Meat Research News Letter

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SOME FACTORS AFFECTING FAT COLOUR IN BEEF

Introduction

Fat colour is an important attribute of meat quality that affects both the domestic and export markets. Yellow fat is perceived by some consumers to be undesirable, as they believe that it is an indication of meat from old or otherwise inferior cattle. However, this is not necessarily so and there is no evidence that fat colour, in its own right, affects the palatability of the cooked product. Despite this, some markets, including the Japanese and Korean markets, demand a certain specification for fat colour (white) and if this is not met then meat is down-graded to a lower value market.

In healthy cattle, creamy/yellow fat colour occurs when cattle graze green pasture. This results from the ingestion and absorption of yellow pigments that are present in plants. These pigments have been identified as carotenoids, with ß-carotene being the major component responsible for fat colour in cattle.

The yellow colour of the carotenoids in green plants is not obvious because their colour is swamped by the large amounts of chlorophyll. However, carotenoids are relatively unstable and as soon as grass appears to have dried, their concentration is much reduced. Lush green pasture may have as much as 500 ppm carotenoids in its dry matter, whereas dry pasture or cut hay may have less than 50 ppm. Most grains contain only small concentrations of carotenoids (usually less than 5 ppm dry matter). This is why fat colour decreases when cattle are grain fed in feedlots.

ß-carotene is only a minor component (about 5-8%) of the total carotenoids in plants. However, it is selectively absorbed, accounting for more than 80% of the yellow pigments present in beef fat. It should be stressed that ß-carotene is essential to maintain the health and performance of animals. Cattle grain-fed for long periods without supplementation can have low vitamin A and carotenoid reserves and their growth performance can be reduced.

Presently, the only way of reducing fat colour of grass-fed cattle is to move them to a feedlot and feed a grain-based (low carotenoid) diet for several months. This produces a satisfactory fat colour in most cattle, but <u>not all</u> animals will finish with acceptable fat colour. The eventual fat colour at the end of the grain-feeding period depends in part on the following factors, as well as days on feed and carotenoid concentrations of the diet:-

1. The yellowness of the fat of animals when they enter the feedlot;

2. The amount of fat that the animal puts on in the feedlot;

3. The rate of utilisation of carotene from body fat.

Breed and nutrition may influence the first factor.

Although there are well known differences in fat colour between certain breeds (Channel Island cattle, e.g. Jerseys and Guernseys compared with Holstein/ Freisian and beef breeds) colour can only develop if the carotenoid pigments are present in their diet. In addition, there appears to be a large difference between individuals of the same breed, even when they have grazed the same pasture, suggesting that individuals have different abilities to absorb, convert to vitamin A and deposit carotenoids in fatty tissues.

These differences are not as great as those known to occur between cattle and some other ruminant species. Unlike cattle, sheep, goats and buffalo have white fat. Some of the difference may be explained by the greater conversion of dietary ß-carotene to vitamin A (a colourless compound) in the gut wall of sheep, goats and buffalo, thus leaving less intact carotenoid to be deposited. However, it is likely that other factors play an equally important role, in particular, the specificity of the absorption process in the gut.

Nutritional setback can influence fat colour in cattle, as loss of depot fat results in the colour of the remaining fat becoming more intense. This is particularly so in older cattle that have been on changing planes of nutrition for many years. Factors such as dietary protein and fat intake increase carotenoid absorption, whereas any disease or condition of the gut, such as coccidiosis or acidosis; decreases absorption.

The amount of fat an animal puts on in the feedlot is influenced by its breed, sex, and liveweight at (entry) and its growth rate. Excitable animals or animals that grow slowly for other reasons, will not fatten and so their initial fat colour is less diluted than that of cattle that grow and fatten normally. There appear to be individual animal variations in the rate of utilisation of carotene from fat, even in animals of the same age, breed and sex, growing at the same rate, on the same feed ration. The causes of these variations are not known.

Fat can be yellow due to jaundice; however, this is rare and such carcasses are condemned and do not reach the market.

Fat colour assessment

Fat colour is measured as part of AUS-MEAT's Chiller Assessment for meat-grading quality. Usually on the day following slaughter, a subjective assessment of fat colour is made on intermuscular fat at the quartering site of the side. This is done by comparing the fat colour, illuminated with a standard light source, with a set of 13 colour strips (continuous gradation from 0 - 12, polar white to very yellow). A fat-colour score of 5 or less is required for most chilled grass-fed product for Japan.

Intensity of fat colour may change during chilling and holding of meat. Chilling may influence fat colour in two ways: first, through surface drying (intensifying the colour of the external surface), which takes place immediately after skinning and washing; secondly, by cooling and solidifying the fat, the effect of which is to reduce colour intensity; however, the effect of temperature alone is temporary in that it can be reversed.

Shrouding the carcase in cloth soaked with common salt or sodium hypochlorite will bleach the fat surface only and will not affect the measurement at the assessment site.

There is nothing unhealthy or harmful about beef fat yellowed as a result of carotene accumulation. Whatever the reason for the dislike, it is ironical that in Australia this same yellowness is so highly prized in butter, margarine and eggs that purified carotenoids are actually added to feedstock diets or to final products to ensure adequate yellow colouration.

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