Kompjuterski vizuelni sistem za određivanje kvaliteta hrane animalnog porekla

Prof dr Igor Tomašević
Poljoprivredni fakultet
Univerzitet u Beogradu

Особа

др Игор Томашевић, редовни професор

Организациона јединица
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441-3152

Академска каријера

	Година	Институција	Област
Избор у звање	2017	Универзитет у Београду-Пољопривредни факултет	Биотехничке науке
Докторат	2011	Универзитет у Београду-Пољопривредни факултет	Биотехничке науке
Магистратура	2007	Универзитет у Београду-Пољопривредни факултет	Биотехничке науке
Диплома	2000	Универзитет у Београду-Пољопривредни факултет	Биотехничке науке

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154
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24
h-index: View *h*-graph

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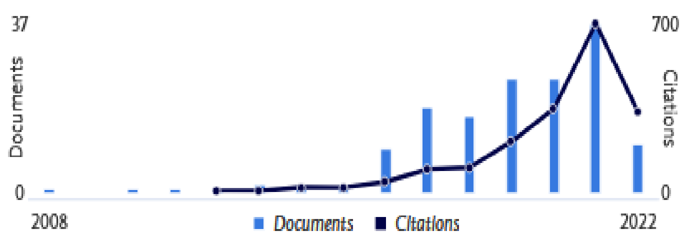

Analyze author output Citation overview

Most contributed Topics 2016–2020

Sausages; Fat; Meat Emulsions
9 documents

Hazard Analysis and Critical Control Points; Food Safety; Sanitation Standard Operating Procedures
7 documents

Beef Production; Functional Unit (Life Cycle Assessment); Life Cycle Assessment
5 documents

View all Topics

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Tomasevic, Igor

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Highly Cited Papers 5

23 H-Index	154 Publications in Web of Science
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176	1,738	23	298	15

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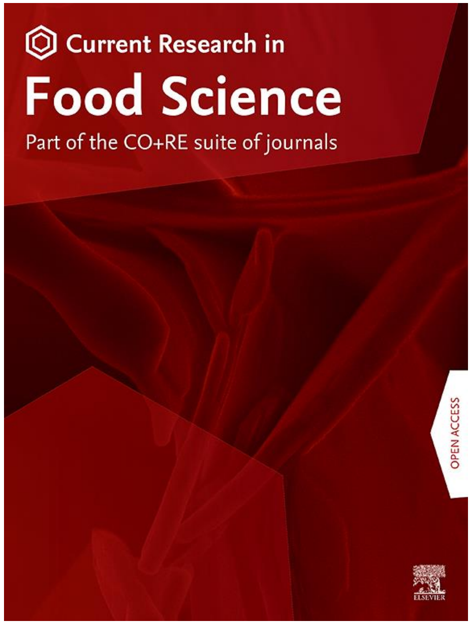

ISSN 2414-438X (Print)
ISSN 2414-441X (Online)

THEORY AND PRACTICE
OF MEAT PROCESSING

ТЕОРИЯ И ПРАКТИКА
ПЕРЕРАБОТКИ МЯСА

Food Science and Technology
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2019

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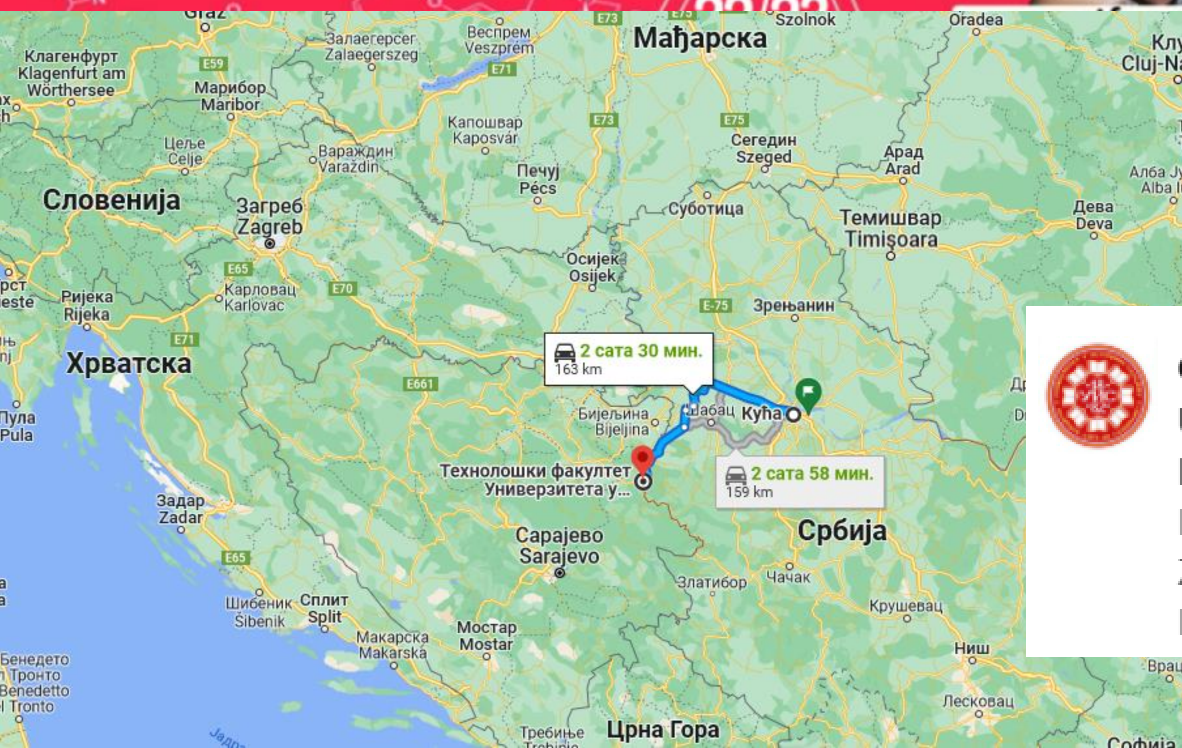
УНИВЕРЗИТЕТ У ИСТОЧНОМ САРАЈЕВУ
ТЕХНОЛОШКИ ФАКУЛТЕТ ЗВОРНИК

Претрага ...

НАСЛОВНА ФАКУЛТЕТ СТУДЕНТИ СТУДИЈЕ ДЈЕЛАТНОСТИ АКРЕДИТАЦИЈА УПИС



Guest Professor

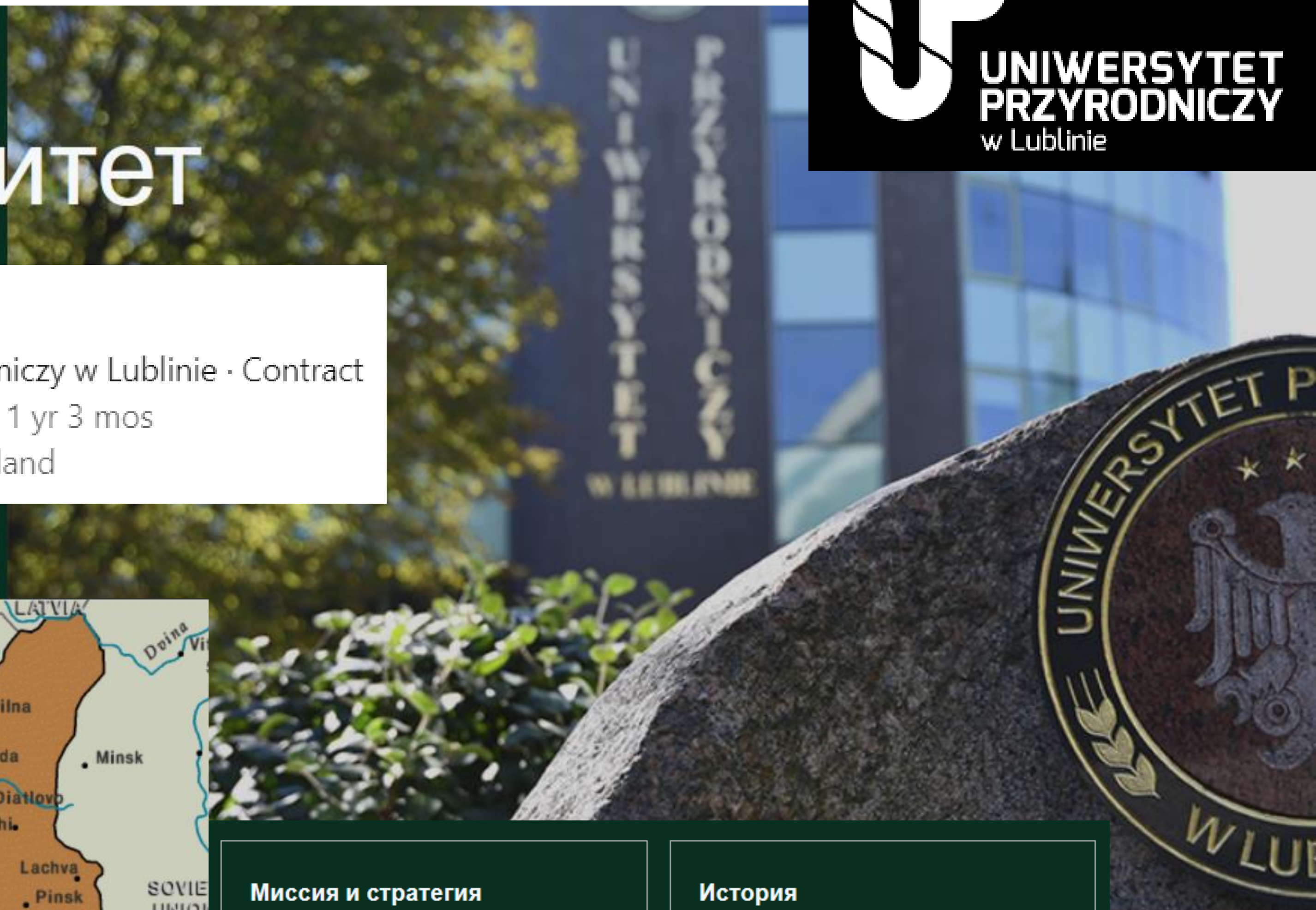
University of East Sarajevo - Univerzitet u Istočnom Sarajevu · Contract

Nov 2021 - Present · 7 mos

Zvornik, Serb Republic, Bosnia and Herzegovina

UNIWERSYTET PRZYRODNICZY w Lublinie

Университет



Guest Professor

Uniwersytet Przyrodniczy w Lublinie · Contract

Mar 2021 - Present · 1 yr 3 mos

Lublin, Lubelskie, Poland

Миссия и стратегия

ЧИТАТЬ ДАЛЬШЕ

История

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Организационная структура

ЧИТАТЬ ДАЛЬШЕ

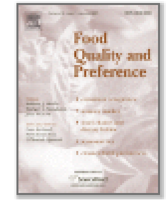
Галерея

ЧИТАТЬ ДАЛЬШЕ

ELSEVIER

Food Quality and Preference

Volume 18, Issue 1, January 2007, Pages 26-36



International preferences for pork appearance: I. Consumer choices

T.M. Ngapo [a, b], J.-F. Martin [b], E. Dransfield [a, c]

⊞ Show more

https://doi.org/10.1016/j.foodqual.2005.07.001

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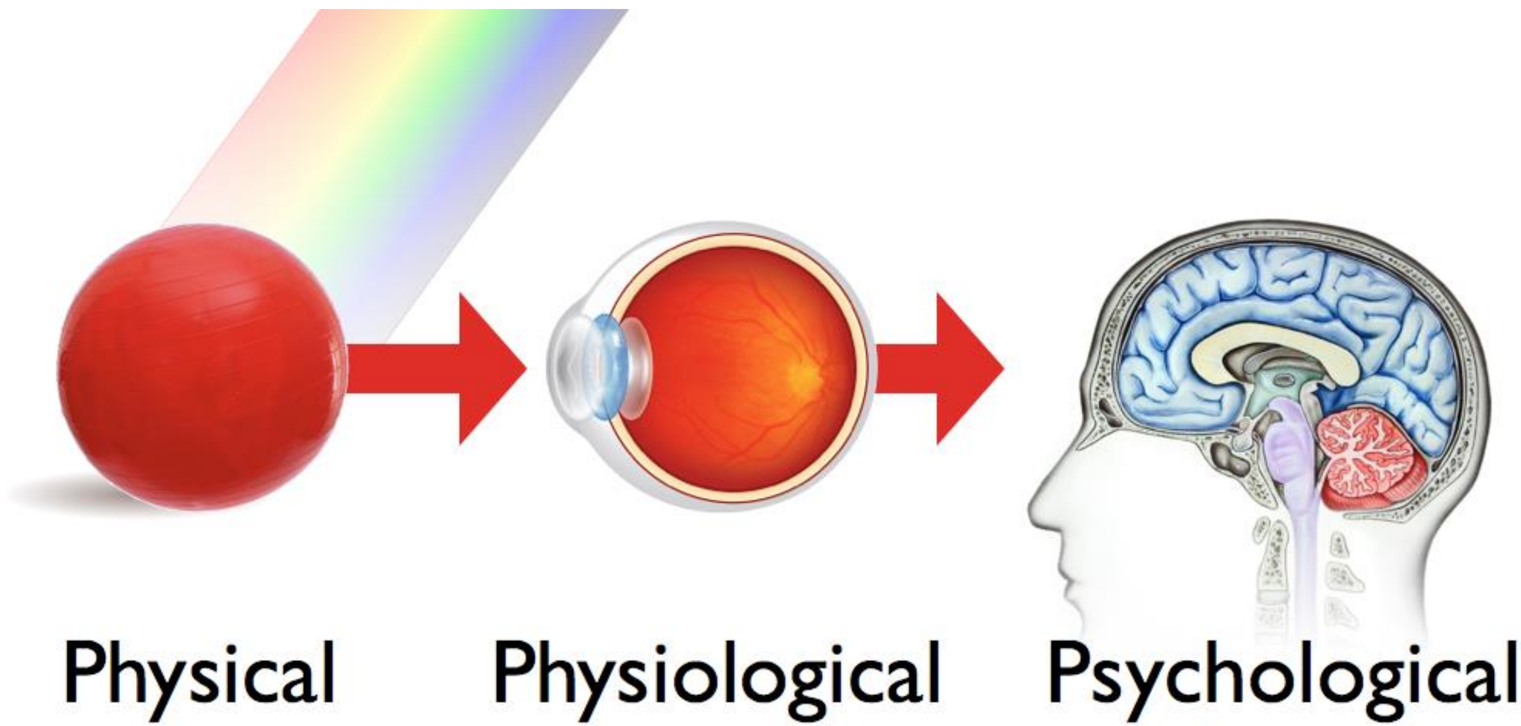
Abstract

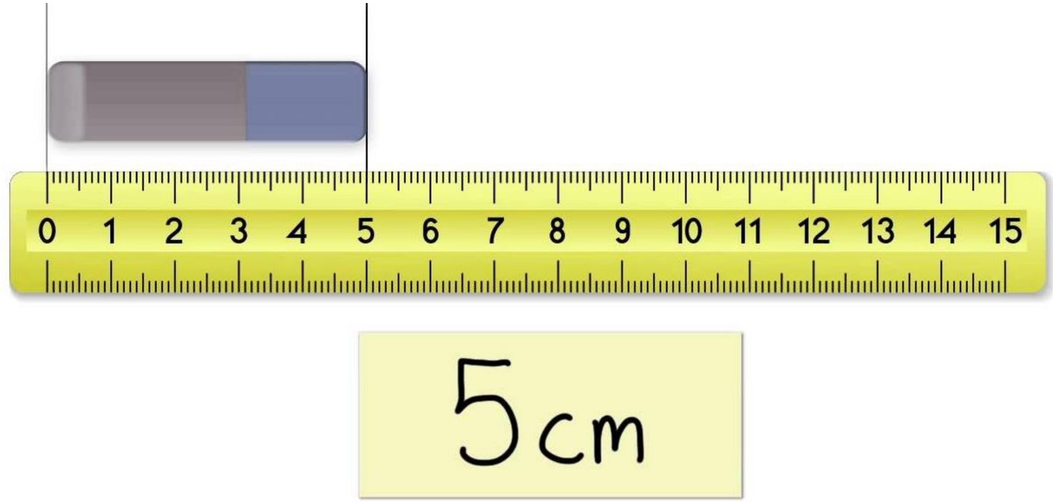
Using the same digital photographs of pork chops varying systematically in fat cover, colour, marbling and drip, 12,590 consumers from 23 countries each selected

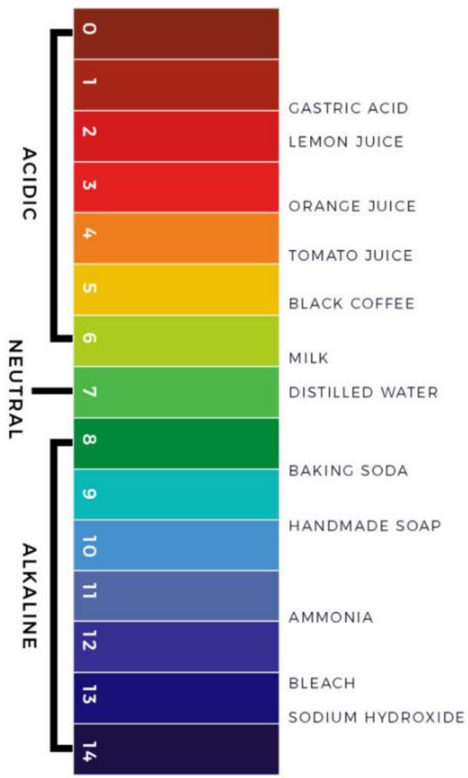
Color - most important characteristic of pork

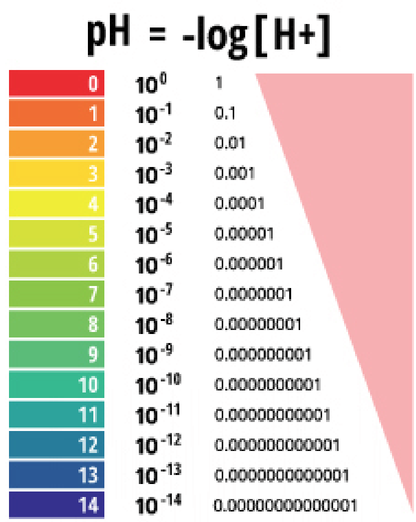
Color is a subjective physical-physiological-psychological characteristic as it exists only in the observer's eyes and brain. Because color perception differs from person to person, and depends upon lighting and numerous other factors, many industries (including food) rely on human vision coupled with an instrumental system of color measurement.

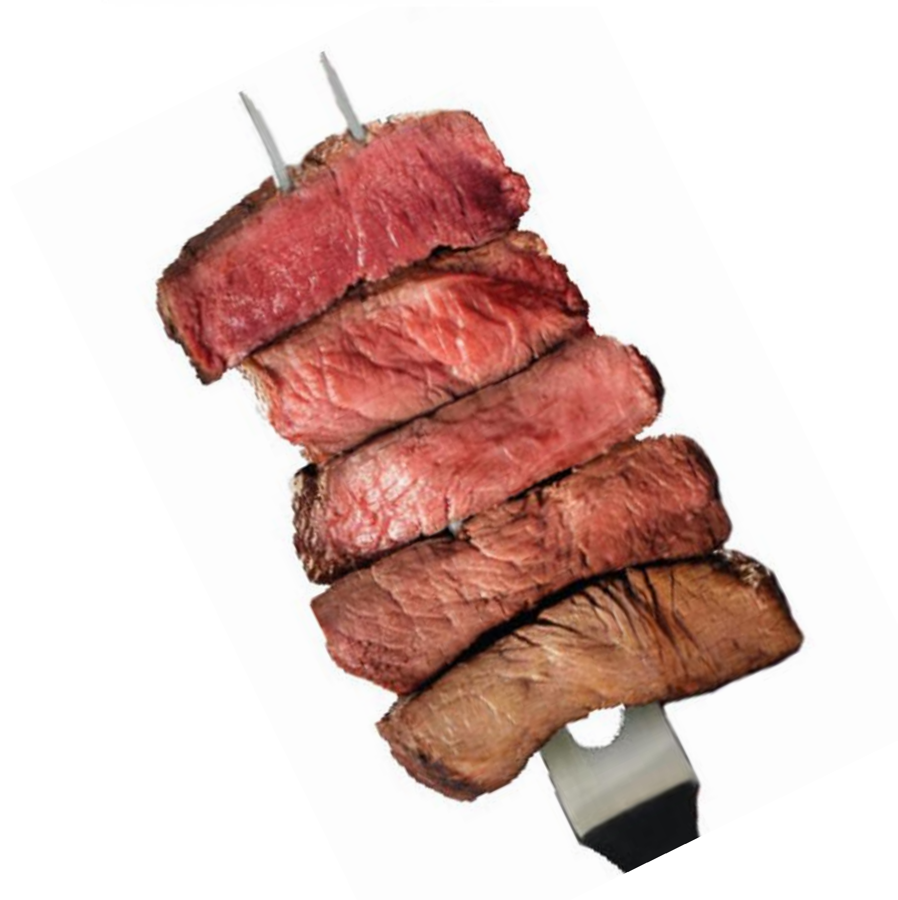



70kg
wiki How to Calculate Your Weight in Stones


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
5cm

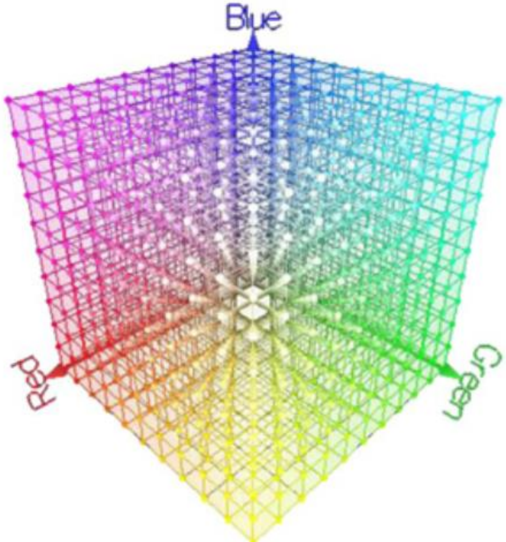

ACIDIC
NEUTRAL
ALKALINE
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
GASTRIC ACID
LEMON JUICE
ORANGE JUICE
TOMATO JUICE
BLACK COFFEE
MILK
DISTILLED WATER
BAKING SODA
HANDMADE SOAP
AMMONIA
BLEACH
SODIUM HYDROXIDE


pH = -log[H+]
0 10^0 1
1 10^-1 0.1
2 10^-2 0.01
3 10^-3 0.001
4 10^-4 0.0001
5 10^-5 0.00001
6 10^-6 0.000001
7 10^-7 0.0000001
8 10^-8 0.00000001
9 10^-9 0.000000001
10 10^-10 0.0000000001
11 10^-11 0.00000000001
12 10^-12 0.000000000001
13 10^-13 0.0000000000001
14 10^-14 0.00000000000001



The colour of an object can be described by several colour coordinate systems. A colour system (model) is a three dimensional orthogonal coordinate representation of colour.

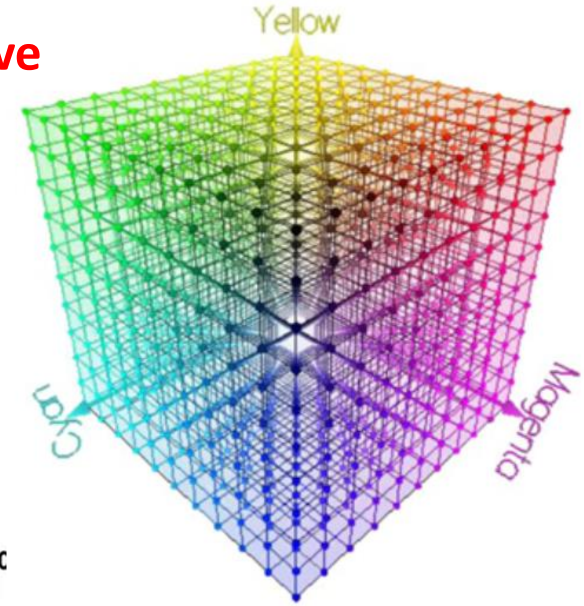
a



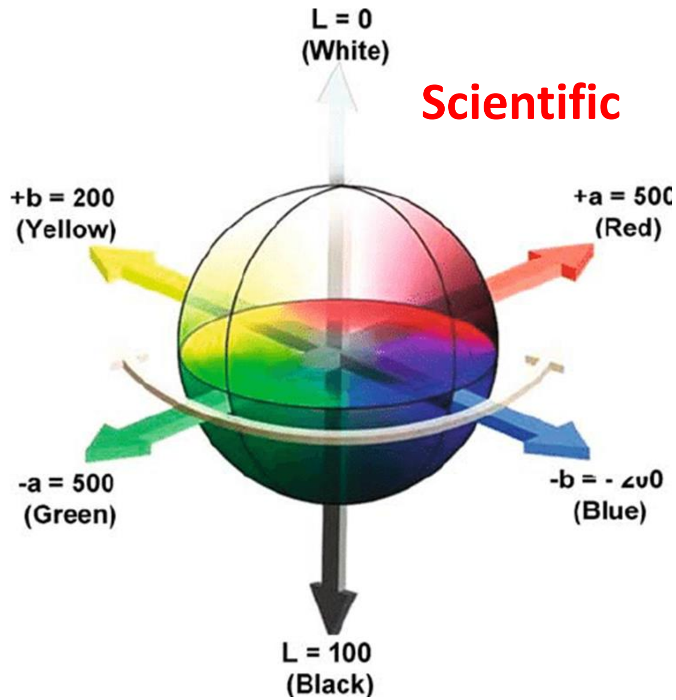
Additive

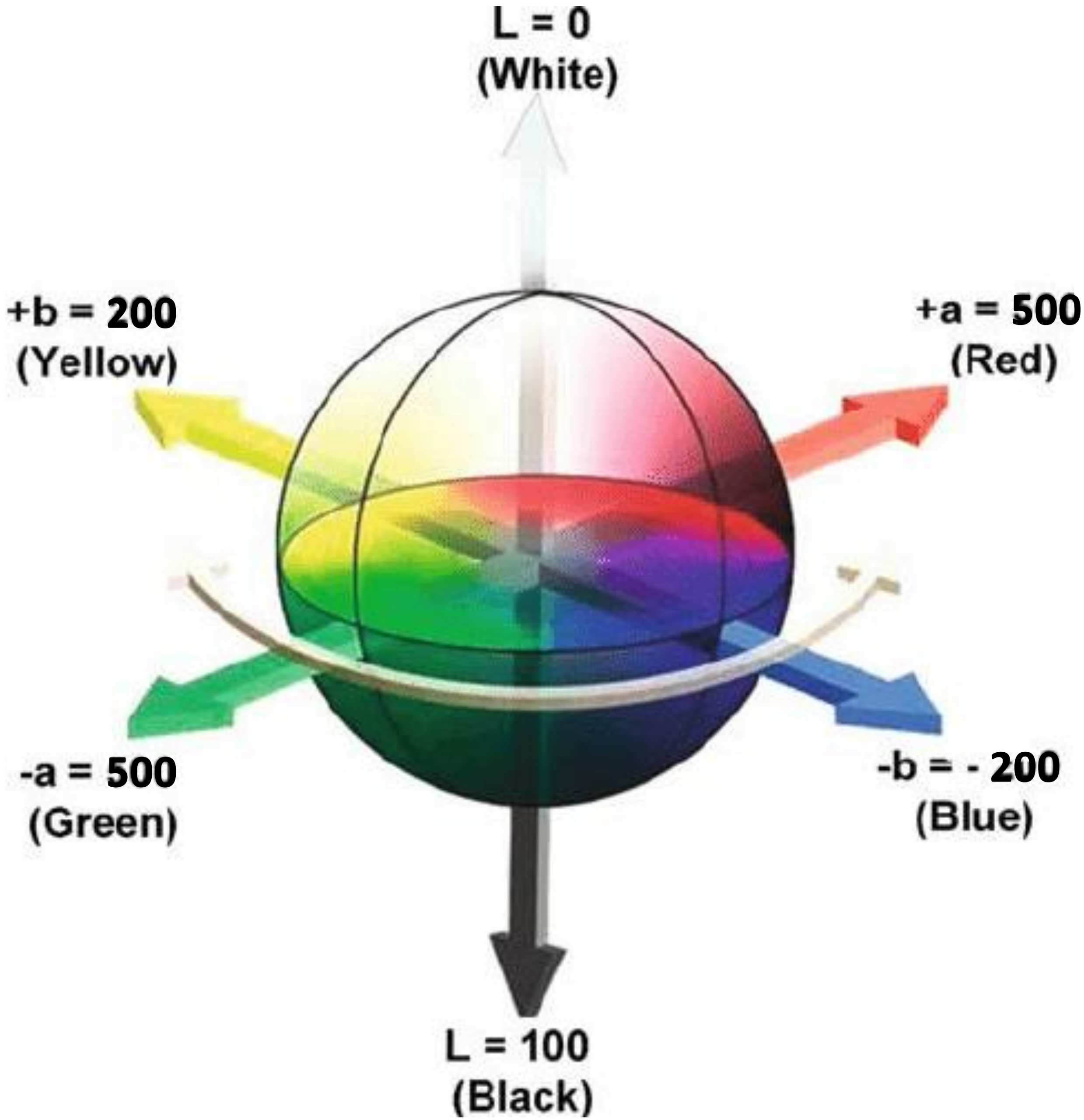
c

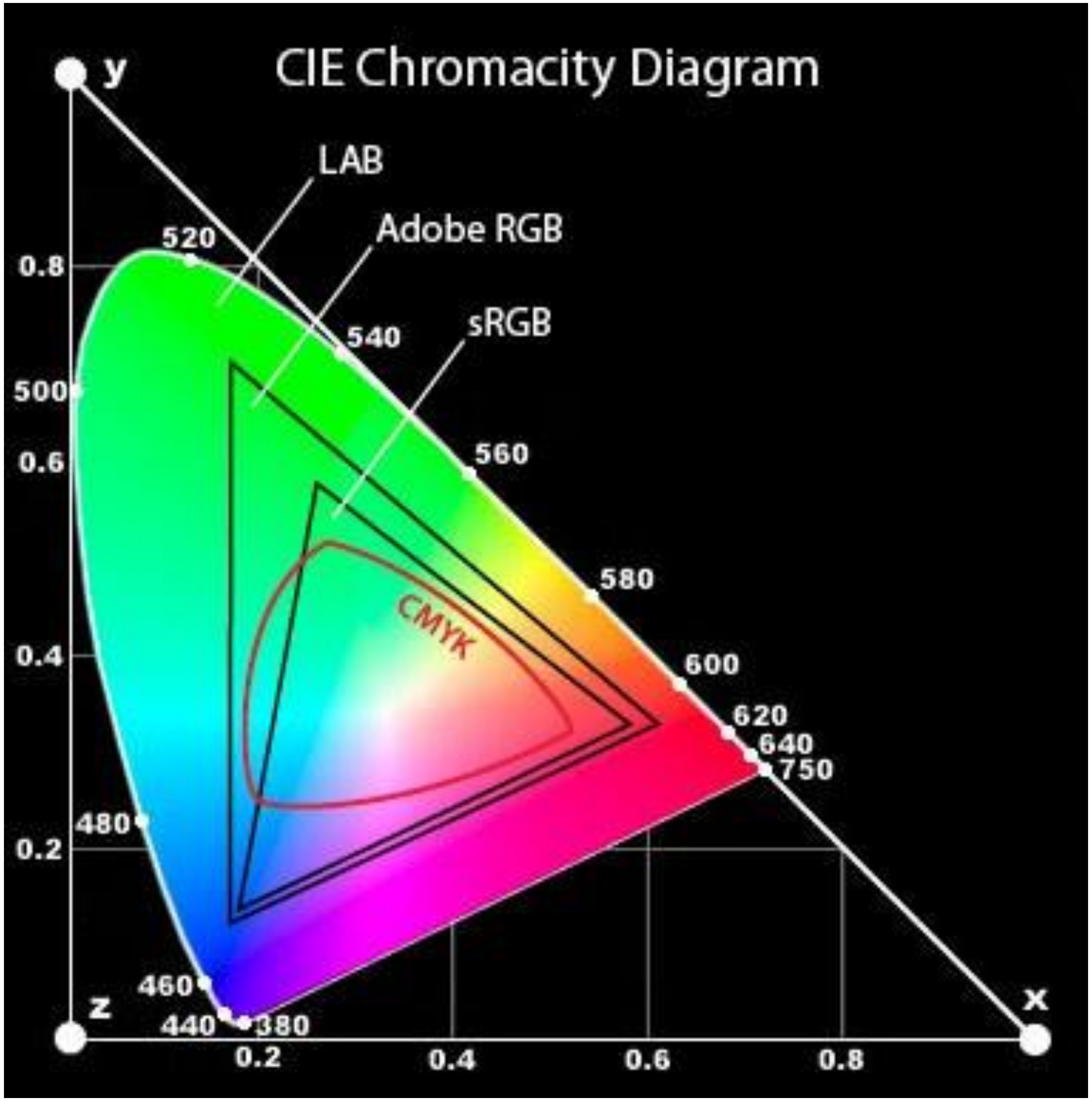
Subtractive



Scientific




L = 0
(White)
+b = 200
(Yellow)
+a = 500
(Red)
-a = 500
(Green)
-b = - 200
(Blue)
L = 100
(Black)



LAB Colour has a bigger gamut (more colours) than the other colour spaces

Meat Science 89 (2011) 1–5

Contents lists available at ScienceDirect

Meat Science

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

How is the instrumental color of meat measured?

W.N. Tapp III, J.W.S. Yancey *, J.K. Apple

Department of Animal Science, University of Arkansas Division of Agriculture, Fayetteville, 72701, USA

1.068 articles

A B S T R A C T

Peer-reviewed journal articles (n = 1068) were used to gather instrumental color measurement information in meat science research. The majority of articles, published in 10 peer-reviewed journals, originated from European countries (44.8%) and North America (38.5%). The predominant specie was pork (44.2%), and most researchers used Minolta (60.0%) over Hunter (31.6%) colorimeters. Much of the research was done using illuminant D_{65} (32.3%); nevertheless, almost half (48.9%) of the articles did not report the illuminant. Moreover, a majority of the articles did not report aperture size (73.6%) or the number of readings per sample (52.4%). Many factors influence meat color, and a considerable proportion of the peer-reviewed, published research articles failed to include information necessary to replicate and/or interpret instrumental color results; therefore, a standardized set of minimum reportable parameters for meat color evaluation should be identified.

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

KONICA MINOLTA

60.0%

The world's true measure of color
HunterLab

31.6%

ELSEVIER

Meat Science 59 (2001) 187–191

MEAT SCIENCE

www.elsevier.com/locate/meatsci

Effect of illumination source on the appearance of fresh meat cuts

S. Barbut *

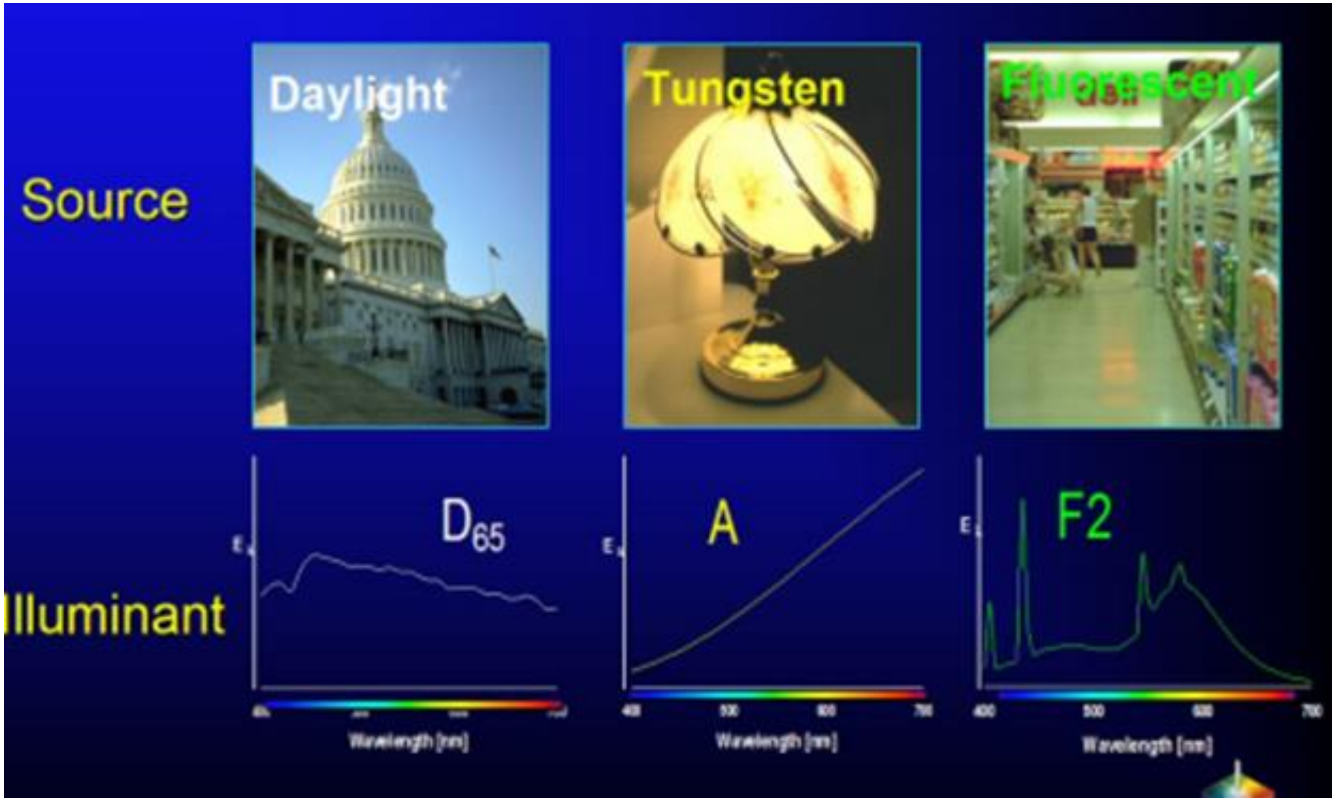
Departments of Animal and Poultry Science, University of Guelph, Guelph, Ontario, Canada N1G 2W1

Received 24 September 2000; received in revised form 14 February 2001; accepted 14 February 2001

Abstract

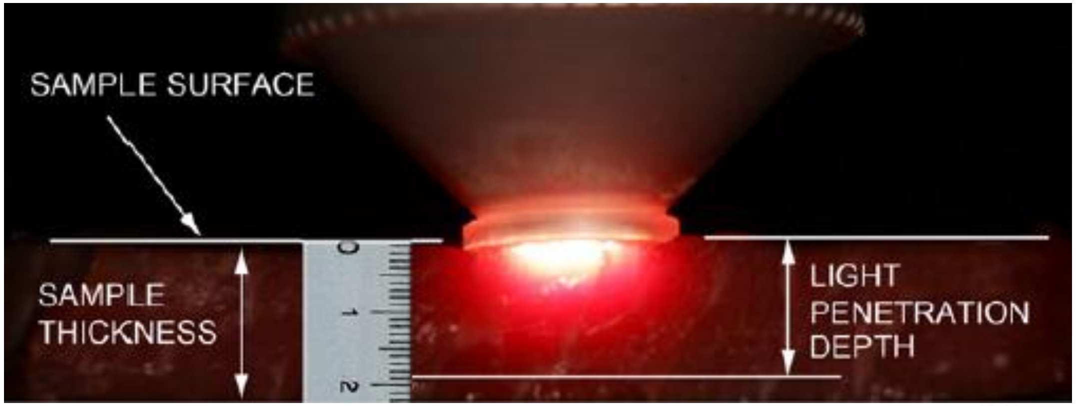
The effects of incandescent (INC), fluorescent (FL), and metal halide (MH) light sources on the appearance of fresh beef, pork and chicken meat were investigated. The color of all meats was more desired ($P < 0.05$) when presented under an INC light source. The color used to describe beef meat presented under INC light was red, but dark brown or dark red under FL and MH. Relative luminance data, collected with a fiber optic probe connected to a photo diode array, demonstrated the reason to be a lack of redness in the commonly used FL and MH light sources. This difference was more pronounced in dark red beef cuts than in lighter pork and chicken cuts.

Illuminant: A source of light used to illuminate samples or standards.

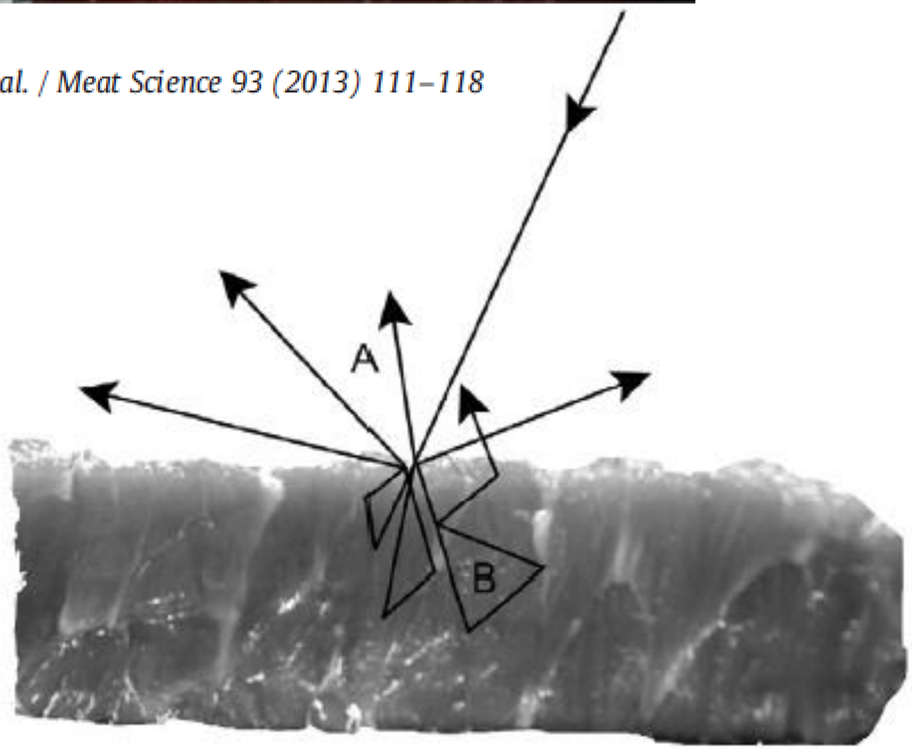


Illuminant D65 (noon daylight, 6500 K)

Illuminant	CIE: C, D65
Light source	Pulsed xenon lamp



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



Computer Vision System

INNOVATION MATTERS


door for samples
light sealed


power cable
handle opening
but closed from inside


metal cover closing the handle opening
preventing the light to get in

CVS illuminant - 6500K daylight white lighting

PHILIPS
Lighting

Product data

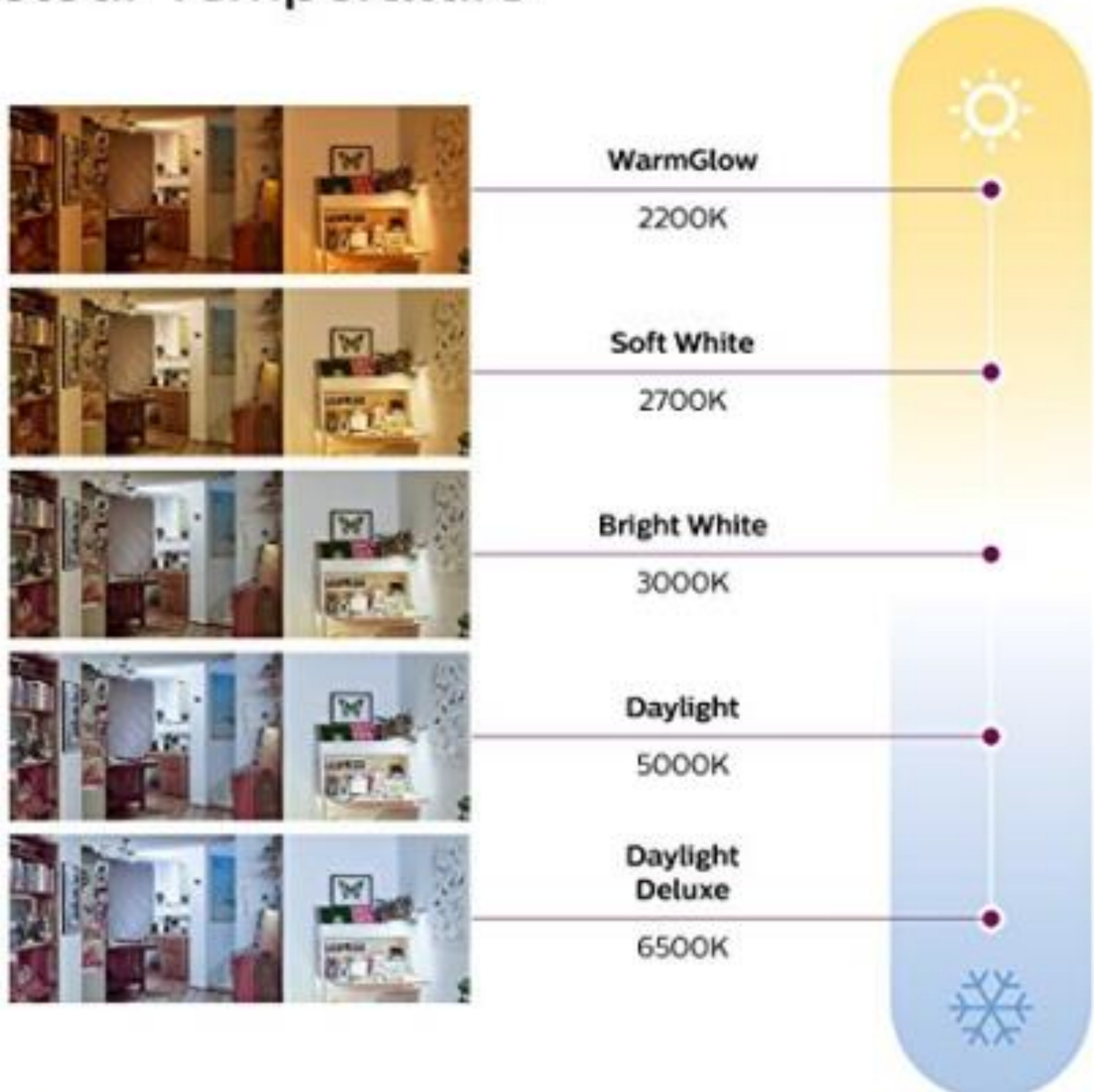
General Information	
Cap-Base	G13 [Medium Bi-Pin Fluorescent]
Life To 10% Failures (Nom)	6000 h
Life to 50% Failures (Nom)	8000 h
Life to 50% Failures Preheat (Nom)	10000 h
LSF 2000 h Rated	99 %
LSF 4000 h Rated	99 %
LSF 6000 h Rated	99 %
LSF 8000 h Rated	99 %
LSF 12000 h Rated	89 %
LSF 16000 h Rated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

MASTER TL-D 90 Graphica

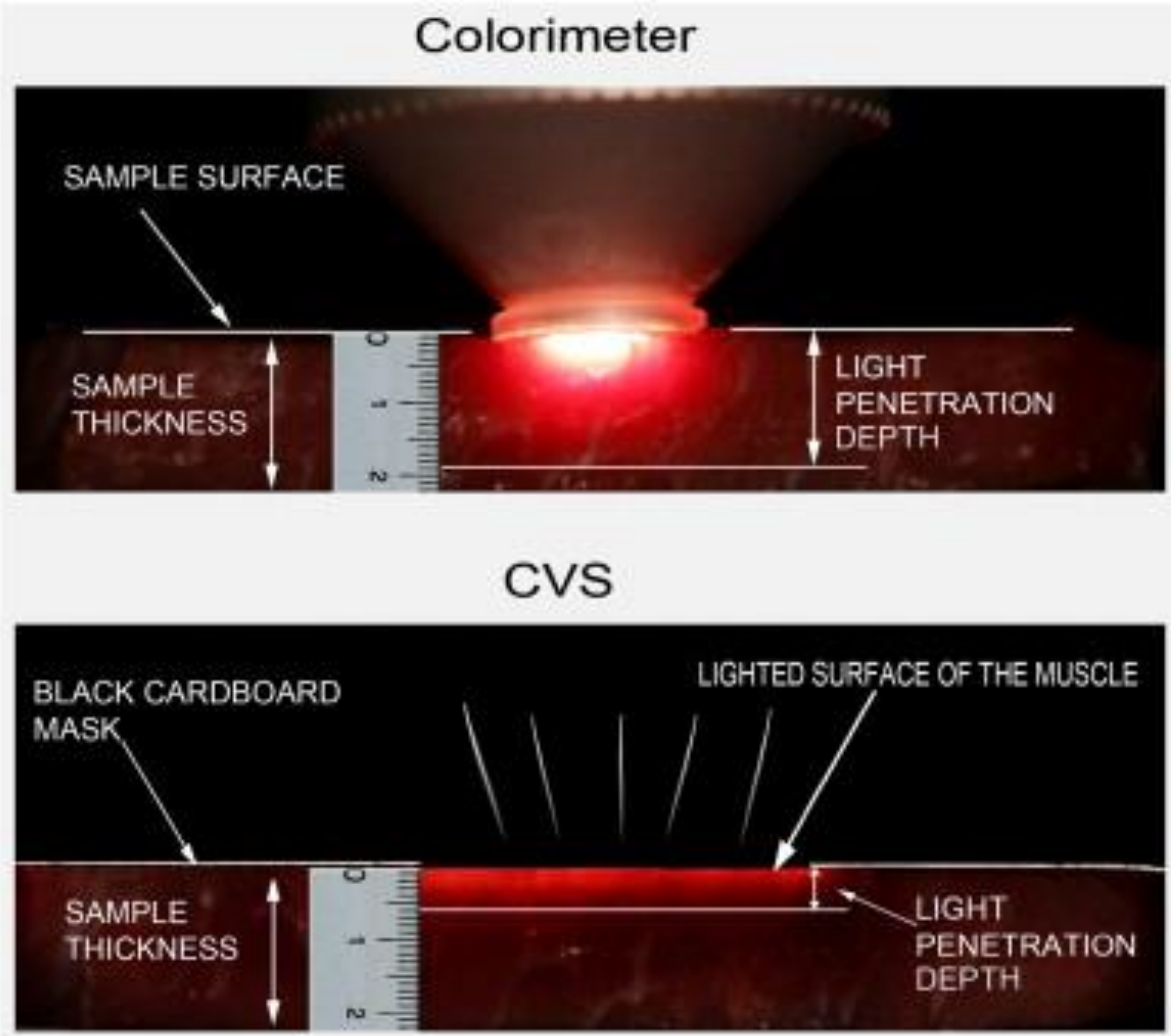
MASTER TL-D 90 Graphica 36W/965 SLV/10

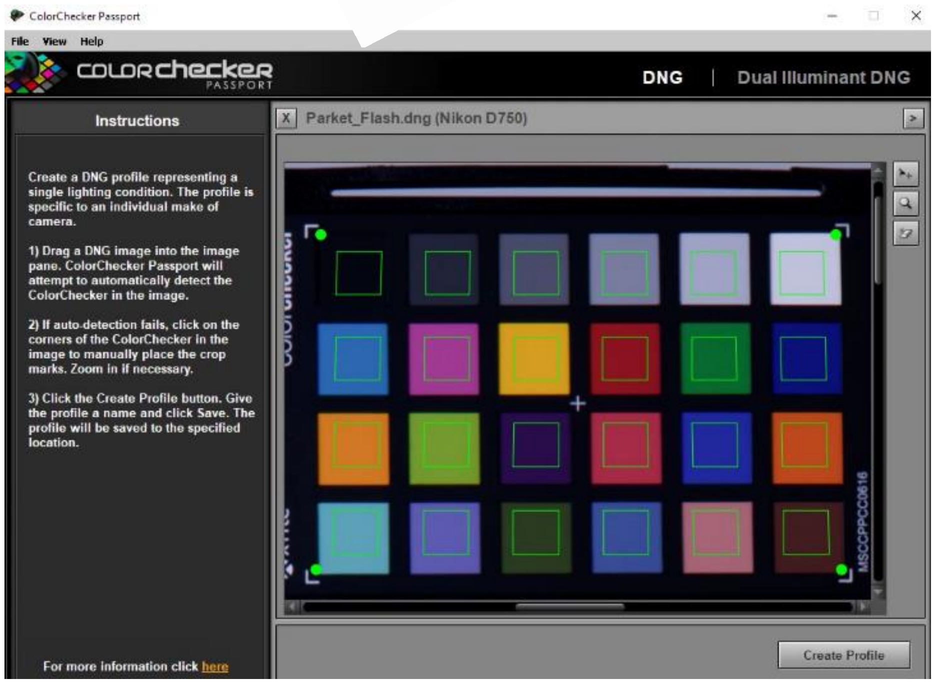
This TL-D lamp has excellent color rendering which makes it very suitable for the graphical and printing industry to check the quality of printed material.

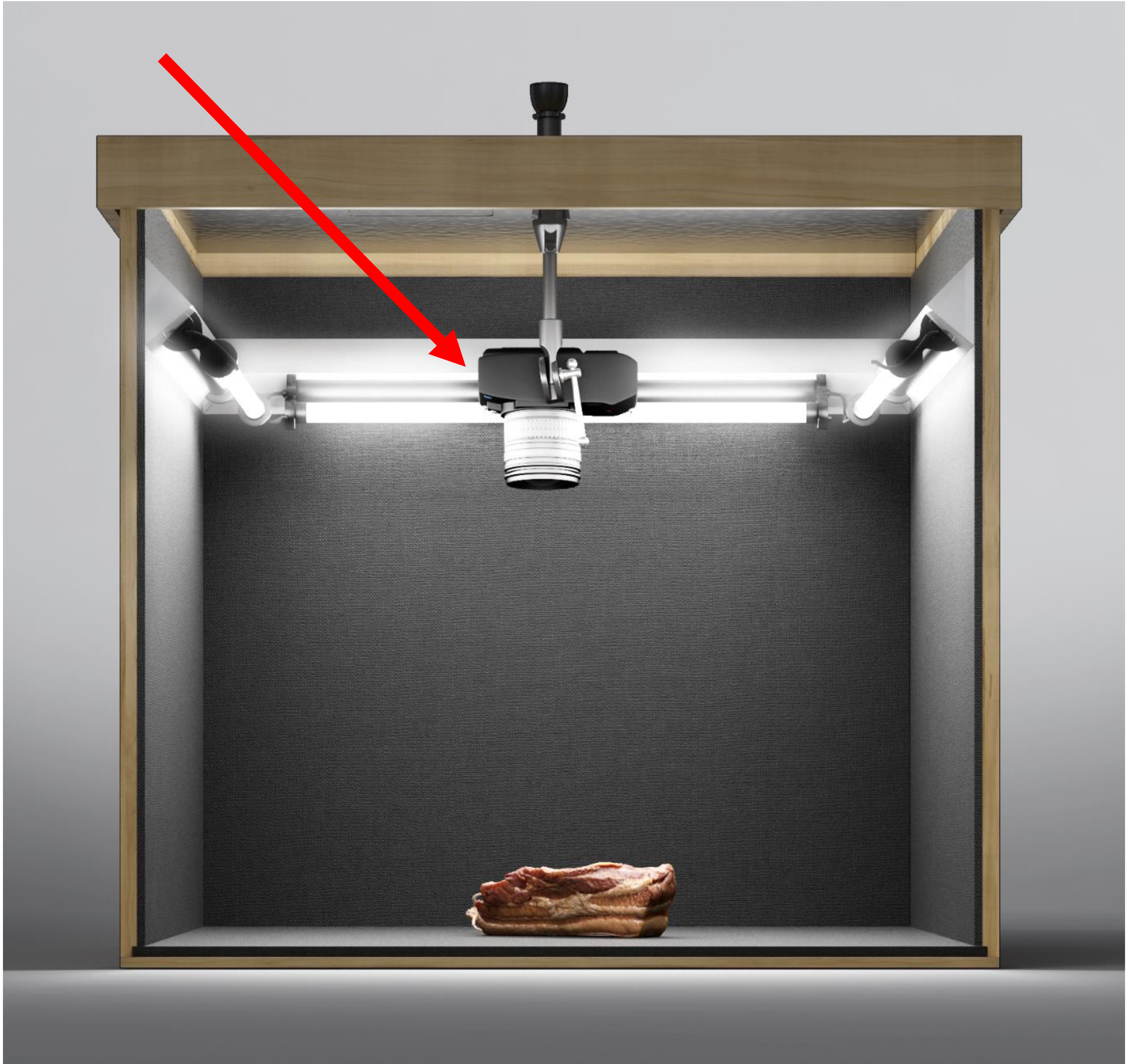
Colour Temperature

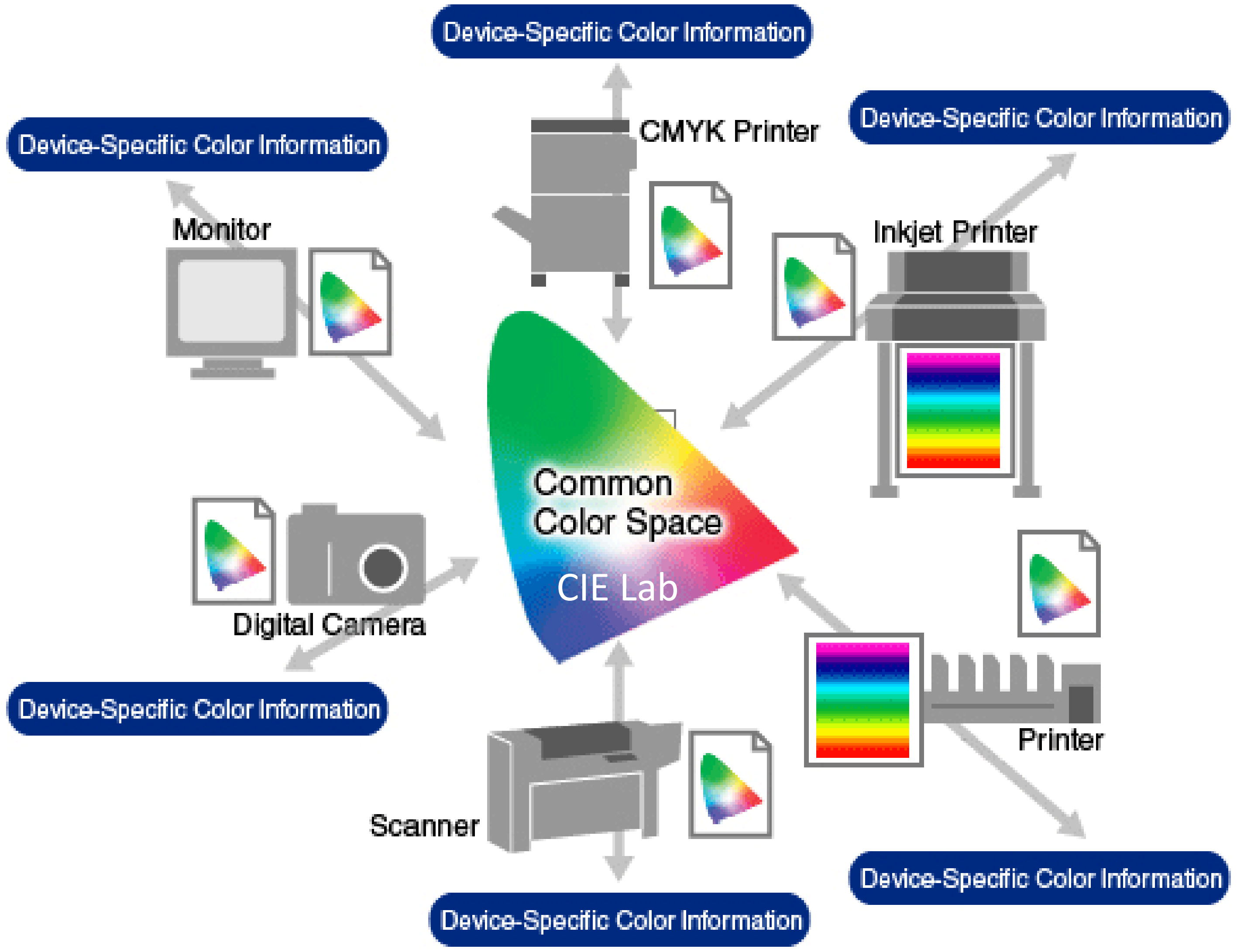


PHILIPS

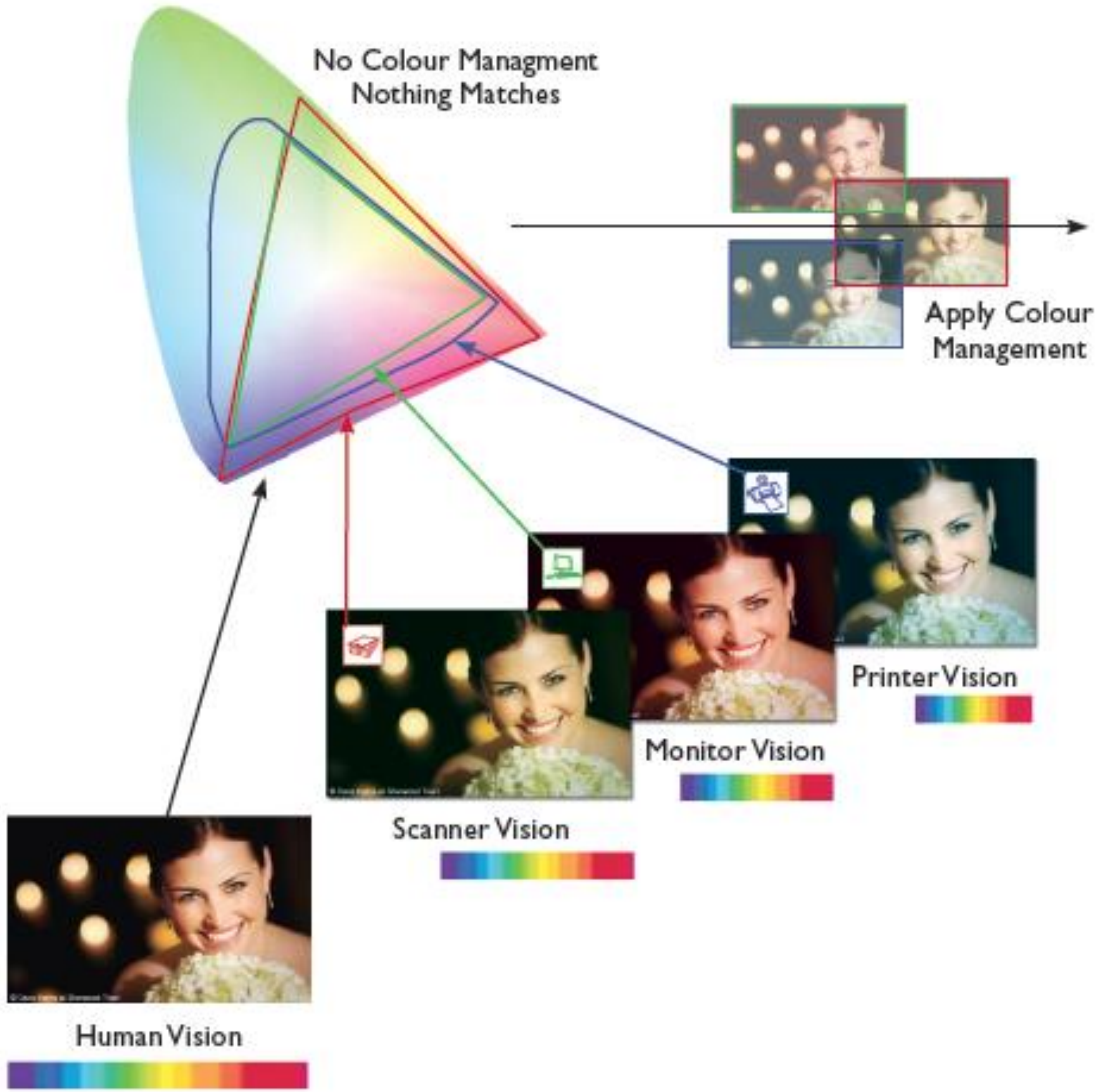

Colorimeter
SAMPLE SURFACE
SAMPLE THICKNESS
LIGHT PENETRATION DEPTH
CVS
BLACK CARDBOARD MASK
LIGHTED SURFACE OF THE MUSCLE
SAMPLE THICKNESS
LIGHT PENETRATION DEPTH


ColorChecker Passport
File View Help
colorchecker PASSPORT
DNG
Dual Illuminant DNG
Instructions
Parket_Flash.dng (Nikon D750)
Create a DNG profile representing a single lighting condition. The profile is specific to an individual make of camera.
1) Drag a DNG image into the image pane. ColorChecker Passport will attempt to automatically detect the ColorChecker in the image.
2) If auto-detection fails, click on the corners of the ColorChecker in the image to manually place the crop marks. Zoom in if necessary.
3) Click the Create Profile button. Give the profile a name and click Save. The profile will be saved to the specified location.
For more information click here
Create Profile





International Color Consortium (ICC) Profiles – device calibration


No Colour Managment
Nothing Matches
Apply Colour
Management
Printer Vision
Monitor Vision
Scanner Vision
Human Vision

IPS + CALIBRATED

Dell UltraSharp 25 Monitor | UP2516D

Refined standards for ideal color coverage.

Expect vivid, accurate color precision, ultrathin bezels and the widest color coverage to suit your professional needs with the Dell UltraSharp 25 Monitor with PremierColor.

- **Ideal color coverage:** Enjoy exceptional color accuracy and consistency right out of the box with an extremely precise Delta-E < 2 factory calibration. The new UP2516D Monitor with PremierColor offers wide coverage of industry color standards with four color spaces, plus user-enabled color customization.
- **Outstanding view:** Experience seamless dual or multi-monitor setup with ultrathin bezels. You can count on beautiful clarity with QHD resolution, plus consistent color across and ultrawide viewing angles.
- **Unrivaled reliability:** Get complete peace of mind with Dell's Premium Panel Guarantee and Advanced Exchange Service.

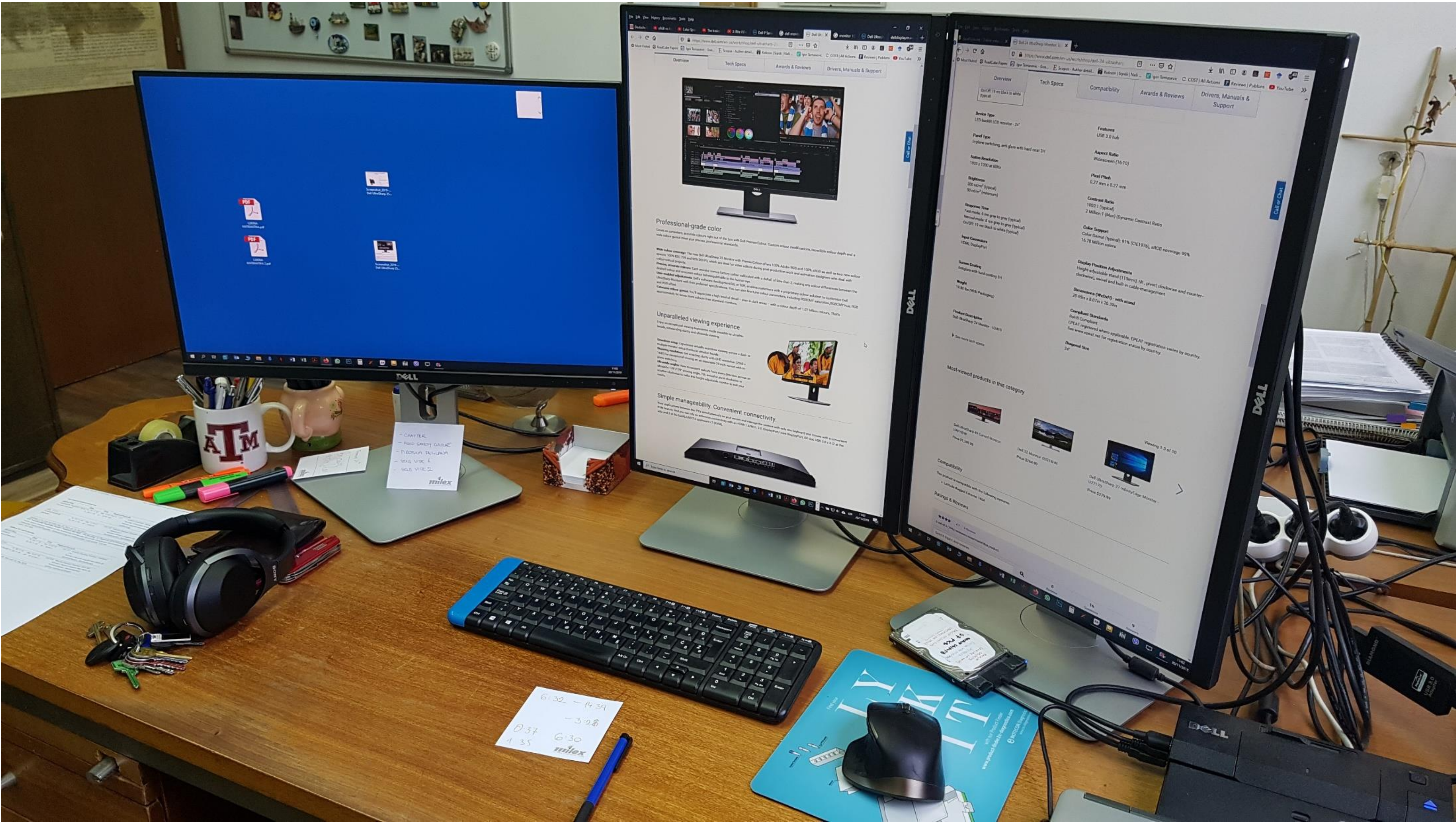
Wide color coverage: The new Dell UltraSharp 25 Monitor with PremierColor offers 100% Adobe RGB and 100% sRGB as well as two new color spaces: 100% REC 709 and 98% DCI-P3, which are ideal for video editors during post-production work and animation designers who deal with color-critical projects.

Total color difference (ΔE) was determined by using the standard equation:

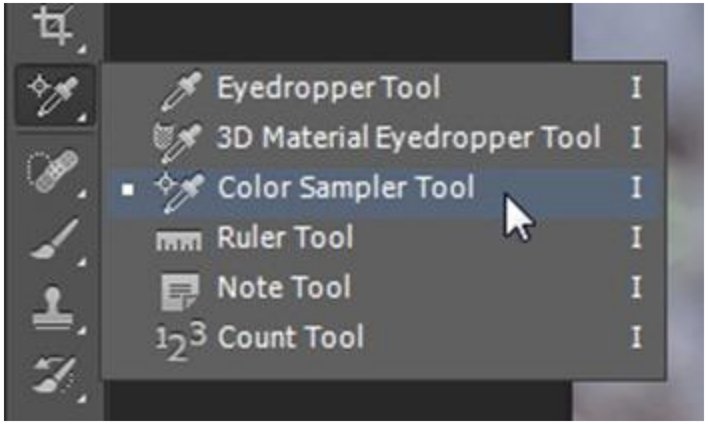
$$\Delta E = \sqrt{(a_C{}^* - a_M^*)^2 + (b_C - b_M^*)^2 + (L_C{}^* - L_M^*)^2} \qquad (1)$$

Values for a_C, b_C, L_C were obtained from the meat products using CVS, and for a_M, b_M, L_M using Minolta.

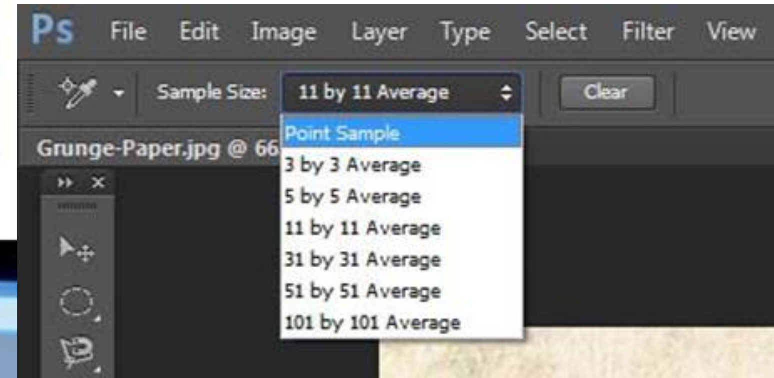
The clear threshold for human meat-color difference detection has not been established but a possible value could be around 2–6 (Larraín, Schaefer, & Reed, 2008). The values of ΔE in a range from 2 to 10 indicate that the difference in color is perceptible at a glance and when they are larger than 10, we can conclude that colors are more opposite than similar (Brainard, 2003). According to Ramirez-Navas and Rodriguez de Stouvenel (2012), all the color differences with ΔE values larger than 6 are considerable.

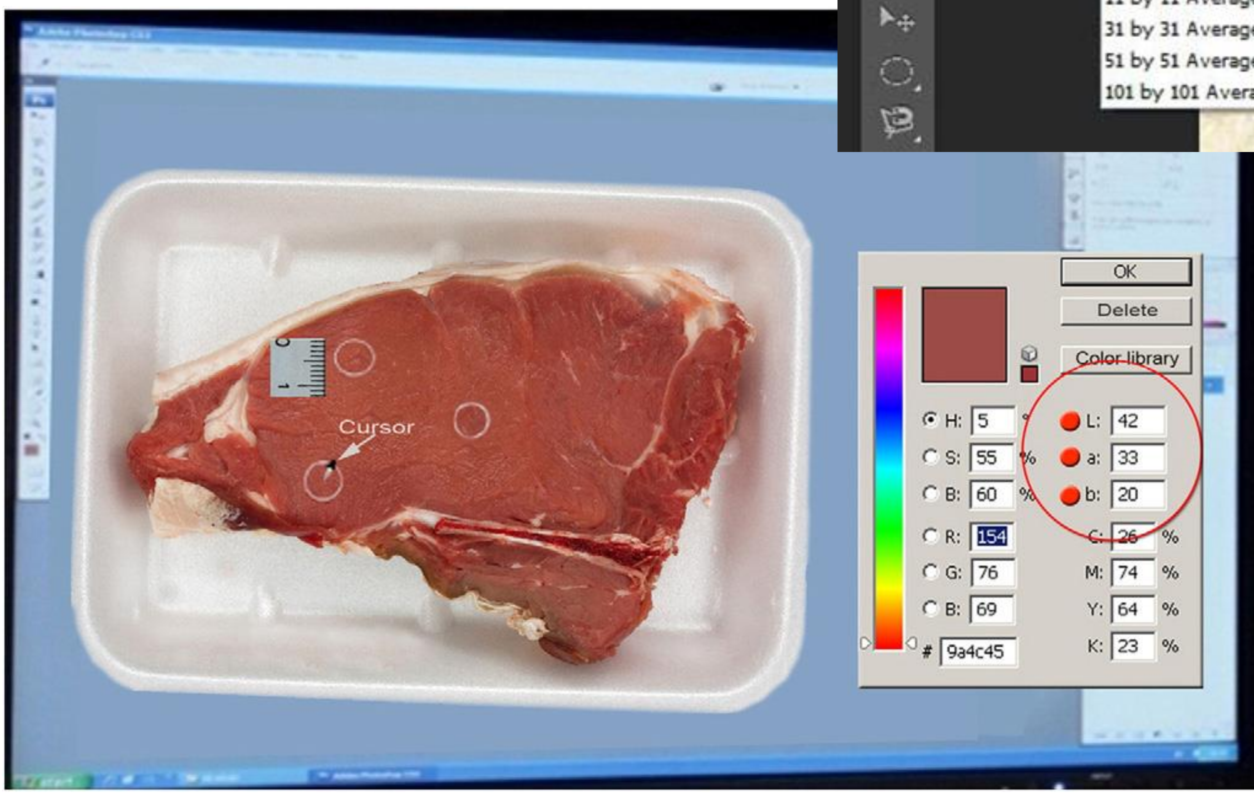

Overview
Tech Specs
Awards & Reviews
Drivers, Manuals & Support
Professional-grade color
Unparalleled viewing experience
Simple manageability. Convenient connectivity
Compatibility
Most viewed products in this category
Drivers, Manuals & Support
milex

INNOVATION MATTERS



Adobe Photoshop CC





CVS vs Minolta CR 410

УНИВЕРЗИТЕТ У БЕОГРАДУ - ПОЉОПРИВРЕДНИ ФАКУЛТЕТ
ОСНОВАН 1919. ГОД

No.	Number		sRGB R	G	B	CIE L*a*b* L*	a*	b*	Munsell Notation Hue	Value / Chroma
1.	dark skin		115	82	68	37.986	13.555	14.059	3 YR	3.7 / 3.2
2.	light skin		194	150	130	65.711	18.13	17.81	2.2 YR	6.47 / 4.1
3.	blue sky		98	122	157	49.927	-4.88	-21.925	4.3 PB	4.95 / 5.5
4.	foliage		87	108	67	43.139	-13.095	21.905	6.7 GY	4.2 / 4.1
5.	blue flower		133	128	177	55.112	8.844	-25.399	9.7 PB	5.47 / 6.7
6.	bluish green		103	189	170	70.719	-33.397	-0.199	2.5 BG	7 / 6
7.	orange		214	126	44	62.661	36.067	57.096	5 YR	6 / 11
8.	purplish blue		80	91	166	40.02	10.41	-45.964	7.5 PB	4 / 10.7
9.	moderate red		193	90	99	51.124	48.239	16.248	2.5 R	5 / 10
10.	purple		94	60	108	30.325	22.976	-21.587	5 P	3 / 7
11.	yellow green		157	188	64	72.532	-23.709	57.255	5 GY	7.1 / 9.1
12.	orange yellow		224	163	46	71.941	19.363	67.857	10 YR	7 / 10.5
13.	blue		56	61	150	28.778	14.179	-50.297	7.5 PB	2.9 / 12.7
14.	green		70	148	73	55.261	-38.342	31.37	0.25 G	5.4 / 8.65
15.	red		175	54	60	42.101	53.378	28.19	5 R	4 / 12
16.	yellow		231	199	31	81.733	4.039	79.819	5 Y	8 / 11.1
17.	magenta		187	86	149	51.935	49.986	-14.574	2.5 RP	5 / 12
18.	cyan		8	133	161	51.038	-28.631	-28.638	5 B	5 / 8
19.	white (.05*)		243	243	242	96.539	-0.425	1.186	N	9.5 /
20.	neutral 8 (.23*)		200	200	200	81.257	-0.638	-0.335	N	8 /
21.	neutral 6.5 (.44*)		160	160	160	66.766	-0.734	-0.504	N	6.5 /
22.	neutral 5 (.70*)		122	122	121	50.867	-0.153	-0.27	N	5 /
23.	neutral 3.5 (.1.05*)		85	85	85	35.656	-0.421	-1.231	N	3.5 /
24.	black (1.50*)		52	52	52	20.461	-0.079	-0.973	N	2 /

#	As reported by X-rite			As measured with Minolta (mean ± SD)				As measured with CVS (mean ± SD)				ΔE_{mc}
Color chip	L_x^*	a_x^*	b_x^*	L_m^*	a_m^*	b_m^*	ΔE_{xm}	L_c^*	a_c^*	b_c^*	ΔE_{xc}	
1	37.5	12.0	13.3	39.5 ± 0.0	11.0 ± 0.0	13.2 ± 0.0	**2.2**	38.1 ± 0.0	13.1 ± 0.0	14.2 ± 0.0	**1.5**	**2.7**
2	65.2	14.8	17.5	65.3 ± 0.0	18.8 ± 0.0	16.6 ± 0.0	**4.1**	66.1 ± 0.1	20.1 ± 0.0	18 ± 0.1	**5.4**	**2.1**
3	50.4	-1.6	-21.4	49.9 ± 0.0	-0.1 ± 0.0	-20.7 ± 0.0	**1.7**	48.8 ± 0.0	-1.7 ± 0.1	-20.7 ± 0.0	**1.7**	**1.9**
4	43.1	-14.6	22.1	43.9 ± 0.0	-14.7 ± 0.0	20.5 ± 0.0	**1.8**	41.2 ± 0.0	-13.8 ± 0.0	20.2 ± 0.0	**2.8**	**2.9**
5	55.3	11.4	-25.3	55.0 ± 0.3	14.6 ± 0.1	-23.6 ± 0.1	**3.6**	54.5 ± 0.0	12.4 ± 0.0	-23.9 ± 0.0	**1.9**	**2.3**
6	71.4	-32.7	1.6	70.5 ± 0.2	-28.7 ± 0.0	-1.6 ± 0.0	**5.2**	73.1 ± 0.1	-30.2 ± 0.0	0.1 ± 0.0	**3.4**	**3.4**
7	61.4	32.9	55.2	63.1 ± 0.0	29.4 ± 0.0	56.8 ± 0.0	**4.2**	61.0 ± 0.0	30.9 ± 0.0	55.1 ± 0.0	**2.0**	**3.1**
8	40.7	16.9	-45.1	40.9 ± 0.0	21.0 ± 0.0	-43.5 ± 0.0	**4.4**	38.9 ± 0.0	20.0 ± 0.0	-44.7 ± 0.1	**3.6**	**2.5**
9	49.9	45.9	13.9	52.8 ± 0.0	43.5 ± 0.1	18.4 ± 0.0	**5.9**	50.3 ± 0.0	42.9 ± 0.1	16.8 ± 0.1	**4.2**	**3.0**
10	30.2	24.9	-22.6	31.5 ± 0.0	24.0 ± 0.0	-17.9 ± 0.0	**5.0**	32.2 ± 0.1	27.0 ± 0.1	-18.8 ± 0.0	**4.8**	**3.2**
11	72.4	-27.5	58.5	71.9 ± 0.0	-27.2 ± 0.0	53.1 ± 0.0	**5.4**	74.0 ± 0.1	-27.0 ± 0.0	53.9 ± 0.1	**4.9**	**2.3**
12	70.9	15.6	66.5	72.0 ± 0.1	11.9 ± 0.0	68.3 ± 0.1	**4.2**	72.0 ± 0.0	11.1 ± 0.0	66.3 ± 0.0	**4.6**	**2.2**
13	29.6	21.4	-49.0	31.1 ± 0.1	22.7 ± 0.0	-46.7 ± 0.1	**3.0**	29.9 ± 0.0	24.1 ± 0.0	-46.1 ± 0.0	**4.0**	**1.9**
14	55.6	-40.8	33.3	55.6 ± 0.0	-40.7 ± 0.0	29.6 ± 0.0	**3.7**	57.0 ± 0.1	-40.6 ± 0.1	28.2 ± 0.1	**5.3**	**2.0**
15	40.6	50.0	25.5	45.4 ± 0.1	48.6 ± 0.1	27.1 ± 0.0	**5.3**	43.8 ± 0.1	48.9 ± 0.1	27.9 ± 0.0	**4.2**	**1.8**
16	81.0	-1.0	80.0	82.0 ± 0.0	-4.4 ± 0.0	79.4 ± 0.0	**3.6**	81.0 ± 0.0	-3.4 ± 0.0	78.6 ± 0.0	**2.8**	**1.6**
17	51.0	49.9	-16.9	52.8 ± 0.0	52.9 ± 0.0	-19.5 ± 0.0	**4.4**	52.7 ± 0.0	52.3 ± 0.0	-17.9 ± 0.0	**3.1**	**1.7**
18	52.1	-24.6	-26.2	50.8 ± 0.0	-27.5 ± 0.0	-28.5 ± 0.0	**3.9**	51.8 ± 0.1	-28.8 ± 0.1	-27.6 ± 0.0	**4.4**	**1.9**
19	96.5	-0.7	1.4	94.6 ± 0.0	-0.4 ± 0.0	3.4 ± 0.0	**2.8**	93.1 ± 0.0	-2.0 ± 0.0	2.0 ± 0.1	**3.7**	**2.6**
20	81.3	-0.6	-0.2	79.9 ± 0.0	-0.4 ± 0.0	0.5 ± 0.0	**1.6**	79.0 ± 0.0	-2.0 ± 0.0	1.0 ± 0.0	**2.9**	**1.9**
21	66.8	-0.6	-0.4	65.9 ± 0.0	-0.6 ± 0.0	0.3 ± 0.0	**1.1**	66.0 ± 0.0	-2.0 ± 0.0	0.0 ± 0.0	**1.6**	**1.4**
22	50.9	-0.1	-0.2	50.5 ± 0.0	-0.5 ± 0.0	0.4 ± 0.0	**0.9**	48.8 ± 0.0	-2.0 ± 0.0	0.0 ± 0.0	**2.8**	**2.3**
23	35.7	-0.2	-1.2	36.7 ± 0.0	-0.5 ± 0.0	-0.2 ± 0.0	**1.5**	37.1 ± 0.0	-2.0 ± 0.0	-1.0 ± 0.0	**2.3**	**1.7**
24	20.5	0.0	-1.0	22.2 ± 0.0	-0.1 ± 0.1	0.2 ± 0.0	**2.1**	23.2 ± 0.1	-1.0 ± 0.0	0.2 ± 0.1	**3.1**	**1.3**
Average ΔE							**3.4**				**3.4**	**2.2**

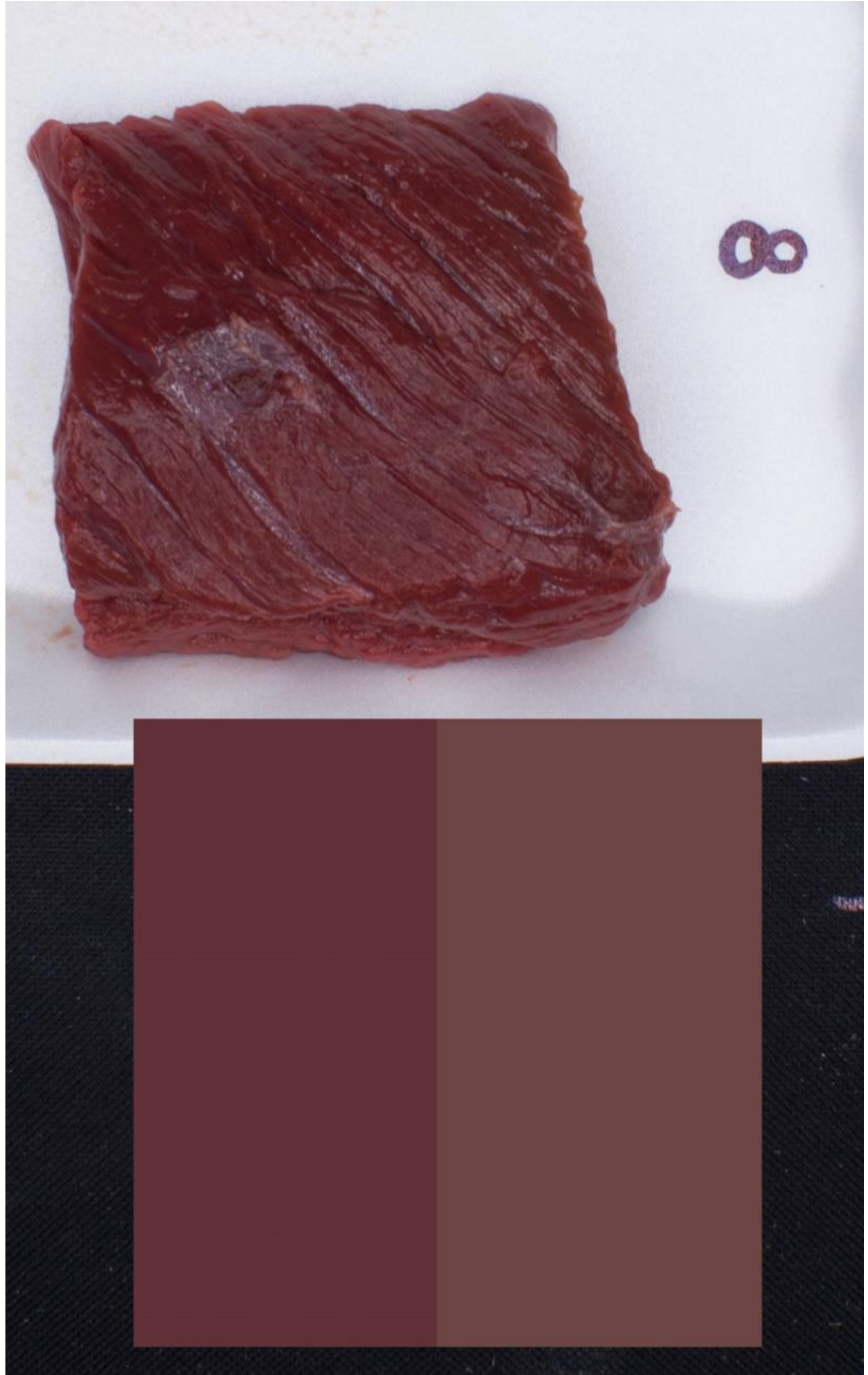
INNOVATION MATTERS

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


8

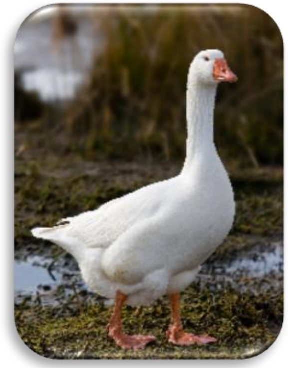
Tab. 2: Similarity test results (tests A and B)

Tab. 2: Ergebnisse der Ähnlichkeitsanalyse (Test A und B)

	Frequency of similarity (test A)	Level of similarity (test A)	CVS vs. colorimeter (test B)
Quail	100%	2.7 ± 1.3[a]	CVS (100%)
Wild boar	100%	3.4 ± 1.3[b]	CVS (100%)
Rabbit	100%	2.7 ± 1.2[a]	CVS (100%)
Deer	100%	4.1 ± 0.8[b]	CVS (100%)
Pheasant	100%	3.2 ± 1.2[a,b]	CVS (100%)

Likert scale ranks from 1 “very low”, 2 “low”, 3 “moderate”, 4 “high” to 5 “very high”

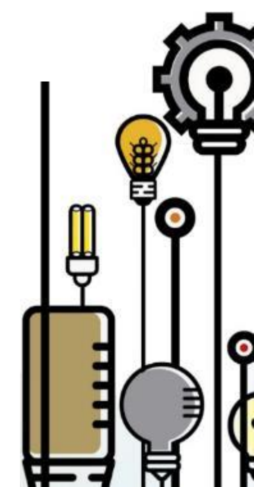
British Food Journal



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]




Actual
CVS
Colorimeter
Chicken
Turkey
Duck
Goose

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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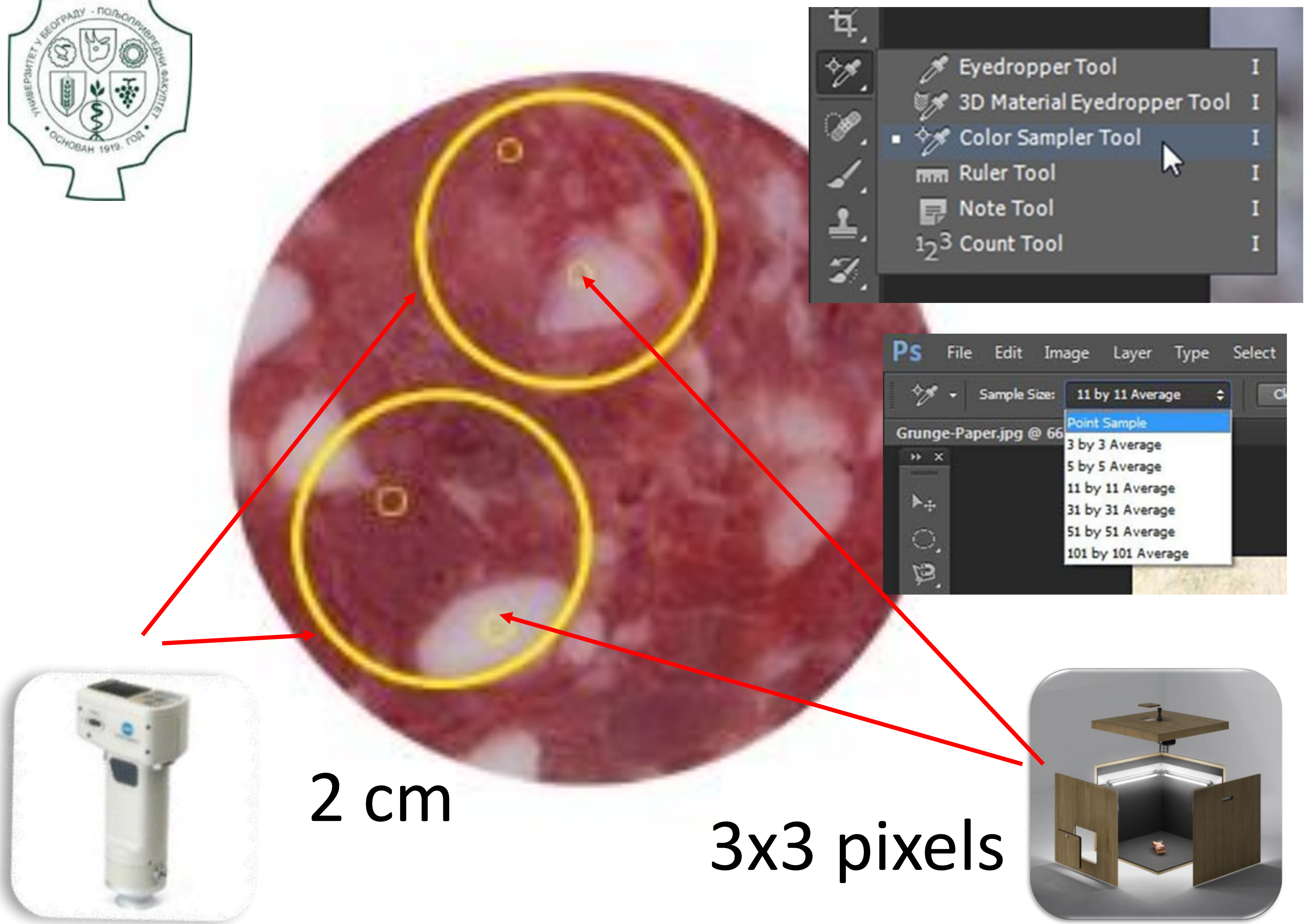
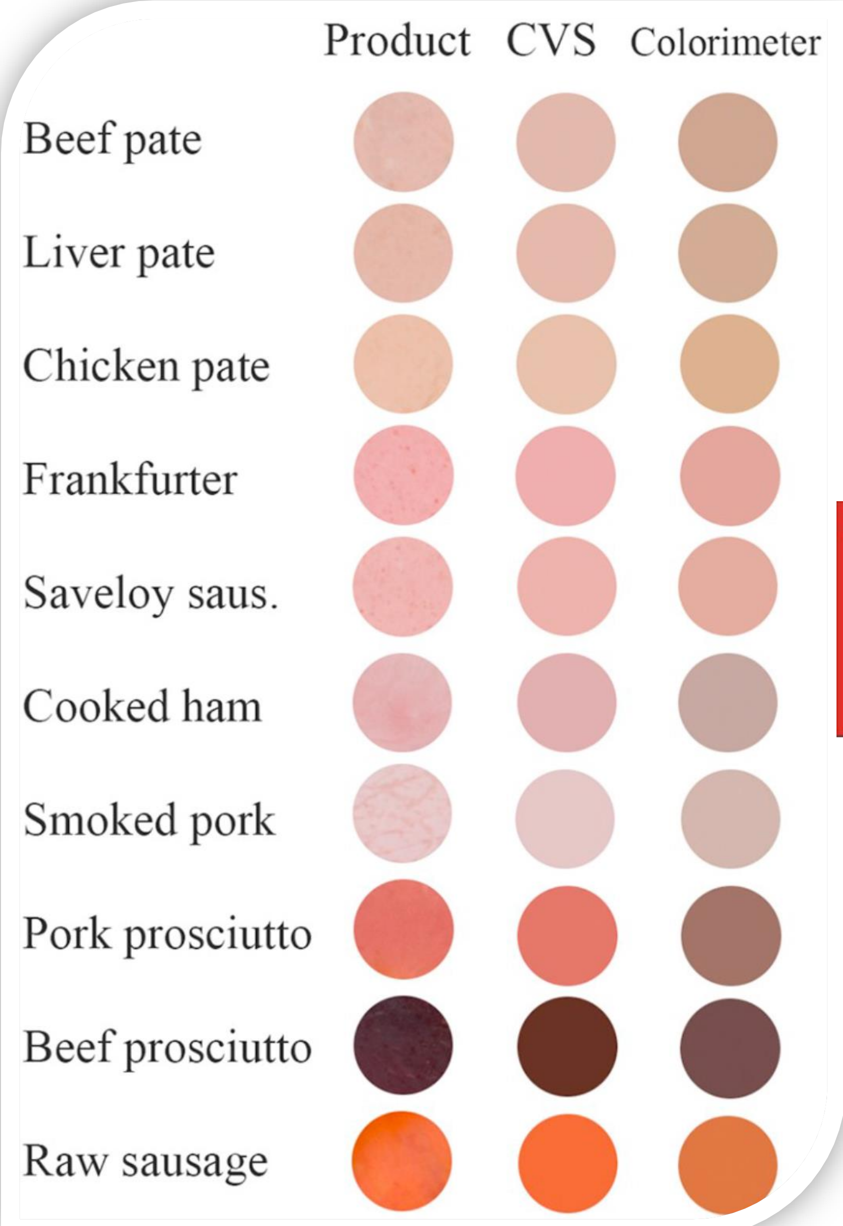
[c] Centro Tecnológico de la Carne de Galicia, Parque Tecnológico de Galicia, Rua Galicia No. 4, San Cibrao das Viñas, Ourense, Spain
[d] Institute of Meat Hygiene and Technology, Kaćanskog 13, Belgrade, Serbia
[e] University of Belgrade, Faculty of Veterinary Medicine, Department of Food Hygiene and Technology, Bulevar oslobodjenja 18, Belgrade, Serbia
[f] Food Safety and Quality Management Department, University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Serbia


Eyedropper Tool
3D Material Eyedropper Tool
Color Sampler Tool
Ruler Tool
Note Tool
Count Tool
Ps
File
Edit
Image
Layer
Type
Select
Sample Size:
11 by 11 Average
Point Sample
3 by 3 Average
5 by 5 Average
11 by 11 Average
31 by 31 Average
51 by 51 Average
101 by 101 Average
2 cm
3x3 pixels


Product
CVS
Colorimeter
Beef pate
Liver pate
Chicken pate
Frankfurter
Saveloy saus.
Cooked ham
Smoked pork
Pork prosciutto
Beef prosciutto
Raw sausage


MEAT SCIENCE
SCIENCE


Product
Meat part
Fat part
CVS
Colorimeter
CVS
Colorimeter
bi-colored
Mortadella
Smoked bacon
Dry porck neck
Pancetta
b) non-uniformly colored
Beef fermented sausage
Pork fermented sausage
Pork hamburger
Beef hamburger

foods

Foods **2020**, *9*, 1629; doi:10.3390/foods9111629

MDPI

Review

What Is the Color of Milk and Dairy Products and How Is It Measured?

Bojana Milovanovic [1,*], Ilija Djekic [1], Jelena Miocinovic [1], Vesna Djordjevic [2], Jose M. Lorenzo [3], Francisco J. Barba [4], Daniel Mörlein [5] and Igor Tomasevic [1]

Abstract: Exactly six-hundred (600) scientific articles that report milk and milk products' color results in scientific journals in the last couple of decades were reviewed. Thereof, the greatest part of the articles derived from Europe (36.3%) and Asia (29.5%). The greatest share of researchers used Minolta colorimeters (58.8%), while 26.3% of them used Hunter devices. Most reports were on cheese (31.0%) followed by fermented products (21.2%). Moreover, the highest number of papers reported color data of milk and milk products made from cow's milk (44.81%). As expected, goat's cheese was the brightest (L* = 87.1), while cow's cheese was the yellowest (b* = 17.4). Most importantly, it appeared that color research results reported were often impossible to replicate or to interpret properly because of incomplete description of the methodology. In some of the manuscripts reviewed, illuminant source (61.0%), aperture size (93.8%), observer angle, and number of readings (over 70% of all cases) were not reported. It is therefore critical to set rules regarding the description of the methodology for (milk) color research articles in order to ensure replicability and/or comparison of studies.

International Dairy Journal 120 (2021) 105084

Contents lists available at ScienceDirect

International Dairy Journal

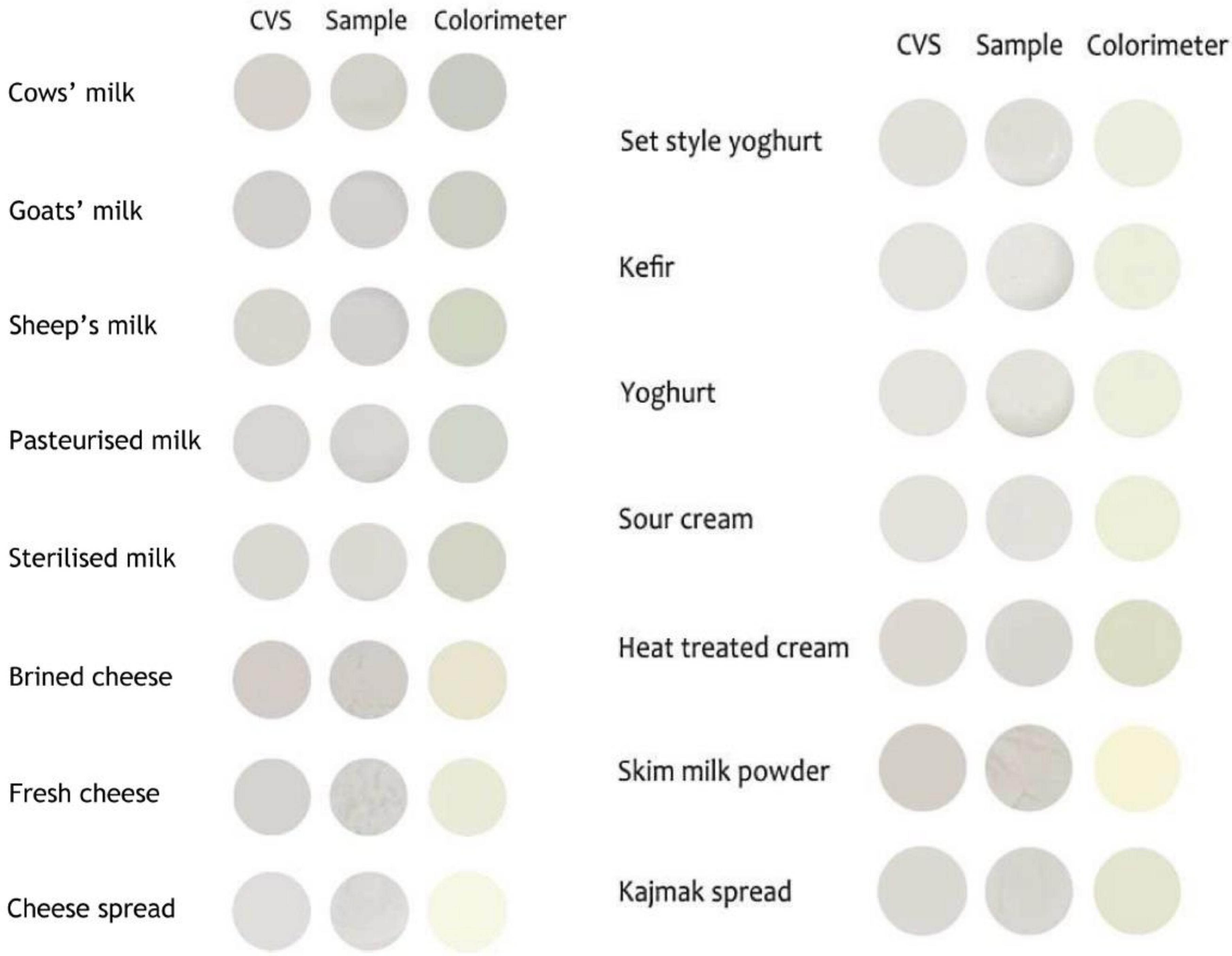
journal homepage: www.elsevier.com/locate/idairyj

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

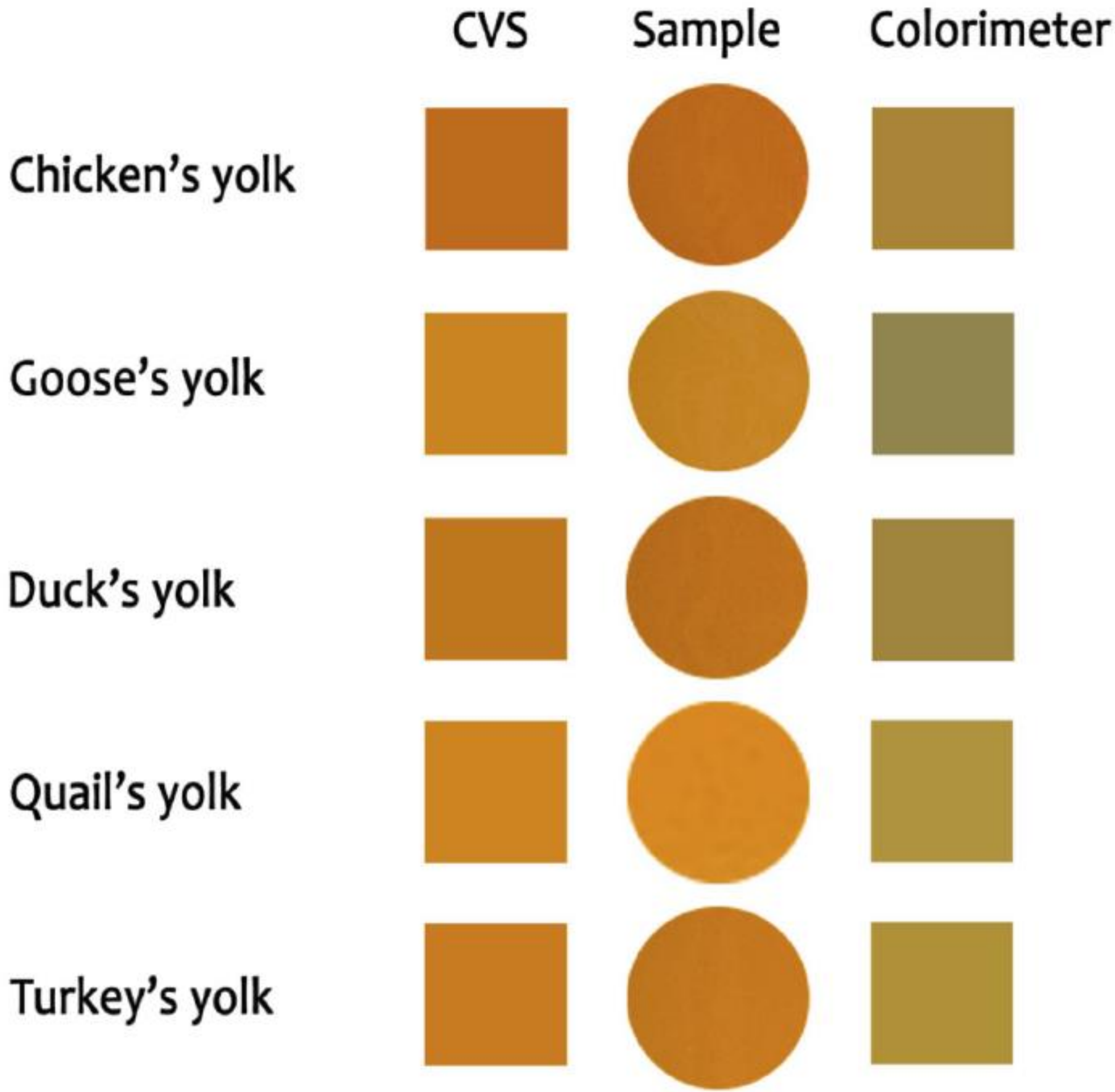
ORIGINAL PAPER

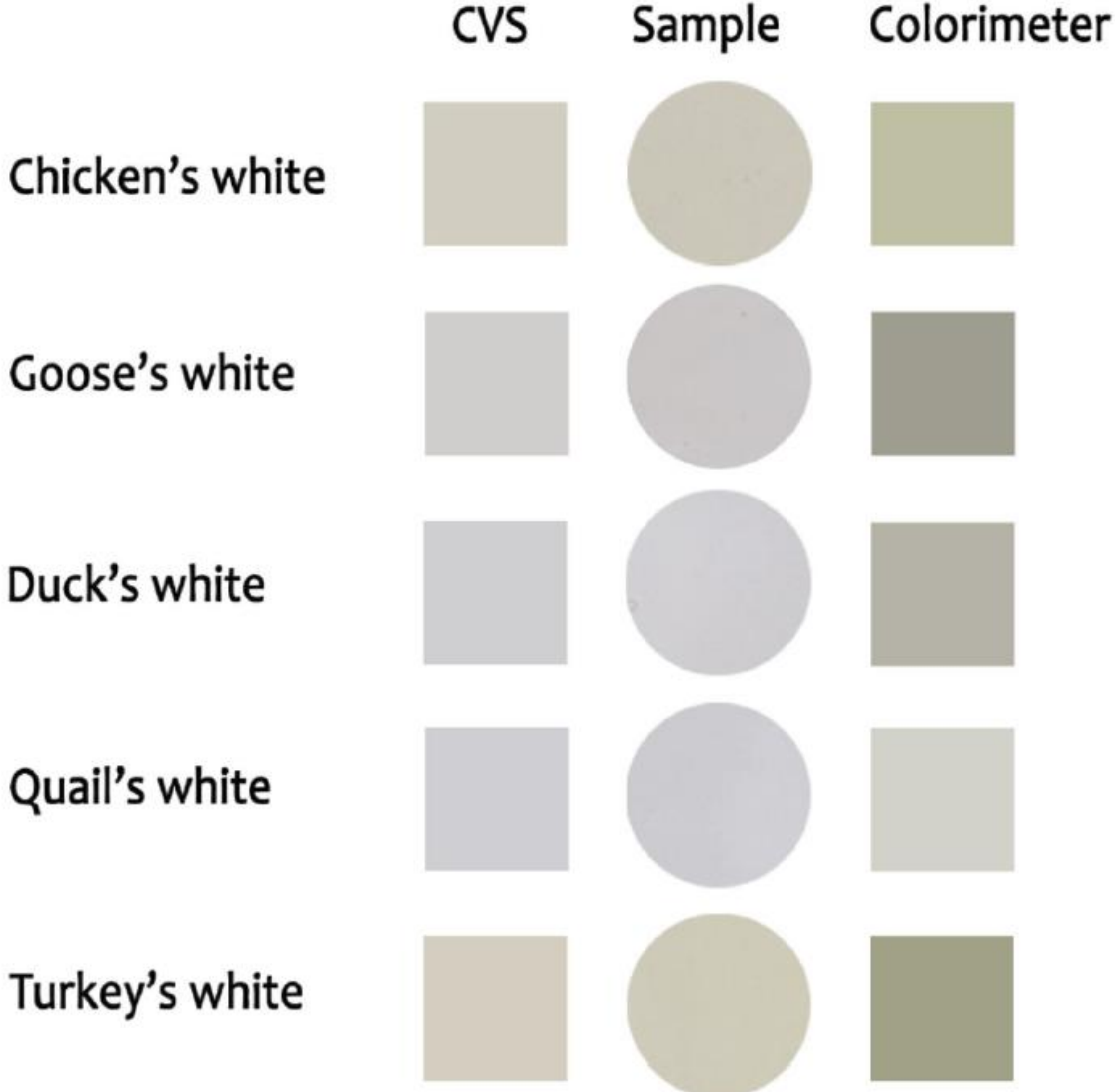
Color assessment of the eggs using computer vision system and Minolta colorimeter

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


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

UDK: 637.524.043
meat technology
ID: 42825481
Founder and publisher: Institute of Meat Hygiene and Technology, Belgrade
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).

IOP Conf. Series: Earth and Environmental Science **854** (2021) 012087 doi:10.1088/1755-1315/854/1/012087

Estimation of fat cover of bovine carcases by means of computer vision system (CVS)

S Simunovic[1], S Rajic[1], V Djordjevic[1], V Tomovic[2], D Vujadinovic[3] I Djekic[4] and I Tomasevic[4]

Abstract. The aims of this study were to obtain percentages of meat and fat cover for SEUROP classification system reference images using a computer vision system (CVS) and to calculate classification intervals which could be used in the future for construction of cheap and easy to use classification devices for small slaughterhouses. Lowest percentages of fat cover were found for the first class marked as “low” (the lowest fat content) and they gradually increased to the last class marked as “very high” (the highest fat content). Based on the obtained results, decision making intervals were proposed. In the present study, classification only refers to classification of adult bovine animals based on fat cover.

2.2. CVS analysis

As the background of the reference images is black and significantly differs from color of meat and fatty tissue, it was not necessary to change it. However, the images were imported into Adobe Photoshop 2020 (Adobe Inc., San Jose, CA, USA) software in which the color of the entire image was changed to black and white in the way that there was a clear color difference between meat and fat parts (Figure 2). This procedure was repeated for each of the reference images. The images were then imported into ImageJ (National Institutes of Health, Version 1.45 K) software which was used for the purpose of color segmentation, wherein three clusters were defined. The first cluster represented the color of meat, the second indicated the color of fatty tissue while the third referred to the background color.

Figure 2. Computer vision analysis of bovine carcases: original image (left), black and white adjustments (middle) and color segmentation (right).

Table 1. Percentages (%) of meat and fat of bovine carcases in the thoracic cavity and outside of the carcass of reference images obtained by CVS

		Categories				
		L	S	A	H	VH
Outside of the carcase	Meat	52.49	43.93	40.23	38.97	36.42
	Fat	47.51	56.07	59.77	61.03	63.57
In the thoracic cavity	Meat	42.66	41.45	39.38	33.83	30.50
	Fat	57.36	58.54	60.62	66.17	69.50

4. Conclusion

The study showed the possibility of CVS application in fat cover estimation of reference images for classification of bovine carcasses based on fat content. However, the limitation of this study was in the lack of a reference method for carcass classification based on which results could be compared. In addition, CVS showed difficulties in distinguishing between color of fatty tissue and color of bones and connective tissue. In the future, there is a need for development of a mathematical model that could be incorporated in classification software.

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Food Hydrocolloids 23 (2009) 1–25

FOOD HYDROCOLLOIDS

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Review

Food oral processing—A review

Jianshe Chen*

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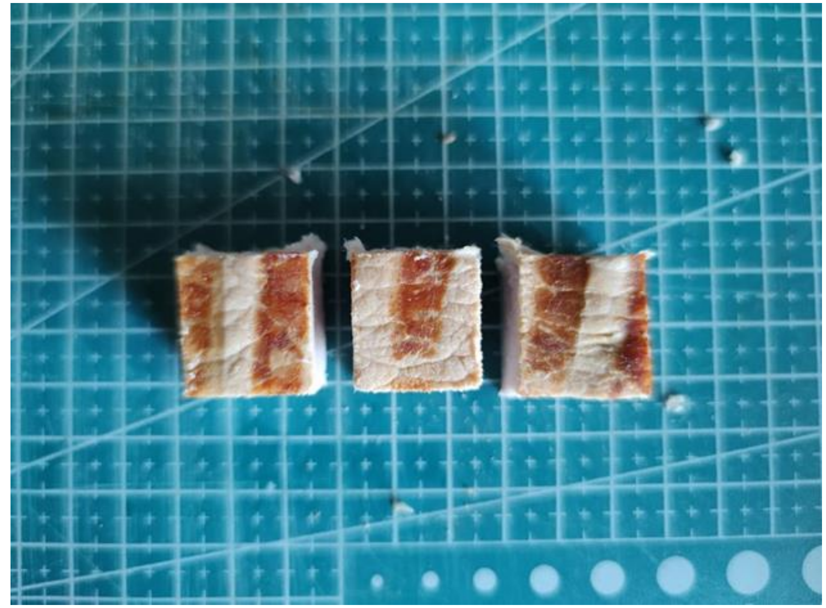
Received 8 June 2007; accepted 17 November 2007

Abstract

Food oral processing is an essential procedure not only for the consumption and digestion of foods but also for the appreciation and pleasure of food texture and food flavour. The consumption of a food inside mouth involves various oral operations, including first bite, chewing and mastication, transportation, bolus formation, swallowing, etc. Exact mechanisms and governing principles of these oral operations are still not fully understood, despite of continuous efforts made by scientists from food, psychology, physiology, dental and clinical studies, and other disciplines. This article reviews recent progresses and literature findings about food processing and transformation in mouth, with particular attention on the physiology and rheology aspects of oral operations. The physiological behaviour of human's oral device is discussed in terms of biting capability, tongue movement, saliva production and incorporation, and swallowing. The complexity of oral processing is analysed in relation to the rheology and mechanical properties of foods. The swallowing and oral clearing process is also examined for its criteria, triggering mechanism, bolus deformation, and the rheology of swallowing.

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Print
Mode
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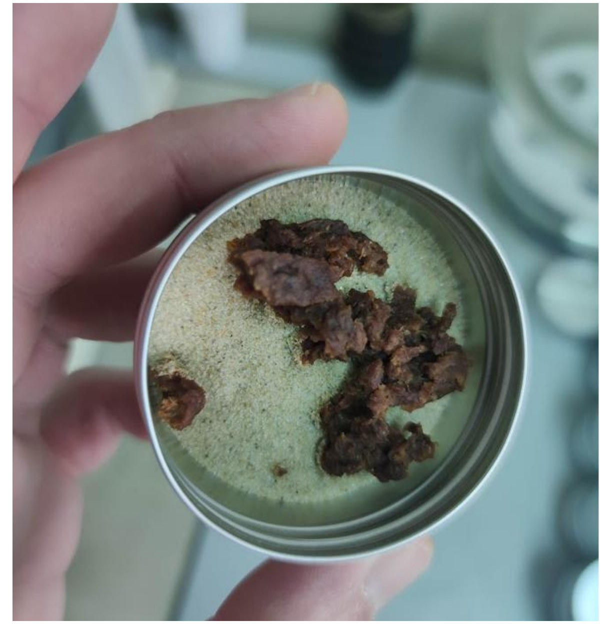
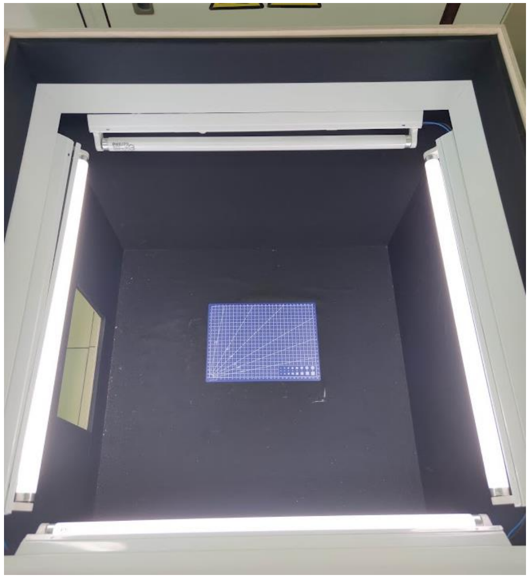
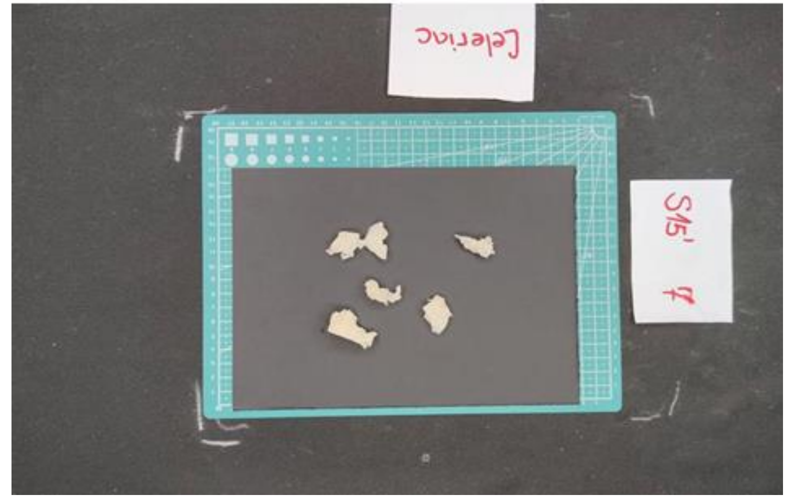
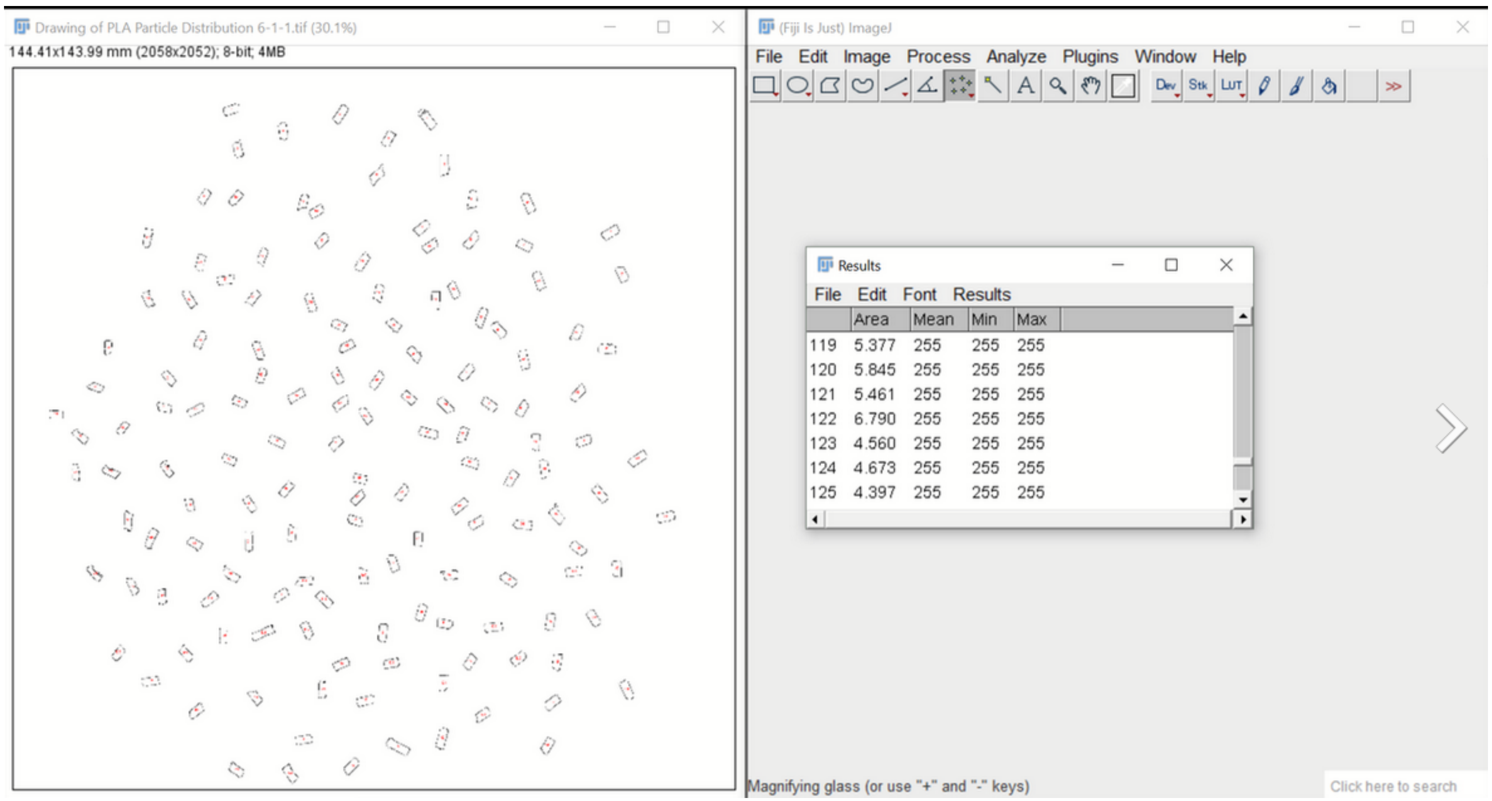
OHAUS


BINDER





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(Fiji Is Just) ImageJ
File Edit Image Process Analyze Plugins Window Help
Results
File Edit Font Results
Area Mean Min Max
119 5.377 255 255 255
120 5.845 255 255 255
121 5.461 255 255 255
122 6.790 255 255 255
123 4.560 255 255 255
124 4.673 255 255 255
125 4.397 255 255 255
Magnifying glass (or use "+" and "-" keys)
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applied sciences

MDPI

Article

Analysis of Pungency Sensation Effects from an Oral Processing, Sensorial and Emotions Detection Perspective—Case Study with Grilled Pork Meat

Ilija Djekic [1,*], Jovan Ilić [1], Jianshe Chen [2], Rastko Djekic [3], Bartosz G. Sołowiej [4], Dragan Vujadinović [5] and Igor Tomasevic [1,4,5]

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RESEARCH ARTICLE

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How do culinary methods affect quality and oral processing characteristics of pork ham?

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Abstract

The influences of three different culinary methods: cooking, *sous vide* and grilling were studied with regards to quality and oral processing characteristics of pork ham. Besides instrumental analysis of color and textural properties of pork ham, sensory panel with 12 trained panelists participated in temporal dominance of sensations, oral processing analysis, boluses collection, particle size distribution analysis, and saliva incorporation. The results revealed that number of chews, mastication time and saliva incorporation are correlated with textural properties and cooking losses. In-mouth sensation was intertwined with juiciness, fibrousness and firmness depending on the culinary methods. Cooked pork ham showed highest results for hardness and cooking loss. Firmness and fibrousness were dominant sensory attributes. *Sous-vide* results show that firmness and juiciness dominated during the first third of consumption time. This corresponds with textural values for lowest values for hardness and cooking, number of chews and total exposure time. *Sous-vide* also resulted in lower values for number of chews and total exposure time associated with oral processing.

KEYWORDS

cooking, food chewing behavior, grilling, particle size distribution, pork ham, *sous-vide*, temporal dominance of sensations

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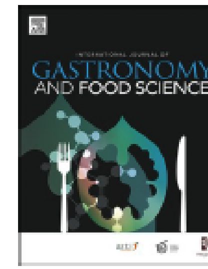

Influence of boiling, steaming, and sous-vide on oral processing parameters of celeriac (*Apium graveolens* var. *rapaceum*)

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Influence of water-based and contact heating preparation methods on potato mechanical properties, mastication, and sensory perception

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ANNUAL REVIEWS

Annual Review of Food Science and Technology

Materials Properties, Oral Processing, and Sensory Analysis of Eating Meat and Meat Analogs

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Figure 3

Commercial burgers. Plant-based: (*a*) pea protein base and (*b*) soy protein base. (*c*) Beef based. The images were made using the computer vision system described in Tomasevic et al. (2019).

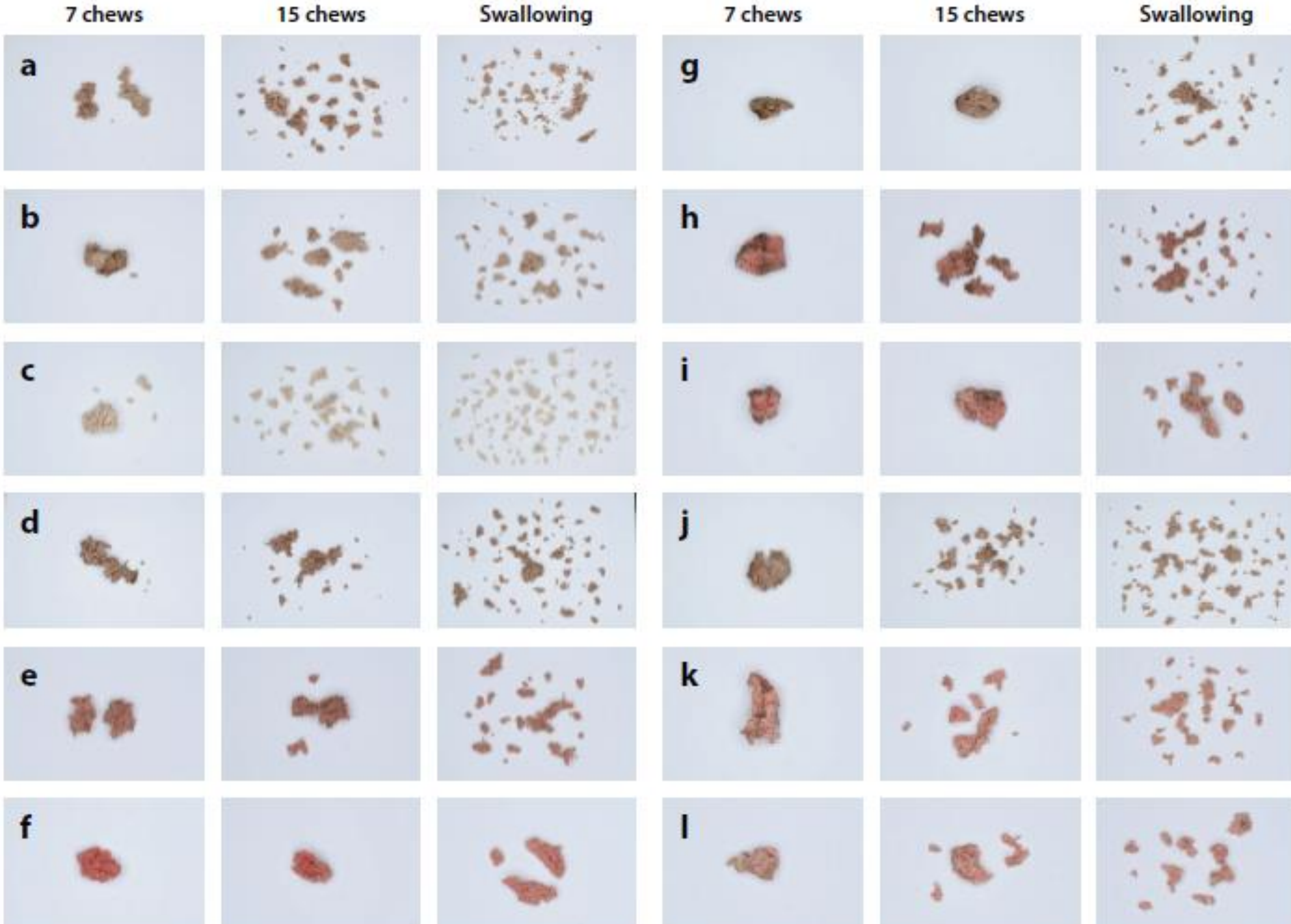

Figure 2

Meat boluses obtained after 7 and 15 chews and at the moment of swallowing. Cubical samples (20 × 20 × 20 mm) of cooked products (with indicated inner temperature after roasting) were used. (*a*) Pork ham (72°C), (*b*) pork neck (72°C), (*c*) pork back (72°C), (*d*) beef ham (72°C), (*e*) beef ham (66°C), (*f*) beef ham (60°C), (*g*) beef neck (72°C), (*h*) beef neck (66°C), (*i*) beef neck (60°C), (*j*) beef back (72°C), (*k*) beef back (66°C), and (*l*) beef back (60°C). The images were made using the computer vision system described by Tomasevic et al. (2019) and following the procedure for bolus analysis described previously in Djekic et al. (2021).

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