THE EFFECT OF SUPPLEMENTING LEFTOVER GROUND TEA TO A GRASS HAY RATION ON THE BODY WEIGHT OF YEARLING SHEEP.

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MoA- Ministry of Agriculture

ABSTRACT

TITLE: THE EFFECT OF SUPPLEMENTING LEFTOVER GROUND TEA TO A GRASS HAY RATION ON THE BODY WEIGHT OF YEARLING SHEEP

This experiment was conducted in HAC Dairy Farm located in Zoba Anseba for a period of 60 days to examine the effect of supplementing left over ground tea to a grass hay ration on the body weight of yearling sheep. Six yearling sheep were used in the trial using CRD with three replications and two treatments. From the feeding trial conducted it was shown that left over ground tea has significant effect on body weight gain of sheep at 5% level of significance. The control groups were fed a basal ration of grass hay and bread and treatment group provided basal ration added with bread and leftover ground tea as a supplementing feed. After the trial was completed treated animals showed increment in body weight that is, 77.67g/day whereas the control group maintained their body weight only increase 8.33g/day. The feed intake of the basal ration on the treatment group were significantly increased at the rate of 356.9g/day by supplementing left over ground tea whereas control group consumed 335.4g/day. Based on the result of this trial it was recommended that ground tea left over supplementation could be used as the main source of feed to improve animal performance in the arid and semi-arid parts of the world including Eritrea.

INTRODUCTION

A poison is a substance or chemical capable of producing adverse effects on an individual under appropriate conditions. Poisonous plants are plants which as a whole or part under all certain conditions and in manner and amount likely to be taken or brought into contact with an organism that exert harmful effect or death either immediately or by cumulative action of property due to the presence of known or unknown chemical substances (Douglas, 2008).

In the nineteenth century, poisonings due to plants reached near-epidemic levels as people often foraged for sources of food from natural plantings. Today, potentially dangerous plants can still be found all around us. Poisonous plants are frequently part of plants at homes as well as in landscape plantings outdoors. This has become increasingly problematic as more and more cultivated, exotic plants from throughout the world are introduced into the landscape. Recent studies have estimated that 3.5% of all poisonings in the United States are due to plants (Douglas, 2008).

The study of plant poisons is known as phytotoxicology. Most of the poisonous higher plants are angiosperms, or flowering plants, but only a small percentage are recognized as poisonous(ref). Several systems have been devised for the classification of poisonous plants, none of which is completely satisfactory. In general poisonous plants may be classified according to the chemical nature of their toxic constituents, their phylogenetic relationship, or their botanical characteristics . The following classification, which is based on their toxic effects, has been found to be useful. Accordingly, the effect of poisonous plants can been seen when: (1) when they are eaten (2) when they come upon direct contact (3) when they produce photosensitization, and (4) when they induce airborne allergies (Halstead, 2010).

All types of native and introduced plants can be poisonous including ferns, herbaceous plants, woody shrubs, and trees. Identifying plants that are poisonous is difficult since poisonous plants do not appear distinctly different from their nontoxic relatives or counterparts. Many poisonous plants have such unpleasant tastes that most adults don’t chew them for very long before spitting them out. However, some poisonous plants are not distasteful and can even be sweet and, if eaten in large quantity, can cause serious problems . An example is the fruit of deadly nightshade, Solanumdulcamara; the red berry is not only attractive but also tastes sweet. However, regardless of age, reactions to poisonous plants vary with the individual and can be influenced by diet, metabolism, and medications being taken (Douglas, 2008)

The substances responsible for poisonings or toxic reactions originate from many different pathways within plants. However, most poisonous principles are considered to be secondary metabolites or by-products from the essential functions of the plant . These are compounds that aren't considered fundamental to the life of the plant. Although there are many theories as to why plants produce these nonessential compounds, one of the key theories maintains that plants have evolved to produce these compounds in order to deter animals from grazing on them and to keep insects from eating them. (Douglas, 2008)

Plants can differ by degree of toxicity and many references classify plants as extremely, moderately, or minimally toxic. However, it is difficult to categorize plants with regard to their toxicity since this varies with the age of the victim (directly related to body weight) as well as other factors that influence levels of toxic principles in plants such as environment and stage of plant growth. For example, young shoots of pokeberry or pokeweed (Phytolaccaamericana) are not poisonous but roots and fruit are poisonous. Additionally, many plants are only mildly poisonous or cause symptoms only in unusual circumstances such as when they are consumed in great quantity. (Douglas, 2008)

Plant poisons, or phytotoxins, comprise a vast range of biologically active chemical substances, such as alkaloids, polypeptides, amines, glycosides, oxalates, resins, toxalbumins, and a large group of miscellaneous compounds whose chemical structure has not yet been determined(ref). Alkaloids, most of which are found in plants, are characterized by the presence of nitrogen and their ability to combine with acids to form salts. They are usually bitter in taste. It has been estimated that about 10 percent of the plant species contain some type of alkaloid. Only a few of the 5,000 alkaloids characterized thus far do not produce any biological activity; most cause a strong physiological reaction when administered to an animal. Amines are organic compounds containing nitrogen.

A polypeptide is a string of three or more amino acids. A few polypeptides and amines are toxic to animals. Some glycosides, which are compounds that yield one or more sugars and one or more other compounds—aglycones (nonsugars)—when hydrolyzed (chemically degraded by the introduction of water molecules between adjacent subunits), are extremely toxic to animals(ref). Toxicity resides in the aglycone component or a part of it.

Oxalates are salts of oxalic acid, which under natural conditions is not toxic, but becomes so because of the oxalate ion. Resins, a heterogeneous assemblage of complex compounds, differ

widely in chemical properties, but have certain similar physical properties. Some resins are physiologically very active, causing irritation to nervous and muscle tissue. Toxalbumins are highly toxic protein molecules that are produced by only a small number of plants. As has been stated by Halstead (2010), Ricin's toxalbumin from the castor bean (Ricinus communis), is one of the most toxic substances known (Encyclopædia Britannica, 2010).

Blood poisons affect the ability of blood to carry oxygen or hamper the functioning of the circulatory system. The glycosides produced by various species of cherries are potential blood toxins, though the fruits must be consumed in large quantities to be toxic . The seeds of the castor bean (Ricinuscommunis), as has been observed contain the toxalbuminricin, which causes burning of the mouth, throat, and stomach, followed by vomiting, diarrhea, and abdominal cramps. Convulsions and difficulty in breathing may follow. A single seed may be sufficient to cause death in children. The rosary pea (Abrusprecatorius), which grows in the tropical regions of the Americas, produces a blood toxin called abrin that is nearly as toxic as ricin .

The flowers and seeds of jimsonweed (Daturastramonium) contain very powerful nerve poisons, hyoscine and atropine. Jimsonweed is widespread in Europe and North America, and its large white flowers make it especially attractive to children. The toxic effects include headache, nausea, dizziness, thirst, and a dry, burning sensation in the skin . This may be followed by mental confusion and loss of memory. Belladonna (Atropa belladonna) and black henbane (Hyoscyamusniger) are widespread poisonous herbs that produce alkaloids quite similar to those found in jimsonweed.

Poisons that interfere with the transmission of impulses from the nerves to the muscles are called neuromuscular poisons. Foxglove (Digitalis purpurea) contains several poisonous chemicals, including digitoxigen and several glycosides. The plant is native to Europe, but it is grown in temperate regions throughout the world. Among the early symptoms of poisoning are loss of appetite, nausea, and drowsiness. These symptoms are followed by slow and irregular heartbeat, headache, and abdominal pain. The drug digitalis is derived from the digitoxigen produced by foxglove and is used in small quantities to treat heart disease.

Curare is a name given to a variety of alkaloids used by some South American Indians to poison the tips of arrows. It is derived from the bark of several trees, most notably the moonseed vine (genus Chondodendron) and Strychnostoxifera. This powerful poison causes almost immediate paralysis.

These poisons affect muscle tissue. For example, false hellebore (Veratrumviride) contains several alkaloids that act directly on muscle tissue. Symptoms include vomiting, abdominal pain, and muscular weakness.

Skin irritants are among the most familiar plant poisons. Poison ivy (Rhustoxicodendron) and poison sumac (R. vernix) are widespread in the Eastern United States, while poison oak (R. diversiloba) is common in the West . The leaves, stems, and roots of these plants produce an oil called urushiol.

Cases of poisoning can develop in all seasons of the year from handling the broken stems, the leaves, or the berries. Even the smoke of burning poison ivy or poison oak can result in severe poisoning of persons in the area.

Not everyone is subject to poisoning by these plants, and some people who are immune for years may suddenly become sensitive to the toxin. Within 12 hours to several days after exposure, small white blisters appear on the skin along with severe itching. As the blisters break, the area becomes moist, swollen, and inflamed.

Poisonwood (Metopiumtoxiferum) grows in the Caribbean region and in Florida. Contact with any part of this tree turns the skin black and eventually causes a rash or blister. Snow-on-the-mountain (Euphorbia marginata) is widely cultivated in gardens in the Northern Hemisphere. The milky sap of this plant can cause severe eye irritation and temporary blindness.

People have found a number of uses for poisonous plants. In some hunting cultures, plant poisons such as curare are used on the tips of arrows and spears to kill large game. Plants that produce narcotic substances are often quite poisonous if eaten in large quantities. Taken in small amounts, however, these plants can cause hallucinations, and they are used in religious ceremonies in some cultures.

A number of poisonous species are popular house and garden plants. Dumbcane (Dieffenbachia seguine), for example, is grown in homes around the world. Some garden plants such as monkshood, foxglove, and larkspur are also poisonous.

Many of the poisons produced by microbes and plants are actually very useful medicines if given in proper doses. For example, curare is used in small doses as a muscle relaxant in the treatment of tremors and tetanus. Many of the toxic compounds produced by bacteria and fungi have antibiotic properties and can be used to fight infection. The deadly narcotic cocaine, derived from the coca plant (Erythroxylum coca), was once used as a local anesthetic until its toxic and

addictive qualities were recognized.(Encyclopædia Britannica, 2010). Our review of litrerature did not indicate any experimental work regarding the toxic effect of the leaves of Capparis Tomentosa. The objective of the present study was to characterize the clinical, pathological and biochemical changes associated with intoxication with leaves of in Capparis Tomentosa rabbits.

The following objectives were investigated

- To study the toxicity of Capparis Tomentosa on rabbits
- To study blood chemistry of the rabbits that were fed the plant
- Investigate the pathological changes due to the plant toxicity.
- Correlate biochemical changes with organ function tests

CHAPTER ONE

Review of literature

1.1 Poisonous plants in Eritrea

There are many poisonous plants in Eritrea. Some of these are: capparis tomentosa, lantana camara(lantana),nerium oleander(red flower),nerium odorium (white flower),calatropis procera(apple of Sodom), ricinius communis (castor bean),nicotiana glauca (tobacco tree), datura stramanium (thorn apple, jimson weed), euphorobia abyssinica. (Orwa,2009)

1.1.1 Capparis tomentosa- habitat

Capparis tomentosa is a small spiny tree or scrambling shrub found in tropical or other warm regions. In northern Botswana and South West Africa it is a good sized tree. It grows up to 10m height, well-branched and with dense leaves. It occurs in a wide range of habitats, as evergreen and costal forests, in open woodlands and hot dry thornvelds and on mountain slopes. (Orwa,2009)

The generic name is derived from the Arabic 'kapar', the name for Capparis spinosa. The specific name ‘tomentosa’ means ‘densely hairy’ in reference to the hairiness of the leaves and branches. It has different local names according to different societies such as Afrikaans (wollerige kapperbos); Amharic (gumero); Arabic (sharube) and English (woolly caper-bush); French (caprier d′ Afrique); Shona (khawa); Somali (gombor lik); Swahili (mbada paka); Tigrigna (andel). (Bein etal.1996)

This species has traditional medicinal and magical uses in Africa. It is a decorative plant in gardens and can be used for hedging; being suitable as a security barrier because of the hooked spines. The fruit may sometimes be eaten by people. (Pooley,1993)

It is a decorative garden plant that is used for hedging in many rural communities in South Africa. Its most popular common name, wag-‘n-bietjie (wait a minute), describes the use of the plant as a security barrier because of its hooked spines. It is a spiny, much-branched shrub or small tree, with an upright trunk and climbing, pubescent branches. Leaves are elliptic, elliptic-oblong or ovate, 26–70 mm long and 13–80 mm wide, with tips usually round with a sharp point, light green to greyish green, sometimes rusty colored, soft and velvety but sometimes smooth. Hooked and sharp spines are found in the axils of the leaves, sometimes notched or blunt; base rounded or narrowed; margin entire and rolled under. The baby leaves and fresh shoots of the related species C. spinosa are eaten as a vegetable or salad. The flower buds are pickled and used as a pungent condiment. Buds grow in clusters and open into large, fragrant flowers with pale yellowish-green petals, up to 3.5 cm in diameter, encircling a tuft of long, slender, white or pink stamens 3.5 cm long; conspicuous gynophore. Trees are well branched and branches are

normally covered with thick yellow hairs; even the robust, recurved spines are often hairy. (Orwa,2009)

Flowers are fragrant with pale yellowish green petals, that surround a tuft of white or pink stamens, that grow up to 30 mm long. The flowers develop into red, globose, pendulous fruits, that grow up to 50 mm in diameter .The fruits of other species are reported to be edible. Seeds are dark brown, ovoid to kidney shaped and 1–15 mm long. They are surrounded by a juicy, white to pinkish pulp. The plants flower in spring and early summer, from August to November. Flowers open in the morning and start to fade in the middle of the day. Fruits are produced in summer, from December to March. (Orwa,2009)

1.1.2 Distribution of the plant

Capparis tomentosa is indigenous to the Eastern Cape, KwaZulu-Natal, Mpumalanga and Limpopo Provinces (ref). It grows in arid, sandy plains, mountain slopes, forests; river banks and coastal bush. The species grows from Natal, Swaziland, Transkei, Zululand, and eastern and northern Transvaal, westward across Botswana into northern Namibia, and northwards into tropical Africa. It occurs in coastal bush, forests, riverbanks, mountain slopes, evergreen forests, hot and dry thorn veld, and in arid sandy plains. It grows most often as a spiny, scrambling bush or dense climber, hauling itself into the branches of trees and shrubs. It also grows on the tops of anthills, making a solid, tidy crown and occurs in the semi-arid and humid lowland and highland woodlands, forest edges and scrub. May become a weed if not adequately controlled.

1.1.3 Toxic compounds of the plant

Glucosinolates are the characteristic compounds of the Capparidaceae plants. If plants are destroyed by crushing, glucosinolates are altered by the enzyme

myrosinase into mustard oils. These bring a bitter taste and a hot smell and have skin irritant and antibacterial properties. Therefore plants of this family are used as condiments like radish or the fresh leaves of the lettuce Rucola.

In dried leaves glucocapparin, gluconorcappasalin and benzylglucosinolates can be found. The air dried root, successively extracted with solvents was eluted on a Silica gel 60 column with EtOAc-petrolether mixture (4:1). It afforded colourless crystals of a new oxindole, 3-hydroxy-3-methyl-4-methoxyoxindole, mp 230° C, MS 193.073).Further, compounds are common plant products like fatty acids, hydrocarbons, ß-carotene, rutin, and sitosterol antibacterial activity.

The new oxindole isolated from the roots of C. tomentosa showed a slight,

anticonvulsant activity.

The most important chemical compounds in the plant family of Capparidaceae are glucosinolates bringing the pungent smell of the condiment. But there was only one, new information about the components of C. tomentosa reporting an oxindole with a weak anticonvulsant activity (4). Regarding this compound no sufficient data is available, but with its heterocyclic structure it must be judged as toxic, particularly with regard to the fatal results with the goats and sheep.

Therefore all parts of *Capparis tomentosa* must be classified toxic in longer use.

Other compounds associated with *Capparis tomentosa* were identified as 24-ethylcholestan-5-en-3-ol a phytosterol and a dipeptide derivative, N-benzoylphenylalanylaninol acetate. (Akoto,2008).

1.1.4 Effect on animals

Medicinal uses of the plant are numerous. It is used to treat fever; mixed with dried hyena and antelope blood and ox fat, it is used in

the ritual treatment of pneumonia. A decoction of the leaves is used for the treatment of asthma; a decoction prepared by scraping the bark and mixing it with goat soup is drunk for chest pains. Decoction of the root is a cough remedy, but it must be used with care, as it is highly poisonous when taken in large quantities. (Lerato,2016).Leaves or roots of Capparidaceae plants are used as spices all over the world. In South Africa C. tomentosa has a reputation for healing a lot of complaints ranging from cough to infertility and impotence (Lerato,2016).

Regardeless of all these beneficial uses the plant exert toxic effects when it is consumed naturally of experimentally. Desert sheep, zebu calves and Toxic effects on Nubian goats

Nubian goats were given repeated doses of 5, 2.5 and 0.25 g/kg of dried leaves or stems of C. tomentosa, orally. At various time points after application the goats died or were slaughtered. The prominent features of intoxication were inappetence, locomotoric disturbances, paresis of the hind limbs and recumbency. Anaemia developed, kidney and liver functions were showing pathological changes. The anatomical investigation showed ne lesions in the gray matter of the spinal cord in the sacral region, degeneration of the renal proximal convoluted and collecting tubules, atrophy of the cardiac, renal and pelvis fat, and straw-coloured fluid in serous cavities. One goat receiving 2.5 g/kg daily developed toxicosis after 8 days, but recovered after cessation of plant administration.

Similarly when five desert sheep and three Zebu calves were given dry leaves of C. tomentosa. The clinical signs of the poisoning were weakness of the hind limbs, staggering, flexion of the fetlock and the phalangal joints, inappetance and recumbancy. In the serum there was a decrease of total protein and calcium. An increase of glutamic oxalacetic transaminase (GOT), ammonia, sodium and potassium values were reported. The main pathological changes were vacuolisation of the neurons and axons in the spinal cord and necrosis of the centrilobular hepatocytes and renal convoluted tubules and glomeruli (2)Nubian goats when fed varying amounts of dry Capparis tomentosa leaves died or were killed in extremis at various times after the commencement of dosing (ref). Signs of Capparis poisoning in the sheep and calves were; weakness of the hind limbs, staggering, swaying, flexion of the fetlock and phalangeal joints, pain in the sacral region, inappetence and recumbency (ref). There was a decrease in the level of total protein and calcium and an increase of glutamic oxaloacetic transaminase (GOT), ammonia, sodium and potassium in serum (Ahmed,1981).

The main pathological changes were vacuolation of the neurons and axons in the spinal cord, with necrosis of the centrilobular hepatocytes and renal convoluted tubules and glomeruli. In Capparis-fed goats, anemia developed and the results of kidney and liver function tests were correlated with clinical abnormalities and pathologic changes.[5] The prominent features of toxicity were inappetence, locomotor disturbances, paresis especially of the hind limbs and recumbency.[5] Lesions were identified as perineuronal vacuolation in the gray matter of the spinal cord at the sacral region, centrilobular hepatocellular necrosis, degeneration of the renal proximal convoluted and collecting tubules, serous atrophy of the cardiac fat and renal pelvis and straw-colored fluid in serious cavities.

1.1.5 Monitoring of the toxic effects

A good method to monitor the toxic effect of the harmful plants is to perform organ function tests. Liver and kidneys play a significant role in this regard. The liver by detoxifying the toxic substances and the kidneys by elimination waste products from the body and expel them from the body as unie. Accordingly, monitoring the function of these organs will give good indicators about the health of the body. In regard to liver there are many tests t\can be performed, but measuring of the levels of proteins, liver enzymes and bilirubin are good tools to monitor the function of the organ. The most commonly used tests to check liver function are the albumin (ABL), Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Alkaline

phosphatase (ALP), bilirubin (BIL-T). For the kidneys the ideal monitoring tests are serum creatinine (CREA) and blood urea nitrogen (BUN). The elevation of the serum levels of these substances is directly correlated with the damage of the organs inflicted by toxic substance when their effect reaches intolerable levels.

CHAPTER TWO

MATERIALS AND METHODS

2.1 Source of experimental animals and their management

The toxic effect of Capparis tomentosa was studies on rabbits. A total of six healthy rabbits were obtained from laboratory animal facility at Hamelmalo Agricultural College (HAC). Each animal was kept in a separate cage and Alfa alfa, cabbidge leaves and water were provided *at labitum*. Prior of the commencement of the experiment the weight of the animals was recorded and blood samples were collected from each rabbit for hematological and biochemical studies. These data were used to establish the standard parameters of the animals.

2.2 Experimental design and administration of the Toxic plant

After one week of acclimatization of the rabbits to the new environment, five animals were assigned as experimental and the six rabbit was used as a control. The experimental animals were given and initial daily dose of freshly picked up green leaves of Capparis tomentosa widely grown in the vicinity of Hamelmalo Agricultural College (Fig1).

The doses of the plant were set as follows: 0.25, 0.5, 0.75, 1.0 and 1.25gm/ body weight. The plant was finely chopped and given with similarly prepared standard ration of alfa alfa and cabiddge leaves (Fig.2).

To ensure the total consumption of the daily dose of the plant, the mixed ration was given around 10 AM every day. After the plant has been consumed, only then more alfa alfa and cabbidge leaves were given *at labitum*.

The animals were observed twice a day for abnormalities and/or detectable clinical signs. After one week of the initial treatment and with lack of visible clinical signs the daily dose of Capparis tomentosa was doubled to be as follows: 0.5, 1.0, 1.5, 2.0 and 2.5g/bwt. Table (1) shows the weight of the animals and the assigned doses. The control animal was given only the standard ration without addition of toxic plant.



Fig.1 Caparris tomentosa grown around Hamelmalo Agricultural College



Fig.2 Feeding of the rabbits with C. tomentosa mixed with Alfa Alfa and cabbidge leaves

Table1. Weight of rabbits and doses of Capparis tomentosa.

Rabbit No	Weight (kg)	1st dose of leaves g/kg	Total consumed plant (g)	2nd dose of leaves g/kg	Total consumed plant (g)
1	4.0	0.25	1.0	0.5	2.0
2	3.0	0.5	1.5	1.0	3.0
3	4.0	0.75	3.0	1.5	6.0
4	4.0	1.0	4.0	2.0	8.0
5	3.0	1.25	3.75	2.5	7.5
6	3.5	0.0	0.0	0.0	0.0

2.3 Collection of samples

Blood samples were collected from the marginal ear vein or directly through cardiac puncture of those recently died or killed animals (Fig.3). Three Blood samples were collected during the experiment with 6-12 days interval. The initial samples, as has been stated earlier, were used to establish normal parameters before the onset of the treatment. The following samples were collected to study the effect of the treatment on the rabbits. Two sets of blood samples were collected from each animal, whole and EDTA-added samples.



Fig. 3 Collection of blood from marginal ear vein

Three Blood samples were collected during the experiment with 10-15 days interval. The initial samples, as has been stated earlier, were used to establish normal parameters before the onset of the treatment. The following samples were collected to study the effect of the treatment on the rabbits. Two sets of blood samples were collected from each animal, whole and EDTA-added samples.

The test tubes containing whole blood were centrifuged at 3000/rpm for 10 -15 minutes or left at room temperature till the serum was completely separated. The separated sera were carefully labeled, packed and sent to the National Laboratory in Asmara for biochemical analysis of liver and kidney function tests. Parameter evaluated for this purpose were albumin (ABL), Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Alkaline phosphatase (ALP), bilirubin (BIL-T), , creatinine (CREA) and blood urea nitrogen (BUN)

Along with the blood, tissue samples were also collected during the postmortem examinatom. The latter include liver, kidney, heart, intestine, gall bladder, lung and whole brain and all were fixed in 10% formalin for further histopathological studies.

The biochemical data was statistically analyzed using F-test

CHAPTER THREE

RESULTS AND DISCUSSION

3.1 Clinical signs

The rate of the clinical signs was accelerated after the commencement of the second treatment**.** These can be summarized as follows. During the experiment, especially after the second treatment, most of the animals showed inappetence which varied from one animal to another, accompanied, animals, in most animal with depression, bloat, lacrimation, excessive salivation and slightly yellow diarrhea. Just prior to death the animals completely refused to eat or drink. At this stage the prominent clinical signs were dullness, incoordination, paresis of the hind limbs and sternal recumbency. One rabbit gave birth of 9 litters, all of them died within 24 hours.

Four animals (4,5,2 and 3, in the order of their deaths'dates) died during the experiment; the control rabbit was slaughtered at the end of the experiment. The first animal receiving the smallest dose of the plant (2g/kgbwt) survived the course of the experiment without showing detectable clinical abnormalities. Animals died during the experiment or slaughtered were immediately necropsied and pathological changes were recorded.

3.2 Postmortem changes

At necropsy, the postmorten changes in all animals were almost consistent and characterized by markedly enlarged stomach, large intestine and colon (Fig. 4).

In one animal the abdominal cavity contained around 30 ml of turbid fluid with fibrin flakes. No readily visible changes were detected in other systems.

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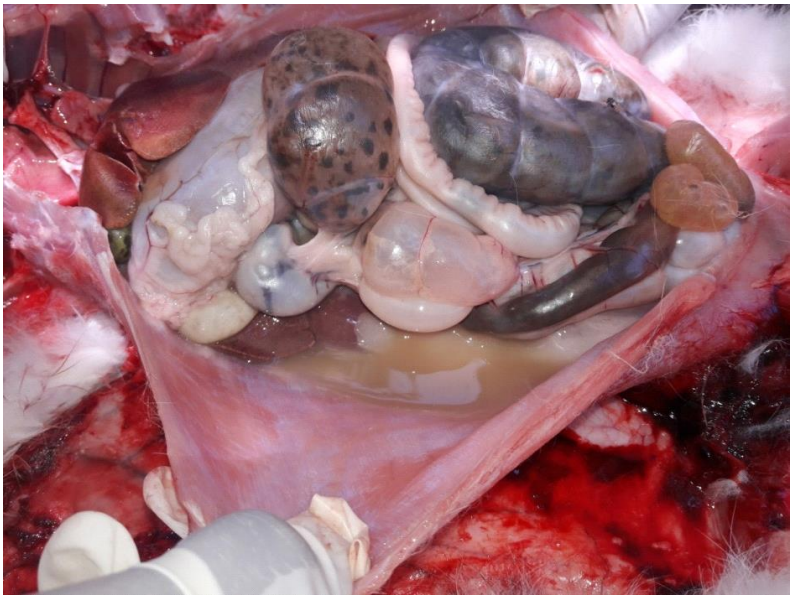


Fig4 Markedly enlarged stomach and cecum





Fig.5 Liver (from rabbit No 5) is enlarged with round edges and the gall bladder is markedly distended. Compare with the control normal liver on the left

3.3 Biochemical data and statistical analysis of serum parameters

In C.tomentosa-fed rabbits, the results of liver and kidney functions tests were correlated with the clinical and pathological changes presented at the time of necropsy. Parameters of normal organ function tests (prior treatments) are presented on Table 2.

Table 2. Results of liver and kidney function tests of the rabbits before the treatment

	Liver function tests					kidney function tests	
Rabbit I.D.	ABL	AST	ALT	ALP	BIL-T	CREA	BUN
1	4.77H	41.90	38.05	9L	0.15	1.6H	10.13
2	4.1H	20.21	42.19H	21L	0.12	1.2	11.09
3	4.59H	25.41	23.10	36L	0.11	1.6H	13.81
4	4.06	12.17	38.50	33L	0.08	1.2	5.93L
5	5.18H	35.85	50.93H	53L	0.19	1.4H	12.52
6	4.47	35.10	13.92	22L	0.15	1.5H	16.79

Table 3 compiled statistical data of treatments

treatment A	ALB	T Bil	AST	ALT	ALP	Creatinine	BUN
1	4.707	0.0625	45	35	14.5	1.425	12.1
2	4.193	0.0475	45	67	4.1	1.378	15.3
3	4.571	0.0386	7	6	25.1	1.411	11.6
4	4.207	0.04	93	59	28.8	1.296	17
5	4.707	0.1467	61	154	35.4	1.429	18.4
control	4.755	0.0575	32	25	24	1.5	16.7
Mean	4.523333333	0.065466667	47.16666667	57.66666667	21.9833	1.4065	15.1833333
P-value	0.112	0.012	0.541	0.216	0.016	0.901	0.677
singnificanc	NO	YES	NO	NO	YES	NO	NO
L.S.D	0.5241	0.05462	100.7	126.3	15.56	0.3031	11.14
C.V	7.2	52.1	131	136.7	44.3	17.5	45.9

Figures 6.1 - 7 show graphic presentation of the level of biochemical results of the studied chemistry panels. It is evident that most of the treated rabbits, particular Nos 4 and 5) receiving the larger doses of the plant (7.5g/bwt) showed the highest level of all liver parameters and BUN; only Creatinine was lower when compared with the control.

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Fig. 6-1 level of albumin

Fig. 6-2 level of bilirubin

Fig. 6-3 level of AST

Fig. 6-4 level of ALT

Fig. 6-6 level of creatinine

Fig 6-5 level of ALP

Fig. 6.7 level of BUN

From here one can speculate that the effect of C. tomentosa was severer on liver function compared to kidney. The livers, particularly in these animal were enlarged, slightly yellowish and the gall bladder was markedly distended with bile (Fig 5). On the other hand postmortem examination of the kidney did not show comparable changes..

Conclusions and Recommendations

Conclusions

The findings of the study revealed that C. tomentosa has a cumulative toxic effect on rabbits. It appears that a daily dose of 2g/bwt is tolerable, but exceeding beyond that the sings of toxicity

can be detected both pathologically and biochemically. The prominent pathological changes were enlarged, slightly yellowish liver with distended gall bladder and marked distention of large intestine. Although the central nervous system was not investigated in this study, yet animal that received the high doses of the plant developed detectable nervous manifestation characterized characterized by tremors, incoordination and hind leg paralysis.

Biochemically there was elevated total bilirubin, AST, ALT, ALP and creatinine, all these are comparable with the pathological findings.

Recommendations

- Toxic plants have adverse effect on animal health and production.
- More research has to be done and the sample size has to be increased.
- More parameters should be investigated to study the real interaction of the toxic plant with tissue
- Similar studies should be conducted especially among small ruminants, the dominant species in the country
- The public should be aware of the toxic potentials of these plants both on human as well animal populations.

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