Perception of red brown colour by consumers

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Abstract

The ratio of reflectance for light of wavelengths 630 and 580 nm (oxy/met) can be used to measure colour change in meat due to formation of metmyoglobin. Previous studies have compared hue but not oxy/met with subjective colour perception (Channon *et al.*, 2004). Consumers at a supermarket were asked to score 8 pieces of lamb meat on a continuous scale of 0 (brown) to 100 (red) by placing a mark on a line 5cms in length. Four loin and 4 topside samples were sliced on different days starting 7 days prior to display. Colour reflectance was measured using a Hunter lab mini scan TM XE plus L. A significant relationship ($P<0.05$) was found that was stronger for topside than loin. These results suggest that consumers perceive colour to change from red to brown (score <50) at an oxy/met level of about 3.5.

Introduction

Despite colour being a poor guide to eating quality, consumers tend to base purchasing decisions on the display colour of meat (Kropf, 1980). To the consumer, meat colour is an indicator of freshness and wholesomeness (Mancini & Hunt, 2005). Discrimination against meat that is not red and bright in colour (Hood & Riodan, 1973) has been reported to cause 15% of retail beef in the United States of America to be discounted in price, equating to a $1billion loss of annual revenues (Mancini & Hunt, 2005).

Peak absorption of light occurs at wavelengths of 580 nm and 630 nm for oxymyogobin and metmyoglobin respectively (Hunt, 1980). The ratio of the reflectance of light for these two wavelengths (oxy/met) can therefore be used to measure the rate of conversion of oxymyoglobin to metmyoglobin in meat during shelf display.

However colour measurement is not in itself a measure of consumer acceptance of meat colour. Calibration of colour measurements with consumer acceptance scores is necessary in order to use reflectometer measurements to assess consumer acceptance of meat colour Hunt (1991).

Current research in Australia has used oxy/met to measure colour change in lamb meat during shelf display (Jacob *et al.*, 2007). Previous studies have compared hue but not oxy/met with subjective colour perception (Channon *et al.*, 2004). This study sought to examine the relationship between oxy/met and the perception of red brown colour in lamb meat by Australian consumers.

Materials and methods

Questionnaires

A face to face survey of 67 consumers was conducted in 3 sessions over a 3-day period in August 2006 at a supermarket in a suburb of Perth WA. This store was located in the Curtin electorate, which has a socioeconomic ranking of 143 out of a possible 153. So a relatively high proportion of consumers in this store may be expected to have high incomes, professional occupations and tertiary qualifications (Newman & Kopras, 2004).

Bias was minimised as much as possible with the same three interviewers, present at all sessions. The interviews were conducted at the one place in the meat aisle. People who were under the age of eighteen, who had children or were, obviously in a rush, were not selected for interview.

Participants were asked to answer a standard list of questions arranged in 3 sections;

(i) demographics including: age, gender, postcode and education,

(ii) perceptions of the colour of a tray of lamb meat,

(iii) attitudes towards the colour of lamb meat.

To obtain a range of meat colours, loin (*m. longissimus)* and topside (*m. semimembranosus*) cuts of lamb were cut on different days during the week before the questionnaire. Samples were uniformly cut with no exterior fat. Eight cubes of lamb (3 x 2 cm), four loin and four topside, varying in colour from red to brown were randomly placed in a 2 x 4 format on a black meat tray wrapped with cling wrap. The two meat trays were placed in the corner on the bottom shelf near the front of the meat cabinet (Tyler Model D2TM/12), under pink fluorescent lighting (NEC TRI – PHOSPHOR 37 watts, FL40SSBR –B/37/HG).

A Hunter Lab Mini Scan(tm) XE Plus (Cat. No. 6352, model No. 45/0-L, aperture size of 25mm) was used to measure light reflectance. The light source was set at "C" with 10 degree standard observer. The instrument was calibrated on a black glass then a white enamel tile as directed by the manufacturer's specifications. Oxy/met was calculated by dividing the percentage of light reflectance at wavelength 630nm by the percentage of light reflectance at wavelength 580nm (Hunt *et al.*, 1991). The average of two measurements, before and after each interview session, was used. Respondents were asked to score colour from 0 to 100 by placing a mark on a line 5 cm long (0 = brown and 100 = red).

The distance the mark placed by respondents on the colour scale in the questionnaire from the red end of the scale, was measured. Regression analysis was used to fit a polynomial function to raw data. Significance was determined by P-value <0.05. The percentage of people who would eat the meat samples were calculated along with the percentages for all questions in Sections i and iii of the questionnaire. One questionnaire was omitted as the colour scale was incorrectly completed.

Results and discussion

Colour influenced meat purchase for the majority of the participants surveyed (Table 1). A significant (P<0.001) cubic relationship was found whereby consumer score accounted for 44.3% and 12.3% of the variation in oxy/met for the topside and loin respectively (

Figure 1). The relatively poor relationship for loin may have been due to a smaller range in oxy/met found in comparison to topside. For topside consumers tended to perceive meat to be more brown than red in colour (score<50) when oxy/met fell below 3.5. However more data is required to confirm this finding given the strength of the relationships found.

Table 1. Participants' attitudes to meat colour

	Percentage (%) of participants			
Question	Agree	Indifferent	Disagree	Don't know
Brown meat that is not past its use-by-date is okay to eat	49	12	30	9
Red meat is an important part of my diet	93	6	1	0
I would eat brown meat that is not past its use-by-date	48	10	41	1
Colour influences which piece of meat I select	84	7	7	2

Fig. 1(a) Topside

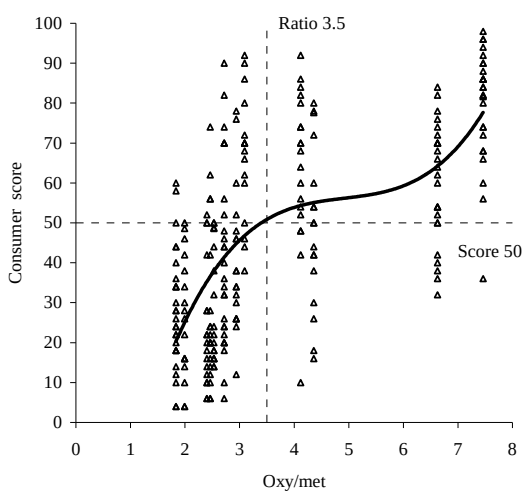

Fig.1(b) Loin

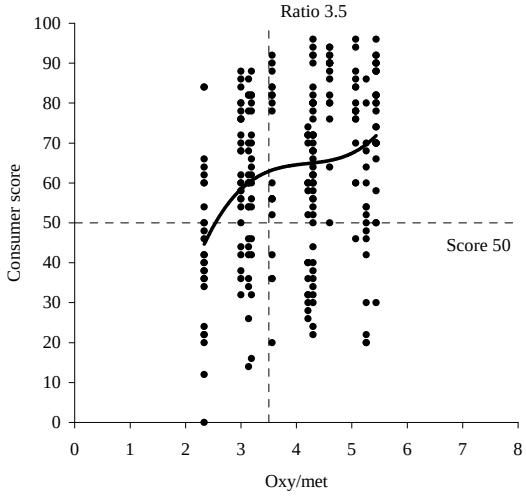

Figure 1. The relationship between oxy/met and consumer score for topside (1a) and loin (1b).

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