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C1

What Do Goats Really Like To Eat?

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Tanning Skins

- Bruce McGregor, Goat Specialist Victorian Institute of Animal Science, Agriculture Victoria, Attwood.

Introduction

All my life I have been told or have read about goats supposedly eating anything and every thing. Even some Department of Agriculture documents have claimed that goats have a "catholic" taste, meaning that they have a universal, liberal approach to what they eat. We all see cartoons of goats "eating" clothes hanging from the clothes line, or munching on tins and other rubbish. So what is the truth about goat diets?

This article discusses behavioural studies of goat diet selection, nutritional studies of goat diets and refers to scientific studies of goat diets in Australia. But first I must refer to a very old story.

What does the story about the Three Billy Goats Gruff teach us?

I have always enjoyed reading the story of the Three Billy Goats Gruff to my daughters. In every one of the 30 or so versions that I have read the goats are prepared to risk death to EAT FRESH GREEN GRASS.

Indeed in almost every scientific study conducted on the grazing preferences of goats, when fresh green grass is available, the goats have eaten more than 50% of their diet as green grass. In Victoria, during spring, my studies showed that Angora and cashmere goats consumed more than 80% of their diet as green grass. The writers of the Billy Goat Gruff story had really observed what goats ate.

Is green grass good for goats? Yes, green grass is the generally the most nutritive food available for goats and it is the cheapest food. During spring the green pasture is usually about 80% digestible and has a crude protein content of 20%. Most of the fibrous parts of the pasture are still quite digestible by the goat. As a result goats can eat lots of the spring pasture and because the pasture is has a very high nutritional value they can grow quickly. The fastest growth rates recorded for weaned goats in southern Australia are from goats grazing spring pasture. The important exceptions to this are when pastures have trace mineral levels that are less than the needs of goats. This usually occurs on soils that have low trace mineral levels.

So why don't goats only eat green grass? Sometimes there is no green grass, or it is too short for goats to easily graze. Some species of grass have low nutritive value even when they are green (like tussocks or some tropical grasses). Sometimes the goats cannot help eating other material, like dead grass mixed with the growing green grass leaves. Sometimes goats prefer to eat other more easily grazed plants. Goats tend to select away from growing clovers but there is no evidence that clovers are harmful to goats. In my studies, when grazing pressure was increased, goats ate clover without harm and from late spring, when the clover flowered and matured, goats ate dry clover pasture.

The behaviour of goats is discussed further in the following section.

The dietary behaviour of goats

In Australia, farmers are familiar with the grazing behaviour of sheep. As a generalisation goats have evolved and adapted to live in different environments or to use the environment differently to the sheep we farm in Australia. So how do goats choose their diet? The explanation that I like uses three aspects of the behaviour of grazing animals to classify how they choose their diets. These aspects of behaviour are selectivity, degree of browsing/grazing and flexibility.

Selectivity Generally goats are more selective compared to sheep. Goats have evolved to adapt to a wider variety of plants including very prickly plants and some bitter tasting plants which sheep avoid.

Goats have also evolved a narrower muzzle compared to sheep and this allows them to nibble the nutritious young shoots and leaves of prickly bushes and to strip the bark from some stems. In this way goats are able to survive better in arid areas where sheep are not as well adapted. The narrower muzzle may place goats at a disadvantage when only very short pasture is available. By comparison cattle are less selective partly because they have a wide mouth.

But goats eat weeds, surely this is not a good nutritional strategy? Yes goats do eat some weeds but the nutritional value of many weeds is very high. My studies of the nutritional value of thistles and blackberries (Table 1), for example, have shown that the nutritional value of these "weeds" can be as high or higher than the nutritional value of pasture. In almost **all cases the goats selected the most digestible part, the fraction with the highest digestible energy.**

Table 1. The nutritive value of various parts of the blackberry plant eaten or avoided by goats

Plant part	Eaten by Goats	Dry matter digestibility%	Metabolisable energy MJ/kg DM
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Blackberry leaves	Yes	70	10.5
Blackberry new stems	Yes	73	11.0
Blackberry old stems	No	51	7.5
Blackberry dead stems	No	45	6.5

Degree of grazing/browsing Browsing means eating the leaves, shoots and twigs of shrubs and trees. Goats have special ecological adaptations for browsing such as a split upper lip, narrower muzzle, longer legs for climbing, different tolerance to plant chemicals, and the documented ability to travel further each day than sheep in search of feed.

However it is not correct to describe goats as browsing animals and sheep as grazers as this is a misleading description of goats. Browsing is a better description for the behaviour of giraffe, koalas and some antelopes. Goats are best described as mixed feeders. Goats **tend** to browse more than sheep if the opportunity exists for browsing. Goats can be kept on grazed pastures without trouble, as I have done for over 20 years.

In my studies, when goats and sheep were grazed together on annual pastures, at low stocking rates the species showed different selectiveness, but at very high grazing pressures when the pasture was short and in very limited supply the sheep always out competed the goats. Studies in environments where there is plenty of browse have shown that increasing the stocking rate of goats usually leads to a reduced intake of browse as the more palatable plants are eaten.

Flexibility Goats are far more flexible in their feeding habits than sheep and cattle. Goats can change their preferences quite quickly. For example goats may avoid a growing plant for some months but will then eat the plant when it begins to flower. These flexible habits apply to both selectivity and grazing/browsing. Goats can eat with high or low selectivity on browse plants and with high selectivity on pasture, very flexible!

To be flexible means that goats must be inquisitive. This results in goats sampling "interesting" things (and this is where the washing and cans come into the stories). Sometimes this sampling of new things leads to death when they eat poisonous plants.

Do goats eat everything? NO GOATS DON'T EAT EVERYTHING. Their ability to be selective, to browse and to be flexible has enabled goats to survive in many environments.

But goats need roughage don't they?

Well this question can be very tricky to answer as everyone has a different

impression of roughage. The Dictionary defines roughage as follows:

1. Rough or coarse material
2. the coarser kinds or parts of fodder or food, of less nutritive value, especially those which assist digestion, as distinguished from those affording more concentrated nutrient.

Most Australians know of the need for roughage or fibre in human diets. Human diets in Australia are largely based on cereals, meats, fruit and vegetables, and dairy products with the roughage mainly coming from vegetables, fruit and some whole grains. **In animal science, roughage diets are composed of forage or herbage.** Concentrate diets are composed of whole or processed grains with a limited amount of roughage. Generally, forage diets have higher levels of fibre and lignin, and lower energy concentrations than concentrate diets.

There are many exceptions to these general statements and the issues can be clouded if you read a European or American book because the nutritive value of herbages and "concentrates" varies depending on plant species, season and the material used in commercial "concentrate" mixes. There are a number of points that I wish to discuss.

- i. **To say that goats need roughage when they are grazing pasture is double speak.** Pasture is roughage. The fastest growth rates, reported in Australia for weaned goats, are from goats grazing spring pasture. Fast growing spring pastures in Australia usually have metabolizable energy concentrations greater than or equal to that found in high energy concentrate diets (such as wheat or barley diets).
- ii. Research has shown that goats are generally superior to sheep in digesting feeds with digestibility between 50 and 60% and that goats have an advantage in digesting the fibre component of the diet. While these findings show goats utilise feeds of low digestibility better than sheep it **certainly** does not mean that the production of goats increases as the quality of grazing or roughage decreases. **As feed quality falls the performance of sheep and goats falls.** Both species lose liveweight and are less productive on high roughage diets which have low metabolizable energy concentrations. For example the fastest rates of liveweight *loss* reported for goats are from goats grazing dead summer pasture. The variation in nutritive value of roughages is enormous (from excellent to very poor).
- iii. Roughage as defined by the Dictionary means "the less nutritive parts". These are the "parts" which goats usually select against. I often ask myself how rough is rough?
- iv. How do we can obtain healthy goats with high levels of production when they are fed concentrate diets? There is increasing evidence that fibre goats have a higher requirement for roughage, in order to maximise their food intake, compared to Merino sheep. The results of several experiments in Australia have shown that when goats were fed concentrate diets the maximum food intake occurred when between 13%

and 34% of the total intake was chopped hay. This appears different to work with sheep where whole wheat based diets fed with straw suggested the roughage requirement of the young sheep did not exceed 2% of the diet. **In most of Australia it is clear that productivity of goats is maximised when goats are fed forage diets of high digestibility, which enable high levels of energy intake and contain sufficient nitrogen and trace minerals. Such diets enable goats to grow and lactate at high levels.**

CONCLUSIONS

Goats are animals that are flexible and selective feeders. Goats have evolved with a greater ability to browse and to digest lower quality herbage than sheep. In southern Australia, when offered fresh green pasture, goats will tend to consume the most highly digestible grasses in preference to clovers and other shorter plants. There is no evidence that clovers harm goats. If fed on rations mainly composed of cereal grains, maximum feed intake is obtained if about one third of the diet is forage based. The selective, flexible and browsing nature of goats enables them to consume very nutritious food from many plants regarded as weeds. Goats are best described as mixed feeders.

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