

Ethnobotanical Study of Poisonous Plants Described by Traditional Herbal Practitioners from Narok County

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Abstract

Traditional medicine has remained first line of treatment to many communities in Africa. However, there are several plants that are known to cause poisoning to both animals and humans. Knowledge of such plants among traditional herbal practitioners is significant in avoiding adulteration of herbal medicine during preparation. Worldwide, many hospital visits, physiological disorders and deaths related to poisoning are caused by plant toxicity. The study sought to document toxic plants in Narok County known to traditional herbal practitioners (30). They were purposively sampled and interviewed using pilot tested questionnaires. They provided information about plants that are toxic to both animals and humans, plants that cause side effects when taken in very large dosages singly or in combination and methods of counteracting plant toxicity. A total of 26 plants were identified, family Euphorbiaceae and Asteraceae had the highest number of toxic plants cited. The most mentioned toxic plants included; Ricinus communis (8), Euphorbia candelabrum (7) and Acokanthera schimperi (7). Concerning plant toxicity related to overdosage, the traditional herbal practitioners mentioned Senna didymobotrya (5), Warbugia ugadensis (4) and Zanthoxylum usambarense (4) as the most known. They also reported several plants that were used to neutralize plant toxicity; mainly, Prunus africana, Toddalia asiatica, Rhus natalensis and Rhamnus staddo. The study concluded that traditional herbal practitioners of Narok County have a rich knowledge of toxic plants. Further investigations are recommended to authenticate safety and efficacy of combination therapy that included toxic plants.

Keywords: Traditional knowledge, toxic, plants, Maasai.

INTRODUCTION

Over the years, traditional medicine has remained a mainstream source of treatment to a myriad of human diseases and health conditions. Traditional remedies offer a cheap, easily available, and sustainable substitute to conventional medicine (White, 2015). But it is also widely understood among traditional health practitioners that some plants have toxic effect on human and animal health. Such plants may cause adulteration on commonly used treatment regimes. Toxic plants grow in farms, roadsides, forests and some are grown as ornamentals. A poisonous plant is defined as one which as a whole or part thereof under all or certain conditions and in manner and in amount likely to be taken or brought into contact with an organism will exert harmful effect or death. The effect (s) can occur either immediately or by reason of cumulative action of toxic property due to presence of known or unknown chemical substances in it and not by mechanical action” (Gupta, 2018).

According to Hak (2004), there are three categories of toxic plants: first, those that contain toxic compounds with extreme toxic activity. They should not be ingested

without prescription for example, *Digitalis spp.* Secondly; herbs with very strong medicinal activity, they should only be taken in correct dosage and under close monitoring of treatment response. Thirdly, herbs with known toxic effects on specific organ function. Notably, toxic plants are ranked top 10 as the most frequent causes of poisoning in young children below the age of 6 (Dolan & Welch-Keesey, 2016). Plant toxic constituents for example cytotoxins, neurotoxins, and metabolic toxins affect body organ systems (Kamsu-Foguem and Foguem 2014), when they come into contact with the skin, ingested/absorbed by the skin, eye exposure or inhalation (Narayanaswamy *et al.*, 2014). Hepatotoxicity is the most common side effect of plant toxicity and is caused by chronic use of herbal medicine or supplements (WHO 2002). In animals, plant toxicity can lead to chronic illness, debilitation, abortion, decreased body weight, abdominal discomfort, congenital defects, salivation, photosensitization or sudden death (Botha & Penrith, 2008).

In India several plants have been identified as toxic; they include, *Abrus Precatorius*, *Agave sisalana*, *Arum maculatum*, *Cannabis sativa*, *Citrullus colocynthis*, *Cleistanthus collinus*, *Gloriosa superba*, *Aconitum ferox* and *Aesculus hippocastacanthum*. Toxicity symptoms range from vomiting, diarrhea, hypotension, difficult breathing neuromuscular weakness and death in severe cases (Narayanaswamy *et al.*, 2014). According to Diriba & Debela (2019), *Guizotia scabra* (5.8%) *Trifolium hybridum* (20.8%), *Plantago Lanceolata* (10%), *Snowdina polystarchia* (12.5%), *Urtica dioica* (7.5%) are the most frequently cited out of a total 30 toxic plants that affect livestock in Ethiopia. In Pakistan Rehman *et al.*, (2018) identified 87 toxic plants and the most cited genera included *Brassica* which had 6 species, *Lathyrus* 5 species, *Astragalus*, *Euphorbia* and *Prunus* 4 species each and *Datura*, *Jatropha*, *Ranunculus*, *Solanum* and *Sorghum* 3 species each.

Lack of knowledge on the potential toxic effect of herbal medicine to many consumers (Oreagba *et al.*, 2011) is a major issue of concern. This is because of the old belief that plant medicines are safe and without side effects (Philomena, 2011). Traditionally, knowledge of toxic plants was passed down to the younger generations by the older members of the community or through apprenticeship (Mokgobi, 2014). Young people and children spent many hours with their elders farming or grazing the animals in the wild. This provided them with an opportunity to continuously learn about their environment and; observe and identify useful and dangerous plants. Knowledge and identification of poisonous plants growing within a geographical region and their associated clinical symptoms is an important prerequisite to appropriate diagnosis and treatment (Rehman *et al.*, 2018). However, studies show that, most of the local population including veterinarians have poor knowledge of toxic plants and are unaware of their poisonous effects because of lack of identification knowledge (Rehman *et al.*, 2018). This increases the risk of inappropriate treatment and management of cases of plant toxicity in animals and humans. Moreover, there are few antidotal treatments for managing plant toxicity (Cheeke, 1998).

Over the years plant toxicity has caused immense losses to livestock farmers, in the form of low production, mortalities, veterinary service fees or a combination of factors (Ogwang, 1997). According to California Poison Control System, treatment for patients of plant poison should provide the common or scientific name or a sample of the plant (<https://calpoison.org/topics/plant>). However, due to lack of information about poisonous plants, the patient may not relate the disorder with plant toxicity. Today there is an exponential decrease in time spends between the

older and younger generation. Many children and young people spent a large proportion of their life time in school or colleges. Notably, this has hindered passing of knowledge as was the case in the past. Remarkably, there is a paradigm shift in medium of communication and sources of information; from orally delivered knowledge to reference to documented information due to a surge in modern technology. This created the need of documenting poisonous plants for future reference by both young and old members of the communities.

METHODOLOGY

Study Area

The study was carried out in Narok County which is in the Rift Valley Region of Kenya. The County is endowed with a rich biodiversity due to fair climatic conditions. It experiences two rainfall seasons; short and long rains. It is warm throughout the year, with temperatures between 27 °C and 33 °C

Data Collection and Analysis

The researchers and research assistants explained the purpose, method of data collection and confidentiality of the information, to the traditional herbal practitioners. Thirty (30) respondents were selected through purposive sampling criteria. Respondents willing to participate signed an agreement declaration form. Data was collected through interviews using pilot tested semi-structured questionnaires and field observations. They provided information about plants that were known to be toxic to both animals and human. They also mentioned about plants that were used in treatment of diseases but had known side effects when the normal dose was exceeded and, plants used to neutralize plant toxicity. Identification of cited plants was done by both the botanist and traditional herbal practitioner both in the field and at the University of Nairobi herbarium where voucher specimens were deposited. Data was analyzed using descriptive statistics.

RESULTS

Data analysis indicated that herbalists were aware of toxic plants. One of the traditional healers explained; “*Among the Maasai, both at community and family level as well as markedly in the herbalist apprenticeship, the issue of toxic plants is taken very seriously due to safety of both the people and livestock*”. A total of twenty-six plants distributed in 15 families and 21 genera were recorded. Plant families with highest number of cited toxic plants include; Euphorbiaceae (3), Asteraceae (3), solanaceae (2) and mimosaceae (2). The most common toxic plants mentioned by the traditional herbal practitioners were *Ricinus communis* (8), *Euphorbia candelabrum* (7) and *Acokanthera schimperi* (7), as they reportedly cause death among other effects (Table 1). In particular, the seeds of *Ricinus communis* were a major cause of animal deaths related to plant toxicity.

Further analysis was done to examine the knowledge of traditional herbal practitioners about medicinal plants that could cause undesired effects when administered in over dose, either singly or in combination. The most common included; *Senna didymobotrya* (5), *Warbugia ugadensis* (4) and *Zanthoxylum usambarense* (4). Most observed side effects included; diarrhea, vomiting and disorders of the digestive system. Notably, *Acokanthera schimperi* was potentially known to cause death. To counteract toxicity and mask the bitter taste, the concoctions and decoctions of some medicinal plants were mixed with excipients including; honey, milk, fat, egg yolk, blood, or boiled in bone soup (Table 2).

Moreover, some toxic plants such as *Senna didybotrya*, *Solanum incunum*, *Acokanthera schimperi*, *Warbugia ugadensis*, *Albizia anthelmintica*, *Aloe secundiflora*, *Clerodendrum myricoides* and *Euphorbia meridionalis*; were combined with other herbs during preparation (Table 3). Major toxic effects resulting from these herbal mixtures included; headache, diarrhea and stomach ache. One of the traditional healers elaborated; *“the traditional herbs are hardly taken singly; herbs notably Carissa edulis and Prunus africana form a critical component of medicinal concoctions to alleviate toxic effects”*.

However, according to the respondents, poisoning due to over dosage was rare; one respondent elaborated; *“we take serious precautionary measures because we know these medicinal plants can be toxic”*. Further knowledge of medicinal plants used to reduce or neutralize plant toxicity was also sought. The results are presented in (Table 4). *Carissa edulis* (3) was the most commonly used plant to manage toxicity having been mentioned three times followed by plants; *Prunus africana*, *Toddalia asiatica*, *Rhus natalensis* and *Rhamnus staddo* which were mentioned two times each. Roots were the plant parts mainly used to neutralize toxicity.

Table 7: Plants that are toxic to both man and livestock as reported by the traditional herbal practitioners of Narok County

Plant Family	Scientific name	Local name	Toxic part	Side Effect	Frequency
		Olawuiwui	Whole plant	Death, respiratory arrest	2
		Olpokai	Whole plant	Death	1
		Orberetiai	Whole plant	may cause death	1
		Chepng'eremit	Leaves	Disorder of digestive system	1
Aloaceae	<i>Aloe lateritia</i>	Osuguroi	Leaves	Diarrhea, abortion	1
	<i>Aloe secundiflora</i>				
Amanitaceae	<i>Amanita muscaria</i>	Mundera	Whole plant	Stomach disorders, death	2
Apocynaceae	<i>Acokanthera schimperi</i>	Olmorijoi	Whole plant	Blood circulatory system, digestive system, death	7
Asteraceae	<i>Tagetes minuta</i>	Orbang'i	Whole plant	Disorders of respiratory and digestive system	4
Asteraceae	<i>Conyza newii</i>	Oleturot	Leaves		1
Asteraceae	<i>Tarchonanthus camphoratus</i>	Oleleishwa	Bark		1
Boraginaceae	<i>Ehretia cymosa</i>	Endalati ekutuk	Leaves, roots	Stomach disorders	1
Canellaceae	<i>Warbugia ugandensis</i>	Osokonoi	Leaves	Fainting, severe headache, excessive sweating, drowsiness	1
Euphorbiaceae	<i>Ricinus communis</i>	Orpaleki	Seeds	Death	8
Euphorbiaceae	<i>Euphorbia candelabrum</i>	Orpopong'i	Whole plant	Blisters on the skin, digestive, blood circulatory system, death	7
Euphorbiaceae	<i>Synadenium grantii</i>	Olkorbobit	Whole plant	Stomach disorders	4
Flacourtiaceae	<i>Casearia battiscombei</i>	Entiangaras	Shoot		1
Meliaceae	<i>Turraea abyssinica</i>	Enchani- enkashe	Leaves		1
Mimosaceae	<i>Acacia sieberiana</i>	Oltarara	Leaves	Affects the brain	1
Mimosaceae	<i>Acacia nilotica</i>	Olkiroriti	Bark	abortion	1
Salicaceae	<i>Dovyalis caffra</i>	Olmorogi	latex	Stomach disorders	3
Solanaceae	<i>Datura stramonium</i>		Whole plant	Death, inflamed skin	4

Solanaceae	<i>Solanum incanum</i>	Olperentai	Fruits	Vomiting and loss of appetite	1
Spurges	<i>Manihot esculenta</i>	Entulelei	Tuber	Disorders of the digestive system	1
Urticaceae	<i>Urtica massaica</i>	Cassava	Leaves	itchiness	2
Viscaceae	<i>Viscum tuberculatum</i>	Entamenjoi	Leaves and root	Stomach disorders	1
Vitaceae	<i>Cyphostemma</i> spp	Endaletoi	Fruit and sap	Disorders of the digestive and blood circulatory system	3

Table 2: Medicinal plants that cause side effects when administered in overdose as reported by the traditional herbal practitioners in Narok County

Scientific name	Local Name	Side Effect	Frequency	Antidote
	Enaluwai oltiani	Over diarrhea / dehydration / death	1	
<i>Acokanthera schimperi</i>	Olmorijoi	death	2	Milk, egg yolk
<i>Ajuga remota</i>	Osarara	Stomachache	2	Milk/bone soup
<i>Aloe secundiflora</i>	Osukuroi	Diarrhea/fever	3	Milk
<i>Clusia abyssinica</i>	Engippanyan	Vomiting, stomachache	1	
<i>Rhamnus prinoides</i>	Orkonyiel	Dehydration	2	Bone Soup
<i>Rhamnus prinoides</i>	Orkonyiel	Dehydration	2	Milk
<i>Senna didymobotrya</i>	Osenetoi	Diarrhea	5	Milk
<i>Warbugia ugadensis</i>	Osokonoi	Fainting, severe headache, excessive sweating, drowsiness	4	Milk
<i>Zanthoxylum usambarense</i>	Oloisiki	Diarrhea and vomiting	4	1 glass of milk

Table 3: Toxic plants used in combination therapy as reported by the traditional herbal practitioners in Narok County

Plant (mixture)/ scientific name	Plants associated with risk of toxicity	Frequency	Effect	Antidote
Osenetoi (<i>Senna didybotrya</i>)	<i>Senna didybotrya</i>	5	Diarrhea	milk
Eseketet (<i>Myrsine africana</i>)				
Entulelei (<i>Solanum incunum</i>)	<i>Solanum incunum</i>	4	Severe headache	
oltepesi (<i>Acacia tort</i>)				
Olamuriaki (<i>Carissa edulis</i>)				
Ormisigioi (<i>Rhus natalensis</i>)	<i>Acokanthera schimperi</i>	4	Fainting, drowsiness, excessive sweating.	
Olmorijoi (<i>Acokanthera schimperi</i>)				
Oledat (<i>Trimeria grandiflora</i>)				
osanankururi (<i>Scutia myrtina</i>)				
Osokonoi (<i>Warbugia ugadensis</i>)	<i>Warbugia ugadensis</i>	3	Diarrhea and vomiting	1 glass of milk
Oloisiki (<i>Zanthoxylum usambarens</i>)				
Osukuroi (<i>Aloe secundiflora</i>)	<i>Albizia anthelmintica</i>	3	fainting	1 glass of milk
ormukutan <i>Albizia anthelmintica</i>				
Olmunyushi <i>Rhus vulgaris</i>	<i>Aloe secundiflora</i>	3	Diarrhea/fever	Olchurrai solution/milk
osukuroi (<i>Aloe secundiflora</i>)				
Ormakutkut (<i>Clerodendrum myricoides</i>)	<i>Clerodendrum myricoides</i>	1	Make poison	
Olkujuk (<i>Prunus africana</i>)				
Olamuriaki (<i>Carissa edulis</i>)				
Osukuroi (<i>Aloe secundiflora</i>)	<i>Aloe secundiflora</i>	1	Diarrhea	
enkokuroi (<i>Euphorbia meridionalis</i>)	<i>Euphorbia meridionalis</i>			
Olmisigioi (<i>Rhus natalensis</i>)				

Table 4: Medicinal plants used by the traditional herbal practitioners to neutralize plant toxicity and prevent side effects in Narok County

Plant Family	Scientific name	Local name	Plant part	Preparation	Frequency
		Olng'echem	Leaves	200g	1
Acanthaceae	<i>Barleria spp</i>	Olerubat	Roots	Boil	1
Anacardiaceae	<i>Rhus natalensis</i>	Olmsigiyoi	Roots	Boil	2
Apocynaceae	<i>Carissa edulis</i>	Olamuriaki	Roots	Boil	3
Combretaceae	<i>Combretum molle</i>	Ormorori	Roots	Boil	1
Flacourtiaceae	<i>Trimeria grandifolia</i>	Oledat	Roots	Boil	1
Flacourtiaceae	<i>Dovyalis abyssinica</i>	Olmorogi	Roots	Boil	1
Leguminosae	<i>Acacia kirkii</i>	Olng'wenying'wenyi	Roots	Boil	1
Rhamnaceae	<i>Rhamnus staddo</i>	Orkokola	Roots	Boil	2
Rosaceae	<i>Prunus africana</i>	Olkujuk	Bark	Soak in water	2
Rutaceae	<i>Toddalia asiatica</i>	Oleparmunyu	Bark	Boil	2
Solanaceae	<i>Solanum incanum</i>	Entulelei			

Table 5: Cross reference of toxic plant species known to traditional herbal practitioners of Narok County against published data

Scientific name	Toxic constituents and mode of action	Symptoms	Toxic part
<i>Acokanthera schimperi</i>	Ouabain (cardiac glycoside) (http://ecocrop.fao.org).	Death occurs instantly in birds on sucking nectar from the flowers (http://ecocrop.fao.org) In cows; grunting respirations, rapid shallow breathing, diarrhea, teeth grinding, muscular spasms, and a profuse, clear, slimy nasal discharge, pale pink lungs distended with air, gastroenteritis, heart hemorrhages (https://www.infonet-biovision.org).	All parts of the plant, except the pulp of the fully ripe fruit (http://www.prota.org)
<i>Datura stramonium</i>	Tropane alkaloids such as scopolamine, hyoscyamine, and atropine (Enno, 2010).	Hallucinogenic properties, hyperthermia; tachycardia; bizarre, and possibly violent behavior; and severe mydriasis tachycardia with right bundle branch block, and urinary retention. (Enno, 2010; Trancă et al., 2017)	Seeds and flowers (Enno, 2010)
<i>Euphorbia candelabrum</i>	Diterpene	In humans; ocular toxicity including; severe burning sensation, decreased visual acuity, mild to severe corneal edema, kerato-conjunctivitis, anterior uveitis, epithelial defects, secondary elevated intraocular pressure and blindness in a few cases (Samar et al., 2009). It's a skin irritant and carcinogenic and mucous membranes, <i>E. candelabrum</i> honey can trigger a burning sensation in the mouth Intensified by drinking water (Lock, 1972; Uzabakiliho et al., 1987). <i>Ingestion of crude ethyl alcohol of E. heliscopia causes</i> increase activity, salivation and irritability, diarrhea, itching the nose and mouth, increased WBCs, and monocytes, creatinine, neutrophils, urea, uric acid, AST, cholesterol, ALP, T. protein and globulin, decreased lymphocytes, alveolar hemorrhages, proliferation of Kupffer cells and congestion of glomerular capillaries (AL-Sultan & Hussein, 2006)	Milky latex produced by all parts of the plant if injured (Tropical Plants Data Base)
<i>Ricinus communis</i>	Recin; which interferes with protein synthesis (Hanane et al., 2018).	In animals; weakness, salivation, diarrhea, mydriasis, teeth grinding in animals (Diriba & Debela, 2019) In children; prostration, gastrointestinal distress/colic, excessive thirst, dullness, decrease in urine, hypotension, a burning sensation in mouth and throat, severe dehydration, abdominal pain, dullness of vision, anorexia, vomiting, nausea, loss of appetite, weakness, muscle twitching, seizures, cramps, tremors, coma and death occur after 3–5 days. In horses sweating, trembling, and incoordination, positive inotropic and tachycardia. In poultry; depression, egg production stops, (Rehman et al., 2018). In sheep, high concentration of serum BUN, creatinine and phosphorus and high activity of serum CK and AST (Aslanian et al., 2007). Submucosal hyperaemia and	Whole plant (Hanane et al., 2018).

		haemorrhage, subepicardial haemorrhage, hyperaemia and tubular necrosis in renal section, extensive myocardial haemorrhage, and degeneration and necrosis of myocardium (Aslanian <i>et al.</i> , 2007). lesions were found in the small intestine, severe fluid accumulation in the intestinal lumen, adrenal glands congestion and hemorrhage, jejunum hemorrhage (Daniele <i>et al.</i> , 2018). Additionally, there is tachycardia, dyspnea, permanent lateral recumbency, death within 48-72 h and spleen hemorrhage in cows (Samuel <i>et al.</i> , 2014)	
<i>Synadenium sp.</i>	diterpene esters	Extremely irritating to the skin, mouth and eyes, skin blisters, irritation to the face, eyelids, nostrils and lips during or after pruning. Ingested; irritation of the throat and mouth, general discomfort or convulsions (Children's Health Queensland Hospital and Health Service, 2020)	Sap
<i>Tagetes minuta</i>	Phototoxic thiophene derivatives,	Severe and prolonged allergic contact dermatitis including skin sensitization/ skin redness and irritation, Nose and eye irritation in humans. In dogs and cats; stomach pain, skin rashes, excessive salivation, swelling, vomiting, drooling, diarrhea, irritation around the eyes, nose and mucous membranes (Kelly, 2008; Maria <i>et al.</i> , 2009)	Flower and sap (Maria <i>et al.</i> , 2009)

DISCUSSION

The present study revealed in-depth knowledge of poisonous plant species to both plants and animals, among the traditional herbal practitioners from the Maasai community. Cross referencing of the mentioned plants with existing literature showed that all of the most cited plants; *Ricinus communis*, *Acokanthera schimperi*, *Euphorbia candelabrum*, *Synadenium spp.*, *Tagetes minuta* and *Datura stramonium*, have been scientifically reported to be toxic (Table 5).

Effects of excess dosage and how to remedy toxicity using plant species and additives were observed. The same was observed among the Kikuyu of Nyeri County; salient toxic plants such as *Ricinus communis*, *Acokanthera schimperi*, *Euphorbia candelabrum* and *Tagetes minuta* were similarly mentioned (Kamau *et al.*, 2016). Toxicity of *Ricinus communis* and *Acokanthera Schimperi* has also been reported in Samburu County especially in regard to causing death in livestock (Kamanja *et al.*, 2015). Further, *Acokanthera Schimperi* is used as arrow poison (Wanzala *et al.*, 2016). In Ethiopia, Diriba & Debela (2019), reported *Ricinus communis*, *Datura stramonium*, *Urtica dioica*, *Ricinus communis* and *Solanum spp* to be toxic in livestock. The same authors reported *Prunus africana* as toxic to livestock, on the contrary, it was cited as an antidote for plant toxicity in the current study and by herbal practitioners from Nyeri County (Kamau *et al.*, 2016).

In the present study, medicinal plants that produced toxic effects when taken in excess included; *Senna didymobotrya*, *Warbugia ugadensis* and *Zanthoxylum usambarense*. They were associated with diarrhea, vomiting and gastrointestinal disorders. The findings corroborate Kamanja *et al.*, (2015) report among the Samburu community. Similar symptoms of herbal medicine have been reported (<https://www.betterhealth.vic.gov.au>). Additionally, Traditional herbal practitioners in the present study reported use of multiple herbs including plants with known toxic effects; in treatment of ailments. These findings corroborate with Biruhalem *et al.*, (2011) study report in which *Datura stramonium*, *Acokanthera schimperi* (100%), *Phytolacca dodecandra*, and *Solanum incanum* which demonstrated very high antimicrobial activity, notwithstanding their toxic effect reported in the present study. For a long time, combination therapy has been used in traditional medicine to increase synergy and thereby efficacy. However, according to the Traditional herbal practitioners in the current study, multiple herbs also caused side effects if taken in large excessive dosages, this required use of other plants or substances to neutralize toxicity. Similar findings have been reported (Phua *et al.*, 2009).

The use of medicinal plants mainly *Carissa edulis*, *Rhamnus staddo*, *Prunus africana*, *Toddalia asiatica* and *Rhus natalensis* to manage toxicity has also been reported in other studies among the Samburu, the Maasai of Tanzania and traditional herbal practitioners of Nyeri (Kamanja *et al.*, 2015, Njau, 2001 and Kamau *et al.*, 2016). In Chinese herb-herb combination therapy, a non-toxic herb is used to detoxify constituents of a toxic plant; for instance, ginger is cooked with *Pinellia ternata* tuber to neutralize its plant toxicity (Chun-Tao *et al.*, 2013). Similarly, the reported mixing of the concoctions and decoctions with soup, milk, fat, egg yolk, oil, and even blood to reduce toxicity and mask the bitter taste of the product has been reported by Njau (2001).

CONCLUSION AND RECOMMENDATIONS

From the foregoing, the current study reported a detailed documentation of traditional knowledge of plants that are poisonous to man and livestock as described by Traditional herbal practitioners from Narok County. The study concluded that, Traditional herbal practitioners from Narok County have continued to conserve knowledge of toxic plants and the various methods of treating or neutralizing the toxic effect of medicinal plants. This information confirms earlier reports that the Maasai community have continued to pass traditional knowledge to the younger generations. The study recommends further research on the efficacy and safety of combination therapy including toxic plants documented in this study.

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REFERENCES

- AL-Sultan, S.I., Yehia, A.H. (2006). Acute Toxicity of *Euphorbia helioscopia* in Rats Pakistan. *Journal of Nutrition*. 5 (2): 135-140.
- Aslania, M.R., Malekib, M., Mohria, M., Sharifia, K., Najjar-Nezhada, V., Afsharia, E. (2007). Castor bean (*Ricinus communis*) toxicosis in a sheep flock. *Toxicon*. 49: 400–406.
- Better Health Channel. (1999/2020). Herbal Medicine
<https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/herbal-medicine#:~:text=Herbal%20medicines%20may%20produce%20negative,a%20qualified%20and%20registered%20practitioner>.
- Biruhalem, T., Mirutse, G., Abebe, A., Jemal, S., (2011). Antibacterial activities of selected medicinal plants in traditional treatment of human wounds in Ethiopia. *Asian Pacific Journal of Tropical Biomedicine*. 1(5): 370–375.
- Botha, J., Penrith, M. (2008). Poisonous plants of veterinary and human importance in Southern Africa. *Journal of Ethnopharmacology*. 119 (2008) 549–558.
- Cheeke, P.R. (1998). Natural Toxicants in Feeds, Forages, and Poisonous Plants, Interstate Publishers. Danville. IL. pp.330-331.
- Children's Health Queensland Hospital and Health Service (2020). African milk bush (*Synadenium grantii*). Retrieved from <https://www.childrens.health.qld.gov.au/poisonous-plant-african-milk-bush-synadenium-grantii/>
- Chun-Tao, C., Zhi, J.W., Moses, S.S.C., Christopher. W.K.L. (2013). Herb-Herb Combination for Therapeutic Enhancement and Advancement: Theory, Practice and Future Perspectives. *Molecules*. 18: 5125-5141.
- Daniele, P. M., Bruna T.S.A., Tiago, F.S. S., Danielli, B. L., Fábio, T.G., Marcos D.D., Gabriela, R., Pedro S. B.J. (2018). Accidental poisoning by castor bean (*Ricinus communis*) cake in horses. *Pesquisa Veterinária Brasileira*. 38:10.
- Diriba, G., Debela, A. (2019). Identification of Poisonous Plants and Their Toxics Effects on Livestock in Horo Buluk District, Horo Guduru Wollega Zone, Oromia Regional State, Western Ethiopia. *Biomedical Journal of Scientific and Technological Research*. 23(3):2019
- Dolan, R., Welch-Keesey, M. (2016). A guide to poisonous and non-poisonous plants in Indiana. Indiana Poison Center. <https://iuhealth.org/images/met-doc-upl/plant-guide.pdf>
- Enno, F. (2010). Toxicity of *Datura Stramonium* in: Pharmacology and Abuse of Cocaine, Amphetamines, Ecstasy and Related Designer Drugs. 2010 ISBN: 978-90-481-2447-3.
- Gomaa, N., Youssef, M., Zaki, D. (1973). Some pharmacological studies on *Dovyalis caffra* W. fruit. *Plant Foods for Humun Nutrition*. 22, 277–284.
- Gupta, P.K. (2018). Poisonous plants in Illustrated Toxicology, 2018. Elsevier Inc.
- Hanane, B., Fadma, G., Abba, H.T., Mustapha, B., Mohamed, O.B.I. and Mustapha, D. (2018). Inventory of Toxic Plants in Morocco: An Overview of the Botanical, Biogeography, and Phytochemistry Studies. *Journal of Toxicology*. ID 4563735, 13 pages.
- Haq, I. (2004). Safety of medicinal plants. *Pakistan Journal of Medical Research*. 43(4): 203-10. <https://www.omicsonline.org/conferences-list/ethnobiology-and-ethnobotany-conferences-to-attend>. Accessed August, 2020
- Infonet biovision (2019). Plant and Other Poisoning (new) Retrieved from; <https://www.infonet-biovision.org/AnimalHealth/Plant-and-Other-Poisoning>
- Kamsu-Foguem, B., Foguem, C. (2014). Adverse drug reactions in some African herbal medicine: Literature review and stakeholder interviews. *Integrative Medicine Research*. 3(3):126-132.

- Kelly Berry (2008). Poisonous Flowers: Marigolds Retrieved from; <https://www.hunker.com/12003594/poisonous-flowers-marigolds>
- Lock, J. M. (1972). "Baboons feeding on *Euphorbia candelabrum*". *African Journal of Ecology*. 10 (1): 73–76.
- Maria L.C., Francesca A., Tiziana D. P., Paola M., Fabrizio M. S., Maurizio B. (2009). Exposures and Intoxications after herb-induced poisoning: A retrospective hospital-based study. *Journal of Pharmaceutical Sciences & Research*. 2(2): 123-136.
- Mokgobi, M.G. (2014). Understanding traditional African healing. *African Journal for Physical, Health Education, Recreation and Dance*. 20(2):24-34.
- Narayanaswamy, T., Thirunavukkarasu, T., Prabakar, S., Ernest, D. (2014). A review on some poisonous plants and their medicinal values. *Journal of Acute Disease*. 85-89.
- Ogwang, B.H. (1997). A survey of poisonous plants of livestock in Swaziland. *Bulletin of Animal Health and Production in Africa*. 45: 99-106.
- Oreagba, I.A., Oshikoya, K.A., Amachree, M. (2011). Herbal medicine use among residents in Lagos, Nigeria. *BMC Complementary and Alternative Medicines*. 11:117-124. DOI: 10.1186/ 1472-6822-11-117
- Philomena, G. (2011). Concerns regarding the safety and toxicity of medicinal plants - An overview. *Journal of Applied Pharmaceutical Sciences*. 2011; 01(6): 40-44.
- Phua, D.H. Zosel, A., Heard, K. (2009). Dietary supplements and herbal medicine toxicities—when to anticipate them and how to manage them. *International Journal of Emergency Medicine*. 2:69–76.
- Rehman, U.K., Sultan, M. and Saad U. K. (2018). Toxic effect of common poisonous plants of district Bannu, Khyber Pakhtunkhwa, Pakistan. *Pakistan journal of Pharmaceutical Sciences*. 31(1):057-067
- Samar, K. B., Partho K. B., Sabitabrata, B., Soham, B. (2009). Keratouveitis caused by *Euphorbia* plant sap. *Indian Journal of Ophthalmology*. 57(4): 311–313.
- Samuel, S.C. A., Brena, P.R., Raquel, F.A., Juceli, S.O., Rosane, M.T. M. et al., (2014). Spontaneous poisoning by *Ricinus communis* (Euphorbiaceae) in cattle. *Pesquisa Veterinária Brasileira*. 34(9):827-831.
- Trancă, S. D., Szabo, R., Cociș, M. (2017). Acute poisoning due to ingestion of *Datura stramonium* - a case report. *Romanian Journal of Anaesthesia and Intensive Care*. 24(1): 65–68.
- Tropical Plants Database, Ken Fern. Tropical.theferns.info. 2020-09-04.
<tropical.theferns.info/viewtropical.php?id=Euphorbia+candelabrum> Retrieved from
<http://tropical.theferns.info/viewtropical.php?id=Euphorbia+candelabrum>. Accessed August, 2020
- Uzabakiliho, B., Largeau, C., Casadevall, E. (1987). "Latex constituents of *Euphorbia candelabrum*, *E. grantii*, *E. tirucalli* and *Synadenium grantii*". *Phytochemistry*. 26 (11): 3041–3045.
- White P. (2015). The concept of disease and healthcare in African traditional religion in Ghana. *HTS Theological Studies*. 71 (3):5
- World Health Organization: WHO traditional medicine Strategy 2002-2005; 2002. WHO Geneva. WHO, 2002.