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USE OF SAİNFOİN İN RUMİNANT NUTRİTİON

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Abstract

In this review, general characteristics of sainfoin and researches on the usability in animal feeding. Sainfoin is a perennial leguminous plant. It is a perennial feed crop with a total area of 1,914,391 hectares in Turkey. Sainfoin grows in pH 7-8 on calcareous soils on the northern slopes of valleys, plains and mountains up to 6 thousand meters in height. The content of nitrogen in the branches and leaves of the sainfoin plant is higher than in the beginning of flowering. The sainfoin contains condensed tannin. The condensed tannin removes protein degradation. Grazing ruminants may encounter many metabolic diseases related to feeding. The minimum plant condensed tannin concentration for this effect should be greater than 5 g / kg (CT) in dry matter. In the sheep study, parasitic infestation of the abomasum and small intestine causes large protein losses in sheep. İn a study reported that the presence of tannin in sheep fed had no effect on milk yield but increased the yield of tannin to 5.9%.

Key words*:Sainfoin. Abomasum, tannin, feed, sheep.*

INTRODUCTION

1. What is Sainfoin?

Sainfoin is a perennial leguminous plant. The French described the corpus with the words "Sain" and "Foin". "Cain" is healthy and "Foin" means grass. In other words, they use healthy herbs for sainfoin. This name has been passed on in English. It is called "Healthy hay", inspired from this name by a project sponsored by the European Union. In some sources it is also called "holy hay" (Carbonero 2011, Carbonero 2012). It is expressed in a word that means the favorite food of donkeys in the shade of greens (Ruprecht 2005, Smith 2011).

2. Type and varieties

There are many varieties of sainfoin (Onobrychis sativa) cultivated in Europe. The variability of these varieties is based on the number of formats in the present. O. sativa. Communis is a plant with a life span of 7 years or more without weed problems. But only its root forms in a year, its body is incarcerated and blooms once a year. In addition to being long-lived, satisfactory cultivation in arid conditions and poor soil has resulted in excessive cultivation. O. sativa Bifera (Giant Safflower) is a variant with a lifetime of one or two years. Much more than the ordinary sainfoin brings to the big body. She blooms twice in a season and she is reared twice. O. sativa. Maxima (Three Shaping Sainfoin) this plant is cut 3 times in one season. However, this feature is not fixed and can be taken in 2 forms according to the ambient conditions. For this reason, it is mixed with giant hull. O. sativa. Persica (Multi-Format that Sainfoin) of these varieties in the south west of Asia, in the Caucasus, it was reported that Turkey is an ecotype and grown in the northeast of Iran.

3. History and geographical distribution

Sainfoin spreads widely in Europe's temperate regions, Asia, Mediterranean countries and Northwest America. It was raised throughout history by locals in more temperate regions (Smoliak 1972, Clark and Malte 1913). In the 15th century the center of Europe spread to countries like Italy, England and Switzerland (Burton and Curley, 1968).

4. General features

Sainfoin is an important feature that the corpuscle grows and develops earlier than other leguminous feedstuffs (Smoliak 1972). Outside the seedling period, drought is particularly resistant to cold. It likes sainfoin, permeable, calcareous, sandy soils. It improves the weak and barren areas by putting into the planting season under all kinds of climate and soil conditions. When seeds are infected with

bacterial culture at the time of planting, nitrogen is added to the soil due to nodosity bacteria. It is included in planting seasons in arid regions, helping to narrow fallow areas. At the same time, it is an important plant which is involved in the construction of artificial lands in arid and erosion open areas. At the same time, sainfoin is a good bee.

5. Anatomic features

The plant has a thickened main stem and a large number of side spines. The root system consists of a main pile root with several large and numerous fine root roots. The pile root can be 5 cm in diameter and can go up to 1-10 m deep. Fists are most often
found on thin side roots. But there may also be some punches on the young pile roots. The body of the protector develops steeply or semi-obliquely. Plant height can be increased up to 60 cm in normal conditions and 90-100 cm in good soil. The plant gives a large number of stems from its crown. The stems are 100-120 cm long. The stalk is round. Empty the floor. In the upper parts, the inside is full and it is hairy. Leaves are reciprocal. On a leaf axis, there are mutually 7 to 15 leaflets. The long egg-shaped leaflets are covered with thin fur. The leaf axis always ends on the leaf. The flowers come out of the leaf seats and are on the handle. It is pink-colored and clustered. Each cluster contains 5-80 flowers. Fruits 5-8 mm. It is semicircular in shape. It's a single-seeded flat one. The fruit shell is veined and threaded. The seeds are kidney-shaped dirty yellow and brown. At the end of maturation, fruit bark is not opened, it is planted as fruit (Genç Ziraat 2007, Temel 2010). It is a perennial feed crop with a total area of 1,914,391 hectares (NRCS 2013) in our country. Although some sources say that the guardian may live 8-20 years (Manga 1995), the economic life in our country is approximately 5-6 years.

6. Adaptability

Sainfoin grows in pH 7-8 on calcareous soils on the northern slopes of valleys, plains and mountains up to 6 thousand meters in height. It is tolerant to cold and drought, is a bait plant resistant to bacterial infections and late spring frosts. It is a good alternate for alfalfa (Medicago sativa) in arid areas where short-term irrigation is inadequate for dry hay production (Smith 2011).

7. Nutrient content

The content of nitrogen in the branches and leaves of the sainfoin plant is higher than in the beginning of flowering. The NDF, ADF content increases with maturation of the plant, and thus the values at the end of flowering are higher than at the beginning of flowering. When the contents of condensed tannin of roots, leaves and plant are all compared with the end of flowering, flowering is higher at the beginning. The digestibility of organic matter is higher at the beginning of flowering than other phenolic periods. During the first 1.5 hours of feed consumption, the nitrogen and ammonia peak values occur in the rumen fluid and fall after 6 hours and after consumption (Theodoridou 2010). Ripe kernels contain 34 g / kg (21% crude protein) nitrogen and 20% soluble carbohydrate in the dry matter. The digestibility of dry matter is about 70% (Waghorn 1998).

Table 1. The chemical composition of the sainfoin in different regions harvested during flowering (Kaplan, 2014)

Composition	Afşin	Tekir	Pazarcık	B. konus
Dry matter	94,67	95,1	95,73	95,58
Crude protein	17,39	15,23	15,16	17,7
NDF	43,31	43,56	47,64	44,61
ADF	35,62	35,61	38,28	34,34
Ash	5,97	7,3	5,21	6,4
Condanse Tannin	4,19	5,76	9,95	6,59

8. Tannins and chemical structure

Tannins are high molecular weight compounds that bind to proteins with polyphenolic bonds. Tannins are structurally composed of 2 groups. These can be hydrolyzed and are condensed tannins (Makkar 2003). By chewing the tannin-containing feed, about 60% of the cells are torn and the resulting tannin mixes with the saliva secretion into the rumen fluid. Tannins at pH 6-7 in rumen protect the plant proteins from proteases and thus may produce an inhibitory effect on ruminal protein digestion. These tannin-protein complexes can not be digested with bacterial enzymes and pass through the rumen without digestion. Rough feed containing low levels of tannin can partially protect proteins from rumen microbial digestion. Complex proteins are secreted by

gastric enzymes present in the abomasum at pH <3.5 digestion and enhance the absorption of amino acids at pH> 7 in the small intestine (McLeod 1974, Jones 1977, Mangan 1988, Hagerman et al 1992, Mueller-Harvey 1992, Waghorn 1996, Mueller -Harvey 2006). Distribution of 4% to 10% of the tannin content of the preservative has beneficial effects on the ruminants. For example; sulfuric amino acid increases digestibility. Thus, even at low concentrations, tannins help milk production by increasing the absorption of essential amino acids from the small intestines (Min et al. 2003).

9. Condensed tannin on protein degradation

Condensed tannins are polyphenol compounds with naturally-binding capacity to proteins. It is found in leguminous foods such as Italian sainfoin, clover (Zeller-Forage 2014). Proteins in leguminous feeds can not be exploited sufficiently by ruminants due to rapid rumen dissolution (Gebrehiwot 2002, Min et al 2003, Broderick 1995). Ammonia emerges as amino acid deamination product of soluble protein in rumen 70% (McMahon 2000). However, sainfoin containing condensed tannins enhances protein utilization in ruminants by protecting microbial digestive proteins in the rumen (McMahon 2000, Waghorn 2008). Protein digestion results in a reduction in the rate of condensed tannin-fast soluble protein (Frutos 2004). In plants containing tannins the protein is reduced to rumen amoa. Tannins reduce degradation of plant proteins and thus allow proteins to pass by-pass (Aerts 1999). When given in early ripening period, when the highest content of sainfoin condensed tannin was given, the urinary nitrogen excretion reduced the ruminal degradability and digestibility of the crude protein. This is directly related to the nitrogen retention of the condensed tannin (Chung 2013).

10. Effect of sainfoin above tympany

Grazing ruminants may encounter many metabolic diseases related to feeding. It's thympany from these diseases. Tympany; chewing of pasture grasses such as alfalfa, fig, clover, destruction of the mesophyll cell wall and mixing of intracellular components into the rumen fluid. It is a gas formation shaped in the rumen. During the chewing and ruminating of cilantro in mixed climates, the tannin and soluble protein are released from the plant material (Wang 2006), and ruminally released soluble proteins cause stabilized foam to form especially in spring (Jones and Lyttleton 1971, Jones et al 1973, Howarth et al., 1978), but can reduce the production of rumen gas by the effect of condensed tannin (Chiquette 1988). At the same time, it is an important reaction that the sainfoin leaves are resistant to the mechanical condition of the epidermal layer and the chewing damage of the mesophyll cell wall. This response reduces the risk of tympany in legumes that are slower at the beginning of digestion and higher than the mechanical resistance of leaf tissues such as red alfalfa and white alfalfa (Howarth ve ark 1978, Chiquette 1988, Wang 2006).

11. Antiparasitic effect of the sainfoin

The condensed tannin with sainfoin is an important feature of the antiparasitic effect. An antiparasitic effect against Haemonchus contortus was found in a study conducted with its dry grass (Heckendorn 2007). The minimum plant condensed tannin concentration for this effect should be greater than 5 g / kg (CT) in dry matter (Li 1996). In the sheep study, parasitic infestation of the abomasum and small intestine causes large protein losses in sheep (MacRae 1993). The development of parasitic resistance to anthelmintic drugs reported in sheep, cattle and cattle in the USA and New Zeland is a major question (Waller 1994). In 55% of the sheep fed parasitic parasitic eggs. In the sheep, sainfoin can be given as coarse feed to stop the egg growth in the periparturient period (Werne et al. 2013). At the same time, condensed tannins have been proposed stratification strategies (Niezen 1998, Molan 2000). Antihelmintic pesticides grow in similar proportions when they consume Italian guacamole (Hedysarum coronarium) and alfalfa. However, unscanned icebergs grow better depending on the effect of the condensed tannin. The consumption of Italian sainfoin (Hedysarum coronarium) is 41% and 45% lower than that of the alfalfa consuming alfalfa and parasite loads (Molan 2000).

12. Effect of the sainfoin on methane production

Methane is one of the greenhouse gases such as carbon dioxide and nitrous oxide. It has been found that methane is more widely distributed in ruminant farms at 55-60% than other gases. It causes a loss of 2-12% of the crude energy (Rochfort et al, 2009). İn rumen is a product of methanogenic bacteria. Tannins cause less methane production (Mc Sweeney 2001), by inhibiting cellulolytic microorganisms or by complexing lignocellulosics to reduce fiber digestion, thus altering the amount of methaneogenesis and the type of fermentation produced in the rumen. Recently, in vitro experiments have shown that the effects of the protection on methane production can be determined (Tavendale et al 2005, Mila 2008, Bhatta 2009).

Table 2. Influence of vegetation period on wild sainfoin gas production, methane production (Kaplan 2014).

Parameters	Flowering Before	Flowering after	Seed Binding
Total gas (mL)	47.02a	44.55b	39.05b
Methane (mL)	7.41a	6.91a	6.23b
Methane (%)	15.63	15.69	15.79
ME	9.58a	9.15a	8.25b
OMS	69.47a	66.15a	59.70b

13. The Effect of Sainfoin and Tannin Resources on Milk Yield and Meat Quality

In the sheep fed with Lotus corniculatus, the condensed tannin does not affect milk secretion during the early lactation period. However, in middle and late lactation, the cigarette increases the secretion, lactose and protein ratios by about 12, 14 and 21%, respectively (Wang 1996). The addition of PEG (Polyethylene Glycol) feed additive to the condensed tannin component increases the milk yield and milk urea ratios in deciduous gardens in the gardens of the gum tree (Pistacia lentiscus) and Oak (Qercus spp.) (Decandia 2000a, Decandia M. 2000b). Petacchi et al. (2007) reported that the presence of tannin in sheep fed had no effect on milk yield but increased the yield of tannin to 5.9% (Petacchi and Buccioni 2007). Some researchers observed no difference in protein yield, protein yield, and fat yield between the two groups when they consumed alfalfa alfalfa hay in the same amount of goat and cattle (Arrigo 2009). However, Romero et al. (Romero 1997) found that cattle fed with corn silage containing less than 0.4% of tannic acid and a ration of alfalfa and 0.8% tannic acid had lower milk yield and milk fat values. Petacchi et al. (2007) reported that the presence of tannin in sheep fed had no effect on milk yield but increased the yield of tannin to 5.9% (Petacchi and Buccioni 2007).

Vasta et al. (2007) have reduced the ruminal biohydrogenation of volatile components such as skatole and indole, which are produced by the rumen microorganisms that provide tannins in their work, to conjugated linoleic acid as an antioxidant (Priolo and Vasta 2007). Tavendale et al. (2005) reported in an in vitro study that the tannins reduced skatole synthesis when sheep fed the Deli Kaplan grass (Dorycnium rectum) in their study (Tavendale et al. 2005). Priolo et al. (2007) have shown that the reduction of B12 vitamins and hemoglobin synthesis by ruminant microorganisms in the ranching rations makes the meat color pale in small ruminants. But; This effect of tannins can be eliminated by the addition of polyethylene glycol (Priolo and Vasta 2007). In the study conducted by Priolo et al. (2000), the adverse effect on the carcass quality of the condensed tannin can be eliminated by adding 40 g of PEG per kilogram of goat horn ration (Priolo et al. 2000).

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