XXI. SCIENTIFIC CONFERENCE WITH INTERNATIONAL PARTICIPATION

under the auspices of the Ministry of Agriculture and Rural Development of the Slovak Republic

March 20-22, 2024
Piešťany, Slovak Republic

Visegrad Fund

Food Quality in Digital Age

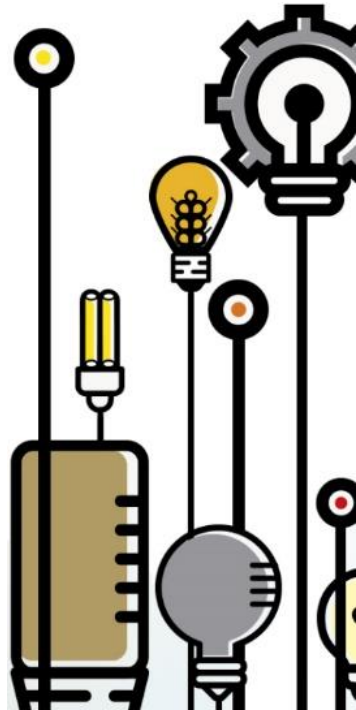
Prof Igor Tomašević

Computer Vision System For Food Quality Evaluation

AGRIF
University of Belgrade
Faculty of Agriculture

Computer Vision System

INNOVATION MATTERS



CVS iluminant - 6500K day light at noon

PHILIPS

Lighting

Product data

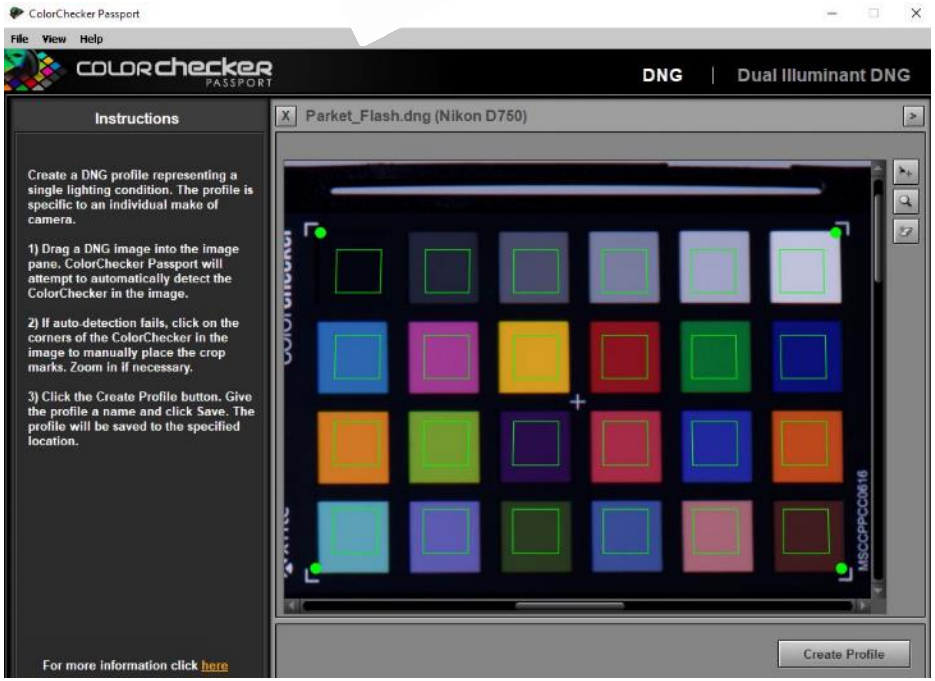
General Information	
Cap-Base	G13 [Medium Bi-Pin Fluorescent]
Life To 10% Failures (Nom)	6000 h
Life to 50% Failures (Nom)	8000 h
Life to 50% Failures Preheat (Nom)	10000 h
LSF 2000 h Rated	99 %
LSF 4000 h Rated	99 %
LSF 6000 h Rated	99 %
LSF 8000 h Rated	99 %
LSF 12000 h Rated	89 %
LSF 16000 h Rated	33 %
LSF 20000 h Rated	2 %

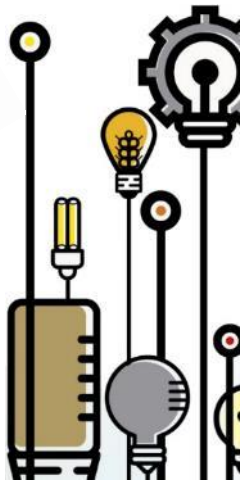
MASTER TL-D 90 Graphica

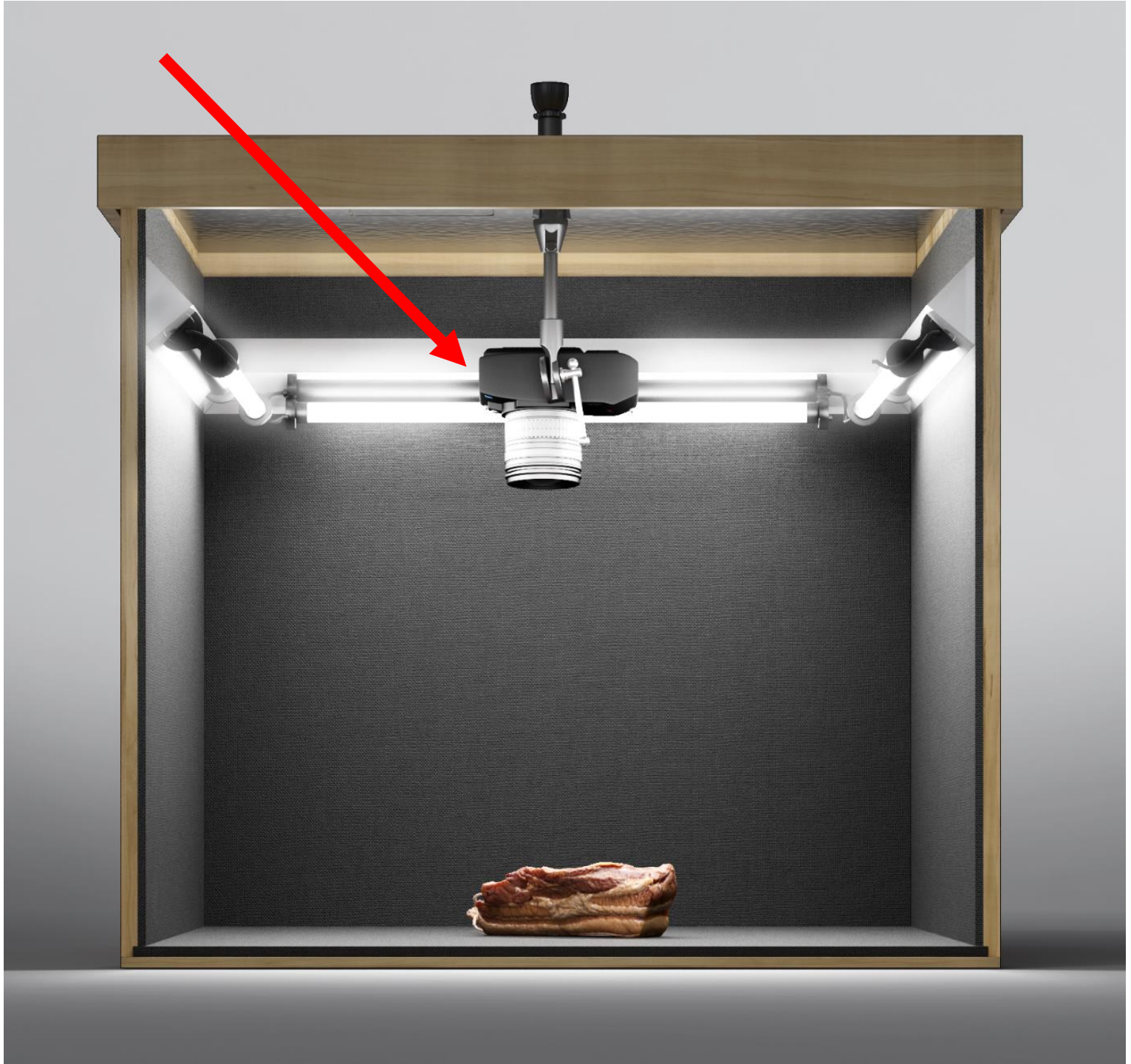
MASTER TL-D 90 Graphica 36W/965 SLV/10

This TL-D lamp has excellent color rendering which makes it very suitable for the graphical and printing industry to check the quality of printed material.

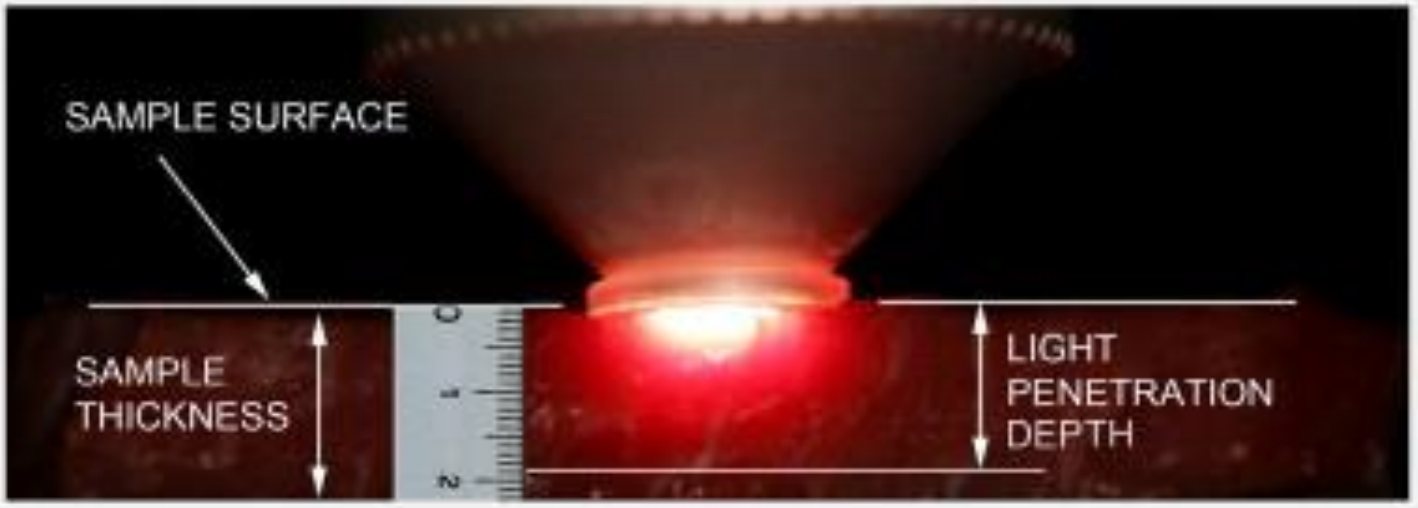
INNOVATION MATTERS



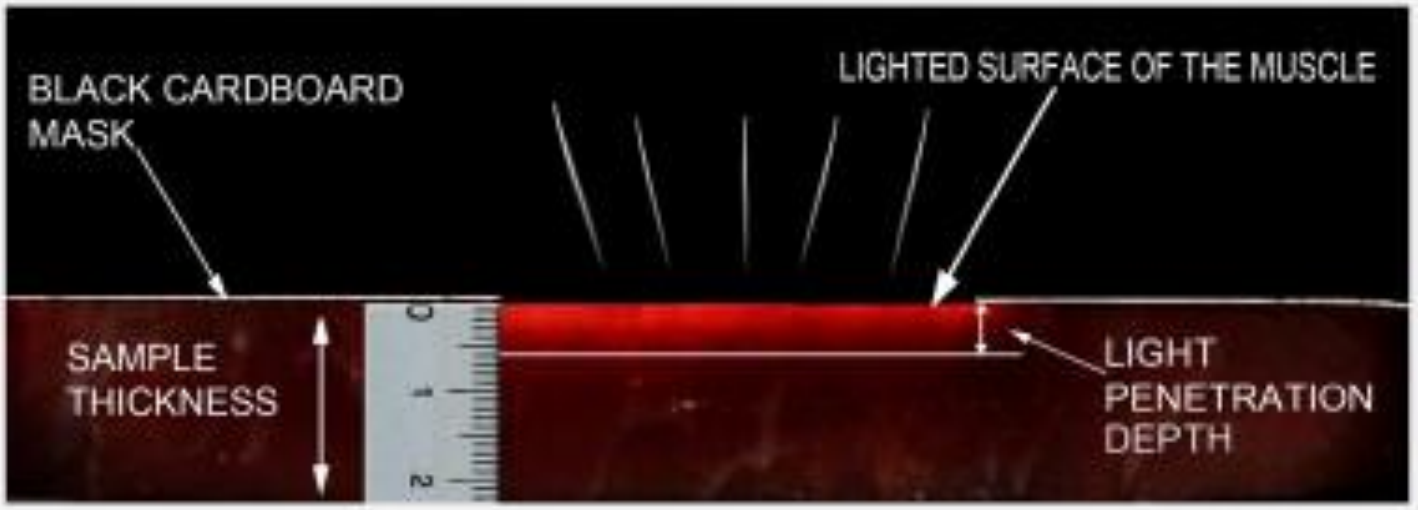




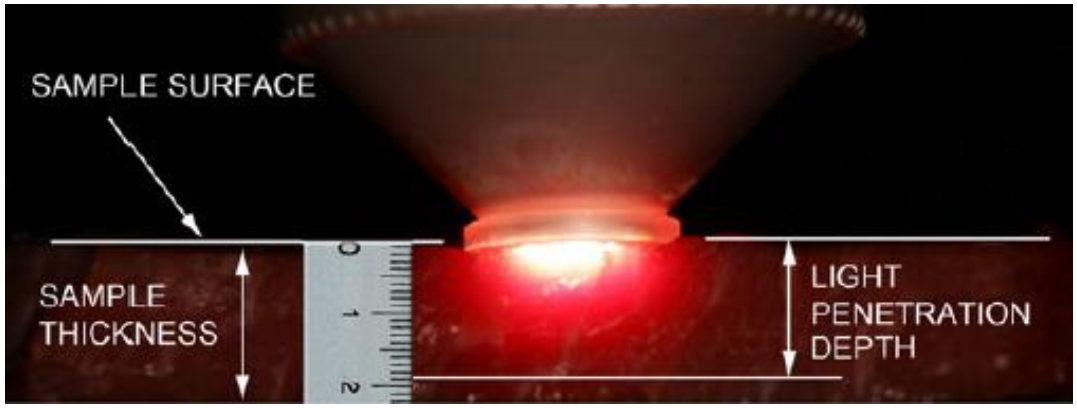
Colorimeter



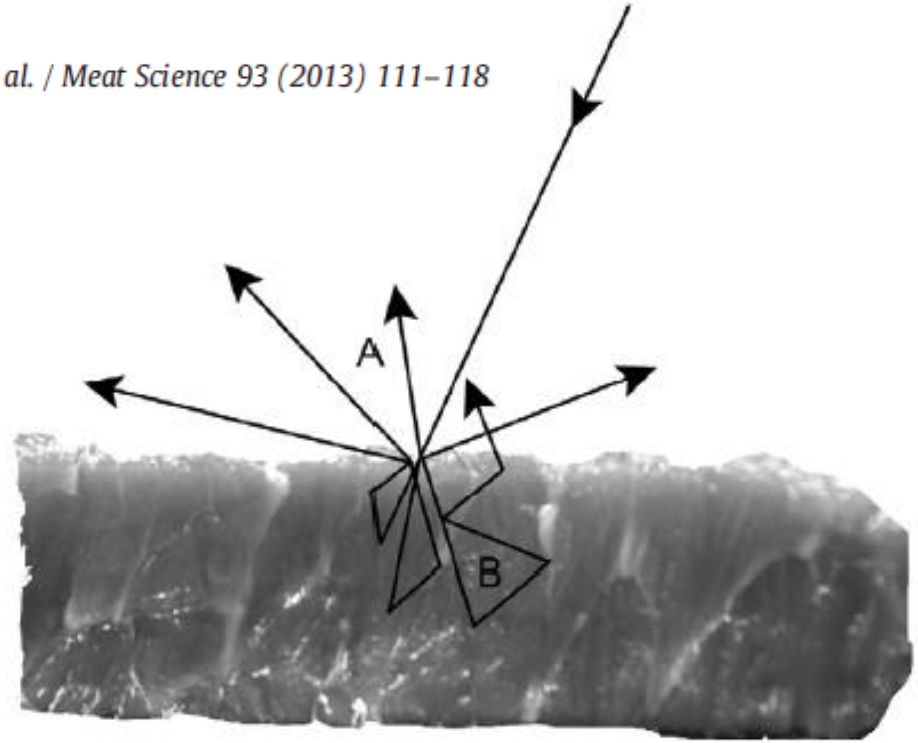
CVS

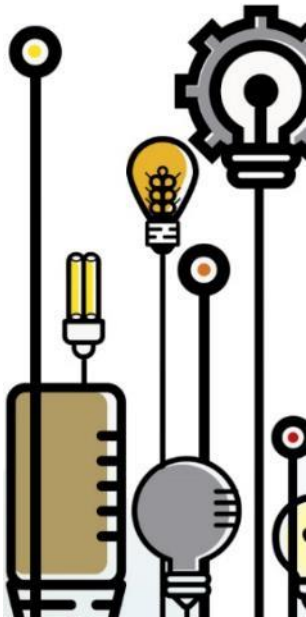


Illuminant	CIE: C, D65
Light source	Pulsed xenon lamp

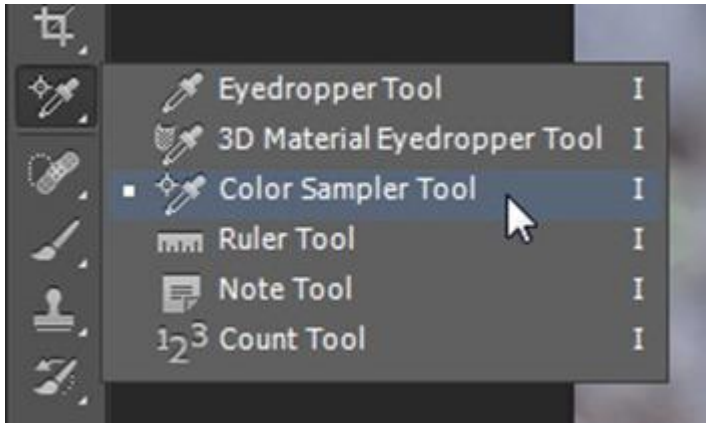


A. Girolami et al. / Meat Science 93 (2013) 111–118



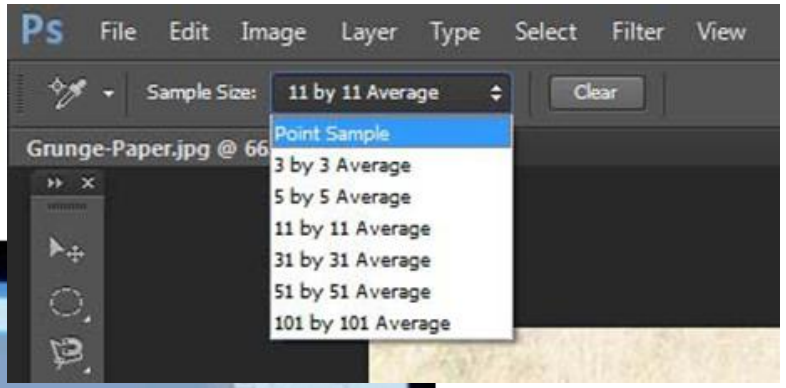


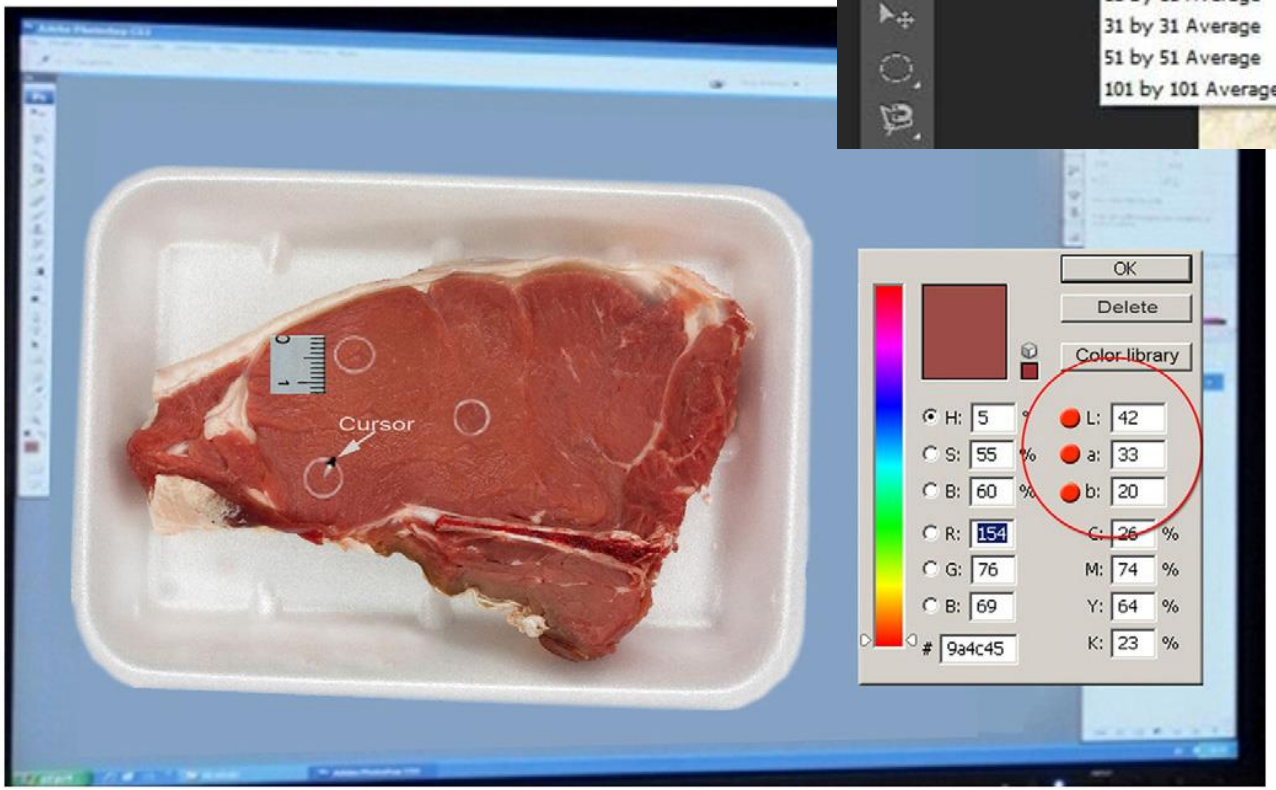
IPS + CALIBRATED



Adobe Photoshop CC

INNOVATION MATTERS





CVS vs Minolta CR 410

How the color of game meat should be measured

Computer vision system vs. colorimeter

By Igor Tomašević, Vladimir Tomović, Francisco J. Barba, Dragan Vasilev, Marija Jokanović, Branislav Šojić, Jose Manuel Lorenzo and Ilija Djekić


Actual
CVS
Colorimeter
Quail
Wild boar
Rabbit
Deer
Pheasant

Evaluation of poultry meat colour using computer vision system and colourimeter

Is there a difference?

Prof. Dr. Igor B. Tomašević[a], Prof. Dr. Vladimir M. Tomović[b], Dr. Slaviša Stajić[a], Dr. Ivan Nastatsijević[c], Dr. Jose M. Lorenzo[d], Prof. Dr. Ilija V. Djekić[a]

INNOVATION MATTERS

Meat Science 148 (2019) 5–12

Contents lists available at ScienceDirect

Meat Science

journal homepage: www.elsevier.com/locate/meatsci

Comparison of a computer vision system vs. traditional colorimeter for color evaluation of meat products with various physical properties

Igor Tomasevic[a,*], Vladimir Tomovic[b], Bojana Milovanovic[a], Jose Lorenzo[c], Vesna Đorđević[d], Nedjeljko Karabasil[e], Ilija Djekic[f]

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[c] Centro Tecnológico de la Carne de Galicia, Parque Tecnológico de Galicia, Rua Galicia No. 4, San Cibrao das Viñas, Ourense, Spain
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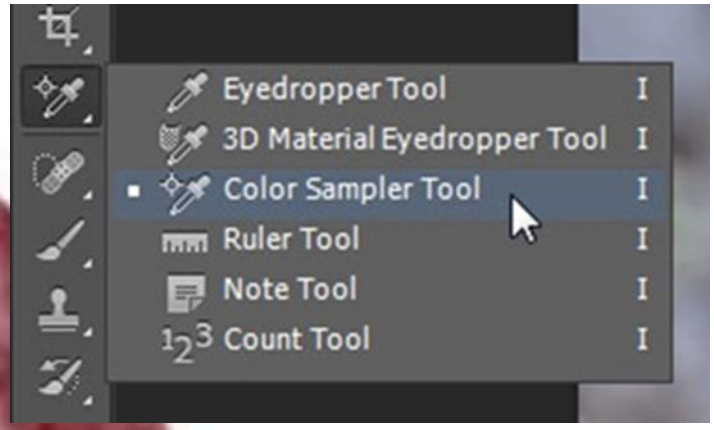
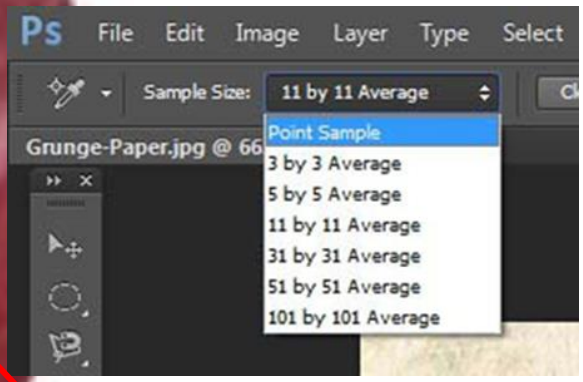
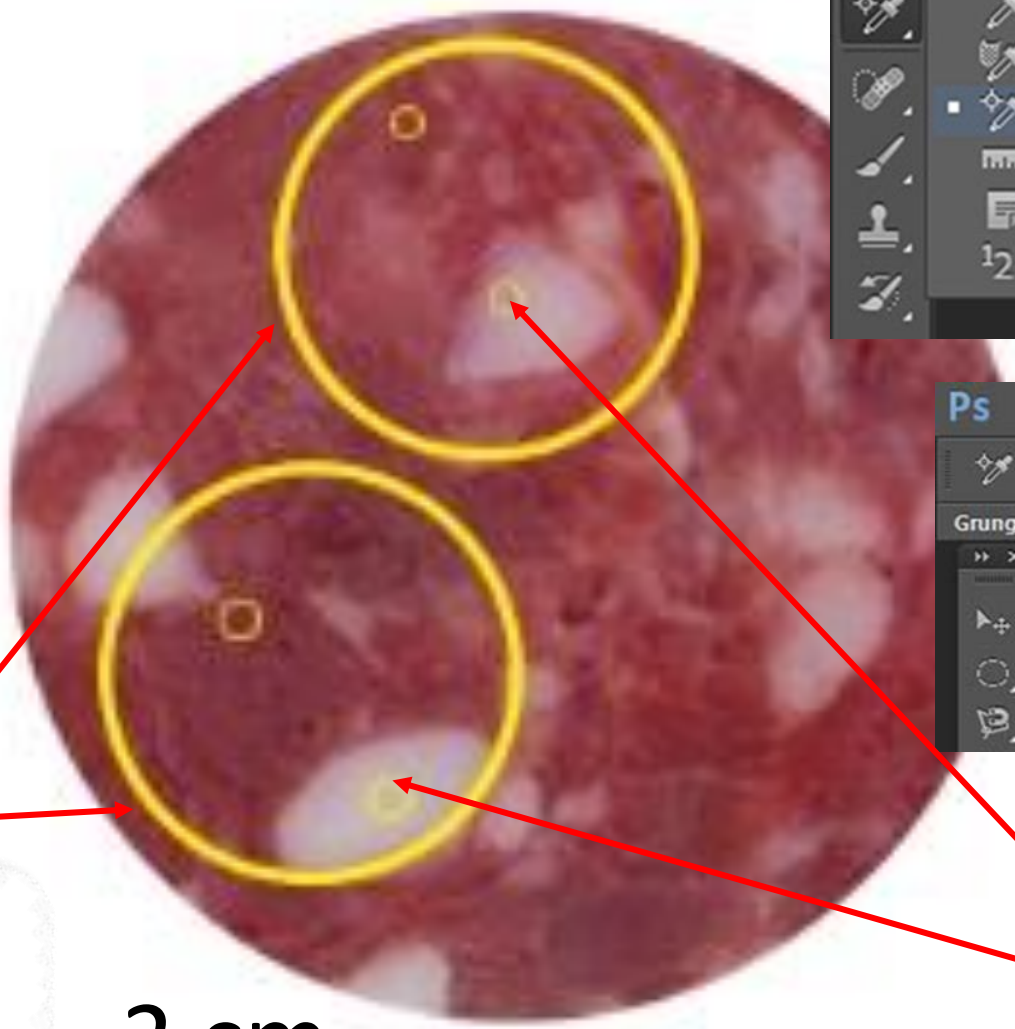
[f] Food Safety and Quality Management Department, University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Serbia

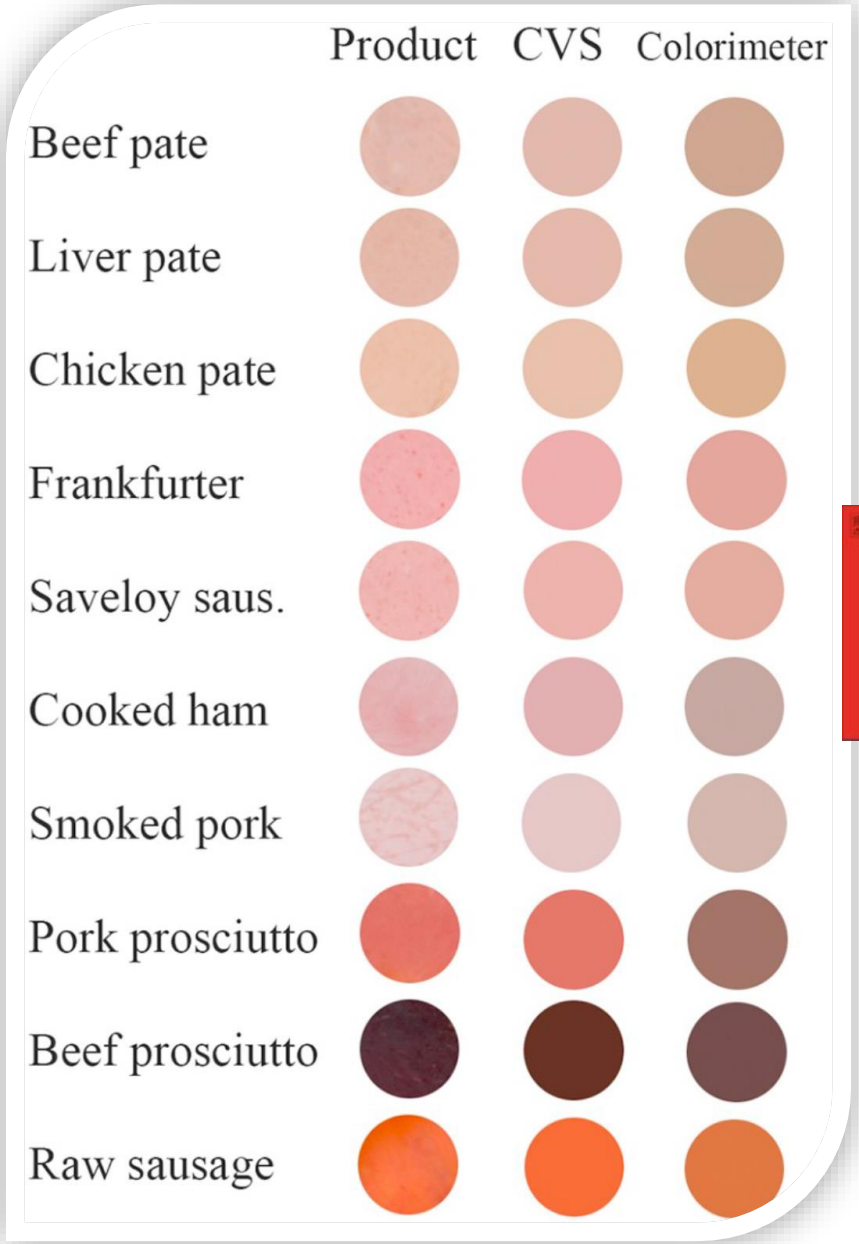






2 cm

3x3 pixels



INNOVATION MATTERS

International Dairy Journal 120 (2021) 105084

Contents lists available at ScienceDirect

International Dairy Journal

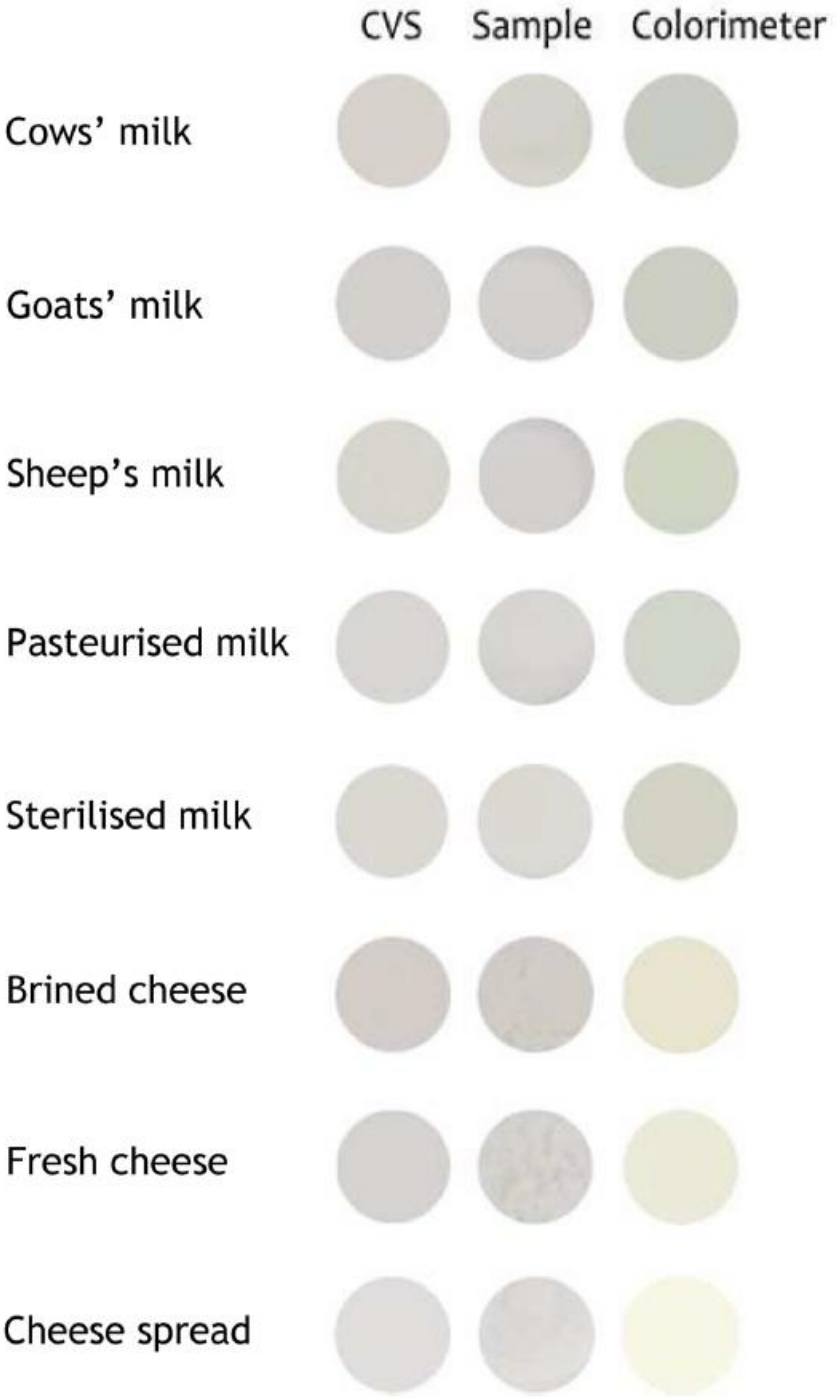
journal homepage: www.elsevier.com/locate/idairyj

Colour assessment of milk and milk products using computer vision system and colorimeter

Bojana Milovanovic [a, *], Vladimir Tomovic [f], Ilija Djekic [a], Jelena Miocinovic [a], Bartosz G. Solowiej [b], Jose M. Lorenzo [c, d], Francisco J. Barba [e], Igor Tomasevic [a]

A B S T R A C T

A computer vision system (CVS) and a colorimeter were compared for their abilities to measure the colour of twenty-seven different milks and milk products. The frequency of similarity test showed that CVS-generated colour chips were similar to the actual sample colour in all trials (100%). The CVS-obtained colours were found to be more similar to the colour of sample visualised on the monitor, compared with colorimeter-generated colour chips, with values of 83.3–100.0% depending on the milk product. The third test showed that there was difference between colour measured by CVS and the colorimeter; colorimeter readings resulted in a darker and yellower colour based on average L*a*b* values, while CVS readings resulted in lighter and less yellow appearance. Compared with a colorimeter, measuring colour by CVS was, therefore, found to be reliable and should be considered as a superior tool for replacing traditional devices by offering improved representativeness and accuracy.


CVS
Sample
Colorimeter
Cows' milk
Goats' milk
Sheep's milk
Pasteurised milk
Sterilised milk
Brined cheese
Fresh cheese
Cheese spread


CVS
Sample
Colorimeter
Set style yoghurt
Kefir
Yoghurt
Sour cream
Heat treated cream
Skim milk powder
Kajmak spread

Journal of Food Measurement and Characterization
https://doi.org/10.1007/s11694-021-01085-4

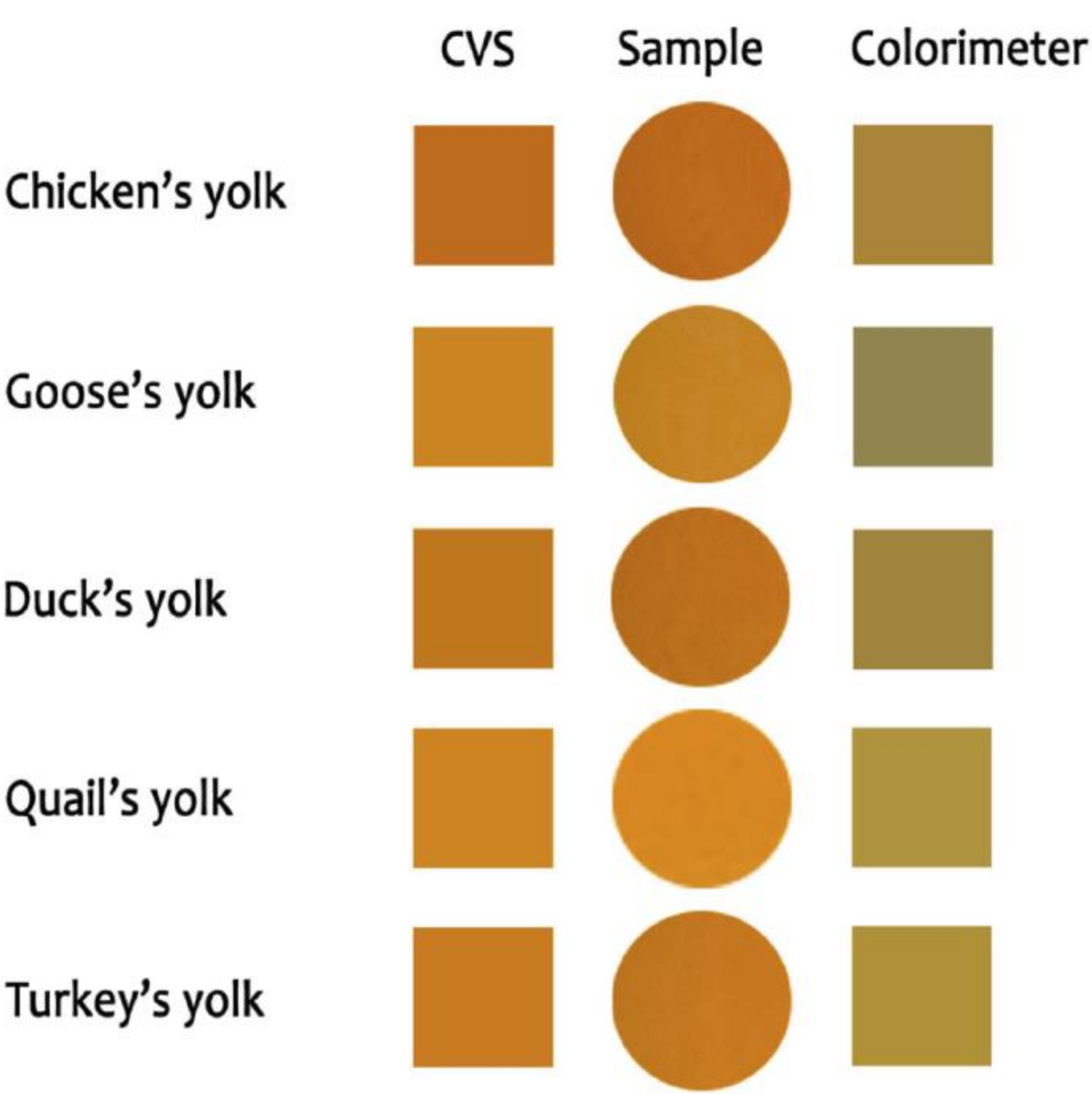
ORIGINAL PAPER

Color assessment of the eggs using computer vision system and Minolta colorimeter

Bojana Milovanovic[1] · Vladimir Tomovic[2] · Ilija Djekic[1] · Bartosz G. Solowiej[3] · Jose M. Lorenzo[4,5] · Francisco J. Barba[6] · Igor Tomasevic[1]

Abstract

The scientific journal articles (n = 150) were examined to obtain instrumental egg color data published in the period 2009–2020. The majority of articles originated from Asia (42.0%), investigated yolk color (45.3%), selected Minolta device (65.3%). The greatest part of papers failed to include parameters such as port size (92.0%), observer (90.0%), illuminant (84.0%), technical replicates (70.0%) and calibration method (66.7%), and, therefore, this represents a key matter in conducting comparative research to ensure equivalence in order to trace and compare different research data. Furthermore, the usage of a computer vision system (CVS) for egg color analysis was investigated. The color of five egg species (chicken, goose, duck, quail and turkey) was estimated using a CVS and a traditional colorimeter. The CVS-produced color was highly similar to the actual color of egg sample (ranging from 75.0 to 100.0%). The color of eggshell gathered through the Minolta depicts brighter, less "red" and more "yellow" appearance than CVS. Regarding the color of yolk samples, Minolta had lighter (except the goose's yolk), more "green" and less "yellow" color, whereas CVS indicated the appearance of albumen as lighter (except quail's), more "red" and less "yellow" than colorimeter. Those results read by Minolta showed a non-real color of egg samples, whereas CVS-obtained color was highly similar to the actual egg color sample. Considering these results, it could be concluded that the CVS is a superior alternative for replacing traditional devices by providing better accuracy.


CVS
Sample
Colorimeter
Chicken's yolk
Goose's yolk
Duck's yolk
Quail's yolk
Turkey's yolk

Superior

meat technology
Founder and publisher: Institute of Meat Hygiene and Technology, Belgrade

UDK: 637.524.043
ID: 42825481
https://doi.org/10.18485/meattech.2021.62.1.3

Original scientific paper

Estimation of fat content in fermented sausages by means of Computer Vision System (CVS)

Stefan Simunović[1], Sara Rajić[1], Vesna Đorđević[1], Vladimir Tomović[2], Dragan Vujadinović[3], Ilija Đekić[4], Igor Tomašević[5]

A b s t r a c t: The aim of this study was to investigate the possibility of computer vision system (CVS) application in fat content estimation for different types of fermented sausages. Four different types of local fermented sausages with different fat contents were studied: Njeguška, Kulen, Pirotska and tea sausage. Results obtained for CVS-estimated fat content were compared to the results of traditional chemical analysis. Relative errors of fat content estimation in Njeguška, Kulen, Pirotska and tea sausage were 1.47%, 0.46%, 20.84% and 11.19%, respectively. Results of t-test showed a significant ($p<0.01$) difference between mean fat contents obtained by CVS and chemical analysis in the case of Pirotska sausage. On the other hand, there was no significant ($p<0.01$) difference between mean fat contents obtained by the two methods for the rest of the analysed sausages. The results indicate CVS has potential for application in the analysis of fat content of fermented sausages.

Keywords: *computer vision, fat content, fat estimation, fermented sausages, dry sausages.*

Figure 1. Results of colour segmentation analysis of Kulen sausage: original image (left), background colour adjustments (middle) and colour segmentation (right).

Table 1. Estimated fat content (mean±standard deviation) in different types of fermented sausages and comparison of fat contents from CVS and traditional chemical analyses

Type of fermented sausage	Estimated fat content by CVS (%)	Chemically determined fat content (%)	Result comparison (%)
Njeguška	43.66±4.14[a]	44.31±0.19[a]	98.53
Kulen	32.75±4.21[a]	32.60±1.42[a]	100.46
Tea	36.16±1.47[a]	32.52±0.21[a]	111.19
Pirotska	11.25±0.71[a]	9.31±0.04[b]	120.84

Legend: [a, b] Values in the same row followed by different letters are significantly different ($p<0.01$)