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Hassan, M.F.H.[a] , Fadhlina, A.[b] , Nor, M.M.[a c] , Sheikh, H.I.[d] , Yusof, Y.A.[e f] , Azman, N.A.[a]

Enhancing physicochemical and leaching properties of grass jelly formulation by incorporation of gelatine
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[a] Faculty of Agro Based Industry, Universiti Malaysia Kelantan, Jeli, Kelantan17600, Malaysia
[b] Department of Fundamental Dental and Medical Sciences, Kulliyyah of Dentistry, International Islamic University Malaysia, Pahang, Kuantan, 25200, Malaysia
[c] Institute of Food Security and Sustainable Agriculture, Universiti Malaysia Kelantan, Jeli, Kelantan17600, Malaysia
[d] Faculty of Fisheries and Food Science, Universiti Malaysia Terengganu, Kuala Nerus, Terengganu21030, Malaysia
[e] Department of Process and Food Engineering, Faculty of Engineering, Universiti Putra Malaysia, Selangor, Serdang, 43400 UPM, Malaysia
[f] Laboratory of Halal Science Research, Halal Products Research Institute, Universiti Putra Malaysia, Selangor, Serdang, 43400 UPM, Malaysia

Abstract
Grass jelly is a popular black jelly used in preparing various drinks and desserts. Nonetheless, preservatives and additional colourants are often used by food industries to maintain the properties of grass jelly and minimize discolouration as well as its leaching occurrence. These additives are linked with deleterious health effects and loss of vitamins in foods. The use of gelling agents such as gelatine in making grass jelly could improve its physiochemical and leaching properties. This study was designed to enhance the physicochemical (pH, colours, Brix) and textural properties of grass jelly using bovine gelatine. A texture profile analysis was conducted to analyse the hardness, springiness, gumminess and chewiness of the grass jelly. This study was also conducted to study the effect of gelatine addition on the leaching and floating properties of the grass jelly. The absorbance value of the grass jelly drink was measured in 10-minute intervals to determine its leaching occurrence while the floating analysis was done by recording the floating time. Various grass jelly formulations (GJF) were designed using a D-optimal mixture design in Design Expert® software. Data from commercial grass jelly were used as a reference during the optimization process. The amount of gelatine added to the formulations was in the range of up to 50 g (~17%). The results showed that the addition of gelatine at approximately 12.5 g (~4%) was effective in maintaining most of the physiochemical properties (L, a, b, Brix) with an overall desirability function of 0.63. This formulation was selected as the optimum grass jelly formulation (OGJF). The leaching properties and floating duration were measured on the OGJF and commercial grass jelly for 90 mins and 60 mins, respectively. The results indicated that OGJF showed a significantly ($p<0.05$) lower leaching rate and floating time ($p<0.05$). Hence, further optimization is needed to increase the floating duration of gelatine-based grass jelly. © 2024 The Authors.

Author Keywords
Black grass jelly; Gelatine; Leaching properties; Mesona chinensis; Physicochemical properties

Index Keywords
cyclophosphamide, gelatin, hydroxypropylmethylcellulose, hyoscyamine, polyphenol, polysaccharide, potato starch, probiotic agent, terpene; aquaculture, Article, bioremediation, cross linking, glycemic control, hydrolysis, leaching, moisture, pH, physical chemistry, refraction index, response surface method, skin conductance, tablet property, temperature, wettability

Chemicals/CAS
cyclophosphamide, 50-18-0, 6055-19-2; gelatin, 9000-70-8; hydroxypropylmethylcellulose, 9004-65-3; hyoscyamine, 101-31-5, 306-03-6; polyphenol, 37331-26-3

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References

- Al-Dubakel, A.Y., Al-Noor, J.M., Al-Shatty, S.M.
  Application of fish gelatin as diet binder in diets for the common carp Cyprinus

carpio L. fingerlings
(2014) *Journal of Zhankoy Sulaimani, Part A, Pure and Applied Science*, 16, pp. 345-354.

- Amdoun, R., Khelifi, L., Khelifi-Slaoui, M., Amroune, S., Asch, M., Assaf-Ducrocq, C., Gontier, E.
The desirability optimization methodology; a tool to predict two antagonist responses in EARCHPAPER biotechnological systems: case of biomass growth and hyoscyamine content in elicited Datura starmonium hairy roots
(2018) *Iranian Journal of Biotechnology*, 16 (1), p. e1339.

- Antoniewski, M.N., Barringer, S.A., Knipe, C.L., Zerby, H.N.
Effect of a gelatin coating on the shelf life of fresh meat
(2007) *Journal of Food Science*, 72 (6), pp. E382-E387.

- Asfaram, A., Ghaedi, M., Goudarzi, A., Rajabi, M.
Response surface methodology approach for optimization of simultaneous dye and metal ion ultrasound-assisted adsorption onto Mn doped Fe 3 O 4-NPs loaded on AC: kinetic and isothermal studies
(2015) *Dalton Transactions*, 44 (33), pp. 14707-14723.

- Boonjing, S., Ruttarattanamongkol, K.
Characteristics and Rheological Properties of Freeze dried Black Grass Jelly Prepared with Different Gelling Agents
(2020) *Proceedings of RSU International Research Conference*,
Thailand, 2020. Thailand: Rangsit University

- Chen, H.W., Wong, W.K., Xu, H.
Data-driven desirability function to measure patients' disease progression in a longitudinal study
(2016) *Journal of Applied Statistics*, 43 (5), pp. 783-795.

- Fadhlina, A., Islam Sarker, M.Z., Ahmed, Q.U., Jaffri, J.M., Sheikh, H.I., Ferdosh, S.
Enrichment of antibacterial compound from the stem bark of Stereospermum fimbriatum using supercritical carbon dioxide extraction
(2020) *Separation Science and Technology*, 55 (9), pp. 1656-1666.

- Feng, X., Fu, C., Yang, H.
Gelatin addition improves the nutrient retention, texture and mass transfer of fish balls without altering their nanostructure during boiling
(2017) *LWT*, 77, pp. 142-151.

- Foroni, F., Pergola, G., Rumiati, R.I.
Food color is in the eye of the beholder: the role of human trichromatic vision in food evaluation
(2016) *Scientific Reports*, 6, p. 37034.

- Granato, D., de Araújo Calado, V.M.
The use and importance of design of experiments (DOE) in process modelling in food science and technology
(2014) *Mathematical and Statistical Methods in Food Science and Technology*, pp. 1-18.
Ares, G. (Ed) United Kingdom: John Wiley and Sons, Ltd

- Gimat, A., Michelin, A., Belhadj, O., Pellizzi, E., Massiani, P., Rouchon, V.
Paper sizing with gelatine: from the macro-to the nano-scale
(2021) *Cellulose*, 28 (4), pp. 2419-2432.

- Guo, J., Davis, R., Starkey, C., Davis, D.A.
Efficacy of various coated materials to prevent nutrient leaching for Pacific white shrimp Litopenaeus vannamei commercial diets
(2021) *Journal of the World Aquaculture Society*, 52 (1), pp. 195-203.

- Harrington, E.C.
  The Desirability Function
  (1965) *Industrial Quality Control*, 21, pp. 494-498.

- Huang, J., Ding, L., Tian, W., Zhi, H., Chen, J., Wu, L., Wang, L., Zhao, S.
  Polyphenolic profiling, antioxidant properties, and inhibition of α-glucosidase of Mesona chinensis benth from Southern China
  (2021) *Microchemical Journal*, 168, p. 106399.

- Hong, Y., Shen, M., Huang, L., Wu, T., Xie, J.
  Mesona chinensis Benth polysaccharides alleviates liver injury by beneficial regulation of gut microbiota in cyclophosphamide-induced mice
  (2022) *Food Science and Human Wellness*, 11 (1), pp. 74-84.

- Juen, O.L.
  (2020) *Development of dried black grass jelly (Mesona Chinensis) containing different Tapioca and Sago starch ratio*,
  Malaysia: University Sains Malaysia, BSc. thesis

- Kreungngern, D., Chaikham, P.
  Rheological, physical and sensory attributes of Chao Kuay jelly added with gelling agents
  (2016) *International Food Research Journal*, 23 (4), pp. 1474-1478.

- Laith, A.A., Ros-Amira, M.K., Sheikh, H.I., Effendy, A.W.M., Najiah, M.
  Histopathological and immunological changes in green mussel, Perna viridis, challenged with Vibrio alginolyticus
  (2021) *Fish and Shellfish Immunology*, 118, pp. 169-179.

- Lim, J., Adisakwattana, S., Henry, C.J.
  Effects of grass jelly on glycemic control: hydrocolloids may inhibit gut carbohydrase
  (2018) *Asia Pacific Journal of Clinical Nutrition*, 27 (2), pp. 336-340.

- Mutlu, C., Tontul, S.A., Erbaş, M.
  Production of a minimally processed jelly candy for children using honey instead of sugar
  (2018) *LWT*, 93, pp. 499-505.

- Nishinari, K., Kohyama, K., Kumagai, H., Funami, T., Bourne, M.C.
  Parameters of Texture Profile Analysis
  (2013) *Food Science and Technology Research*, 19 (3), pp. 519-521.

- Periche, A., Heredia, A., Escriche, I., Andrés, A., Castelló, M.L.
  Potential use of isomaltulose to produce healthier marshmallows
  (2015) *LWT-Food Science and Technology*, 62 (1), pp. 605-612.

- Pourmortazavi, S.M., Sahebi, H., Zandavar, H., Mirsadeghi, S.
  Fabrication of Fe3O4 nanoparticles coated by extracted shrimp peels chitosan as sustainable adsorbents for removal of chromium contaminates from wastewater: The design of experiment
  (2019) *Composites Part B: Engineering*, 175, p. 107130.

- Prakoso, A.
  (2013) *Improvement of green grass (Premna oblongifolia Merr.) jelly's production process and its effects on physical and functional properties*,
  Indonesia: Bogor Agricultural University, BSc. Thesis

- Ren, Y., Xiao, W., Rong, L., Han, X., Shen, M., Liu, W., Luo, Y., Xie, J.
  The role of alkali in sweet potato starch-Mesona chinensis Benth polysaccharide

gels: Gelation, rheological and structural properties
(2021) *International Journal of Biological Macromolecules*, 170, pp. 366-374.

- Sasmita, A.O., Ling, A.P.K.
Bioactivity of Mesona palustris (Black Cincau) as a Nutraceutical Agent
(2017) *Journal of Engineering and Science Research*, 1 (2), pp. 47-53.

- Silva, E.V.C.D., Lourenço, L.D.F.H., Pena, R.S.
Optimization and characterization of gelatin from kumakuma (Brachyplatystoma filamentosum) skin
(2017) *CyTA-Journal of Food*, 15 (3), pp. 361-368.

- Su, S., Li, S., Hu, J., Yu, T., Tao, L., Hu, F., Xianyu, Y.
A colorimetric sensing strategy for detecting 10-hydroxy-2-decenoic acid in royal jelly based on Ag (I)-tetramethylbenzidine
(2022) *Sensors and Actuators B: Chemical*, 354, p. 131241.

- Tireki, S., Sumnu, G., Sahin, S.
Correlation between physical and sensorial properties of gummy confections with different formulations during storage
(2021) *Journal of Food Science and Technology*, 58 (9), pp. 3397-3408.

- Thao, N.T.P., Thi, N.T., Hanh, N.T.H.
Hypolipidemic effect of ethanol extract from Mesona chinensis Benth. in high fat diet-induced obesity mice
(2019) *VNU Journal of Science: Medical and Pharmaceutical Sciences*, 35 (1), pp. 2588-1132.

- Widyaningsih, T.D., Martati, E., Lukitasari, D.M.
Immunomodulatory effects of black cincau (Mesona palustris BL.) supplement on Escherichia coli strain O157-infected mice
(2017) *Asian Journal of Pharmaceutical and Clinical Research*, 10 (9), pp. 326-330.

- Widyaningsih, T.D., Siska, A.I., Fanani, R., Martati, E.
Traditional drink of black cincau (Mesona palustris BL)-based wedang uwuh as immunomodulator on alloxan-induced diabetic rats
(2020) *Nutrition and Food Science*, 50 (6), pp. 0034-6659.

- Widyaningsih, T.D., Widjanarko, S.B., Waziiroh, E., Wijayanti, N., Maslukhah, Y.L.
Pilot plant scale extraction of black cincau (Mesona palustris BL) using historical-data response surface methodology
(2018) *International Food Research Journal*, 25 (2), pp. 712-719.

- Wulandari, N.F., Suharna, N., Yulinery, T., Nurhidayat, N.
Probiotication of black grass jelly [Mesona chinensis (Benth.)] by encapsulated Lactobacillus plantarum Mar8 for a ready to drink (RTD) beverages
(2019) *International Journal of Agricultural Technology*, 15 (2), pp. 375-386.

- Xiao, Y., Liu, S., Shen, M., Jiang, L., Ren, Y., Luo, Y., Wen, H., Xie, J.
Physicochemical, rheological and thermal properties of Mesona chinensis polysaccharides obtained by sodium carbonate assisted and cellulase assisted extraction
(2019) *International Journal of Biological Macromolecules*, 126, pp. 30-36.

- Yuris, A., Hardacre, A.K., Goh, K.K.T., Matia-Merino, L.
The role of calcium in wheat starch-Mesona chinensis polysaccharide gels: Rheological properties, in vitro digestibility and enzyme inhibitory activities
(2019) *LWT*, 99, pp. 202-208.

- Zhou, X.Y., Yu, J.H., Yu, H.
Effect of gelatin content and oral processing ability on vitamin C release in gummy

jelly
(2021) *Journal of Food Science and Technology*, 59 (2), pp. 677-685.

Correspondence Address
Fadhlina A.; Department of Fundamental Dental and Medical Sciences, Pahang, Malaysia; email: anis_fadhlina@iium.edu.my

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