KRMIVA

EFFECTS OF DIFFERENT LEVELS OF DRIED PISTACHIO EPICARP ON WOOL CHARACTERISTICS OF GROWING AFSHARI LAMBS

DJELOVANJE RAZLIČITIH RAZINA EPIKARPA SUŠENE PISTACIJE NA ZNAČAJKE VUNE AFSHARI JANJADI U RASTU

M. Salehi, A. Mahdavi, M. Zahedifar

Original scientific paper - Izvorni znanstveni članak
Received - Primljeno: 31. march - ožujka 2009.

SUMMARY

Twenty - four male lamb of Afshari sheep (mean live weight 35±1.21 kg, 10 month of age) were used to study the effect of different levels of dried pistachio epicarp (0, 12, 22 and 32 %) on wool characteristics. The staple length on shoulder (STS), flank (STF), back (STB) and rump (STR), true wool fiber (TW), medullated fiber (MF), kemp fiber (KF) percentage, mean wool fiber diameter (MD) and its coefficient variation (CVMD), breaking load (BL), wool tenacity (WT) and extension (E) were measured. These data were analyzed by one- way ANOVA using SAS software package. The total means of STS, STB, STF, STR, TW, MF, KF, MD, CVMD, BL, WT and E of wool were 6.06 ± 0.26, 6.60 ± 0.19, 6.23 ± 0.18 and 5.64 ± 0.18 cm, 63.74 ± 2.2, 12.36 ± 1.9 and 23.87 ± 2.1 %, 36.37 ± 0.85 mu, 46.7 ± 1.99 %, 7.06 ± 0.3 kgf, 3.2 ± 0.17 gf/tex and 33.59 ± 1.4 % respectively. Although there were no significant differences among treatments, the results showed that feeding lambs pistachio epicarp up to 32.5 percentage of total dry matter intake did not affect wool characteristics.

Key words: Afshari lambs - Dried pistachio epicarp - Wool traits

INTRODUCTION

Pistachio by-product has a potentially high nutritive value but its biological effects in ruminants have not been studied extensively. Iran is one the main pistachio producers in the world. There are about 298939 hectares of pistachio plantation in Iran and annual dry pistachio production is 307036 tons. Pistachio by products usually have some antinutritional substances such as tannin which have different effects on animal performance (Decandia, 2000). The total phenolic substance is 6.4 percent as reported by Labavitch et al, 1982. Tannins in feeds may have positive nutritional effects, but at high level they may inhibit microbial activity of rumen and thereby reduce the microbial production. High level of tannin in feed (50 – 100 g/kg DM) reduces DM intake and digestibility of DM, Thereby the result is reduction of daily gain and wool production, but at lower level (20 -40 g) it has beneficial effects for animals (Brooker et. al, 1995, Kumar and S. Vaithiyanathan, 1990). The goal of this experiment was determination of the

Mahnaz Salehi, Animal Science Research Institute, Dehghan Villa 1, POB 1483-PC:31585 Karaj Iran.

effect of feeding different levels of pistachio epicarp, containing high levels of tannins, on quality and quantity characteristics of Afshari lambs wool.

MATERIAL AND METHODS

Four groups of male lambs (age 10 months, initial live weight 35.9±1.21 Kg), were fed for 90 days, iso-caloric, iso-nitrogenous diets, containing either no added pistachio epicarp (control) and added levels 12.5, 22.5 and 32.5 percentage pistachio epicarp (based on dry matter) in rations (table 1). Dry matter (DM), crude protein (CP) and organic matter (OM), were determined by AOAC (2000) methods. Van Soest and Robertson's method was used to analyze neutral detergent fiber (NDF). Total phenolic compounds (Julkunen, 1985), and total tannins (Makkar-1992) were determined. Crude protein degradability was determined by nylon bag method (Orskov, 1979) and in vitro gas production test was used for samples (Menke, 1988). Tilley and Terry's methods (later modified by Marten and Barnes, 1980) were used to determine in vitro dry matter digestibility (IVDMD) of silage samples. In vitro dry matter digestibility and gas production were used to estimate metabolism energy. The staple lengths of the shoulder, flank and rump were determined and greasy fleece weight measured at the end of experiment. Wool samples of about 20 grams were taken just before shearing from the right mid-side fleece of each ewe. Three or four locks were randomly chosen from the area throughout each sample. Locks from each sample were individually washed in hot water (45 °C) and a non-ionic detergent, rinsed in hot

Table 1. Characteristics of Rations
Tablica 1. Značajke obroka

	Ratio - Omjer			
	0	12.5	22.5	32.5
Soybean meal - Sojino brašno	2.15	1.50	0.98	1.03
Barley grain - Ječmeno brašno	43.00	44.35	45.23	46.48
Wheat bran - Pšenične posije	16.50	15.30	14.45	12.35
Wheat straw - Pšenične slama	16.15	9.95	5.15	1.88
Cotton seed - Sjemenke pamuka	0.00	0.55	1.05	1.85
Alfalfa - Lucerna	19.85	13.55	8.35	1.63
Mineral premix - Mineralni premiks	0.25	0.25	0.25	0.25
Vitamin premix - Vitaminski premiks	0.25	0.25	0.25	0.25
Salt - Sol	0.50	0.50	0.50	0.50
Oyster shell - Školjke kamenice	1.25	1.28	1.30	1.30
Metabolic energy* - Metabolička energija*	2.47	2.47	2.47	2.47
Crude protein - Sirova bjelančevina (%)	11.11	11.11	11.11	11.11
Ca : P ratio - Omjer Ca : P	3:1	3:1	3:1	3:1
Forage - Stočna hrana (%)	36	36	36	36
Neutral detergent fiber - Neutralna deterđentna vlakna (%)	37.35	36.76	36.18	35.97
Rumen degradable protein (DIP) - Bjelančevina razgradiva u buragu (%)	74.45	75.00	75.42	75.3
Rumen undegradable protein (UIP) - Bjelančevina nerazgradiva u buragu (%)	25.55	25.00	24.58	24.70
Total phenolic compounds - Ukupni spojevi fenola	0	1.15	2.08	3.00
Total tannin - Ukupni tanin	0	0.78	1.41	2.04

* Mcal per kilogram dry matter - Mcal na kilogram suhe tvari

water, and then dipped in a commercial solvent (dichloromethane alcohol) to remove any residual grease not removed in washing. Care was taken to avoid disturbing the staple formation of the fibres and to minimize the loss of shorter fibres in the samples. Samples were then air-dried overnight. Small amounts of wool samples were separated as sub samples for wool fineness analyses and other sub samples for measuring the tenacity and different fiber types in carpet wool. The first sub sample was prepared for measurement with the projection microscope technique in accordance with ASTM D2130-78 short – section procedure to determine fibre diameter. Each sample was compressed and fibres were cut at mid-staple with a heavy – duty cross-section device to provide snippets 200-300 μm in length. Over one hundred fibres from each sample were measured. Mean fibre diameter and standard deviation were obtained for each sample and the CV was calculated. Visual subjective test was used to separate the various fiber types, including true wool, medullated, kemp and colored fibers. Then the samples were subjected to the benzol test.

The sub sample was paralleled in fibro liner component of Almeter. However, after that there was a sufficient number of fibres so that, after combing, an aligned specimen of 15 to 25 mg was available for testing. The paralleled fibres were combed at the protruding end with a coarse comb to remove loose fibres and foreign material and to secure partial parallelization of the fibres. Reverse the tuft and repeat the combing on the other end. The clamped tuft was placed in the grips of tensile testing machine (Instron) and 1 N capacity load cell was used with the pulling clamps moved at 25 cm /mm. the breaking load was recorded, the broken fibres weighed to the nearest 0.0001 g and breaking tenacity was calculated using Eq1 (ASTM.D-1294 and ASTM D 123 – 82a).

(Eq1) Breaking tenacity, gf / Tex = (b / M) *2/54*10¯5 where B = bundle breaking load in gf. And M= bundle mass (g).

The following model was used for statistical analysis by one – way ANOVA using SAS software package (SAS / STAT User's Guide, 1987).

$$\gamma_{ik} = \mu + \alpha_i + \varepsilon_{jk}$$

Where γ_{ik} is individual records on each of traits, α_i is the effect of ith treatment and ε_{jkm} is the residual effect.

RESULT AND DISCUSSION

Although there was a high range of differences among treatments the results did not show significant differences among treatments (table 2 and fig 1, 2, 3). Some important traits such as fiber diameter and kempt fiber percentage were reduced from 37.09 micron and 28.6 % in the first treatment (0 levels) to 33.27 micron and 16.36 % in the high level (32 % pistachio epicarp level). There were a few studies on the effect of pistachio epicarp intake on fiber performances. The only study has shown that feeding four different levels of pistachio epicarp (0, 12, 20 and 30 percent of dry matter) to goats, affected growth and cashmere production. The results showed that the highest mean fleece, finer cashmere and more strength were found after diet with 10 % of pistachio epicarp, but the lowest belonged to the control group. Total fleece weight at the end of the experiment was similar (Seyed Momen, *et al* 2004). Effect of condensed tannins upon body weight, wool growth and rumen metabolism in sheep grazing Sulla contained 40 – 50 g condensed tannins (CT)/kg DM discussed by Terrill, et al (1992). They concluded that after chewing the feed, a lower proportion of total CT was readily extractable and greater proportions were protein – bound and fiber – bound, because the action of CT decreased rumen ammonia concentration and also decreased molar proportion of bio – butyrate and iso and *n* – valerate. In the highest growth of wool (CT increased wool growth rate) such effect was not observed when wool growth was low. There are not any other projects on effects of feeding pistachio epicarp on wool characteristics but the results of other projects show that the use of feeds containing high levels of tannins like pistachio epicarp result in low performance in fattening lambs feeding pistachio epicarp up to 30 percents of total ration (Mahdavi. 2008), decreasing in CP degradation in rations (Fazaeli, 2007) and also feeding pistachio epicaro to dairy cattle up to 10 percents result in in milk yield, lactose and protein decrease (Memarizade, 2007).

Table 2. Effects of different levels of dried pistachio epicarp on wool characteristics of growing Afshari lambs
Tablica 2. Djelovanje različitih razina epikarpa sušene pistacije na značajke vune janjadi Afshari u porastu

Traits - Značajke		Treatment - Tretman					
		0	12.5	22.5	32.5	SE	
Fleece Weight - Težina runa (g)		1658	1633	1575	1625	180	
Staple length - Duljina vlakna (cm)	Shoulder - Rame	5.92	6.50	6.00	5.83	0.55	NS
	Back - Leđa	6.75	6.75	6.50	6.64	0.4	NS
	Mid-side - Sredina	6.50	6.41	5.92	6.08	0.37	NS
	Rump - But	5.83	6.17	5.33	5.25	0.34	NS
	Mean - Prosjek	6.20	6.45	5.95	5.90	0.37	NS
Fiber diameter - Promjer vlakna (µ)		37.9	37.83	36.3	34.26	1.7	NS
CV of diameter - CV promjera (%)		46.7	44.58	51.8	43.70	4.05	NS
True wool - Prava vuna (%)		63.1	64.45	62.0	65.37	4.70	NS
Medullated fiber - Srž vlakna (%)		8.2	14.7	11.9	1458	4.00	NS
Kempt - Uredno vlakno (%)		28.6	20.84	26.0	20.05	4.24	NS
Breaking load - Opterećenje lomljenja (kg)		6.96	7.53	6.59	7.16	0.64	NS
Tenacity - Žilavost (gf/tex)		3.06	3.33	2.95	3.45	0.35	NS
Extension - Duljina (%)		31.6	35.58	32.4	35.37	2.80	NS

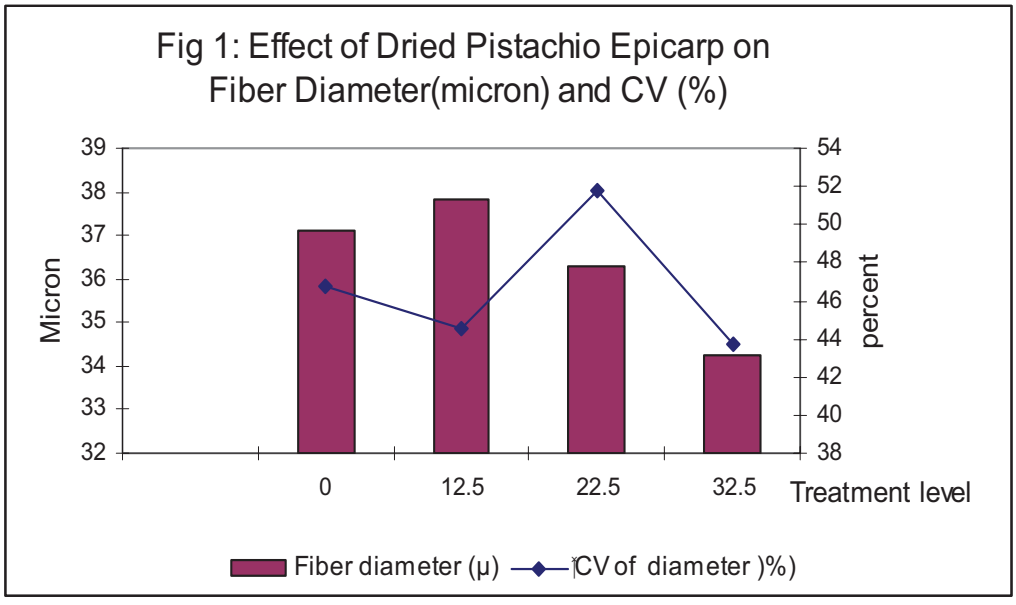


Fig 2: Effect of Dried Pistachio Epicarp on wool contant

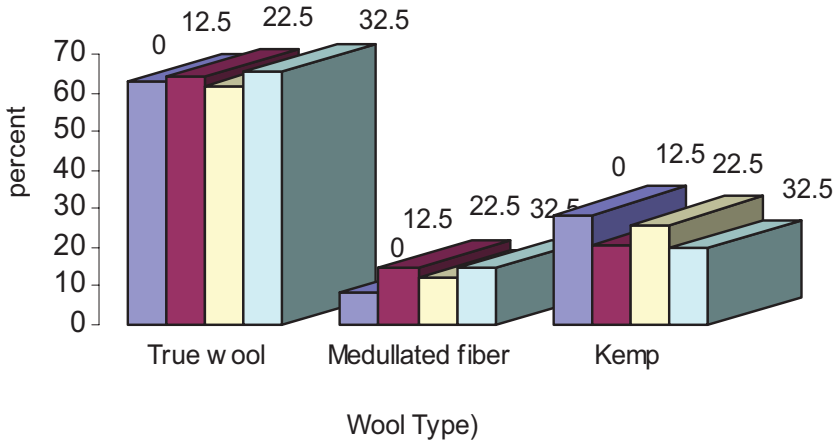
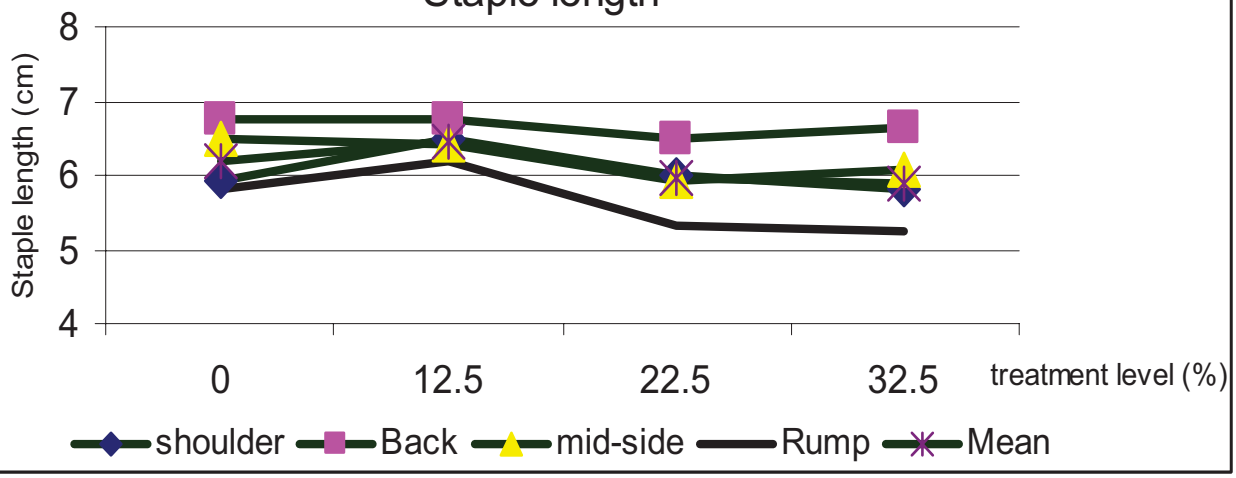


Fig 3: Effect of Dried Pistachio Epicarp on Staple length



CONCLUSION

It was concluded that nutritional effect, due to tannin, must to be established using plants containing intermediate tannin concentration (10 – 20 g/kg DM). Due to high variation observed in quality and quantity characteristic of wool (table 3), it is necessary that feeding experiments such as this one are done in a long period because the effects of feeding on wool are slow and time consuming.

ACKNOWLEDGMENTS

Technical wool assistance by M. Afshar is gratefully acknowledged and the farm staff of Animal Science Research Institute is also acknowledged.

Table 3. The average total for wool performances of Afshari lamb

Tablica 3. Ukupni prosjek performance vune

Traits - Značajke		Mean ± SE - Prosjek ± SE	CV	Min	Max
Fleece Weight - Težina runa (g)		1622.92.5±84	25.38	900	2550
Staple lengths Duljina vlakna (cm)	Shoulder - Rame	6.06±0.26	21.24	4.5	9.5
	Back - Leđa	6.60±0.19	13.93	5	9
	Flank - Slabina	6.23±0.18	14.19	4.5	8.5
	Rump - But	5.64±0.18	15.33	4	7.5
	Mean - Prosjek	6.12±0.18	14.32	4.5	8.1
Fleece fiber contents Sadržaj tkiva runa (%)	True wool - Prava vuna	63. 74±2.2	16.85	43.21	82.2
	Medullated - Srž	12.36±1.9	77.96	1.58	40.3
	Kemp - Uredna vuna	23.87±2.1	43.35	8.2	43.05
Mean fiber diameter - Prosječni promjer vlakna (µ)		36.37±0.85	11.5	28.1	45.72
CV of fibre diameter - CV promjera vlakna (%)		46.7±1.99	20.89	31.34	70.32
Breaking load - Opterećenje lomljenja (kg)		7.06±0.3	21.33	3.93	9.6
Tenacity - Žilavost (gf/tex)		3.20±0.17	26.22	1.6	4.7
Extension - Duljina (%)		33.59±1.4	19.24	20	44.8

REFERENCES

1. Anon. (1982): Breaking strength of wool fibre bundles 1 IN. Gage length. American Society for Testing Materials (ASTM). D. 2130 –610.
2. Anon. (1982): Diameter of wool and other animal fibres by micro projection. American Society for Testing Materials (ASTM). D1294-79. 32:295–302.
3. Anon. (1982): Standard definition of terms relating to textiles. American Society for Testing Materials (ASTM). D 123 – 82a.
4. Anon. (2000): AOAC. Official methods of analysis. 17th ed. Association of official analytical chemists. Gaithersburg. M, D.
5. Brooker, J.D., Klum, D., Miller, S., Skene, I., Donovan, L. O. (1995): Rumen microorganism as providers of high quality protein. Livestock Research for Rural Develop. 6(3): 1-4.
6. Decandia, M. (2000): Responses to an ant tannic supplementation by browsing goats. 7th International Conference Goats. France.1:71-3.
7. Fazaeli, H. (2007): Nutritive value of dried pistachio by product in sheep. Proceedings of the 2nd congress on animal and aquatic science. 722-725.
8. Julkunen-Titto, R. (1985): Phenolics constituents in the leaves of northern willows: Methods for the analysis of certain phenolics. Journal of Agriculture and Food Chemistry. 33: 213-217.
9. Kumar, R., Vaithiyanathan, S. (1990): Occurrence, nutritional significance and effect on animal productivet of tannins in tree leaves. Animal feed science Technology. 30: 21-38.
10. Labavitch, J. M., Heintz, C. M., Rae, H. L., Kadar, A. A. (1982): Physiological and compositional changes associated with maturation of Kerman pistachio. Journal of American Social Horticultural science. 107(4): 688 – 692.
11. Mahdavi, A. (2008): Effects of physical and chemical treatments on quality of pistachio epicarp and lamb performance. Animal Science PhD Thesis. Tehran University.
12. Makkar, H. P. S., Borrowy, N. K., Becker, K. (1992): Quantitation of polyphenols in animal feedstuffs. Proceeding of XVI International Conference of group of polyphenol. Lisbon. 13-17 July.
13. Memarizade, R. (2007): Effects of pistachio epicaep replacement in Holstein dairy cattle. Animal Science M.Sc Thesis. Azad Islami University. Khoeasgan branch.

14. Menke, K. H. Steingass, H. (1988): Estimation of the energetic feed value obtained from chemical analysis and in vitro gas production using rumen fluid. Animal Research Develop. Separate Print. 28, 7-55.
15. Orskov, E. R, McDonald, I. (1979): The estimation of protein degradability in the rumen from incubation measurements weighted according to rate of passage. *Journal of Agricultural Science*. Cambridge 92: 499-503.
16. SAS / STAT (1987): User's Guide, 6.03 editions. SAS institute Inc. 602–610, 624, 632.
17. Sayyed Moumen, S. M., Nik Khah, A., Zahedifar, M., Salehi, M. (2004): The effect of different levels of pistachio by product and its tannins on growth and cashmere production of Raeini goats. Journal of Pajouhesh-va-Sazandegi, Iran, 65: 92- 101.
18. Terrill, T. H., Douglas, G. B., Foote, A. G., Purchase, R. W., Wilson, G. F., Barry, T. N. (1992): Effect of condensed Tannin upon body growth, wool growth and rumen metabolism in sheep grazing Sulla (Hedysarum coronarium) and perennial pasture. Journal of Agricultural Science, Cambridge, 119: 265 – 273. England.
19. Tilley, J. M. A., Terry, R. A. (1963): Two Stage Technique for the in vitro digestion of forage crops. Journal Breeding Grassl. Society.18: 104- 111.
20. Van Soest, P. J., Robertson, J. B. (1979): Systems of analyses for evaluation of fibrous feed. (In: W. J. Pigden., C. C. Balch, and M. Graham Eds.). Proceeding of International Workshop on Standardization of Analytical Methodology for Feeds, 49-60. International Development Research Center, Ottawa, Canada.

SAŽETAK

Dvadeset četiri muške janjadi pasmine Afshari (prosječne žive mase 35±1.21 kg u dobi 10 mjeseci) korišteno je za istraživanje djelovanja različitih razina epikarpa sušene pistacije (0,12, 22 i 32%) na značajke vune. Mjereni su dužina vlakna vlakna na ramenu (STS), slabinama (STF), leđima (STB) i butu (STR), vlakna prave vune (TW), srž/unutrašnjost vlakna (MF), postotak urednog vlakna (KF), prosječni promjer vlakna vune (MD) i variranje njegovog koeficijenta (CVMD), opterećenje lomljenja (BL), čvrstoća vune (WT) i duljina (E). Ti su podaci analizirani pomoću jednosmjerne ANOVA-e primjenom paketa softvera SAS. Ukupan prosjek STS-a, STB-a, STF-a, STR-a, TW-a, MF-a, KF-a, MD-a, CVMD-a, BL-a, WT-a i E vune bio je 6.06-0.26, 6.60-0.19, 6.23-0.18 i 5.64-0.18 cm, 63.74-2.2, 12.36-1.9 i 23.87-2.1%, 36.37-0.85mu, 46.7-1.99%, 7.06-0.3 kgf, 3.2-0.17gf/tex i 33.59-1.4%. Premda nije bilo značajnih razlika među tretmanima, rezultati su pokazali da hranjenje janjadi epikarpom pistacije do 32.5 posto ukupnog unosa suhe tvari nije djelovalo na značajke vune.

Ključne riječi: janjad Afshari, epikarp suhe pistacije, značajke vune