THE EFFECTS OF PRESLAUGHTER WITHHOLDING OF FEED AND WATER FROM RABBITS ON THEIR CARCASS YIELD AND MEAT QUALITY.

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ABSTRACT

Ninety rabbits (California White breed) with an average weight of 2.3kg were allocated at random to one of nine treatments to assess the effects of withholding feed alone or feed together with water on carcass shrinkage and meat quality. The nine treatments were: The control (given *ad libitum* feed and water), and 12, 24, 36 and 48 hours periods without feed alone prior to slaughter and 12, 24, 36 and 48 hours without feed and water. Live and carcass weights were taken to monitor shrinkage. Other relevant meat quality parameters such as protein content, pH, index of water holding capacity, colour and wetness scores, cooking losses and the percentage gross composition of the carcass were determined. Live and carcass weights, weights of head, liver, kidneys and heart decreased progressively as the length of fasting period increased. The progressive decreases in weights were found to be more pronounced in animals from which feed together with water were withdrawn. Within 24 hours of fasting, decreases in weights were found to be significant ($P < 0.05$). Ultimate pH and index of water holding capacity of the meats also increased with the increase in length of fasting period, with a concomitant decrease in cooking losses. The fat ratio of the carcass component decreased with increase in length of fasting. A preslaughter period of only a few hours between 0 and 12 hours is therefore recommended for rabbit meat processing.

Keywords: Rabbit, Feed, water, withholding, Carcass yield, meat Quality.

INTRODUCTION

The greatest potential for the use of rabbit meat is in developing countries which

experience national meat shortages, such as Nigeria. Of recent in Nigeria, interest in the domestic rabbit production has increased tremendously that people want to make some money out of the business. They therefore want to know more about all the intricacies of the business, particularly the prospects for commercial operation (Abe, 1988). A common meat processing practice is to subject animals to fasting prior to slaughter in an attempt to reduce the risk of carcass contamination by feed. While fasting of animals immediately prior to slaughter has been shown to influence meat quality parameters, such as meat colour, the effects have been assumed (Jones, *et al.* 1990) to be quite small and generally believed to have little commercial importance. But beef cattle kept for 12 hours or longer without feed and water was found not only to lose carcass weight, but also appeared to produce tougher meat when compared with animals not subjected to feed and water restriction prior to slaughter (Jones, *et al.* 1990).

There is a distinct paucity of information in the literature on combined effect of feed and water withdrawal in rabbit on carcass shrinkage and meat quality under tropical ambient condition. This study was therefore designed to evaluate the effects of withholding feed and water over a 48-hour period at tropical ambient temperatures (25-30°C) prior to slaughtering on rabbit carcass yield and quality.

MATERIALS AND METHODS

Ninety rabbits (California White breed) raised under uniform conditions of feeding and management to an average market weight of 2.3kg so as to minimize initial differences in carcass composition was used in this study. Two weeks before slaughter the rabbits were allotted randomly into a control group with feed and

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water given *ad libitum* and T₂-T₅ where feed alone was removed for any of the following periods 12, 24, 36 or 48 hours, while rabbits in groups T₆-T₉ had both feed and water removed for 12, 24, 36 or 48 hours respectively.

After each experimental period the rabbits in the group were killed by first stunning with a wooden club applied at the base of the head behind the two ears before slitting the neck at the level of atlas vertebra. The rabbits were then allowed to hang head downward for 5 minutes for proper bleeding. The head, fore feet (cutting at the carpal joint), hind feet (between the tibia and calcaneus joint) and the tail (close to the base) were removed before the pelt was removed. Evisceration was then accomplished by the removal of the internal organs (Kidneys, liver heart, trachea and lung) which were individually weighed. Live weight (prior to slaughter) and eviscerated weight (carcass weight) of each rabbit were taken and dressing percentage computed.

Each eviscerated carcass was splitted into two equal longitudinal halves. One half of the carcass was weighed and carefully dissected into fat, bone and lean meat. The lean meat, fat and bones were then weighed separately and percentage lean meat, fat and bone calculated as a ratio of carcass weight. Visual assessment of colour and wetness of the lean meat were as described by MacDougall and Disney (1967).

Analytical Procedures: ~

pH readings were taken postmortem after 45 minutes (pH₁), 2 hours (pH₂) and after overnight storage (pH ultimate) by sticking the electrodes of a standardized Kent EIL 7020 pH meter into the thigh muscles. Crude protein content was determined as described by AOAC (1975). Water holding capacity of the lean meat was assessed using the filter press method as described by MacDougall and Disney (1967). Cooking losses were determined by comparing weight of meat (Cut into cubes of approximately 2 cm²) before and after 15 minutes cooking (Wood, *et al.* 1981)

Statistical analysis of variance was based on a control (no fasting) and 2 x 4 factorial arrangement of two types of fasting (withdrawal of feed alone or feed and water) and four length of fasting (12, 24,36 or 48 hours). Duncan's Multiple Range test method (1955) was then used to determine significant differences between means.

RESULTS

Live and carcass weights, weights of head, liver, kidneys, heart and dressing out percentage decreased progressively as the length of fasting period increased (Table 1). Within 24 hours of fasting, decreases in weights determined were found to be significant ($P < 0.05$).

The percentage crude protein, ultimate pH and index of water holding capacity of meats increased while cooking losses decreased with the increase in length of time of fasting (Table 2). Variation in tested parameters was found to be significant ($P < 0.05$) within 24 hours of fasting by the animals, with observable differences between experimental treatments (withdrawal of feed alone or feed together with water). Length of time of fasting was found to influence meat colour and wetness, with animals without feed or feed and water within 24 hours preslaughter having darker and drier meat (Table 3). Carcass component proportions changed as the length of time without feed or feed and water preslaughter increased. The percentage lean meat and fat decreased while that of bone increased significantly ($P < 0.05$) within 24 hours of fasting.

DISCUSSION

The observed decrease in the live and carcass weights and weights of the organs could be attributed to the removal of feed and faeces from the intestine of the rabbits. The decrease could also be attributed to the fact that in the absence of feed or feed and water the animal's body may be forced to switch to a wasting metabolism, drawing on its stored reserves of carbohydrate and fat and within a day or so, on its protein tissues as well, in order to meet the

maintainance metabolic energy requirement (Whitney and Hamilton, 1981). This result is in line with the observation of Jones, *et al* (1990) that losses in carcass weight commenced within 24 hours after both feed and water were withdrawn from beef cattle.

The increase in ultimate pH as the period of fasting increased may be due to a decrease in glycogen content of the muscle of rabbit leading to a lower lactic acid production postslaughter, and hence higher ultimate pH of the muscles. The increase in ultimate pH of the meat may be linked with the decrease in cooking losses of the meat because it is not easy to express juice from meat with high pH (Lawrie, 1985). The result of the sensory scores for meat colour and wetness may be associated with shrinkage of the muscle and the lower pre-slaughter glycogen reserves as fasting period increased which may have led to higher pH and consequently darker meat (Lawrie, 1985).

In conclusion, from this study with rabbit under tropical ambient condition (25 - 30°C), the effects of preslaughter fasting on carcass yield and meat quality became pronounced ($P < 0.05$) within 24 hours of fasting periods resulting into a decrease in live and carcass weights and dressing percentage, change in percentage gross composition of the carcass, and meat colour and wetness. We therefore suggest that rabbits should be slaughtered after a short period of fasting between 0 and 12 hours for good carcass yield and quality meat production.

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FASTING VS CARCASS QUALITY

Table 1: PHYSICAL CHARACTERISTICS OF RABBITS IN RESPONSE TO DIFFERENT PERIODS OF TIME OF WITHDRAWAL OF FEED ALONE OR FEED AND WATER IN THE PRESLAUGHTER PERIOD.

Parameter	Length of time preslaughter without feed or feed and water				
	0	12	24	36	48
Live weight (g)					
Feed alone SD ±	2331.0 ^a	2321.6 ^a	2301.7 ^b	2283.4 ^{bc}	2271.2 ^c
SD ±	1.8	1.6	1.6	1.9	1.3
Feed and water	2330.6 ^a	2318.4 ^a	2252.6 ^b	2220.1 ^c	2200.0 ^d
SD ±	1.7	1.3	1.3	1.4	1.5
Carcass weight (g)					
Feed alone	1195.8 ^a	1170.1 ^b	1109.2 ^c	1084.6 ^d	1067.5 ^d
SD ±	1.1	1.0	1.4	1.0	1.2
Feed and water	1186.3 ^a	1163.8 ^b	1057.6 ^c	1012.4 ^d	973.1 ^e
SD ±	1.0	1.2	1.3	1.0	1.0
Dressing out percentage					
Feed alone	51.3 ^a	50.4 ^a	48.2 ^b	47.5 ^b	47.0 ^b
SD ±	0.1	0.1	0.1	0.2	0.1
Feed and water	50.9 ^a	50.2 ^a	46.9 ^b	45.6 ^{bc}	44.2 ^c
SD ±	0.2	0.1	0.1	0.1	0.1
Head weight (g)					
Feed alone	217.0 ^a	212.2 ^a	210.0 ^b	206.2 ^b	200.0 ^c
SD ±	0.7	0.6	0.4	0.8	0.5
Feed and water	214.8 ^a	201.3 ^b	193.2 ^c	190.3 ^c	181.8 ^d
SD ±	0.6	0.6	0.8	0.2	0.4
Liver weight (g)					
Feed alone	46.2 ^a	46.0 ^a	43.8 ^b	43.0 ^b	42.8 ^b
SD ±	0.1	0.2	0.1	0.3	0.1
Feed and water	45.8 ^a	45.1 ^a	41.3 ^b	41.0 ^b	40.7 ^b
SD ±	0.1	0.2	0.2	0.2	0.2
Kidneys weight (g)					
Feed alone	11.9 ^a	11.8 ^{ab}	11.4 ^b	10.9 ^c	10.4 ^d
SD ±	0.1	0.1	0.1	0.1	0.1
Feed and water	12.0 ^a	11.9 ^a	10.8 ^b	10.2 ^c	10.0 ^c
SD ±	0.1	0.1	0.1	0.1	0.1
Heart weight (g)					
Feed alone	16.2 ^a	16.0 ^{ab}	15.8 ^{ab}	15.5 ^b	14.8 ^d
SD ±	0.1	0.1	0.1	0.1	0.1
Feed and water	16.1 ^a	15.9 ^a	15.0 ^b	14.7 ^b	14.0 ^c
SD ±	0.1	0.1	0.1	0.1	0.1

Different superscripts on means within a row indicate significant difference ($P < 0.05$).

Table 2: CHEMICAL QUALITY ATTRIBUTES OF THE MEAT OF RABBITS IN RESPONSE TO DIFFERENT PERIODS OF TIME OF WITHDRAWAL OF FEED ALONE OR FEED AND WATER IN THE PRESLAUGHTER PERIOD.

Parameters	Length of time preslaughter without feed or feed and water(h)				
	0	12	24	36	48
Crude protein (%dry wt.)					
Feed alone	74.8 ^a	75.0 ^a	75.7 ^a	75.8 ^a	76.0 ^a
SD±	1.2	1.1	1.3	1.0	1.1
Feed and water	74.6 ^a	75.1 ^a	75.8 ^a	75.8 ^a	76.0 ^a
SD±	0.8	1.1	1.0	0.9	1.0
Ultimate pH					
Feed alone	5.90 ^a	5.93 ^b	6.00 ^c	6.22 ^d	6.40 ^e
SD±	0.01	0.01	0.02	0.05	0.04
Feed and water	5.90 ^a	5.95 ^b	6.02 ^c	6.23 ^d	6.50 ^a
SD±	0.01	0.01	0.03	0.04	0.05
Index of W.H. C.					
Feed alone	48.3 ^a	48.9 ^a	51.1 ^b	51.8 ^b	53.9 ^c
SD±	0.5	0.5	0.5	0.4	0.5
Feed and water	48.3 ^a	49.0 ^a	53.5 ^b	54.6 ^b	56.8 ^c
SD±	0.4	0.3	0.3	0.3	0.4
Cooking losses					
Feed alone	33.5 ^a	32.0 ^a	30.0 ^b	29.5 ^b	25.2 ^c
SD±	0.2	0.2	0.4	0.2	0.2
Feed and water	33.5 ^a	31.5 ^b	26.9 ^c	25.1 ^{cd}	24.8 ^d
SD±	0.2	0.3	0.1	0.2	0.2

Different superscripts on means within a row indicates significant difference ($P < 0.05$).

Table 3: VARIATION IN THE COLOUR AND WETNESS OF THE RAW MUSCLE, AND PERCENTAGE MUSCLE, BONE AND FAT CONTENTS OF THE RABBITS IN RESPONSE TO DIFFERENT PERIODS OF TIME OF WITHDRAWAL OF FEED ALONE AND FEED AND WATER IN PRESLAUGHTER PERIOD.

Parameters	Length of time preslaughter without feed and feed and water (h)				
	0	12	24	34	48
Meat colour scores*					
Feed alone	5.0 ^a	5.9 ^b	6.4 ^c	6.5 ^c	6.5 ^c
SD ±	0.1	0.1	0.2	0.2	0.2
Feed and water	5.0 ^b	6.0	6.4 ^c	6.5 ^c	6.5 ^c
SD ±	0.1	0.2	0.2	0.2	0.2
Meat wetness scores*					
Feed alone	3.5 ^a	4.0 ^b	4.5 ^c	4.9 ^d	5.4 ^e
SD ±	0.1	0.1	0.1	0.1	0.1
Feed and water	3.5 ^a	4.1 ^b	4.7 ^c	5.2 ^d	5.5 ^e
SD ±	0.1	0.1	0.1	0.2	0.2
Lean Meat (%)**					
Feed alone	64.5 ^a	64.0 ^a	63.8 ^{ab}	62.4 ^{ab}	61.0 ^b
SD ±	0.4	0.6	0.3	0.5	0.6
Feed and water	64.2 ^a	63.9 ^a	63.0 ^{ab}	62.1 ^{ab}	60.8 ^b
SD ±	0.6	0.8	0.7	0.3	0.4
Bone (%)**					
Feed alone	30.9 ^a	31.7 ^{ab}	32.3 ^{ab}	34.1 ^{bc}	35.8 ^c
SD ±	0.3	0.6	0.5	0.7	0.7
Feed and water	30.9 ^a	31.9 ^{ab}	33.3 ^{ab}	34.6 ^{bc}	36.3 ^c
SD ±	0.5	0.5	0.4	0.7	0.4
Fat (%)**					
Feed alone	4.0 ^a	3.9 ^a	3.6 ^b	3.0 ^c	2.9 ^c
SD ±	0.1	0.1	0.1	0.1	0.1
Feed and water	4.1 ^a	3.8 ^b	3.4 ^c	2.8 ^d	2.6 ^d
SD ±	0.1	0.1	0.1	0.1	0.1

* Rated on a scale of / = deep colour, or dry; 1 = pale, or wet.

** All percentages were computed as a ratio of carcass weight. Different superscripts on means within a row indicate significant difference ($P < 0.05$).