Determination of degradability of whole seeds Safflower and its proteins fractions

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Abstract: This study was carried out to determine whole seed Safflower (WSS) crud protein (CP) degradation characteristics by using nylon bags. The rumen degradability of WSS CP at ruminal outflow rate of 0.02/h, 0.05/h and 0.08/h were 84.8, 77.5 and 71.7, respectively. Crud protein degradability of WSS at 0, 2, 4, 8, 16, 24 and 48 h incubation were 16.87, 42.62, 58.1, 83.79, 85.8, 88.21 and 92.58 percent.
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Keywords: Whole seed Safflower, Protein degradation, in situ, crud protein

Abbreviations: WSS, whole seed Safflower; CP, crude protein.

1. Introduction

Safflower is an annual plant from the family Compositae. It is referred to in literature as cultivated (Carthamus tinctorius L.) and wild species (C.lanatus L.). Africa and Asia are mentioned as places of origin, with the Medditeranean as the main region of distribution. Safflower is an important aromatic and medicinal plant. Due to high oil content in seed, it is also cultivated as an oil crop. Cartamine (C21H22O11), a coloring substance found in the flowers of this plant, is used as colorant in food-processing industry (Hegi, 1954. Rapotiand and Romvani, 1972).

Also, Safflower is a major protein source for humans and other animals (Neilsen et al, 1989). Rapidly growing ruminants and lactating dairy cattle rely on both microbial protein and rumen-undegradable protein (escape protein) digested in the small in testing to meet their amino acid requirements. When good quality protein is fed to ruminants, it is subject to extensive microbial fermentation. During fermentation most protein is degraded to peptides, amino acids, and finally to ammonia (Chalupa, 1981).

In these cases, the advantage of protein quality, in terms of balance of essential amino acid and digestibility, are lost.

2. Material and Methods

2.1. Samples preparation

The WSS samples were obtained from commercial sources in Iran. The CP of a sample (5g) of seeds was determined by drying at 550C for 48h.

2.2. Animal and diets

Three ruminal cannulated Iranian Ghezel male sheep weighing approximately 54kg were placed in individual 2.2 * 1.8m pens with concentrate. Floors that cleaned were regularly. Sheeps were fed 4kg dry matter, a total mixed ration containing concentrate and alfalfa hay, diets twice daily at 08:00 and 14:00 h.

2.3. In situ evaluation of crud protein

Nylon bag technique was used to measure disappearance in the rumen of WSS. Nylon bags (45-m pore size. 8cm * 16cm bag size) containing 5g of WSS samples were incubated in the rumen of each sheep. Six bags of WSS were removed after 2, 4, 8, 16, 24 and 48h of incubation in the rumen. Then individual bags with content were washed in running tap water until the bags were free of rumen matter. Bags were then dried to a constant weight at 550C for 48h and weighed.

The solubility or washing loss was determined by socking samples of each material in water at 37-400C for 1h followed by the washing procedure above.

Digestion kinetics of CP was determined according to the equation of Orskov and McDonald (1979):

Estimated using the equation of Orskov and McDonald (1979):

$$Pe= a+bc/ k+c$$

Where, Pe is the effective degradation, k the fractional ruminal outflow rate, a, b and c are as defined above. Effective degradability was calculated with an estimated solid outflow rate from the rumen (k) of 0.02, 0.05 and 0.08 h-1 (Bhargave and Orskov, 1987).

2.4 Chemical analysis

Feed samples were analyzed for CP and CP content of their residues after rumen incubation by using the procedures of AOAC (1984).

2.5. Determination of rumen degradability

In the procedure of ruminal incubation, the method of Mehrz and Orskov (1977) was followed. For this, 5g of samples of WSS were weighed in duplicate into nylon bags. Group includes 21 samples (two replicates * three sheep for treatment) prepared into individual nylon bags for assay. Bags were incubated in the ventral sac of the rumen of three Irannian Ghezel sheep for 0, 2, 4, 4, 8, 16, 24 and 48h.

Diet was offered at 4g/kg of body weight daily in two equal portions (08:00 and 14:00h). In the ditely after removal from the rumen, bags were put in ice water to stop microbial fermentation, and washed under tap water until the rinsing water became colorless, then dried out and weighed.

2.6. Statistics

Digestion kinetics of CP was determined according to the equations of Orskov and McDonald (1979) as:

$P= a+b (1-e-ct)$,

$ERD= a+bc/(c+k)$

Where 'P' is CP disappearance (g/kg) at time t (hour), 'a' the water soluble fraction (g/kg), 'b' the potentially degradable fraction (g/kg), 'c' the rate of degradation (h-1) of 'b' fraction, RED the effective rumen degradation, and 'k' the fractional ruminal outflow rate.

3. Results and Discussions

The rumen degradation characteristics of CP of WSS are given in Table1. As seen in Table1, CP washing losses were 7.66%.

Table1. The rumen degradation characteristic was crud protein in whole seeds Safflower.

Time (h)	treatment
	WSS
2	42.62
4	58.1
8	83.79
16	85.8
24	88.21
48	92.58
Estimated parameters	
Washing loss (%)	7.66

CP disappearance of WSS, after 2, 4, 8, 16, 24 and 48h of incubation in rumen were 42.62, 58.1, 83.79, 85.8, 88.21 and 92.58 g/kg, respectively. These values in WSS were higher from meal Sunflower. The values for WSS are approximately similar to that reported by Deniz and Tuncer (1995) and similar to the results obtained in earlier studies (Mir et al., 1984. Harstad and windschitl, 2000).

All discrepancies reported in varietal differences in the meal incubated, in situ technique, basal diet or variation. In the extent of microbial contamination were incubated samples (Freer and D.Ve. 1984., Nocek. 1988).

4. Conclusion

This study may provide a useful description of sub fractional protein degradation of protein supplements occurring in the rumen.

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