Journal of Rural Advancement
(RNI No. UPENG03889/2013; ISSN 2347 - 2561)
Vol. 01, Issue 01, Year 2013

Effect of oral quercetin administration on the exoskeleton of Barbari goats in subtropics regions

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Abstract

The present investigation was designed to study find out the influence of oral administration of quercetin on the exoskeleton of goats. The study was carried out on six Barbari goats selected randomly from the herd and offered identical balanced feed. Those were given oral administration of quercetin at the rate of 1.5 mg per Kg live weight, in the morning daily. Samples of hairs, horns, and hooves were collected from goats under experiment on the days 00, 30, 60, and 90 of the experimental trial. The samples were estimated for crude protein, crude fat, and major and trace elements. The data recorded during the experiment were statistically analyzed using suitable models. A salient conclusion based on the study can be drawn that content of crude protein in the exoskeleton, and magnesium in hooves of goats was increased with the advancement in the duration of administration of quercetin in goats.

Keywords: Exoskeleton, Goat, Hairs, Hooves, Horns, Quercetin.

Introduction

Quercetin, having anti-inflammatory and antioxidant properties, (Stewart et al 2008, Davis et al 2009) is a plant-derived flavonoid, which is used as a nutritional supplement. Biochemically Quercetin is the aglycone form of flavonoid glycosides, such as rutin together with rhamnose and rutinose, respectively, and quercitrin, which is found in citrus fruit, buckwheat, and onions.

In laboratory studies of cells (in vitro), quercetin produced changes that are also produced by compounds that cause cancer (carcinogens), but not reported increased cancer in animals or humans (Verschoyle et al 2007, Rietjens et al 2005, van der Woude et al 2005). Quercetin has been claimed to suppress skin and prostate cancer cells (Paliwal et al 2005) reduce blood pressure (Edwards et al 2007), inhibit chronic prostatitis, (Shoskes 1999), and inhibited the production of fat cells In combination with resveratrol (Yang et al 2008). Despite these preliminary indications of possible

medicinal effects, quercetin has neither been confirmed as a specific therapeutic action nor approved by any regulatory agency. Quercetin influences cellular mechanisms in a very limited fashion, to reduce the risk of certain cancers (Neuhouser 2004, Murakami et al 2008) in the human population. Quercetin is defined as an inhibitor of CYP2C9 (Dayong et al 2009) however, the sources are not so consistent as to whether quercetin is an inhibitor (Hsiu et al 2002) or inducer (Raucy 2003) of CYP3A4.

The present investigation was designed to study find out the influence of oral administration of quercetin on the exoskeleton of goats. Materials and methods:

The study was carried out on six Barbari goats selected randomly from the herd, based on various phenotypic traits (Age 845.3±5.4 d; LW 17.3±0.6 Kg; BL 573.7±6.4 mm; BH 551.2±6.6 mm; HG 572.8±6.4 mm). The subjected animals (both sheep and goats) were reared at the door of the farmer in village Chaumuhan and were offered identical feed as per the specification of ICAR (1998) to meet their daily nutritional requirements. The steps were taken for deworming under the prescription and supervision of a veterinarian to make sure that the animals will remain free from internal and external parasitic infection during the investigation. The animals were given oral administration of Quercetin at the rate of 1.5 mg per Kg live weight, in the morning daily.

Samples of hairs, horns, and hooves were collected from goats under experiment on the days 00, 30, 60, and 90 of the experimental trial. Samples of hairs were collected from the neck, shoulder, mid flank, ventral abdomen, croup, and lateral thigh region. Samples of the horns were collected at the base and the tip of both the left and right horns. The samples of hooves were collected from the four legs of the animals.

The samples were immediately brought to the laboratory and washed to remove all the outer material using standard techniques followed by drying. The collected samples were subjected to estimation of crude protein, crude fat, and major and trace elements (Denis 1922, Robertson and Webb 1938, Macpherson and Stewart 1939, Allen 1940, De Loureiro and Janz 1944, Jones 1948, Fowden 1951, Futterman and Saslaw 1961, AOAC 1990, Mathpal and Kandpal 2009). The data recorded during the experiment were statistically analyzed using suitable models (Snedecor and Cochran 1994).

Results and discussion

The observations regarding the effect of quercetin supplementation on the distribution of different components in the exoskeleton, at different intervals (day 00, 30, 60, and 90 days) of the regime of antioxidant has been presented in Table 1.

Table 1(a): Composition of the exoskeleton of goat as affected by oral administration of quercetin

Subject	Organ	Day 00	Day 30	Day 60	Day 90
Crude protein	Hairs	81.44 ±0.13 [b]	84.28 ±0.73 [a,b]	86.92 ±0.67 [a]	88.77 ±0.62 [a]
	Horns	71.37 ±0.74 [b]	72.51 ±0.55 [a,b]	72.68 ±0.50 [a]	75.09 ±0.46 [a]
	Hooves	74.25 ±0.69 [c]	5.55 ±0.55 [b,c]	76.42 ±0.74 [a,b]	77.76 ±0.38 [a]
Crude fat	Hairs	8.09 ±0.14	8.22 ±0.10	8.23 ±0.13	8.13 ±0.40
	Horns	12.54 ±0.22	12.75 ±0.21	12.68 ±0.19	12.74 ±0.25
	Hooves	14.26 ±0.32	14.36 ±0.27	14.24 ±0.25	14.11 ±0.35

Content of crude protein (CP) ranged from 81.44 to 88.77, 71.37 to 75.09 and 74.25 to 77.76, and crude fat (CF) 8.09 to 8.23, 12.54 to 12.75 and 14.11 to 14.36µg/100g in goat hairs, horns, and hooves, respectively during the study. The content of CP in the exoskeleton was significantly increased but CF remained unaffected due to the increased length of oral administration of quercetin. Williams et al (1983) presented findings similar to those recorded during the present results in the control group in terms of CP and CF distribution in soft tissues.

The contents of major elements except magnesium in the exoskeleton were not differed due to the increased length of oral administration of quercetin in goats, however, the content of magnesium in goat hooves was increased because of the lengthened duration of oral administration of magnesium. Very modest information is available in the literature concerning the major element profile in the exoskeleton of goats affected by quercetin administration. The findings of BoBelmann et al (2007) for the content of calcium, sodium, and magnesium and Abdin-Bey (2007) for phosphorus in exoskeleton in control groups were well comparable. Present findings in the control group also confirmed the outcomes of Williams et al (1983), Hidiroglou and Williams (1986), Anson (2000), and Ali (2008) in this regard.

The contents of microelements in the exoskeleton of goats did not differ as a result of lengthened oral administration of quercetin. Very little information is available in the literature about the profile of microelements in the exoskeleton of goats. The present findings in the control group were in agreement with the results perceived by Onwuka et al (2001), AL Qahtani (2004), Abdin-Bey (2007), and Ali (2008) in terms of cobalt profile; Hidiroglou and Williams (1986), AL Qahtani (2004), Abdin-Bey (2007), Ali (2008) and Mehren (2009) in terms of the copper profile; Williams et al (1983), Anson (2000), Onwuka et al (2001), Al Qahtani (2004), Ali (2008) and Mehren (2009) in terms of iron profile and Spruit and Bongaarts (1977), Chatt and Katz (1988), Aras and Ataman (2006) and Ali (2008) in terms of nickel profile of exoskeleton of mammals.

Table 1(b): Composition of the exoskeleton of goat as affected by oral administration of quercetin

Subject	Organ	Day 00	Day 30	Day 60	Day 90
Calcium	Hairs	774.17 ±9.97	776.83 ±9.24	774.50 ±6.65	776.83 ±5.94
	Horns	108.33 ±4.71	108.67 ±4.89	108.67 ±4.89	129.83 ±5.38
	Hooves	120.17 ±1.96	119.67 ±1.75	119.17 ±1.96	119.17 ±1.96
Phosphorus	Hairs	385.00 ±1.03	391.83 ±2.04	396.83 ±1.80	398.83 ±1.54
	Horns	129.83 ±5.38	132.17 ±5.51	133.67 ±5.53	134.67 ±5.53
	Hooves	136.50 ±1.71	138.50 ±1.71	140.50 ±1.71	141.50 ±1.71
Sodium	Hairs	83.70 ±2.18	80.27 ±1.87	78.58 ±1.05	77.85 ±1.68
	Horns	433.60 ±5.17	427.67 ±5.17	418.67 ±4.95	417.00 ±4.99
	Hooves	184.67 ±6.90	185.67 ±6.90	185.67 ±6.90	184.67 ±6.90
Magnesium	Hairs	400.67 ±5.53	399.67 ±2.82	402.67 ±1.45	401.00 ±1.15
	Horns	169.17 ±1.56	169.17 ±1.56	170.17 ±1.56	171.17 ±1.56
	Hooves	440.83 ±1.26 [a]	434.50 ±1.05 [b]	425.50 ±1.72 [a]	424.00 ±1.72 [c]

Conclusion

A salient conclusion based on the study can be drawn that content of crude protein in the exoskeleton, and magnesium in hooves of goats was increased with the advancement in the duration of administration of quercetin in goats.

Table 1(c): Composition of the exoskeleton of goat as affected by oral administration of quercetin

Subject	Organ	Day 00	Day 30	Day 60	Day 90
Cobalt	Hairs	10.37 ±0.03	11.17 ±0.09	11.22 ±0.08	10.22 ±0.08
	Horns	1.90 ±0.17	1.91 ±0.17	1.93 ±0.18	1.88 ±0.17
	Hooves	1.63 ±0.04	1.64 ±0.04	1.66 ±0.04	1.62 ±0.04
Copper	Hairs	182.50 ±0.92	186.33 ±1.69	184.17 ±1.14	184.17 ±1.45
	Horns	21.00 ±2.42	21.35 ±2.46	21.18 ±2.44	21.47 ±2.48
	Hooves	18.42 ±0.55	18.75 ±0.57	18.55 ±0.57	18.82 ±0.55
Iron	Hairs	67.93 ±2.06	69.77 ±0.78	75.05 ±1.22	79.62 ±2.16
	Horns	25.33 ±2.16	26.20 ±2.23	28.03 ±2.39	29.82 ±2.53
	Hooves	19.12 ±0.55	19.73 ±0.56	21.08 ±0.60	22.48 ±0.64
Nickel	Hairs	30.15 ±1.59	29.20 ±0.94	31.72 ±0.95	27.67 ±1.58
	Horns	35.67 ±2.42	33.55 ±2.28	36.92 ±2.50	34.82 ±2.36
	Hooves	31.15 ±0.90	29.32 ±0.84	32.25 ±0.92	30.42 ±0.88

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