COMPENSATORY GROWTH AND ZERANOL IMPLANTS: EFFECT ON STEER BODY FATS.

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Summary

The influence of Zeranol implants on intramuscular fat content and fatty acid composition of M. Biceps brachii, Longissimus dorsi, Psoas major and Semitendinosus and seven fat depots was studied in 40 Angus steers under a management program ad libitum or making compensatory growth. The percentages of intramuscular fat were lower in the restricted-implated animals ($p < .05$). Discriminant Factor Analysis allows using the fatty acid composition to classify the different adipose tissues into groups. Considering the subcutaneous, brisket and perinephric fatty acid composition was possible to get 100% of the steers correctly classified showing clearly the effect of both factors, food restriction and Zeranol implants on fatty acid composition of steer body fats.

Introduction

The quantity and quality of fat from meat animals are important from the economical and nutritional point of view. Adipose tissue has the capacity to contract or expand in response to nutritional and experimental treatments and its fatty acid composition is also affected for these variables. Grazing animals are submitted to periods of limited nutrition followed by periods of abundance. Under such conditions, compensatory growth occurs (Allden, 1970; Reid & White, 1977).

Anabolic agents increase weight gain and nitrogen balance and improve feed efficiency in meat animals. The effect of both factors, compensatory growth and zeranol implants in the quality and quantity of body fat in grazing steers is not well know but could be important for its effects in carcass and meat quality. The effect in the amount of intramuscular fat could be also important because intramuscular fat (marbling) is believed to influence the eating quality of beef.

This study was undertaken to examine the influence of Zeranol implanted in the quantity and quality of intramuscular fat and in the fatty acid composition of dissected fats from 40 Angus steers under a management program making compensatory growth.

Material and methods

The distribution of the 40 Angus steers in the 4 treatment is shown in Table 1. This research is part of a Fumagalli et al.(1990) work and additional information could be found there. One additional group from each nutritional level was slaughter at the end of Period 1 and used to establish baseline fat composition for the two groups.

Carcass sampling

M. Psoas major (PM) and Longissimus dorsi (LD): A slice of approximately 150 g from the middle of the muscle.

M. Semitendinosus (ST) and Biceps brachii (BB): The total muscles were minced and an aliquot sample of approximately 300 g was kept from each.

Subcutaneous fat (SB): Fat covering the eye muscle in the area from the tenth to the twelfth ribs.

Brisket fat (B): External brisket fat at the 5-6a sternebrae.

Perinephric (PN), pelvic (PV), cod (C), subescapular (SE) and brisket internal (BI): An aliquot sample of approximately 50 g from each.

All samples were kept at -25C until analyzed. Two aliquot samples of 10 g each, from the minced muscles, were first dried and then extracted with petroleum ether (boiling point 68C) for 16 hs to determine the total weight of chemical fat. A third aliquot sample was extracted according to the method of Folch et al. (1957) for compositional lipid analyses.

The triglycerides were isolated by TLC and the fatty acid concentrations from the total l the triglyceride fractions were determined by GLC (Garcia et al.,1979). The lipids we extracted from the adipose tissue with petroleum ether and the triglycerides were isolat from the other lipids by TLC. The fatty acid composition was determined by GLC separation methyl esters (Garcia et al.,1979).

Multivariate analysis of variance was performed using a least square- model. Princip component analysis (PCA) was performed using the correlation matrix. Discriminant fac analysis (DFA) was performed to classify the adipose tissues into groups according with t fatty acid composition.

Results and discussion

The percentages of intramuscular fat in BB, LD, PM and ST muscles in the fo experimental groups, RO ZO, RO ZI, RI ZO and RI ZI are presented in Table 2. Not signific differences among RO ZO, RO ZI and RI ZO in MF% in the four muscles studied were detec but they differ from the RI ZI group ($p<.05$). Reductions in marbling in implanted ste when compared to nonimplanted steers have been reported by Prior el al. (1978) but in t experiment only was noticeable in the steers that have been previously restricted. The f of the data set extracted two axes which accounted for 74.8 % of data variance shared 53.5 % and 21.5 % between axis 1 and 2, respectively. Three variables fell into one clust with high loading on the first axis (LD, PM and ST MF%) while BB MF% showed preferenti loading on axis 2. Inside the cluster the variables were significantly and positive correlated ($r > .70$, $p>.05$). The MF% in BB was not different when the experiment stu between RO and RI steers (Table 2).

In all the tissues, specially in the restricted steers, a general effect on percentages of stearic acid was observed (Fig.1). The DFA shows that using the fatty a composition grouping the muscles in their respective classes was achieved at differ degrees. LD fatty acids allows the grouping of 94% of muscles from restricted steers (Ta 3).

The classification matrix from the DFA using the fatty acid composition from different fat depot is shown in Table 4. The percentage of correct considering the differ fat depot fatty acid composition goes from 40 to 95%. The ad libitum steers can classified using SB fatty acid composition from the restricted ones (95%). Considering SB, B and PN fatty acid composition was possible to get 100% of the steers correctly cla ified (Fig.2) showing clearly the effect of both factors, restriction and zeranol implan in the fatty acid composition of steers body fats.

Conclusions

Reduction in intramuscular fat was found in restricted-implanted steers. Both factor restriction and Zeranol implants affected the fatty acid composition of body fats.

References

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Table 1 - Experimental distribution of the steers

Treatment	n	Period 1	Period 2
RO ZO		119 days	up to 400 kg live-weight
RO ZI	10	High energy diet	High energy diet
RI ZO	10	High energy diet	High energy diet-36 mg Zeranol
RI ZI	10	Low energy diet	High energy diet
	10	Low energy diet	High energy diet-36 mg Zeranol

Table 2- Percentages of muscular fat in BB, LD, PM and ST muscles. Initial (I) and final (F) values.

Treatment	BB		LD		PM		ST	
	I	F	I	F	I	F	I	F
RO ZO		4.4 a		4.4 a		6.2 a		3.2 a
RO ZI	2.9	4.5 a	2.4	4.4 a	4.1	6.5 a	1.5	2.8 a, c
RI ZO		4.5 a		4.8 a		6.2 a		3.3 a
RI ZI	2.8	3.5 a	0.9	3.5 b	2.7	5.6 b	0.6	2.5 b, c

abc. Means in the same row with unlike letters a, b and c are significantly different ($p < .05$).

Table 3- Classification matrix from the DFA. Percentage of correct considering the different muscle fat fatty acid composition in triglycerides and total lipids.

Muscle	ROZO	ROZI	RIZO	RIZI	RO	RI	ZO	ZI
BB Total lipids	60	75	86	80	67	94	71	83
Triglycerides	60	78	75	78	68	77	60	76
PM Total lipids	70	60	90	50	80	69	67	72
Triglycerides	50	56	72	78	78	75	45	56

Table 4. Classification matrix from the DFA. Percentage of correct considering the different fat depot fatty acid composition.

RO IO	SB	B	PN	PV	C	F	SE	BI
RO I1	70	60	50	40	60	40	80	63
RI IO	70	50	40	60	40	40	85	60
RI I1	80	60	80	70	70	90	80	60
RO(IO+I1)	70	60	50	80	60	60	70	70
RI(IO+I1)	95	65	70	90	90	75	90	66
IO(RO+R1)	80	70	75	85	65	80	80	85
I1(RO+R1)	85	85	75	60	70	75	80	65
	75	75	70	40	65	75	70	65

Fig. 1. Percentages of stearic acid in the different fat depots and muscle lipids in the four groups.

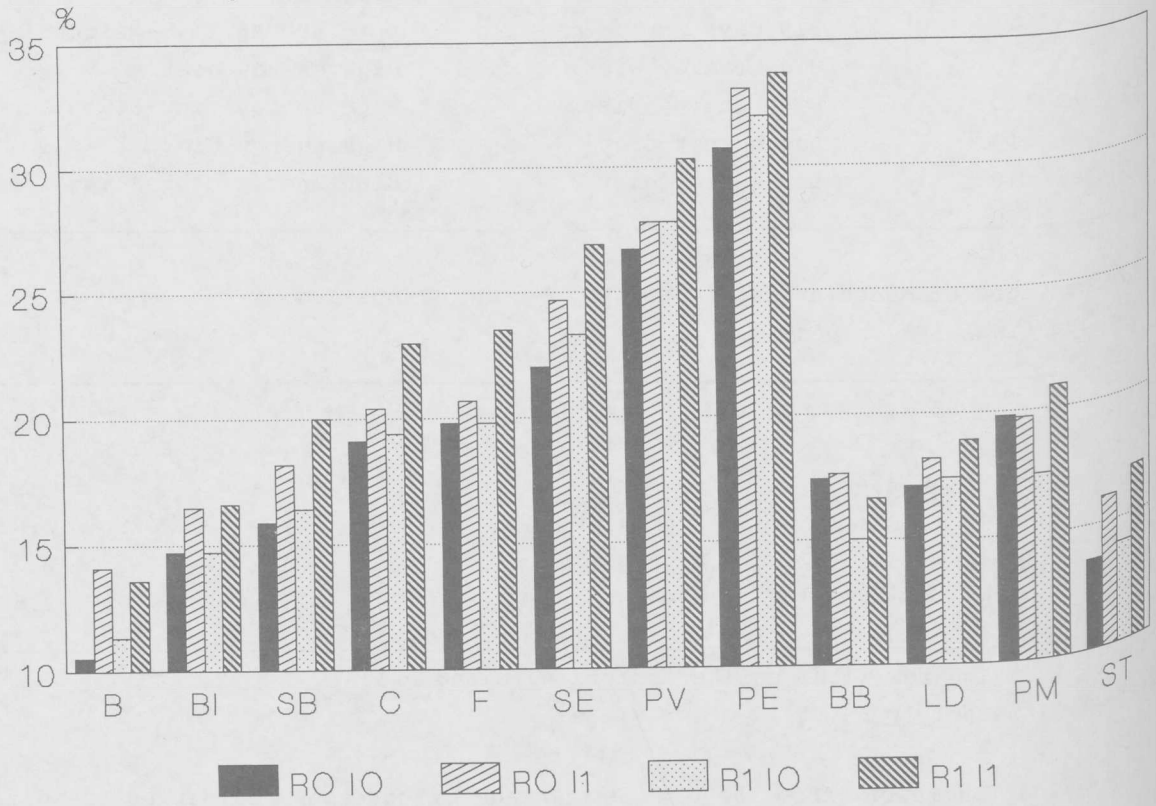

Fig.2. Effects of restriction and Zeranol implants. DFA performed to classified in groups according to the fatty acid composition.