



Effects of electron beam and gamma irradiation on free gossypol, ruminal degradation and in vitro protein digestibility of cottonseed meal



Mehdi Taghinejad -Roudbaneh, Islamic Azad University ,Tabriz Branch, Tabriz, Iran

THE MESSAGE

Irradiation processing:

- *Improved nutritional value.*
- *Decreased ruminal protein degradability.*
- *Increased intestinal protein digestibility.*
- *Decreased free gossypol.*

METHODS

- Samples were irradiated at the Atomic Energy Organization of Iran.
- Nylon bags were suspended in the rumens of three ruminally-fistulated rams for up to 48 h.

$$P = a + b(1 - e^{-ct}), \quad ED = a + bc/(c + k)$$

- Digestibility of rumen undegraded CP was estimated using the three-step procedure.
- Gossypol content was measured, ISO: 6866. 1985

RESULTS

Table 1. Rumen degradation parameters crude protein and *in vitro* crude protein digestibility of undegraded protein of untreated, gamma and electron beam-irradiated cottonseed meal (n = 3)

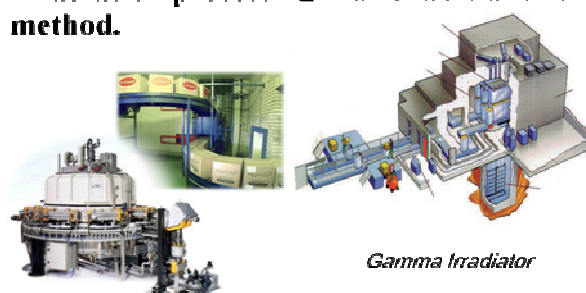
Degradation Parameters	Untreated cottonseed meal	γ-irradiated cottonseed meal			E.B-irradiated cottonseed meal			SEM
		15 kGy	30 kGy	45 kGy	15 kGy	30 kGy	45 kGy	
<i>a</i> (g/kg)	264 ^a	252 ^a	221 ^b	174 ^c	257 ^a	227 ^b	194 ^c	9.1
<i>b</i> (g/kg)	771 ^c	720 ^{bc}	755 ^b	804 ^a	725 ^{bc}	745 ^b	793 ^a	13.0
<i>c</i> (%.h ⁻¹)	8.8 ^a	8.3 ^a	6.9 ^b	4.5 ^c	8.2 ^a	6.7 ^b	5.0 ^c	0.38
ERD (g/kg)								
0.02 h ⁻¹	843 ^a	831 ^a	806 ^a	741 ^b	835 ^a	799 ^a	760 ^b	10.2
0.05 h ⁻¹	718 ^a	670 ^{ab}	659 ^c	567 ^d	707 ^{ab}	652 ^c	591 ^d	13.8
0.08 h ⁻¹	637 ^a	617 ^a	571 ^b	475 ^c	624 ^a	566 ^b	499 ^c	6.0
<i>In vitro</i> crude protein digestibility (g/kg)	643 ^c	660 ^{bc}	711 ^{ab}	744 ^a	653 ^a	680 ^b	730 ^c	16.5
Free gossypol content (g/kg)	4.7 ^a	4.2 ^b	3.8 ^c	3.4 ^c	4.1 ^b	4.0 ^b	3.7 ^d	0.10

a,b,c,d Means in the same row with different letters differ (p<0.05).

a: washout fraction (g/kg); b: potentially degradable fraction (g/kg); c: rate of degradation; ERD: effective rumen degradability.

INTRODUCTION

- Proteins of CSM are extensively degraded in the rumen.
- Free form of gossypol in CSM, is toxic.
- Limitations in CSM free usage in animal's diets.
- Radiation processing is a reliable and safe method.



TT₂₀₀ Rhodotron accelerator

Gamma Irradiator

CONCLUSIONS

- Irradiation processing of CSM improve its nutritional quality for ruminants.
- Further studies is needed to elucidate the economical benefits of this process.