customary among local veterinarians to write case reports, thus most of the plant poisonings that occur in the country are not documented in the literature. Hence, it is imperative to bring to the attention of all professionals to the effects of poisonous plants on animal health and productivity (Kaufmann, 1986). Therefore, this study was designed to identify and document potentialtoxic plants to livestock in selected districts of Horro Guduru Wollega Zone, Western Ethiopia.

## **Materials and Methods**

### ***Study area***

The study was conducted from December 2013 up to April 2014 at Selected Districts of Horro Guduru Wollega Zone, Western Ethiopia. The districts are found about 251 Km west of Addis s Ababa. The study area is located at an elevation of 2,088m above sea level. The annual average temperature is 21°C and the annual average rainfall is 1800 mm (NMSA, 2011). The rural and peri-urban areas of the zones are featured by mixed agricultural system where livestock play an important role. The vegetation of the area is dominated by xerophylic plants. The study sites were selected based on the availability of practice of traditional medicine and on the recommendations of knowledgeable elders and local authorities.

### ***Study population***

The target populations for this study were livestock owners, animal health practitioners including traditional animal healers. The survey was conducted through questioner surveys designed for farmer particularly knowledgeable elders, veterinarians, traditional animal healers and other related professionals. A total of 354 individuals were interviewed in which convenience method was employed. The sampling methodology was strategically designed and purposive sampling methods were used.

### ***Study methodology***

Questionnaire survey was carried out on the selected individuals by interviewing voluntary animal owners, animal health practitioners and traditional animal healers. First some districts of each zones and kebeles from the district were purposefully selected by considering the proximity to the center, and also availability of the issue of plant and availability of traditional animal healers. All volunteer traditional healer selected based on recommendation from elders and local authorities (Development Agents and Peasant Administration Officials) of the study area. The structured questionnaire was used to collect information related to toxic plants in livestock and its associated risk factors. The prepared questionnaire for farmers, animal health practitioners and traditional animal healers were interviewed to collect the toxic plants obtained in this study. The plants were collected from surrounding forests of study areas to know its in-situ aimed to use in further research. The samples collected from the forest were preserved in the veterinary laboratory for further reference and the other were compressed and taken to the National Herbarium (NH) for taxonomic identification at Addis Ababa University.

### **Data storage and statistical analysis**

The collected data during survey of suspected toxic plants 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

In the present study, a total of 24 toxic plant species were identified and documented during the period in the study areas. The majority of the study participants were livestock owners (70.1%) followed by animal health practitioners (19.5%) and traditional healers (10.4%). Among the assessed predisposing factors, shortage of feed (55.6%) and nutritional deficiency (24.3%) were the major problems that expose the livestock to the toxic plants as complained by study participants. The animals are usually poisoned at the end of rainy season (58.2%) and during the dry season (24%) (Table 1)

In this study, the majorities of the plant parts that cause toxicosis to the livestock were whole and leaves. Most of the toxic plants that were identified and documented in the study area cause bloating and bloody urine. Among these plants *Medicago burweed* (39.9%), *Prunus africana* (16.9%), *Plantago lanceolata* (14.1%), *Braken fren* (10.1%) and *Snowdina, polystarch* (9.3%) were the most frequently complained toxic plants in the study areas. However, six toxic plants (*Girardinia bullosa (steud.) wedd.*, *Phytolacea-dodecandra*, *Olea europaea*, *Ricinuscomiunis* and *Prunus africana*) were also reported by the study participants as medicinal plants (Table 2).

The majority of the toxic plants that are caused toxicosis to the livestock were by single exposure and bovine species were the most susceptible animals to the exposure (Table 3). The present survey depicted that the toxic parts of 159 (64.1%), 84 (33.9%), 4 (1.60%) and 1 (0.4%) of suspected poisonous plants were whole part, leaf, seed and stem respectively. Plants with root toxicity were not reported (Table 4).

## Discussion

The findings of the present study revealed that phytotoxicity are among causes of toxicosis in livestock. Out of 354 interviewed individuals, livestock owners (70.1%) followed by animal health practitioners (19.5%) and traditional healers (10.4%) pose health problems in the livestock in the study area. The results in general have shown that toxic plants are causing significant animal health problems in and around western Ethiopia. The result was in line with the previous findings of (Abera *et al.*, 2014) in central Ethiopia; (Adediwura and Kola, 2012) in Nigeria; (Torres *et al.*, 2012) in Colombia; (Durairaj, 2012) in Tiruchrapalli districts of Tamil Nadu, South India.

Shortage of feed and nutritional deficiencies can enforce the livestock to browse perennial shrubs and bushes while most of these perennial plants have been known to contain toxic secondary metabolites in study area (Seifert, 1969; Radostits *et al.*, 2007).

In this study, 24 common major toxic plants to livestock were identified and documented. Among these plants: *Medicago burweed* (39.9%), *Prunus africana* (16.9%), *Plantago lanceolata* (14.1%), *Braken fren* (10.1%) and *Snowdina, polystarch* (9.3%) were the most frequently complained toxic plants in the study areas. However, six plants (*Girardinia bullosa (steud.) wedd.*, *Phytolacea-dodecandra*, *Olea europaea*, *Ricinuscomiunis* and *Prunus africana*) were having toxic as well as medicine value in the areas. Various plants grow in different areas that have different edaphic and climatic factors. These factors also contribute 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 *Medicago burweed* (whole part) has been known to cause poisoning of cattle in Central Ethiopia (Abera *et al.*, 2014). These plants have already been confirmed to contain nitrate in their tissues (Osweiler *et al.*, 1985; Munro, 2009). Similarly, the importance of *Trifolium burchellianum*, *Accacia* and Sorghum *bicolouras* causes of livestock poisoning have been published (Osweiler *et al.*, 1985). 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 *et al.*, 2007; Munro, 2009) and it has also been reported elsewhere (Peattie *et al.*, 1983; Osweiler *et al.*, 1985).

Studies conducted on this regards indicated that 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 (Adediwura and Kola, 2012; Torres *et al.*, 2012; Abera *et al.*, 2014).

The present study indicated that herbal poisoning were among important causes of health problems in and around Horro Gudurru Wollega Zone, Western Ethiopia. There is a very limited research conducted in the country as well as outside the country.

## Conclusion

In the present study, 24 common major toxic plant species was identified and documented during the study period in the study area. The majority of the study participants were livestock owners. Shortages of feed and

nutritional deficiency were the major problems that expose the livestock to the toxic plants as complained by study participants. The animals are usually poisoned at the end of rainy season and during the dry season and *Medicago burweed* and *Prunus africana* were highest botanical frequent toxic plants recorded in the study area. Bovine species were the most susceptible poisoned animals. Thus, detailed investigation should be performed to know the epidemiology of the poisonings caused by plants and experimental studies should be carried out to substantiate the empirical knowledge of plant poisonings; animal health practitioners, government and non-governmental organizations should focus on pasture to minimize risk of poisonings.

### Competing interests

All authors have declared that no competing interests exist

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### Author contributions

Contributed to designing the methodology and collecting materials: Dereje Abera. Correcting of the methodology and checking up for collected materials: Dereje Abera and Tadesse Birhanu, Contributed to writing the manuscript: Dereje Abera and Tadesse Birhanu. Reviewing the manuscript to be ready for publication and Sultan Abda contributes on drafting of the manuscript.

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**Table 1.** Summary of predisposing factors, sources of toxic plants and groups of interviewed with percentages

Variables		Total No of respondents	No of identified major risk factors (%)
Predisposing Factors	Shortage of feed	197	55.6%
	Nutritional deficiency	86	24.3%
	Excess consumption	59	16.7%
	Unknown reasons	12	3.39%
Common Poisoning season	Beginning of rainy season	63	17.8%
	During drought	85	24.0%
	End of rainy season	206	58.2%
Sources of Plants	Wild	251	70.9%
	Domestic	59	16.7%
	Both	44	12.4%
Group of interviewed	Livestock owners	248	70.1%
	Animal health practitioners	69	19.5%
	Traditional healers	37	10.4%

**Table 2.** Summary of Toxic plants parts, toxicosis, season of occurrence and source of the plants

Scientific name	Local name	Parts	Toxicosis	Season	Source
<i>Prunus africana</i>	Homi	Leaf	Bloating ,salivation, Colic	Any time	Wild
<i>Medicago burweed</i>	Sidissa	Whole	Bloating	Summer	Both
<i>Plantago lanceolata</i>	Qorxobi	Whole	Bloating	Summer	Wild
<i>Braken fren</i>	Trimi	Leaf	Bloody urine	Any time	Wild
NA	lemana	Leaf	Bloody urine	Any time	Both
<i>Snowdina, polystarch</i>	Muja	Whole	Bloating	Summer	Domestic
<i>Acacia</i>	Lafto	Leaf	Bloating	Any time	Wild
<i>Ricinuscomiunis</i>	Qobo	Leaf	Bloating	Any time	Domestic
<i>Trifolium burchellianum</i>	Hasangira	Whole	Salivation	Spring	Wild
<i>Maytenus senegalensis</i>	Kombolcha re'ee	Leaf	Bloody urine	Winter	Wild
NA	Ashkokko	Leaf and Seed	Bloating, salivation	Autumn	Wild
NA	Qoricha lagaa	Whole	Bloating, colic	Summer	Wild
NA	Ertoo ararisso	Leaf	Bloating, colic	Summer	Wild
NA	Sadi boba'oo	Leaf	Bloating	Winter	Wild
<i>Solanium- incanum</i>	Hiddi	Seed	Lacrimation, coordination	Any time	Wild
<i>Amaranthus spp</i>	Rafu	Leaf	Bloody urine	Any time	Wild
<i>Sorghum bicolour</i>	Zenegada	Leaf	Boating	Summer	Domestic
NA	Alaalituu	Leaf	Bloody urine	Any time	Wild
<i>Phytolacea- dodecandra</i>	Handoodee	Leaf	Bloating	Any time	Wild
NA	Hirmi re'ee	Leaf	Bloating	Summer	Wild
<i>Lantana camara</i>	Akayi sinbirra	Leaf	Bloody urine	Any time	Wild
<i>Nicotiana tabacum</i>	Tambo	Leaf	Bloating	Summer	Domestic
<i>Olea europaea</i>	Ejersa	Leaf	Bloating	Any time	Domestic
<i>Girardinia bullosa (Steud.) Wedd.</i>	Gurgubbee	Shrub	Skin burn	Summer	Both

**Table3. Summary of Toxic plants frequency, exposure and species of animals exposed/farmers**

Local name of Toxic plants (Afan Oromo)	Botanical frequency	Veterinary Frequency	Exposure Level	Species of Animal exposed
Homi	42 (16.9%)	Bloating (40), salivation (2)	Single	Bovine and Caprine
Sidissa	99 (39.9%)	Bloating (94), salivation (4)	Single	Bovine, Ovine
Qorxobi	35 (14.1%)	Bloating (35), anuria (3)	Single	Bovine, Ovine
Tirmii	25 (10.1%)	Bloody urine (25)	Repeated	Bovine, Caprine
Muja	23 (9.3%)	Bloating (23), anuria(2)	Single	Bovine, Ovine
Lemana	2 (0.8%)	Bloody urine (2)	Single	Bovine
Lafto	1 (0.4%)	Bloating (6), abortion (6)	Single	Caprine
Qoboo	2 (0.8%)	Bloating (2), salivation (2)	Single	Bovine
Qorcha lagaa	3 (1.2%)	Bloating (2)	Repeated	Bovine, Ovine
Sadi boba'oo	2 (0.8%)	Bloating (2)	Single	Bovine, Caprine
Ejersa	1 (0.4%)	Bloating (3)	Single	Bovine
Tambo	1 (0.4%)	Bloating (4), salivation (2)	Single	Bovine
Kombolcha re'ee	2 (0.8%)	Bloating (5)	Repeated	Caprine
Hiddii	2 (0.8%)	Lacrimation and incoordination (2)	Single	Ovine, Caprine
Zangadaa	8 (3.23%)	Bloating (6), salivation (2)	Single	Bovine
Ertoo Ararsoo	2 (0.8%)	Bloating and colic (4)	Single	Ovine, Caprine
Hirmi re'ee	9 (3.60%)	Bloating and anuria (6), depression (3)	Single	Caprine
Ashkokko	1 (0.4%)	Bloating and salivation (2)	Repeated	Caprine
Gurgubbee	3 (1.2%)	Skin burn (1)	Single	All species

**Table4. Frequency of plant parts, seasons, signs and symptoms with origins of the toxic plants**

	Characteristics	Frequency	Percentage (%)
Parts	Leaf	84	33.9
	Seed	4	1.60
	Whole	159	64.1
	Stem	1	0.4
Seasons	Any time	37	14.9
	Summer	198	79.8
	Winter	5	2.0
	Spring	7	2.80
	Autumn	1	0.4
Signs and Symptoms	Bloating	206	83.1
	Salivation	14	5.64
	Colic	4	1.61
	Bloody Urine	28	11.3
	Lacrimation and In coordination	2	0.4
	Bloating and Colic	4	1.61
	Bloating and Salivation	2	0.4
	Bloating and anuria	6	2.42
Origins	Abortion	6	2.42
	Jarte Jardega	50	20.2
	Jimma Geneti	50	20.2
	Horro	50	20.2
	Abay Chomen	50	20.2
	Ababo Guduru	48	19.4

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