

## Biology of bezoars formation in goat

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**Abstract :** Bezoars were isolated from gastrointestinal tract of certain goats and they were used the treatment of ailments like snake bite, old age, plague, high fever, convulsion, stroke, epilepsy and evil spirits as it was believed that bezoars had healing powers. Bezoars are classified according to the materials which they are composed. In view of the lack of information and owing to importance of the problem towards medicine preparations and its health hazards the present study has been undertaken. The aim of the present study was to evaluate the effect of plant material, season, sex, age on bezoars formation in goat.

**Key words :** Bezoars, *A.indica*, Abomasum, Antidote

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## INTRODUCTION

Bezoars are tightly packed collection of partially digested or undigested material stuck in the stomach or other parts of the digestive tract. The word "bezoar" is derived from the Arabic "bezahor" or "badzehr", which means antidote or counter-poison; animal bezoars were widely used in medicine until 18<sup>th</sup> century (Dietrich, 1985, De backer, 1999 and Bowden, 1983). Arabs and persians had the strange fortune of consuming in large quantities as having medicinal properties (Goldman *et al.*, 1998 and Mc loughlin, 1979 and Zarlign *et al.*, 1984). Bezoars are classified according to the material which they are composed of: phytobezoars (Lee *et al.*, 1977), trichobezoars (Scoular *et al.*, 1979), drug bezoars (Bruck *et al.*, 1975), lactobezoars (Emersm, 1987) and miscellaneous bezoars or poly bezoars (Robles, 1994). Bezoars formed in animals were used as an anti dotes to poison (Vishwanathan *et al.*, 1986).

The original bezoars came from goats found in the mountains of Western Persia. They were introduced to Europe from the Middle East some time in 11<sup>th</sup> century and they remained popular there until the 18<sup>th</sup> century (Walker Renard, 1993). Zarlign and Thompsan (1984) studied the properties of bezoars by modern examination. They have shown that they could, when immersed in an arsenic-laced solution, remove the poison.

In the past bezoars were isolated from the gastrointestinal tract of certain goats and sheep and preserved to be used as medical charms. This has been used as early as 1000BC (Andrus, 1989) It was believed that bezoar has the power of universal antidotes against any poison including snake bite. Bezoar is widely reputed antidote in traditional medicine among Iranian tribes, and is mostly used orally (Warell, 1976). Alam (1998) showed that the anti-snake venom activity of bezoar be due to its plant component. The beneficial efforts of bezoar on snake venom toxicity may be through its interaction with haemostatic system which is altered by snake venom injection (Asuzu, 2003). Phytobezoars are the most common type of bezoars today. They are composed of food material non digestible by humans including cellulose, hemicellulose, lignin and fruit tannins (Balik, 1993 and Holloway, 1980). In high concentrations, fruit tannins may form a coagulum upon exposure to an acidic environment initiating the formation of phytobezoars (Matsue, 1978 and Izumi, 1933).

## RESEARCH METHODOLOGY

The present study has been undertaken in Regonda mandal, Warangal district, A.P. The former of this area and parents of one of the authors (Raju) have been rearing bezoar

goats for the last 20 years. With this vast experience the authors have inspired to undertake this work. The study extends from Jan.2006 to Dec.2008 involving selection of area, number of goats, prevalence of bezoar goats, methods and type of feeding and analysis of results.

### Study design :

#### Collection and storage of *Acacia indica* fruits:

Ripen fruits of *A. indica* were collected during April and May from different places of this region and dried under sun light. During this process some gum like substance forms a layer around the seeds of the fruits. Clean and complete dried fruits will be stored in gunny or polythen bags till to feeding.

#### Feeding of *A. indica* fruits :

Local available goats (1-2 years old) have selected for the experiment. Salt water (1kg salt/20 L water) was sprinkled on dried fruits before feeding. Dried fruits were fed to goats morning (6-7am) and evening (6-7 pm) daily (1/2kg/30kg body weight) before they feed plants material. Period of this feeding was 10-20 days.

#### Bezoars formation:

After feeding with *A.indica* dried fruits, goats were provided specific plants material (leaves of *Bridelia*, *Chlorozylon* and *Holarrhea* species). These plants are trees or bushes which are available in Regonda forest area. Feeding of plants material was 90-120 days. During this period bezoars were formed. In which bezoars were not formed they were called as non-bezoar goats.

#### Reasons for non-formation of bezoars:

- Some goats do not like to feed dried fruits of *A. indica*
- Specific plants material may not be available for

required periods or goats do not feed these plants.

- Due to infections/disease and high body temperature.
- Due to incomplete de wormation.
- Some plant materials inhibit bezoars formation.

#### Processing of bezoars :

Immediately after feeding period is over goats were cut at slaughter house and bezoars were separated from stomach (abomasums). They were green (5%), grey (10%) and block (85%) in color. Color depends on type of plants material which goats eat. Immediately after removal, bezoars were washed in fresh water to remove waste material. Then bezoars were wrapped in dried cloth to remove moisture. These cleaned bezoar were dried at room temperature for 7-10 days. There was no change in the color. Powder was separated from bezoars and stored in air tight bottles. There was no change in color, quality and quantity of powder even after years to gather preservation. The powder was being sold in international market. The cost of bezoars powder is near about Rs 1000/-per one gram in international market.

## RESULTS AND DISCUSSION

The Table 1 shows the prevalence of bezoars in goats during three years study period. Out of 600 goats, bezoars were formed in 66 % ( 396/600) of goats. The percentage of bezoars formation was varying from year to year (70% in 2006 and 59.5% in 2008). The percentage of bezoar formation is more in male (63.8%) than in female (36.2%) goats. The weight of bezoar and non – bezoar goats was given in Table 2. Gender wise analysis of bezoars formation in goats is presented in Table 3. Table 4 shows the number of bezoars formed in each goat and weights of bezoars. Feeding of different plants

**Table1: Prevalence of bezoar formation in goats**

	2006 (n=200)			2007(n=200)			2008(n=200)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Bezoars goats	94	47	141	87	49	136	72	47	119
Non Bezoars goats	46	13	59	53	11	64	68	13	81

**Table 2: Weight of bezoar and non-bezoar goats**

	Average weight of bezoar goats (in kgs)	Average weight of non-bezoar goats (in kgs)
2006	15.8 + 9 (n=141)	18.5 + 8.0 (n=200)
2007	15.75 + 8.5 (n=136)	19.46 + 7.5 (n=200)
2008	14.90 + 10.5 (n=119)	17.75 + 9.0 (n=200)

**Table 3: Gender wise analysis of bezoar formation in goats**

	Male goats		Female goats		Total (n=200)
	No	%	No	%	No
2006	94	66.6	47	33.4	141
2007	87	64	49	36	136
2008	72	60.6	47	39.4	119

**Table 4: The number and weight of bezoars in goat**

	2006(n=141)		2007(n=136)		2008(n=119)	
	Male (n=9)	Female (n=47)	Male (n=87)	Female (n=49)	Male (n=72)	Female (n=87)
Average number of bezoars	27±4	26±4	30±5	29±3	30±5	30±3
Average wet weight of single bezoars (in mg)	52.5±7	50.7±6	50.5±5	48.2±6	53.8±7	49.5±5
Average dry weight of single bezoars (in mg)	16.7±5	15.9±4	15.5±5	12.8±6	15.8±7	14.7±5
Average weight of powder from single bezoar (in mg)	8.3±3	7.93±2	8.5±5	6.4±6	7.2±7	7.0±5

leaves, bezoars are shown in Fig.1-3. The value of one gram bezoar powder is near about one thousand rupees. Therefore the quality and economic value of bezoars depending on the number and weight of bezoars formed in goats. The goats fed



**Fig.1 : Bezoar goats in Warangal district**



**Fig. 2 : Feeding of plant leaves**



**Fig. 3 : Identification of bezoars by pressing of the stomach region**



**Fig. 4 : The bezoars in stomach goat**



**Fig. 5 : Different shape of bezoar formation**



**Fig. 6 : Bezoars formation due to long and short term of feeding plant material**



**Fig. 7 : Different colour of Bezoars**

with leaves of all the three plant species the formation of bezoars was high when compared with the goats fed with one or two plant species.

The percentage of bezoar goats was high (70.5%) in 2006, when compared to 2008(59.5%). Bezoars formation in male goats was higher (63.8%) than in female goats (36.2%). Before bezoars formation the average weight of goats was  $18.5 \pm 8.0$  kgs (n=600). After bezoar formation the average weight of goats was  $15.85 \pm 9.5$  kgs. The decreasing weight of bezoar goats indicates the formation of bezoars may be affected on the physiological systems of the body, Gold stein (1984) reported that the formation of bezoars affected on the body weight and animal morphology. The reason for high percentage of bezoars formation in male goats is not known. Schlang (1970) has stated that the bezoars were formed more in male than in female goats.

In the present study quantity of bezoars were determined by measuring the number of bezoars formed in each goat and weight of bezoars. In some cases more amount of powder was obtained even the bezoars were smaller in size. The average number of bezoars formed was  $28 \pm 6$ . There was not much difference in number of bezoars formed in female and male goats. The average weight of each bezoar is  $16.5 \pm 4.5$  mg. Newman *et al.* (1990) stated that bezoars formation is depending on the feed. The goats fed with leaves of all the three types of plants were not active but formation of bezoars in these goats was high when compared to other groups of goats fed with one or two types of plants. This study indicates

specific feed is very important and responsible for formation of bezoars in goat. Ladas *et al.* (2002) has reported that number of bezoars was increased when goats were fed with Acacia seeds and other plant leaves.

From this study it is clearly evident that bezoars formation depends on systematic steps in feeding (dry fruits of *A.indica* and leaves of specific plants –*B. hamifffonia*, *C.Swietenia* and *H. pubesens*) mechanism and season, age and gender are important influencing factors on bezoars formation.

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