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Food Science and Nutrition • Open Access • 2023

Document type

Article • Gold Open Access • Green Open Access

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Journal

ISSN

20487177

DOI

10.1002/fsn3.2968

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^1H nuclear magnetic resonance-based metabolomics study of serum and pectoralis major for different commercial chicken breeds

Tan, Chengkeng^{a, b}; Selamat, Jinap^{a, c} ; Jambari, Nuzul Noorahya^{a, c}; Sukor, Rashidah^{a, c}; Murugesu, Suganya^a; Muhamad, Azira^d; Khatib, Alfi^{e, f}

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Nuclear magnetic resonance (NMR)-based quantification on flavor-active and bioactive compounds and application for distinguishment of chicken breeds

Kim, H.C. , Yim, D.-G. , Kim, J.W.

^a Laboratory of Food Safety and Food Integrity (FOSFI), Institute of Tropical Agriculture and Food Security, Universiti Putra Malaysia (UPM), Serdang, Malaysia

^b National Public Health Laboratory, Ministry of Health Malaysia, Sungai Buloh, Malaysia




^c Department of Food Science, Faculty of Food Science and Technology, Universiti Putra Malaysia (UPM), Serdang, Malaysia

^d Malaysia Genome Institute, National Institutes of Biotechnology Malaysia (NIBM), Kajang, Malaysia

^e Department of Pharmaceutical Chemistry, Faculty of Pharmacy, International Islamic University Malaysia, Kuantan, Malaysia

^f Faculty of Pharmacy, Airlangga University, Surabaya, Indonesia

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Abstract

This study aimed to characterize the metabolic composition of four types of commercially available chicken breeds [village chicken, colored broiler (Hubbard), broiler (Cobb), and spent layers (Dekalb)] by ¹H NMR coupling and discriminate them using multivariate analysis. Five chickens were collected for each chicken breed based on the marketing age from the respective commercial farms. The orthogonal partial least squares discriminant analysis (OPLS-DA) results showed an obvious separation of local village chickens from the other breeds based on the metabolites present in their serum and meat (pectoralis major). The cumulative values of Q^2 , R^2X , and R^2Y of the OPLS-DA model for chicken serum

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were 0.722, 0.877, and 0.841. For the pectoralis major muscle, the cumulative values of Q^2 , R^2X , and R^2Y of the OPLS-DA model were reported as 0.684, 0.781, and 0.786, respectively. The quality of both OPLS-DA models was accepted by the cumulative values of $Q^2 \geq 0.5$ and $R^2 \geq 0.65$. The ^1H NMR result with multivariate analysis has successfully distinguished local village chicken from the other three commercial chicken breeds based on serum and pectoralis major muscle. Nonetheless, colored broiler (Hubbard) was not distinguished from broiler (Cobb) and spent layers (Dekalb) in serum and pectoralis major, respectively. The OPLS-DA assessment in this study identified 19 and 15 potential metabolites for discriminating different chicken breeds in serum and pectoralis major muscle, respectively. Some of the prominent metabolites identified include amino acids (betaine, glycine, glutamine, guanidoacetate, phenylalanine, and valine), nucleotides (IMP and NAD^+), organic acids (lactate, malate, and succinate), peptide (anserine), and sugar alcohol (myo-inositol). © 2023 The Authors. Food Science & Nutrition published by Wiley Periodicals LLC.

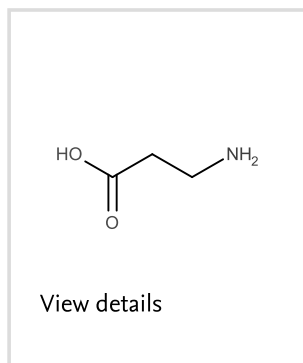
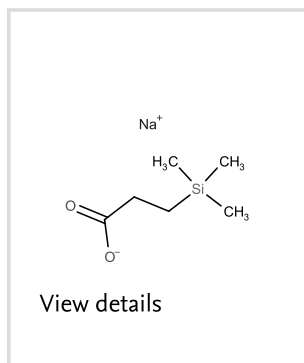
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References (53)

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Create bibliography

-
- 1 Ali, M., Lee, S.-Y., Park, J.-Y., Jung, S., Jo, C., Nam, K.-C.
Comparison of functional compounds and micronutrients of chicken breast meat by breeds
(2019) *Food Science of Animal Resources*, 39 (4), pp. 632-642. Cited 26 times.
https://www.kosfaj.org/download/download_pdf?pid=kosfa-39-4-632
doi: 10.5851/kosfa.2019.e54

View at Publisher
-
- 2 Azahan, E.A.E.
The red and black-red native chickens of Malaysia
(1994) *Malaysian Agricultural Research and Development Institute Research Journal*, 22 (1), pp. 73-78. Cited 3 times.
-
- 3 Azhar, K.
(2019) *Beware of 'coloured chicken. The Star*
<https://www.thestar.com.my/news/nation/2019/07/15/beware-of-coloured-chicken/>
-

View PDF

- 4 Beauclercq, S., Nadal-Desbarats, L., Hennequet-Antier, C., Collin, A., Tesseraud, S., Bourin, M., Le Bihan-Duval, E., (...), Berri, C.
Serum and Muscle Metabolomics for the Prediction of Ultimate pH, a Key Factor for Chicken-Meat Quality
(2016) *Journal of Proteome Research*, 15 (4), pp. 1168-1178. Cited 76 times.
<http://pubs.acs.org/journal/jprobs>
doi: 10.1021/acs.jproteome.5b01050

[View at Publisher](#)

- 5 Behan, A.A., Akhtar, M.T., Loh, T.C., Fakurazi, S., Kaka, U., Muhamad, A., Samsudin, A.A.
Meat quality, fatty acid content and nmr metabolic profile of dorper sheep supplemented with bypass fats
(2021) *Foods*, 10 (5), art. no. 1133. Cited 11 times.
<https://www.mdpi.com/2304-8158/10/5/1133/pdf>
doi: 10.3390/foods10051133

[View at Publisher](#)

- 6 Bisht, B., Kumar, V., Gururani, P., Tomar, M.S., Nanda, M., Vlaskin, M.S., Kumar, S., (...), Kurbatova, A.
The potential of nuclear magnetic resonance (NMR) in metabolomics and lipidomics of microalgae- a review
(2021) *Archives of Biochemistry and Biophysics*, 710, art. no. 108987. Cited 18 times.
<http://www.elsevier.com/inca/publications/store/6/2/2/7/8/7/index.htm>
doi: 10.1016/j.abb.2021.108987

[View at Publisher](#)

[View PDF](#)

- 7 Charoensin, S., Laopaiboon, B., Boonkum, W., Phetcharaburanin, J., Villareal, M.O., Isoda, H., Duangjinda, M.

Thai native chicken as a potential functional meat source rich in anserine, anserine/carnosine, and antioxidant substances

(Open Access)

(2021) *Animals*, 11 (3), art. no. 902, pp. 1-13. Cited 21 times.

<https://www.mdpi.com/2076-2615/11/3/902/pdf>

doi: 10.3390/ani11030902

[View at Publisher](#)

- 8 Choe, J.H., Nam, K., Jung, S., Kim, B., Yun, H., Jo, C.

Differences in the quality characteristics between commercial Korean native chickens and broilers (Open Access)

(2010) *Korean Journal for Food Science of Animal Resources*, 30 (1), pp. 13-19. Cited 67 times.

[http://www.kosfa.kr/journal.do?](http://www.kosfa.kr/journal.do?method=currentIssue&journalSeq=J000033&menuId=0201&introMenuId=0201)

[method=currentIssue&journalSeq=J000033&menuId=0201&introMenuId=0201](http://www.kosfa.kr/journal.do?method=currentIssue&journalSeq=J000033&menuId=0201&introMenuId=0201)

doi: 10.5851/kosfa.2010.30.1.13

[View at Publisher](#)

- 9 de Souza, C., Eying, C., Viott, A.M., de Avila, A.S., Pacheco, W.J., Junior, N.R., Kohler, T.L., (...), Nunes, R.V.

Effect of dietary guanidinoacetic acid or nucleotides supplementation on growth performances, carcass traits, meat quality and occurrence of myopathies in broilers

(Open Access)

(2021) *Livestock Science*, 251, art. no. 104659. Cited 9 times.

http://www.elsevier.com/wps/find/journaldescription.cws_home/706547/description#description

doi: 10.1016/j.livsci.2021.104659

[View at Publisher](#)

[View PDF](#)

- 10 Dilger, R.N., Bryant-Angeloni, K., Payne, R.L., Lemme, A., Parsons, C.M.
Dietary guanidino acetic acid is an efficacious replacement for arginine for young chicks (Open Access)

(2013) *Poultry Science*, 92 (1), pp. 171-177. Cited 93 times.
<http://ps.fass.org/content/92/1/171.full.pdf+html>
doi: 10.3382/ps.2012-02425

[View at Publisher](#)

- 11 Safety and efficacy of guanidinoacetic acid as feed additive for chickens for fattening
(2009) *EFSA Journal*, 988, pp. 1-30. Cited 87 times.
<https://doi.org/10.2903/j.efsa.2008.773>

- 12 Eriksson, L., Byrne, T., Johansson, E., Trygg, J., Vikström, C.
(2006) *Multi-and megavariate data analysis basic principles and applications*. Cited 1916 times.
2nd ed., Umetrics Academy

- 13 Feng, Y., Cai, Y., Fu, X., Zheng, L., Xiao, Z., Zhao, M.
Comparison of aroma-active compounds in broiler broth and native chicken broth by aroma extract dilution analysis (AEDA), odor activity value (OAV) and omission experiment (Open Access)

(2018) *Food Chemistry*, 265, pp. 274-280. Cited 129 times.
www.elsevier.com/locate/foodchem
doi: 10.1016/j.foodchem.2018.05.043

[View at Publisher](#)

[View PDF](#)

□ 14 Fontanesi, L.

Meat Authenticity and Traceability

(2017) *Lawrie's Meat Science: Eighth Edition*, pp. 585-633. Cited 14 times.

<http://www.sciencedirect.com/book/9780081006948>

ISBN: 978-008100697-9; 978-008100694-8

doi: 10.1016/B978-0-08-100694-8.00019-4

[View at Publisher](#)

□ 15 Hakim, A.

(2019)

<https://www.therakyatpost.com/news/malaysia/2019/07/15/public-told-keep-eye-out-fake-coloured-chickens/>

□ 16 Jakes, W., Gerdova, A., Defernez, M., Watson, A.D., McCallum, C., Limer, E., Colquhoun, I.J., (...), Kemsley, E.K.

Authentication of beef versus horse meat using 60 MHz ¹H NMR spectroscopy (Open Access)

(2015) *Food Chemistry*, 175, pp. 1-9. Cited 113 times.

www.elsevier.com/locate/foodchem

doi: 10.1016/j.foodchem.2014.11.110

[View at Publisher](#)

[View PDF](#)

- 17 Jayasena, D.D., Jung, S., Bae, Y.S., Park, H.B., Lee, J.H., Jo, C.
Comparison of the amounts of endogenous bioactive compounds in raw and cooked meats from commercial broilers and indigenous chickens

(2015) *Journal of Food Composition and Analysis*, 37, pp. 20-24. Cited 32 times.

<http://www.elsevier.com/inca/publications/store/6/2/2/8/7/8/index.htm>

doi: 10.1016/j.jfca.2014.06.016

[View at Publisher](#)

- 18 Jayasena, D.D., Jung, S., Kim, H.J., Yong, H.I., Nam, K.C., Jo, C.
Taste-active compound levels in Korean native chicken meat: The effects of bird age and the cooking process (Open Access)

(2015) *Poultry Science*, 94 (8), pp. 1964-1972. Cited 27 times.

<https://www.journals.elsevier.com/poultry-science/>

doi: 10.3382/ps/pev154

[View at Publisher](#)

- 19 Jung, S., Bae, Y.S., Kim, H.J., Jayasena, D.D., Lee, J.H., Park, H.B., Heo, K.N., (...), Jo, C.
Carnosine, anserine, creatine, and inosine 5'-monophosphate contents in breast and thigh meats from 5 lines of Korean native chicken

(2013) *Poultry Science*, 92 (12), pp. 3275-3282. Cited 94 times.

<http://ps.fass.org/content/92/12/3275.full.pdf+html>

doi: 10.3382/ps.2013-03441

[View at Publisher](#)

[View PDF](#)

- 20 Jung, Y., Lee, J., Kwon, J., Lee, K.-S., Ryu, D.H., Hwang, G.-S.
Discrimination of the geographical origin of beef by ¹H NMR-based metabolomics (Open Access)
- (2010) *Journal of Agricultural and Food Chemistry*, 58 (19), pp. 10458-10466. Cited 154 times.
doi: 10.1021/jf102194t
- [View at Publisher](#)
-

- 21 Jung, Y., Jeon, H.J., Jung, S., Choe, J.H., Lee, J.H., Heo, K.N., Kang, B.S., (...), Jo, C.
Comparison of quality traits of thigh meat from Korean native chickens and broilers (Open Access)
- (2011) *Korean Journal for Food Science of Animal Resources*, 31 (5), pp. 684-692. Cited 50 times.
doi: 10.5851/kosfa.2011.31.5.684
- [View at Publisher](#)
-

- 22 Khajali, F., Lemme, A., Rademacher-Heilshorn, M.
Guanidinoacetic acid as a feed supplement for poultry (Open Access)
- (2020) *World's Poultry Science Journal*, 76 (2), pp. 270-291. Cited 26 times.
<https://www.tandfonline.com/toc/twps20/current>
doi: 10.1080/00439339.2020.1716651
- [View at Publisher](#)
-

[View PDF](#)

- 23 Lengkidworraphiphat, P., Wongpoomchai, R., Bunmee, T., Chariyakornkul, A., Chaiwang, N., Jaturasitha, S.
Taste-active and nutritional components of thai native chicken meat: A perspective of consumer satisfaction
(2021) *Food Science of Animal Resources*, 41 (2), pp. 237-246. Cited 14 times.
https://www.kosfaj.org/archive/view_article?pid=kosfa-41-2-237
doi: 10.5851/kosfa.2020.e94
View at Publisher
-

- 24 Łukasiewicz, M., Puppel, K., Kuczyńska, B., Kamaszewski, M., Niemiec, J.
 β -Alanine as a factor influencing the content of bioactive dipeptides in muscles of Hubbard Flex chickens (Open Access)
(2015) *Journal of the Science of Food and Agriculture*, 95 (12), pp. 2562-2565. Cited 8 times.
[http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1097-0010](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1097-0010)
doi: 10.1002/jsfa.6970
View at Publisher
-

- 25 Mabuchi, R., Adachi, M., Kikutani, H., Tanimoto, S.
Discriminant analysis of muscle tissue type in yellowtail *seriola quinqueradiata* muscle based on metabolic component profiles (Open Access)
(2018) *Food Science and Technology Research*, 24 (5), pp. 883-891. Cited 7 times.
https://www.jstage.jst.go.jp/article/fstr/24/5/24_883/_pdf/-char/en
doi: 10.3136/fstr.24.883
View at Publisher
-

View PDF

- 26 Mabuchi, R., Ishimaru, A., Tanaka, M., Kawaguchi, O., Tanimoto, S.
Metabolic profiling of fish meat by gc-ms analysis, and correlations with taste attributes obtained using an electronic tongue (Open Access)

(2019) *Metabolites*, 9 (1), art. no. 1. Cited 31 times.

<https://www.mdpi.com/2218-1989/9/1/1/pdf>

doi: 10.3390/metabo9010001

[View at Publisher](#)

- 27 Markley, J.L., Brüschweiler, R., Edison, A.S., Eghbalnia, H.R., Powers, R., Raftery, D., Wishart, D.S.

The future of NMR-based metabolomics

(2017) *Current Opinion in Biotechnology*, 43, pp. 34-40. Cited 582 times.

<http://www.elsevier.com/locate/copbio>

doi: 10.1016/j.copbio.2016.08.001

[View at Publisher](#)

- 28 Maulidiani, Abas, F., Khatib, A., Perumal, V., Suppaiah, V., Ismail, A., Hamid, M., (...), Lajis, N.H.

Metabolic alteration in obese diabetes rats upon treatment with *Centella asiatica* extract (Open Access)

(2016) *Journal of Ethnopharmacology*, 180, pp. 60-69. Cited 60 times.

www.elsevier.com/locate/jethpharm

doi: 10.1016/j.jep.2016.01.001

[View at Publisher](#)

[View PDF](#)

- 29 Miggiels, P., Wouters, B., van Westen, G.J.P., Dubbelman, A.-C., Hankemeier, T.

Novel technologies for metabolomics: More for less

(Open Access)

(2019) *TrAC - Trends in Analytical Chemistry*, 120, art. no. 115323. Cited 93 times.

www.elsevier.com/locate/trac

doi: 10.1016/j.trac.2018.11.021

[View at Publisher](#)

- 30 Mohammed, H.H.H., He, L., Nawaz, A., Jin, G., Huang, X., Ma, M., Abdegadir, W.S., (...), Khalifa, I.

Effect of frozen and refrozen storage of beef and chicken meats on inoculated microorganisms and meat quality

(2021) *Meat Science*, 175, art. no. 108453. Cited 27 times.

<http://www.elsevier.com/locate/meatsci>

doi: 10.1016/j.meatsci.2021.108453

[View at Publisher](#)

- 31 Mohd Shahmi Hakimi, M., Alias, Z., Wan Khadijah, W.E., Abdullah, R.B., Rahman, M.M., Wan Khadijah, W.E., Abdullah, R.B.

Effect of Diet Containing Palm Kernel Cake and Coconut Meal Cake on Growth Performance and Carcass Quality of Free-Range Chicken in Malaysia (Kesan daripada Diet yang Mengandungi Isirung Kernal Sawit dan Isirung Kelapa pada)

(Open Access)

(2019) *Sains Malaysiana*, 48 (5), pp. 991-998. Cited 3 times.

http://www.ukm.my/jsm/pdf_files/SM-PDF-48-5-2019/07%20M.%20Mohd%20Shahmi%20Hakimi.pdf

doi: 10.17576/jsm-2019-4805-07

[View at Publisher](#)

[View PDF](#)

- 32 Moroni, R.F., Cazzaniga, E., Palestini, P., Sculati, M.
The feasibility of a diet which enhances inositol availability
(2021) *Progress in Nutrition*, 23 (2), art. no. e2021078. Cited 5 times.
<https://www.mattioli1885journals.com/index.php/progressinnutrition/article/view/10356>
doi: 10.23751/pn.v23i2.10356
View at Publisher
-

- 33 Akhtar, M.T., Samar, M., Shami, A.A., Mumtaz, M.W., Mukhtar, H., Tahir, A., Shahzad-Ul-hussan, S., (...), Kaka, U.
H-NMR-based metabolomics: An integrated approach for the detection of the adulteration in chicken, chevon, beef and donkey meat (Open Access)
(2021) *Molecules*, 26 (15), art. no. 4643. Cited 13 times.
<https://www.mdpi.com/1420-3049/26/15/4643/pdf>
doi: 10.3390/molecules26154643
View at Publisher
-

- 34 Nagana Gowda, G.A., Djukovic, D., Bettcher, L.F., Gu, H., Raftery, D.
NMR-Guided Mass Spectrometry for Absolute Quantitation of Human Blood Metabolites (Open Access)
(2018) *Analytical Chemistry*, 90 (3), pp. 2001-2009. Cited 42 times.
<http://pubs.acs.org/journal/ancham>
doi: 10.1021/acs.analchem.7b04089
View at Publisher
-

View PDF

- 35 Nagesh Babu, G., Gupta, M., Paliwal, V.K., Singh, S., Chatterji, T., Roy, R.
Serum metabolomics study in a group of Parkinson's disease patients from northern India

(2018) *Clinica Chimica Acta*, 480, pp. 214-219. Cited 36 times.
www.elsevier.com/locate/clinchim
doi: 10.1016/j.cca.2018.02.022

[View at Publisher](#)

- 36 Ramlah, A.H.
Performance of village fowl in Malaysia (Open Access)

(1996) *World's Poultry Science Journal*, 52 (1), pp. 77-79. Cited 16 times.
<http://journals.cambridge.org/WPS>
doi: 10.1079/wps19960009

[View at Publisher](#)

- 37 Razali, M.T.A., Zainal, Z.A., Maulidiani, M., Shaari, K., Zamri, Z., Idrus, M.Z.M., Khatib, A., (...), Ismail, I.S.
Classification of raw stingless bee honeys by bee species origins using the NMR- and LC-MS-based metabolomics approach

(2018) *Molecules*, 23 (9), art. no. 2160. Cited 31 times.
<http://www.mdpi.com/1420-3049/23/9/2160/pdf>
doi: 10.3390/molecules23092160

[View at Publisher](#)

[View PDF](#)

- 38 Rikimaru, K., Takahashi, H.
Evaluation of the meat from Hinai-jidori chickens and broilers: Analysis of general biochemical components, free amino acids, inosine 5'-monophosphate, and fatty acids
(Open Access)

(2010) *Journal of Applied Poultry Research*, 19 (4), pp. 327-333. Cited 59 times.

<http://japr.fass.org/cgi/reprint/19/4/327>

doi: 10.3382/japr.2010-00157

[View at Publisher](#)

- 39 Saeed, M., Babazadeh, D., Naveed, M., Arain, M.A., Hassan, F.U., Chao, S.
Reconsidering betaine as a natural anti-heat stress agent in poultry industry: a review

(2017) *Tropical Animal Health and Production*, 49 (7), pp. 1329-1338. Cited 71 times.

doi: 10.1007/s11250-017-1355-z

[View at Publisher](#)

- 40 Soglia, F., Silva, A.K., Lião, L.M., Laghi, L., Petracci, M.
Effect of broiler breast abnormality and freezing on meat quality and metabolites assessed by ¹H-NMR spectroscopy
(Open Access)

(2019) *Poultry Science*, 98 (12), pp. 7139-7150. Cited 33 times.

<https://www.journals.elsevier.com/poultry-science/>

doi: 10.3382/ps/pez514

[View at Publisher](#)

[View PDF](#)

- 41 Triki, M., Herrero, A.M., Jiménez-Colmenero, F., Ruiz-Capillas, C.
Quality assessment of fresh meat from several species based on free amino acid and biogenic amine contents during chilled storage (Open Access)

(2018) *Foods*, 7 (9), art. no. 132. Cited 94 times.

<https://www.mdpi.com/2304-8158/7/9>

doi: 10.3390/foods7090132

[View at Publisher](#)

- 42 Wang, L.-H., Qiao, K.-N., Ding, Q., Zhang, Y.-Y., Sun, B.-G., Chen, H.-T.
Effects of two cooking methods on the taste components of Sanhuang chicken and Black-bone silky fowl meat (Open Access)

(2018) *Journal of Food Processing and Preservation*, 42 (11), art. no. e13772. Cited 15 times.

[http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1745-4549](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1745-4549)

doi: 10.1111/jfpp.13772

[View at Publisher](#)

- 43 Wang, X., Fang, C., He, J., Dai, Q., Fang, R.
Comparison of the meat metabolite composition of Linwu and Pekin ducks using 600 MHz ¹H nuclear magnetic resonance spectroscopy

(2017) *Poultry Science*, 96 (1), pp. 192-199. Cited 27 times.

<https://www.journals.elsevier.com/poultry-science/>

doi: 10.3382/ps/pew279

[View at Publisher](#)

[View PDF](#)

□ 44 Wen, D., Liu, Y., Yu, Q.

Metabolomic approach to measuring quality of chilled chicken meat during storage (Open Access)

(2020) *Poultry Science*, 99 (5), pp. 2543-2554. Cited 52 times.
<https://www.journals.elsevier.com/poultry-science/>
doi: 10.1016/j.psj.2019.11.070

[View at Publisher](#)

□ 45 Wheelock, A.M., Wheelock, C.E.

Trials and tribulations of 'omics data analysis: Assessing quality of SIMCA-based multivariate models using examples from pulmonary medicine (Open Access)

(2013) *Molecular BioSystems*, 9 (11), pp. 2589-2596. Cited 240 times.
doi: 10.1039/c3mb70194h

[View at Publisher](#)

□ 46 Williams, P., Norris, K.

(1987) *Near-infrared technology in the agriculture and food industries*, pp. 143-167. Cited 1518 times.
American Association of Cereal Chemists, Inc

[View PDF](#)

□ 47 Xiao, Z., Ge, C., Zhou, G., Zhang, W., Liao, G.

^1H NMR-based metabolic characterization of Chinese Wuding chicken meat (Open Access)

(2019) *Food Chemistry*, 274, pp. 574-582. Cited 81 times.
www.elsevier.com/locate/foodchem
doi: 10.1016/j.foodchem.2018.09.008

[View at Publisher](#)

- 48 Xiao, Z., Zhang, W., Yang, H., Yan, Z., Ge, C., Liao, G., Su, H.
¹H NMR-based water-soluble lower molecule characterization and fatty acid composition of Chinese native chickens and commercial broiler (Open Access)

(2021) *Food Research International*, 140, art. no. 110008. Cited 19 times.
www.elsevier.com/inca/publications/store/4/2/2/9/7/0
doi: 10.1016/j.foodres.2020.110008

[View at Publisher](#)

- 49 Yang, L., Dai, B., Ayed, C., Liu, Y.
Comparing the metabolic profiles of raw and cooked pufferfish (*Takifugu flavidus*) meat by NMR assessment (Open Access)

(2019) *Food Chemistry*, 290, pp. 107-113. Cited 35 times.
www.elsevier.com/locate/foodchem
doi: 10.1016/j.foodchem.2019.03.128

[View at Publisher](#)

- 50 Zampiga, M., Laghi, L., Zhu, C., Cartoni Mancinelli, A., Mattioli, S., Sirri, F.
Breast muscle and plasma metabolomics profile of broiler chickens exposed to chronic heat stress conditions (Open Access)

(2021) *Animal*, 15 (7), art. no. 100275. Cited 18 times.
<https://www.journals.elsevier.com/animal/>
doi: 10.1016/j.animal.2021.100275

[View at Publisher](#)

[View PDF](#)

- 51 Zhang, T., Lu, H., Wang, L., Yin, M., Yang, L.
Specific expression pattern of IMP metabolism related-genes
in chicken muscle between cage and free range conditions
(Open Access)
- (2018) *PLoS ONE*, 13 (8), art. no. e0201736. Cited 13 times.
[http://journals.plos.org/plosone/article/file?
id=10.1371/journal.pone.0201736&type=printable](http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0201736&type=printable)
doi: 10.1371/journal.pone.0201736

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-
- 52 Zhu, C., Li, C., Wang, Y., Laghi, L.
Characterization of yak common biofluids metabolome by
means of proton nuclear magnetic resonance spectroscopy
- (2019) *Metabolites*, 9 (3), art. no. 41. Cited 16 times.
<https://www.mdpi.com/2218-1989/9/3/41/pdf>
doi: 10.3390/metabo9030041

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-
- 53 Zotte, A.D., Gleeson, E., Franco, D., Cullere, M., Lorenzo, J.M.
Proximate composition, amino acid profile, and oxidative
stability of slow-growing indigenous chickens compared with
commercial broiler chickens
- (2020) *Foods*, 9 (5), art. no. foods9050546. Cited 32 times.
<https://www.mdpi.com/2304-8158/9/5/546>
doi: 10.3390/foods9050546

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👤 Selamat, J.; Laboratory of Food Safety and Food Integrity (FOSFI), Institute of Tropical
Agriculture and Food Security, Universiti Putra Malaysia (UPM), Selangor, Serdang,
Malaysia; email: sjinap@gmail.com

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