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The effect of hay supplementation on performance of grazing alpaca in the Peruvian Andes

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Abstract

Productivity of alpaca grazing rangelands in the Andes is often limited by the low availability and quality of those pastures during the dry season of the year. The use as supplements of forages cultivated during the rainy season in appropriate areas in the Andes may be a strategy to improve performance of alpacas. Therefore, the supplementation of oat-vetch pellets or oat hay was evaluated and compared with a control group without supplementation. Sixty three female alpacas (15 months of age, 34 ± 1.0 kg BW), divided in three groups, grazing range pastures (6.1% crude protein and 61.3% NDF) during dry season in Puno region of the Peruvian Andes were used for the study. The supplement was offered daily after grazing (400 g/alpaca/day). The study lasted for 84 days with evaluations of weight gain and intake every 28 days. Weight gain was greater for animals supplemented with oat-vetch pellet (3.1 ± 0.27 kg) compared to oat hay (0.98 ± 0.33) ($P \leq 0.05$) while the control lost BW (0.64 ± 0.22). The total dry matter intake (pasture and supplement) was 502, 575.6 and 579.5 g / alpaca/ day for the control, oat-vetch pellet and oat hay group respectively indicating partial replacement of pasture by the supplement. Under the study conditions, the supplementation of oat-vetch pellets improved performance better than oats hay or no supplementation for alpacas grazing range pastures during the dry season.

Introduction

Alpaca (*Vicugna pacos*) is the most important species for fiber production among South American camelids and is adapted to Andean environments with high capacity to efficiently use dietary energy (Barreda 2017). This animal feeds on pasture of low nutritional quality and is adapted to environments with poor food availability (San Martin 1996). However, several studies predict that the adverse effects of climate change will worsen and will be more recurring in the coming years that will affect the availability of pastures and production of alpacas (Herzog *et al.*, 2012). The use of nutritional supplements in critical periods may be an appropriate strategy to alleviate some nutritional deficiencies (Van Saun 2006). Therefore, the present study aims to evaluate the effect of supplements of oat-vetch pellets or oat hay on weight gain and consumption of alpacas in range pastures during the dry season.

Materials and Methods

Study site

The study was carried out in the Instituto Nacional de Innovación Agraria (INIA) experimental unit

“Quimsachata” (4200 masl), Puno Region, Peru, which is characterized by having an average annual temperature of 7 °C, being considered Cool temperature moist forest (Holdridge 1987).

Treatments

Sixty-three 15-month-old female alpacas of Huacaya breed were used. The animals were assigned to one of three treatments: grazing range pasture (T1), supplementation with oat-vetch pellets + grazing range pasture (T2) or supplementation with oat hay + grazing range pasture (T3). The average live weight of animals for T1, T2 and T3 were 33.9 ± 0.94 , 34.5 ± 1.22 and 34 ± 1 kg respectively. The animals after grazing received 400 g of oat-vetch pellets or alpaca oat hay/day. The variables evaluated were dry matter intake (grass and supplement) and weight gain every 28 days for 84 days during the dry season (July-October) of 2017. Total dry matter intake was calculated considering an intake of NDF to 0.9 percent of live weight (Van Saun 2006). As supplement intake was registered daily the difference of total dry matter intake was considered

range pasture. The chemical composition of range pasture, oat-vetch pellets and oat hay is shown in Table 1. Dry matter, crude protein, calcium and phosphorous content were determined according to the method of the Association Official Analytical Chemist (AOAC 2005). The determination of Neutral Detergent Fiber (NDF) was carried out by the method of ANKOM Neutral Detergent

Fiber in feed - Filter bags technique (ANKOM 2007). *In vitro* Digestibility of Organic Matter was determined by ANKOM Daisy Incubator. Metabolizable energy was estimated using the formula proposed by Geenty and Rattray (1987).

Table 1: Chemical composition (100% dry matter) of range pasture, oat-vetch pellets and oat hay

	Range pasture	Oat-vetch pellets	Oat hay
Dry matter	91.7	89.7	89.8
Crude protein	6.1	8.9	6.7
Neutral detergent fiber	61.3	55.7	46.6
Calcium	0.3	0.5	0.3
Phosphorous	0.2	0.2	0.1
<i>In vitro</i> organic matter digestibility	44.4	60.1	60.4
Metabolizable energy (Mcal/kg)	1.7	2.31	2.32

Statistical analysis

The variables were evaluated through an analysis of variance, using a completely randomized design with 3 treatments and 21 repetitions with 3 subsamples of 7 animals per pen. The comparison of means was carried out by Tukey test with a level of significance of 5%. The statistical software used was SAS 9.4 (SAS 2016).

Results

The results of dry matter intake and nutrient of animals are shown in table 2. The average dry matter intakes of oat-vetch pellets and oat hay in dry matter were 327.4 and 280.5 g / alpaca / day, covering 57 and 48% of the ration, respectively. The total and daily weight gain of animals are shown in table 3.

Table 2: Dry matter and nutrients intake of animals (g/animal/day) (unit?)

Period	Treatment 1		Treatment 2		Treatment 3		
	Range pas- ture	Oat-vetch pel- lets	Range pasture	Total	Oat hay	Range pasture	Total
Dry matter intake							
28 d	507	269.1	289.9	559	256.8	312.1	568.9
56 d	509	356.1	226.2	582.3	293.6	292.3	585.9
84 d	489	357	228.6	585.6	291	292.7	583.7
Average	502	327.4	248	575.6	280.5	299	579.5
Average nutrient intake							
Crude protein, g	30.6	29.1	15.1	44.3	18.8	18.2	37
Ca, g	1.5	1.6	0.7	2.4	0.8	0.9	1.7
P, g	1	0.7	0.5	1.2	0.3	0.6	0.9
Metabolizable energy, Mcal	0.85	0.76	0.42	1.2	0.65	0.51	1.2

Discussion

The results shown that the average dry matter intakes of range pasture was high at the beginning of the experiment and decreased over time, this is probably due to shortage of pasture and higher intake of supplement (oat-vetch pellets or oat hay). The treatment supplemented with Oat-vetch pellets had a weight gain of 36.9 g/d, followed by the treatment supplemented with oat hay (17.9 g/d). These values are lower than the 95 g/d reported in female alpacas fed with 750 g of alfalfa pellets plus 1 kg of alfalfa hay (Rosadio and Risco, 2014).

Table 3: Total (kg) and daily weight gain (g/animal) of animals

Period of evaluation	Treatment 1	Treatment 2	Treatment 3
01-28 d	0.57 ^b ± 0.24	1.81 ^a ± 0.33	0.57 ^b ± 0.25
28-56 d	0.19 ^a ± 0.24	1.05 ^a ± 0.31	0.67 ^a ± 0.20
56-84 d	-1.14 ^b ± 0.19	0.24 ^a ± 0.18	0.24 ^a ± 0.05
Total weight gain	-0.64 ^c ± 0.22	3.10 ^a ± 0.27	0.98 ^b ± 0.33
Daily weight gain	-0.01	36.9	17.9

The lower weight gain of alpacas in this experiment is due to the fact that they were grazed in the dry season with low quality pastures. While the treatment without supplementation lost weight (-0.01 g/d), this weight loss was due to the low supply of nutrients from range pasture and low *in vitro* organic matter digestibility (44.4%). In conclusion, under the study conditions, the supplementation of oat-vetch pellets improved performance better than oats hay or no supplementation for alpacas

grazing range pastures during the dry season.

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