*Polymers* • *Open Access* • Volume 14, Issue 20 • October 2022 • Article number 4416

**Document type**
Article • *Gold Open Access*

**Source type**
Journal

**ISSN**
20734360

**DOI**
10.3390/polym14204416

**Publisher**
MDPI

**Original language**
English

View less

# Evaluation and Characterization of Hard-Shell Capsules Formulated by Using Goatskin Gelatin

Zilhadia, Zilhadia[a] ; Harahap, Yahdiana[b, c]; Jaswir, Irwandi[d, e]; Anwar, Effionora[b]

Save all to author list

[a] Department of Pharmacy, Faculty of Health Sciences, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Banten, 15412, Indonesia

[b] Faculty of Pharmacy, Universitas Indonesia, Depok, 16424, Indonesia

[c] Faculty of Military Pharmacy, Republic of Indonesia Defense University, Bogor, 16111, Indonesia

[d] International Institute for Halal Research and Training, International Islamic University Malaysia, Kuala Lumpur, 53100, Malaysia

View additional affiliations

## Abstract

Gelatin is used as an additive in medicine, food, and cosmetics. Gelatin from goatskin is a new excipient that has not been explored by researchers, including for hard-shell capsules . The aim of this study was to evaluate and characterize the hard-shell capsules produced from goatskin gelatin . The goatskin gelatin was extracted by an acid hydrolysis method, and the functional properties were investigated. Hard-shell capsules were then produced from goatskin gelatin , evaluated, and characterized. The gelatin extracted from goatskin had 56.9% ± 0.95 clarity and a pH of 5.11 ± 0.09, 97.51% ± 1.1 protein content, 9.23% ± 0.08 water content, 0.18% ± 0.07 ash content, 2.08% ± 0.35 fat content, gel strength of 298 ± 2.64 gbloom, and viscosity of 27.33 ± 2.07 mPs. The gelatin has met the requirements to be made into hard-shell capsules . The average weight of the hard-shell capsules produced was 96.9 mg with 8.69 standard deviation. The average size of the body and cap length was 18.84 ± 0.64 mm and 10.98 ± 0.30 mm, respectively. The results of capsule evaluation and characterization were as follows: the pH was 4.82 ± 1,27, water content was 10.03 ± 0.21, disintegration time was 4.02 ± 2.09 min, and there was no microbial growth. Thus, the capsules made have met the requirements and can be produced in a large quantity. © 2022 by the authors.

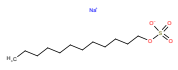
## Author keywords

gelatin ; goatskin ; hard-shell capsule

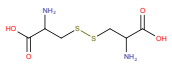
## Reaxys Chemistry database information

Substances

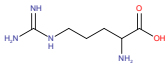
View all substances (10)



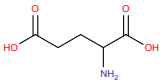
View details



View details



View details



View details

Powered by Reaxys

Indexed keywords

SciVal Topics

Metrics

Funding details

## References (43)

View in search results format >

All

Export Print E-mail Save to PDF Create bibliography

1 Lachman, L., Lieberman, H.A., Kanig, J.L.
(1994) *The Theory and Practice of Industry Pharmacy*. Cited 1335 times.
Lea and Febiger, Philadelphia, PA, USA

2 Schrieber, R., Gareis, H.
Gelatine Handbook: Theory and Industrial Practice

(2007) *Gelatine Handbook: Theory and Industrial Practice*, pp. 1-334. Cited 496 times.
http://onlinelibrary.wiley.com/book/10.1002/9783527610969
ISBN: 978-352731548-2
doi: 10.1002/9783527610969

View at Publisher

3 Available online
https://www.marketsandmarkets.com/Market-Reports/empty-capsules-market-218018190.html?gclid=Cj0KCQjw_ez2BRCyARIsAJfg-kvnZnUDCgWcByEdOcdwEkkImBN2Hu-Y6Dq2CsHiLt5hWjpABZf61RMaAnC6EALw_wcB

4 (2019) *Gelatin Handbook*. Cited 89 times.
GMIA, Chandler, AZ, USA, Available online
http://www.gelatin-gmia.com/uploads/1/1/8/4/118450438/gmia_gelatin_manual_2019.pdf

5 Zilhadia, Yahdiana, H., Irwandi, J., Effionora, A.
Characterization and functional properties of gelatin extracted from goatskin

(2018) *International Food Research Journal*, 25 (1), pp. 275-281. Cited 13 times.
http://www.ifrj.upm.edu.my/25%20(01)%202018/(36).pdf

6 Karim, A.A., Bhat, R.
Gelatin alternatives for the food industry: recent developments, challenges and prospects

(2008) *Trends in Food Science and Technology*, 19 (12), pp. 644-656. Cited 262 times.
doi: 10.1016/j.tifs.2008.08.001

View at Publisher

7 Derkach, S.R., Kolotova, D.S., Kuchina, Y.A., Shumskaya, N.V.
Characterization of Fish Gelatin Obtained from Atlantic Cod Skin Using Enzymatic Treatment (Open Access)

(2022) *Polymers*, 14 (4), art. no. 751. Cited 3 times.
https://www.mdpi.com/2073-4360/14/4/751/pdf
doi: 10.3390/polym14040751

View at Publisher

8 Shyni, K., Hema, G.S., Ninan, G., Mathew, S., Joshy, C.G., Lakshmanan, P.T.
Isolation and characterization of gelatin from the skins of skipjack tuna (katsuwonus pelamis), dog shark (scoliodon sorrakowah), and rohu (labeo rohita)

(2014) *Food Hydrocolloids*, 39, pp. 68-76. Cited 111 times.
doi: 10.1016/j.foodhyd.2013.12.008

View at Publisher

9 Venien, A., Levieux, D.
Differentiation of bovine from porcine gelatines using polyclonal anti-peptide antibodies in indirect and competitive indirect ELISA

(2005) *Journal of Pharmaceutical and Biomedical Analysis*, 39 (3-4), pp. 418-424. Cited 78 times.
doi: 10.1016/j.jpba.2005.04.013

View at Publisher

10 Zin, Z.M., Sarbon, N.M., Zainol, M.K., Jaafar, N.A., Syukri, M.M., Rahman, A.H.
Halal and Non-Halal Gelatine as a Potential Animal By-Products in Food Systems: Prospects and Challenges for Muslim Community
(2020) *Proceedings of the First International Conference on Science, Technology, Engineering and Industrial Revolution*. Cited 8 times.
Bandung, Indonesia, 14–15 November 2020, Advances Social Science, Education and Humanities Research Series, Atlantis Press, Dordrecht, The Netherlands

11 Rakhmanova, A., Khan, Z.A., Sharif, R., Xin, L.
Meeting the requirements of halal gelatin: A mini review
(2018) *Food Process. Technol*, 6, pp. 477-482. Cited 13 times.

12 Irwandi, J., Faridayanti, S., Mohamed, E.S.M., Hamzah, M.S., Torla, H.H., Che Man, Y.B.
Extraction and characterization of gelatin from different marine fish species in Malaysia

(2009) *International Food Research Journal*, 16 (3), pp. 381-389. Cited 57 times.
http://www.ifrj.upm.edu.my/16%20(3)%202009/11[1]%20Irwandi.pdf

13 Jayathilakan, K., Sultana, K., Radhakrishna, K., Bawa, A.S.
Utilization of byproducts and waste materials from meat, poultry and fish processing industries: A review (Open Access)

(2012) *Journal of Food Science and Technology*, 49 (3), pp. 278-293. Cited 554 times.
doi: 10.1007/s13197-011-0290-7

View at Publisher

14 Mad-Ali, S., Benjakul, S., Prodpran, T., Maqsood, S.
Characteristics and gel properties of gelatin from goat skin as influenced by alkaline-pretreatment conditions (Open Access)

(2016) *Asian-Australasian Journal of Animal Sciences*, 29 (6), pp. 845-854. Cited 19 times.
http://www.ajas.info/upload/pdf/ajas-29-6-845.pdf
doi: 10.5713/ajas.15.0784

View at Publisher

15 Avena-Bustillos, R.J., Olsen, C.W., Olson, D.A., Chiou, B., Yee, E., Bechtel, P.J., McHugh, T.H.
Water vapor permeability of mammalian and fish gelatin films

(2006) *Journal of Food Science*, 71 (4), pp. E202-E207. Cited 167 times.
doi: 10.1111/j.1750-3841.2006.00016.x

View at Publisher

16 Jamilah, B., Harvinder, K.G
Properties of gelatins from skins of fish - Black tilapia (Oreochromis mossambicus) and red tilapia (Oreochromis nilotica) (Open Access)

(2002) *Food Chemistry*, 77 (1), pp. 81-84. Cited 299 times.
doi: 10.1016/S0308-8146(01)00328-4

View at Publisher

17 (2000) *Official Methods of Analysis*. Cited 59070 times.
17th ed., AOAC, Washington, DC, USA

18 (2014) *Indonesia Pharmacopoeia*. Cited 32 times.
5th ed., Ministry of Health Republic of Indonesia, Jakarta, Indonesia

19 Binulal, N.S., Natarajan, A., Menon, D., Bhaskaran, V.K., Mony, U., Nair, S.V.
Gelatin nanoparticles loaded poly(€-caprolactone) nanofibrous semi-synthetic scaffolds for bone tissue engineering

(2012) *Biomedical Materials (Bristol)*, 7 (6), art. no. 065001. Cited 28 times.
http://iopscience.iop.org/1748-605X/7/6/065001/pdf/1748-605X_7_6_065001.pdf
doi: 10.1088/1748-6041/7/6/065001

View at Publisher

20 Podczeck, F., Jones, B.E.
(2004) *Pharmaceutical Capsule*. Cited 74 times.
2nd ed., Pharmaceutical Press, London, UK, Chicago, IL, USA

21 (2005) *The United States Pharmacopeia 29 and National Formulary 24*
Authority of the United States Pharmacopeial Convention, Washington, DC, USA

22 Stegemann, S., Bornem, C.
(2002) *Hard Gelatin Capsules Today and Tomorrow*. Cited 35 times.
2nd ed., Capsugel Lybrari, Morristown, NJ, USA, Available online
https://cpsl-web.s3.amazonaws.com/kc/library/hard-gelatin-capsules-today-and-tomorrow.pdf

23 Allen, L.V., Ansel, H.C.
Ansel's pharmaceutical dosage forms and drug delivery systems: Tenth edition

(2014) *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems: Tenth Edition*, pp. 1-794. Cited 45 times.
http://www.lww.com/Product/9781451188769
ISBN: 978-146987194-3; 978-145118876-9

24 (1995) *Official Methods of Analysis*. Cited 59070 times.
16th ed., AOAC, Washington, DC, USA

25 (2022) *European Pharmacopoeia*. Cited 5 times.
10th ed., EDQM Council of Erope, Strasbourg, France

26 Ahmad, M., Benjakul, S.
Characteristics of gelatin from the skin of unicorn leatherjacket (Aluterus monoceros) as influenced by acid pretreatment and extraction time
(2011) *Food Hydrocolloids*, 25 (3), pp. 381-388. Cited 220 times.
doi: 10.1016/j.foodhyd.2010.07.004
View at Publisher

27 Rowe, R.C., Sheskey, P.J., Quinn, M.E.
(2009) *Handbook of Pharmaceutical Excipients*. Cited 3286 times.
6th ed., Pharmaceutical Press and American Pharmacist Association, Washington, DC, USA

28 Ockerman, H.W., Hansen, C.L.
Glue and gelatin
(1999) *Animal By-Product Processing and Utilization*, pp. 183-216. Cited 242 times.
CRC Press, Boca Raton, FL, USA

29 Mhd Sarbon, N., Badii, F., Howell, N.K.
Preparation and characterisation of chicken skin gelatin as an alternative to mammalian gelatin (Open Access)
(2013) *Food Hydrocolloids*, 30 (1), pp. 143-151. Cited 169 times.
doi: 10.1016/j.foodhyd.2012.05.009
View at Publisher

30 Balti, R., Jridi, M., Sila, A., Souissi, N., Nedjar-Arroume, N., Guillochon, D., Nasri, M.
Extraction and functional properties of gelatin from the skin of cuttlefish (Sepia officinalis) using smooth hound crude acid protease-aided process
(2011) *Food Hydrocolloids*, 25 (5), pp. 943-950. Cited 97 times.
doi: 10.1016/j.foodhyd.2010.09.005
View at Publisher

31 Jellouli, K., Balti, R., Bougatef, A., Hmidet, N., Barkia, A., Nasri, M.
Chemical composition and characteristics of skin gelatin from grey triggerfish (Balistes capriscus)
(2011) *LWT*, 44 (9), pp. 1965-1970. Cited 89 times.
https://www.journals.elsevier.com/lwt
doi: 10.1016/j.lwt.2011.05.005
View at Publisher

32 Jones, N.R.
Uses of gelatin in edible products
(1977) *The Science and Technology of Gelatin*, pp. 366-395. Cited 92 times.
Ward A.G., Courts A., (eds), Academic Press Inc., New York, NY, USA

33 Gudmundsson, M., Hafsteinsson, H.
Gelatin from cod skins as affected by chemical treatments

(1997) *Journal of Food Science*, 62 (1), pp. 37-39. Cited 231 times.
http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1750-3841
doi: 10.1111/j.1365-2621.1997.tb04363.x

View at Publisher

34 (2011) *The United States Pharmacopeia 34 and National Formulary 29*
Authority of the United States Pharmacopeial Convention, Rockville, MD, USA

35 Skocaj, M., Filipic, M., Petkovic, J., Novak, S.
Titanium dioxide in our everyday life; Is it safe? (Open Access)

(2011) *Radiology and Oncology*, 45 (4), pp. 227-247. Cited 353 times.
http://www.degruyter.com/view/j/raon
doi: 10.2478/v10019-011-0037-0

View at Publisher

36 Demina, P.A., Grigoriev, D.O., Kuz'micheva, G.M., Bukreeva, T.V.
Preparation of pickering-emulsion-based capsules with shells composed of titanium dioxide nanoparticles and polyelectrolyte layers

(2017) *Colloid Journal*, 79 (2), pp. 198-203. Cited 15 times.
http://www.springerlink.com/content/1061-933X
doi: 10.1134/S1061933X1702003X

View at Publisher

37 Fauzi, M.A.R.D., Pudjiastuti, P., Wibowo, A.C., Hendradi, E.
Preparation, properties and potential of carrageenan-based hard capsules for replacing gelatine: A review (Open Access)

(2021) *Polymers*, 13 (16), art. no. 2666. Cited 7 times.
https://www.mdpi.com/2073-4360/13/16/2666/pdf
doi: 10.3390/polym13162666

View at Publisher

38 Ridgway, K.
(1987) *Hard Capsules: Development and Technology*. Cited 19 times.
Pharmaceutical Press, London, UK

39 Mahato, R., Narang, A.
(2018) *Pharmaceutical Dosage Forms and Drug Delivery*. Cited 87 times.
3rd ed., Taylor and Francis, New York, NY, USA

40 Carstensen, J.T.
(2001) *Advanced Pharmaceutical Solids*. Cited 76 times.
Marcel Dekker Inc., New York, NY, USA

41 Hillery, A.M., Llyod, A.W., Swarbrick
(2005) *Drug Delivery and Targetting for Pharmacist and Pharmaceutical Scientist*. Cited 140 times.
Taylor and Francis, London, UK, New York, NY, USA

42 Hunter, E., Fell, J.T., Calvert, R.T., Sharma, H.
'In vivo' disintegration of hard gelatin capsules in fasting and non-fasting subjects

(1980) *International Journal of Pharmaceutics*, 4 (3), pp. 175-183. Cited 31 times.
doi: 10.1016/0378-5173(80)90133-7

View at Publisher

43 Marvola, M., Hannula, A.-M., Westermarck, E., Happonen, I., Kopra, T.
Disintegration of hard gelatin capsule formulations in the dog stomach - a radiological study

(1988) *International Journal of Pharmaceutics*, 44 (1-3), pp. 159-167. Cited 6 times.
doi: 10.1016/0378-5173(88)90112-3

View at Publisher

Zilhadia, Z.; Department of Pharmacy, Faculty of Health Sciences, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Banten, Indonesia; email:zilhadia@uinjkt.ac.id

## About Scopus

What is Scopus

Content coverage

Scopus blog

Scopus API

Privacy matters

## Language

日本語版を表示する

查看简体中文版本

查看繁體中文版本

Просмотр версии на русском языке

## Customer Service

Help

Tutorials

Contact us