Schriftenreihe der Haushaltstechnik Bonn

Band 1/2012

**Christiane Pakula**

# Changes in internal meat colour and colour opacity as predictors of cooking time

D 98 (Diss. Universität Bonn)

Shaker Verlag
Aachen 2012

**Bibliographic information published by the Deutsche Nationalbibliothek**
The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at http://dnb.d-nb.de.

Zugl.: Bonn, Univ., Diss., 2012



Printed in Germany.

ISBN 978-3-8440-1074-9
ISSN 1863-320X

Shaker Verlag GmbH • P.O. BOX 101818 • D-52018 Aachen
Phone: 0049/2407/9596-0 • Telefax: 0049/2407/9596-9
Internet: www.shaker.de • e-mail: info@shaker.de

**Changes in internal meat colour and colour opacity as predictors of cooking time**

Roasted beef loin is traditionally served at different degrees of doneness, depending on the preferences of the consumer for rare, medium or well-done meat. While automatic cooking programmes assess the degree of doneness, and thus the end of the cooking process, by measuring the internal meat temperature, consumers and cooks often assess the degree of doneness of roasted beef by the internal meat colour.

The aim of this work was, therefore, to develop real-time colour measurement in order to determine the degree of doneness by the changes in internal meat colour. In addition, theoretically modelling the increase in colour lightness caused by heat treatment and generating deeper knowledge about the changes in meat colour caused by heat treatment was attempted.

The experiments were conducted with pieces of bovine *longissimus dorsi.* The meat was cooked in dry heat in an oven commonly used in private households. The oven temperature and internal meat temperature were measured by thermocouples and the changes in internal meat colour were measured with a true colour sensor. The design of experiments (DoE) method was used to investigate the influence of various oven temperatures, meat weight and final meat temperatures, and to ensure the reproducibility of the experiments. The increase in colour lightness was theoretically attempted by using the Verhulst equation of biological growth.

The results show significant variation within initial and final *XYZ* values measured by the true colour sensor. Converting the *XYZ* values to the CIE *L*a*b** system reveals that the change in colour lightness (*L**) is dominant. The cooking time until the desired degree of doneness is reached can reliably be predicted from the point of most rapid changes in colour lightness, and the end of the cooking process can also be determined by final *b** values. The model created by using the Verhulst equation shows that the change in colour lightness cannot be readily explained by the increase in internal meat temperature. Other parameters, such as the water content of the meat, might have to be considered to generate a universally applicable model.