

REFERENCES

- Acioli-Moura, R., & Chang, Y. K. (2006). Effects of Corn Meal, Vital Wheat Gluten, High Amylose Starch and Extrusion Parameters on Technological Properties of Wheat-based Extruded Breeding. *Journal of Food Quality*, 29(3), 229-251.
- Ambari, D., Anwar, F., & Damayanthi, E. (2014). Formulasi Sosis Analog Sumber Protein Berbasis Tempe dan Jamur Tiram sebagai Pangan Fungsional Kaya Serat Pangan. *Jurnal Gizi Dan Pangan*, 9(1), 65-72.
- Berry, L. (2015). *Why do We Love Chicken So Much?*. al. Retrieved 15 April 2021, from https://www.al.com/news/2015/03/why_do_americanslove_chicken_s.html.
- Bohrer, B. M. (2019). An Investigation of the Formulation and Nutritional Composition of Modern Meat Analogue Products. *Food Science and Human Wellness*, 8(4), 320-329.
- Bourne, M. C. (2002). Texture, Viscosity, and Food. *Food Texture and Viscosity*, 1–32.
- Brannan, R. G. (2008). Analysis of Texture of Boneless, Fully Fried Breaded Chicken Patties as Affected by Processing Factors. *Journal of Food Quality*, 31(2), 216–231.
- Carbs in Chicken*. Carb-counter.org. Retrieved 2 July 2021, from <http://www.carb-counter.org/poultry/search/Chicken/0500>.
- Chandel, A. (2018). *Harmful Effect of Reusing of Cooking Oils on Health*. Scind.org. Retrieved 2 July 2021, from <https://www.scind.org/977/Health/harmful-effect-of-reusing-of-cooking-oils-on-health.html>.
- Chapter 2: Methods of Food Analysis*. Fao.org. Retrieved 13 August 2021, from <http://www.fao.org/3/Y5022E/y5022e03.htm>.
- Chapter 4: Summary - Integration of Analytical Methods and Food Energy Conversion Factors*. Fao.org. Retrieved 19 April 2021, from <http://www.fao.org/3/y5022e/y5022e05.htm>.

- Chapter 20: Metal Inclusion (A Physical Hazard)*. Seafoodhaccp.cornell.edu. Retrieved 15 April 2021, from http://seafoodhaccp.cornell.edu/Intro/purple_pdf/Ch20.pdf.
- Chen, J., & Rosenthal, A. (2015). Food Texture and Structure. *Modifying Food Texture*, 3–24.
- Chicken Nuggets*. Fatsecret.com. Retrieved 15 April 2021, from <https://www.fatsecret.com/calories-nutrition/generic/chicken-nuggets?portionid=50418&portionamount=100.000>.
- Chicken Nuggets Trends, Analytics and Statistics*. Tastewise. Retrieved 4 March 2021, from <https://www.tastewise.io/foodtrends/chicken%20nuggets>.
- Commercial Item Description*. Ams.usda.gov. (2001). Retrieved 7 July 2021, from <https://www.ams.usda.gov/sites/default/files/media/CID%20Chicken%20Nuggets%2C%20Fingers%2C%20Strips%2C%20Fritters%2C%20and%20Patties%2C%20Fully%20Cooked%2C%20Individually%20Frozen.pdf>.
- Cooking and Its Effect on Human Nutrition*. Acsedu.co.uk. Retrieved 2 July 2021, from <https://www.acsedu.co.uk/uploads/Food/Lesson%201%20and%20Assignment%201%20Sample%20Human%20Nutrition%20II.pdf>.
- Coppola, D. (2021). *U.S. Retail Price of Chicken Breast 2006-2020*. Statista. Retrieved 14 March 2021, from <https://www.statista.com/statistics/236836/retail-price-of-chicken-breast-in-the-united-states/>.
- Dahiru, T. (2008). P-Value, A True Test of Statistical Significance? A Cautionary Note. *Annals Of Ibadan Postgraduate Medicine*, 6(1), 21-26.
- Derbyshire, E. J. (2017). Flexitarian Diets and Health: A Review of the Evidence-based Literature. *Frontiers in Nutrition*, 3, 55.
- Dewi, R. K. (2011). *Kajian Komposisi Kimia, Kualitas Fisik Dan Organoleptik Duck Nuggets Dengan Filler Tepung Maizena pada Proporsi yang Berbeda*. Universitas Sebelas Maret. Surakarta. Retrieved 5 July 2021, from <http://perpustakaan.uns.ac.id>.

- Dinesh Babu, P., Bhakayaraj, R., & Vidhyalakshmi, R. (2009). A Low Cost Nutritious Food “Tempeh” - A Review. *World Journal of Dairy & Food Science*, 4(1), 22-27.
- Duncan, I. J. H. (2001). Animal Welfare Issues in the Poultry Industry: Is There a Lesson to Be Learned? *Journal of Applied Animal Welfare Science*, 4(3), 207–221.
- Egbert, R., & Borders, C. *Achieving Success with Meat Analogs*. Faunalytics.org. Retrieved 4 March 2021, from <https://faunalytics.org/wp-content/uploads/2015/05/Citation852.pdf>
- El-Anany, A., Ali, R., & Elanany, A. (2020). Nutritional and Quality Characteristics of Chicken Nuggets Incorporated with Different Levels of Frozen White Cauliflower. *Italian Journal of Food Science*, 32, 45-59.
- Faloye, O.R., Sobukola, O.P., & Shittu, T.A. (2021). Influence of Frying Parameters and Optimization of Deep Fat Frying Conditions on the Physicochemical and Textural Properties of Chicken Nuggets from FUNAAB-Alpha Broilers. *SN Applied Science*, 3, 241 (2021).
- Fan, J., Singh, R. P., & Pinthus, E. J. (1997). Physicochemical Changes in Starch During Deep-fat Frying of a Molded Corn Starch Patty. *Journal of Food Processing and Preservation*, 21(6), 443–460.
- Fillion, L., & Henry, C. J. K. (1998). Nutrient Losses and Gains During Frying: A Review. *International Journal of Food Sciences and Nutrition*, 49(2), 157–168.
- Green Butcher: Indonesia’s First Plant-Based Meat Producer Finalises Seed Round Investment*. vegconomist.com. (2021). Retrieved 15 April 2021, from <https://vegconomist.com/investments/green-butcher-indonesias-first-plant-based-meat-producer-finalises-seed-round-investment/>.
- Grumbles, S. (2005). *Optimization of Ingredient and Process Parameters for Chicken Nuggets*. Retrieved 15 January 2021, from https://shareok.org/bitstream/handle/11244/8445/Grumbles_okstate_0664M_10116.pdf?sequence=1

- Hafid, H., Agustina, D., Ananda, S. H., Anggraini, D. U., & Nurhidayati, F. (2019). Chicken Nugget Nutrition Composition with An Additional Variation of Breadfruit Flour. *In IOP Conference Series: Earth and Environmental Science*, 382(1), 1-7.
- Hafid, H., Agustina, D., Fitriyaningsih, Inderawati, & Hasnudi. (2018). pH, Cooking Loss, and Yield of Chicken Nuggets with Intestine Substitution. *International Journal of Agronomy and Tropical Plants*, 1(1), 9-13.
- He, J., Evans, N. M., Liu, H., & Shao, S. (2020). A Review of Research on Plant-based Meat Alternatives: Driving Forces, History, Manufacturing, and Consumer Attitudes. *Comprehensive Reviews in Food Science and Food Safety*, 19(5), 2639-2656.
- Heinz, G., & Hautzinger, P. (2007). *Meat Processing Technology for Small- to Medium-scale Producers* (20th ed., p. 60). FAO.
- Hurrell, R. F., & Finot, P. A. (1983). Food Processing and Storage as a Determinant of Protein and Amino Acid Availability. *Nutritional Adequacy, Nutrient Availability and Needs*, 135–156.
- I. *Pendahuluan*. Repository.sb.ipb.ac.id. Retrieved 17 April 2021, from <http://repository.sb.ipb.ac.id/260/5/R42-05-Sanitining-BabiPendahuluan.pdf>.
- Joshi, V. K., & Kumar, S. (2015). Meat Analogues: Plant-based Alternatives to Meat Products-A Review. *International Journal of Food and Fermentation Technology*, 5(2), 107-119.
- Kadam, S. U., Tiwari, B. K., & O'Donnell, C. P. (2015). Improved Thermal Processing for Food Texture Modification. *Modifying Food Texture*, 115–131.
- Kassama, L. S., Ngadi, M. O., & Raghavan, G. S. V. (2003). Structural and Instrumental Textural Properties of Meat Patties Containing Soy Protein. *International Journal of Food Properties*, 6(3), 519–529.
- Kiers, J. L., Meijer, J. C., Nout, M. J. R., Rombouts, F. M., Nabuurs, M. J. A., & van der Meulen, J. (2003). Effect of Fermented Soya Beans on Diarrhoea and Feed Efficiency in Weaned Piglets. *Journal of Applied Microbiology*, 95(3), 545–552.

- Kotula, A. W., & Berry, B. W. (1986). Addition of Soy Proteins to Meat Products. *ACS Symposium Series*, 74–89.
- Krokida, M., Oreopoulou, V., & Maroulis, Z. (2000). Water Loss and Oil Uptake as a Function of Frying Time. *Journal of Food Engineering*, 44(1), 39–46.
- Kumar, P., Chatli, M. K., Mehta, N., Singh, P., Malav, O. P., & Verma, A. K. (2015). Meat Analogues: Health Promising Sustainable Meat Substitutes. *Critical Reviews in Food Science and Nutrition*, 57(5), 923–932.
- Kumar, P., Kumar, R., & Sharma, B. (2011). Product Profile Comparison of Analogue Meat Nuggets Versus Chicken Nuggets. *Fleischwirtschaft International*, 91, 72-75.
- Kumar, P., Sharma, B., Kumar, R., & Kumar, A. (2012). Optimization of the Level of Wheat Gluten in Analogue Meat Nuggets. *Indian Journal of Veterinary Research*, 21(1), 54-59.
- Kurniawan, R. (2014). *SNI 6683 2014 (Nugget Ayam)*. Academia.edu. Retrieved 8 July 2021, from https://www.academia.edu/36095611/Sni_6683_2014_nugget_ayam_.
- Kyriakopoulou, K., Dekkers, B., & van der Goot, A. J. (2019). Plant-Based Meat Analogues. *Sustainable Meat Production and Processing*, 103–126.
- Ma'ruf, W., Rosyidi, D., Radiati, L., & Purwadi, P. (2019). Physical and Organoleptic Properties of Chicken Nugget from Domestic Chicken (*Gallus domesticus*) Meat with Different Corn Flours as Filler. *Research Journal of Life Science*, 6(3), 162-171.
- MacDonald, R., & Reitmeier, C. (2017). Food Processing. *Understanding Food Systems: Agriculture, Food Science, and Nutrition in the United States*, 1, 179-225.
- Maheshwari, S. (2013). Environmental Impacts of Poultry Production. *Poultry, Fisheries & Wildlife Sciences*, 1(1).
- Makinson, J. H., Greenfield, H., Wong, M. L., & Wills, R. B. H. (1987). Fat Uptake During Deep-Fat Frying of Coated and Uncoated Foods. *Journal of Food Composition and Analysis*, 1(1), 93–101.

- Maskat, M. Y., & Kerr, W. L. (2002). Coating Characteristics of Fried Chicken Breasts Prepared with Different Particle Size Breading. *Journal of Food Processing and Preservation*, 26(1), 27–38.
- McClements, J. *Analysis of Ash and Minerals*. People.umass.edu. Retrieved 25 June 2021, from <https://people.umass.edu/~mcclemen/581Ash&Minerals.html>.
- Meat and Meat Products in Human Nutrition*. Fao.org. Retrieved 2 July 2021, from <http://www.fao.org/3/T0562E/T0562E09.htm>.
- Meat Eater's Guide: Methodology*. Static.ewg.org. (2011). Retrieved 15 April 2021, from https://static.ewg.org/reports/2011/meateaters/pdf/methodology_ewg_meat_eaters_guide_to_health_and_climate_2011.pdf.
- Model Rencana HACCP (Hazard Analysis Critical Control Point) Industri Chicken Nugget* (2006). eBookPangan.com. Retrieved 15 April 2021, from <http://tekpan.unimus.ac.id/wp-content/uploads/2013/07/MODEL-RENCANA-HACCP-INDUSTRI-CHICKEN-NUGGET.pdf>.
- Mundry, R., & Fischer, J. (1998). Use of Statistical Programs for Nonparametric Tests of Small Samples Often Leads to Incorrect P-values: Examples from Animal Behaviour. *Animal Behaviour*, 56(1), 256–259.
- Nishinari, K., Kohyama, K., Kumagai, H., Funami, T., & Bourne, M. C. (2013). Parameters of Texture Profile Analysis. *Food Science and Technology Research*, 19(3), 519–521.
- Nout, M. J. R., & Kiers, J. L. (2005). Tempe Fermentation, Innovation and Functionality: Update into the Third Millennium. *Journal of Applied Microbiology*, 98(4), 789–805.
- Nutritional Effects of Food Processing*. Nutritiondata.self.com. Retrieved 25 June 2021, from <https://nutritiondata.self.com/topics/processing>.
- Orcutt, M., McMIndes, M., Chu, H., Mueller, I., Bater, B., & Orcutt, A. (2005). Textured Soy Protein Utilization in Meat and Meat Analog Products. *Soy Applications in Food*, 155-184.

- Ortolan, F., & Steel, C. J. (2017). Protein Characteristics that Affect the Quality of Vital Wheat Gluten to be Used in Baking: A Review. *Comprehensive Revision of Food Science and Food Safety*, 16, 369–381.
- Peraturan Badan Pengawasan Obat dan Makanan. Standarpangan.pom.go.id. (2019). Retrieved 5 July 2021, from https://standarpangan.pom.go.id/dokumen/peraturan/2019/PerBPOM_No_11_Tahun_2019_tentang_BTP.pdf.
- Plant-based Meat Market*. (2020). Retrieved 22 January 2021, from <https://www.marketsandmarkets.com/Market-Reports/plant-based-meat-market-44922705.html>.
- Polizer, Y. J., Pompeu, D., Hirano, M. H., Freire, M. T. de A., & Trindade, M. A. (2015). Development and Evaluation of Chicken Nuggets with Partial Replacement of Meat and Fat by Pea Fibre. *Brazilian Journal of Food Technology*, 18(1), 62–69.
- Quorn Crispy Nuggets*. Quorn. Retrieved 15 April 2021, from <https://www.quorn.co.uk/products/chicken-style-nuggets>.
- Rata-rata Harga Eceran Nasional Beberapa Jenis Barang 2014-2016*. Bps.go.id. Retrieved 15 April 2021, from <https://bps.go.id/indicator/102/254/1/rata-rata-harga-eceran-nasional-beberapa-jenis-barang.html>.
- Reddy, M. B., & Love, M. (1999). The Impact of Food Processing on the Nutritional Quality of Vitamins and Minerals. *Impact of Processing on Food Safety*, 99–106.
- Rees Clayton, E. M., Specht, E. A., Welch, D. R., & Berke, A. P. (2018). Addressing Global Protein Demand Through Diversification and Innovation. *Reference Module in Food Science*.
- Rhoads, J. M., Argenzio, R. A., Chen, W., Rippe, R. A., Westwick, J. K., Cox, A. D., Berschneider, H. M., & Brenner, D. A. (1997). L-glutamine Stimulates Intestinal Cell Proliferation and Activates Mitogen-

- activated Protein Kinases. *American Journal of Physiology-Gastrointestinal and Liver Physiology*, 272(5), 943-953.
- Riaz, M. N. (2011). Texturized Vegetable Proteins. *Handbook of Food Proteins*, 395–418.
- Role of Meat and Meat Products in Human Nutrition*. Fao.org. Retrieved 7 July 2021, from <http://www.fao.org/3/T0562E/T0562E02.htm#Nutritional%20value%20of%20meat>.
- Rosenthal, A. J. (2010). Texture Profile Analysis - How Important are the Parameters? *Journal of Texture Studies*, 41(5), 672–684
- Shahbandeh, M. (2021). *U.S. Retail Price of Ground Beef 1995-2020*. Statista. Retrieved 14 March 2021, from <https://www.statista.com/statistics/236776/retail-price-of-ground-beef-in-the-united-states/>.
- Shahbandeh, M. (2021). *Retail Price of Pork Chops 1995-2020*. Statista. Retrieved 14 March 2021, from <https://www.statista.com/statistics/236827/retail-price-of-pork-chops-in-the-united-states/>.
- Sharma, S., Pathak, V., Singh, V. P., Awasthi, M., & Bharti, S. (2018). Comparative Quality Assessment of Meat Nuggets Prepared from Meat of Different Food Animals. *International Journal of Livestock Research*, 8(1), 139-148.
- Sharima-Abdullah, N., Faujan, N., Hassan, C., & Arifin, N. (2018). Physicochemical Properties and Consumer Preference of Imitation Chicken Nuggets Produced from Chickpea Flour and Textured Vegetable Protein. *International Food Research Journal*, 25(3), 1016-1025.
- Shurtleff, W., & Aoyagi, A. (1979). *The Book of Tempeh* (1st ed.). Harper & Row.
- Stein, H. H., Berger, L. L., Drackley, J. K., Fahey, G. C., Hernot, D. C., & Parsons, C. M. (2008). Nutritional Properties and Feeding Values of Soybeans and Their Coproducts. *Soybeans*, 613–660.
- Stephanie, S., Ratih, N. K., Soka, S., & Suwanto, A. (2017). Effect of Tempeh Supplementation on the Profiles of Human Intestinal Immune System and Gut Microbiota. *Microbiology Indonesia*, 11(1), 2.

- Tang, C. (2019). Nanostructures of Soy Proteins for Encapsulation of Food Bioactive Ingredients. *Biopolymer Nanostructures for Food Encapsulation Purposes*, 247–285.
- Tempeh, Cooked*. USDA. Retrieved 15 April 2021, from <https://fdc.nal.usda.gov/fdc-app.html#/food-details/172467/nutrients>.
- Texture Analyzer*. <http://www.arrowscientific.com.au/>. Retrieved 28 June 2021, from http://www.arrowscientific.com.au/index.php?option=com_content&view=article&id=21:texture-analyser&catid=7&Itemid=37.
- TVP® (Textured Vegetable Protein)*. Bob's Red Mill Natural Foods. Retrieved 19 April 2021, from <https://www.bobsredmill.com/tvp-textured-veg-protein.html>.
- Tyagi, S., Kharkwal, M., & Saxena, T. (2015). Impact of Cooking on Nutritional Content of Food. *DU Journal of Undergraduate Research and Innovation*, 1(3), 180-186. Retrieved 29 June 2021, from <http://journals.du.ac.in/ugresearch/pdf-vol3/U18.pdf>.
- Vital, R., Bassinello, P., Cruz, Q., Carvalho, R., de Paiva, J., & Colombo, A. (2018). Production, Quality, and Acceptance of Tempeh and White Bean Tempeh Burgers. *Foods*, 7(9), 136.
- Wan, L. (2018). *Asia Dominates Vegetarian Markets but Understanding Local Factors Crucial for Sales Success*. [foodnavigator-asia.com](https://www.foodnavigator-asia.com). Retrieved 15 April 2021, from <https://www.foodnavigator-asia.com/Article/2018/07/02/Asia-dominates-vegetarian-markets-but-understanding-local-factors-crucial-for-sales-success#>.
- Water Footprint of Crop and Animal Products: A Comparison*. Waterfootprint.org. Retrieved 15 April 2021, from <https://waterfootprint.org/en/water-footprint/product-water-footprint/water-footprint-crop-and-animal-products/>.
- Widyastuti, R. (2021). *Harga Kedelai Impor Naik, Kemendag: Harga Tempe Bisa Rp. 16.000 per Kg*. Tempo. Retrieved 15 April 2021, from <https://bisnis.tempo.co/read/1428618/harga-kedelai-impor-naik-kemendag-harga-tempe-bisa-rp-16-000-per-kg>.

- Why Plant-based Chicken is About to Take Off*. The Good Food Institute. (2019). Retrieved 15 April 2021, from <https://gfi.org/blog/2020-plant-based-chicken/>.
- Wulansari, R. (2013). *Mempelajari Pengaruh Penambahan Hidrokoloid Terhadap Karakteristik Nugget Tempe*. 123dok.com. Retrieved 1 July 2021, from <https://123dok.com/document/1y9mx5lq-mempelajari-pengaruh-penambahan-hidrokoloid-terhadap-karakteristik-nugget-tempe.html>.
- Yazdan, M., Jamilah, B., Yaakob, C., & Sharifah, K. (2009). Moisture, Fat Content and Fatty Acid Composition in Breaded and Non-breaded Deep-fried Black Pomfret (*Parastromateus niger*) Fillets. *International Food Research Journal*, 16, 225-231. Retrieved 29 June 2021, from <https://core.ac.uk/reader/153799710>.
- Yoon, H. R., Bednar, C., Czajka-Narins, D., & King, C. (1997). Effect of Preparation Methods on Moisture Content, Fat Content and Sensory Characteristics of Breaded Food Items Served in School Lunches. *Journal of the American Dietetic Association*, 97(9), 97.
- Yuliarti, O. (2020). Textural Characteristics of Indonesian Foods. *Textural Characteristics of World Foods*, 137–150.
- Yuliasuti, E. (2012). *Pengaruh Penggunaan Tepung Tempe sebagai Bahan Pensubstitusi Daging Sapi terhadap Komposisi Proksimat dan Daya Terima Bakso*. Core.ac.uk. Retrieved 5 July 2021, from <https://core.ac.uk/display/148591859>.

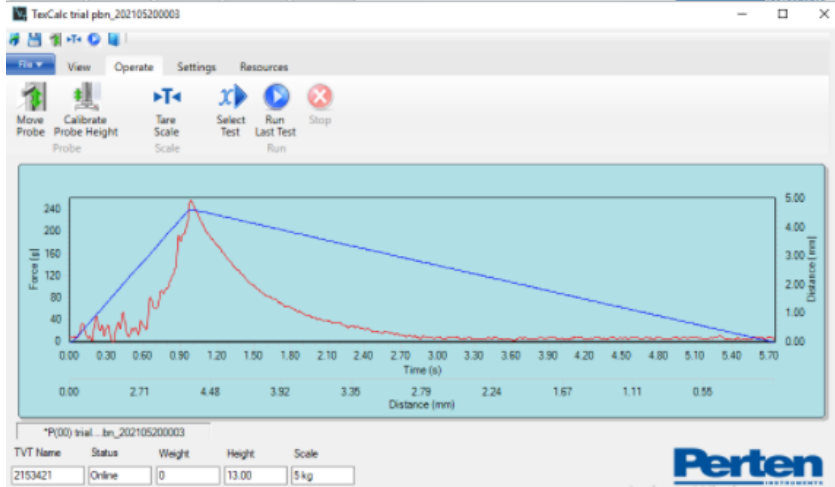
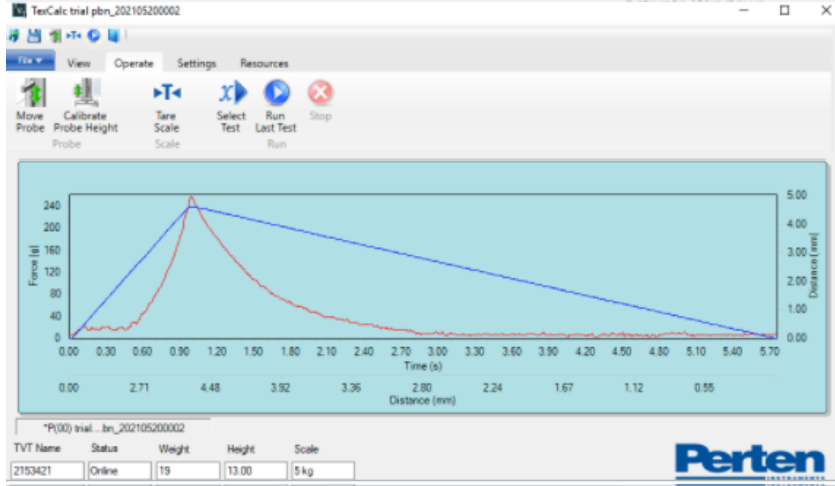
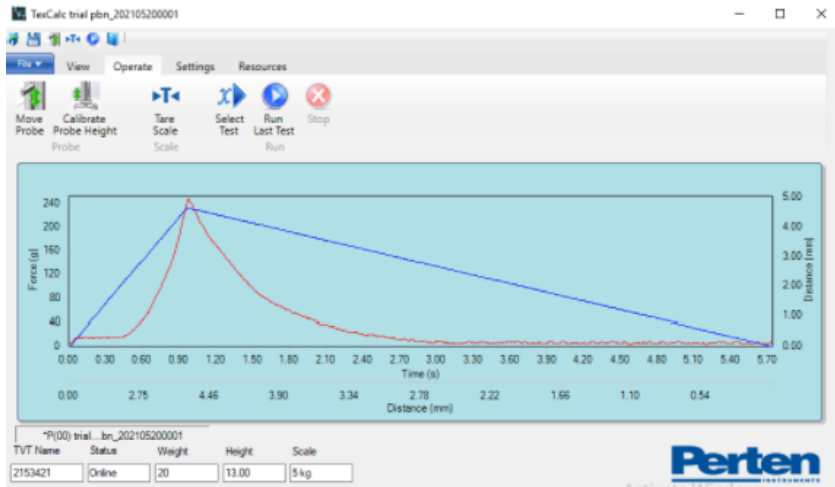
APPENDICES

Appendix 1. Plant-based Nugget Productions

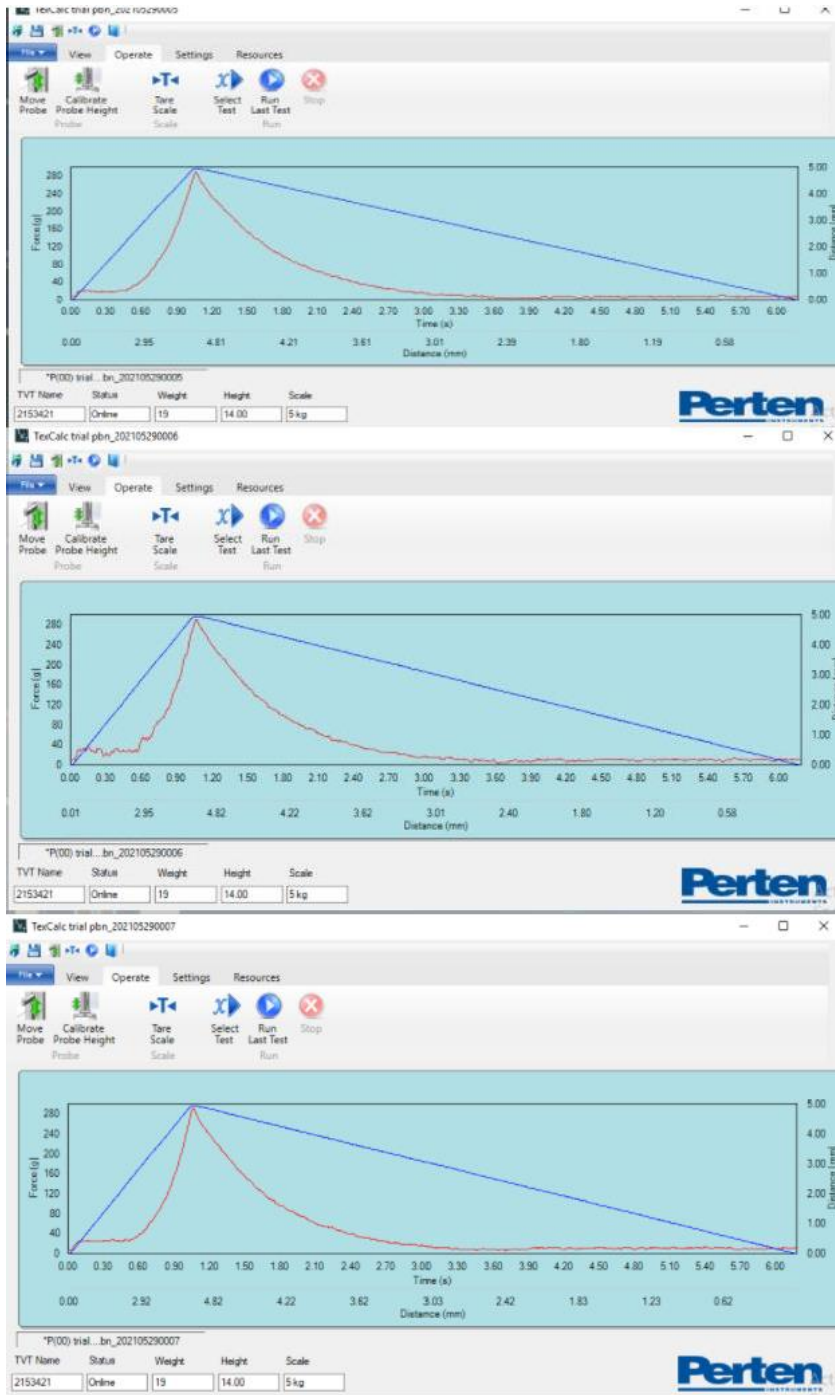


From upper left to lower right: commercial chicken nugget, control (hung TVP + ground TVP), hung TVP + tempeh, ground TVP + tempeh, tempeh, hung TVP + ground TVP + tempeh, commercial chicken nugget (cut), control (hung TVP + ground TVP, cut), hung TVP + tempeh (cut), ground TVP + tempeh (cut), tempeh (cut), hung TVP + ground TVP + tempeh (cut).

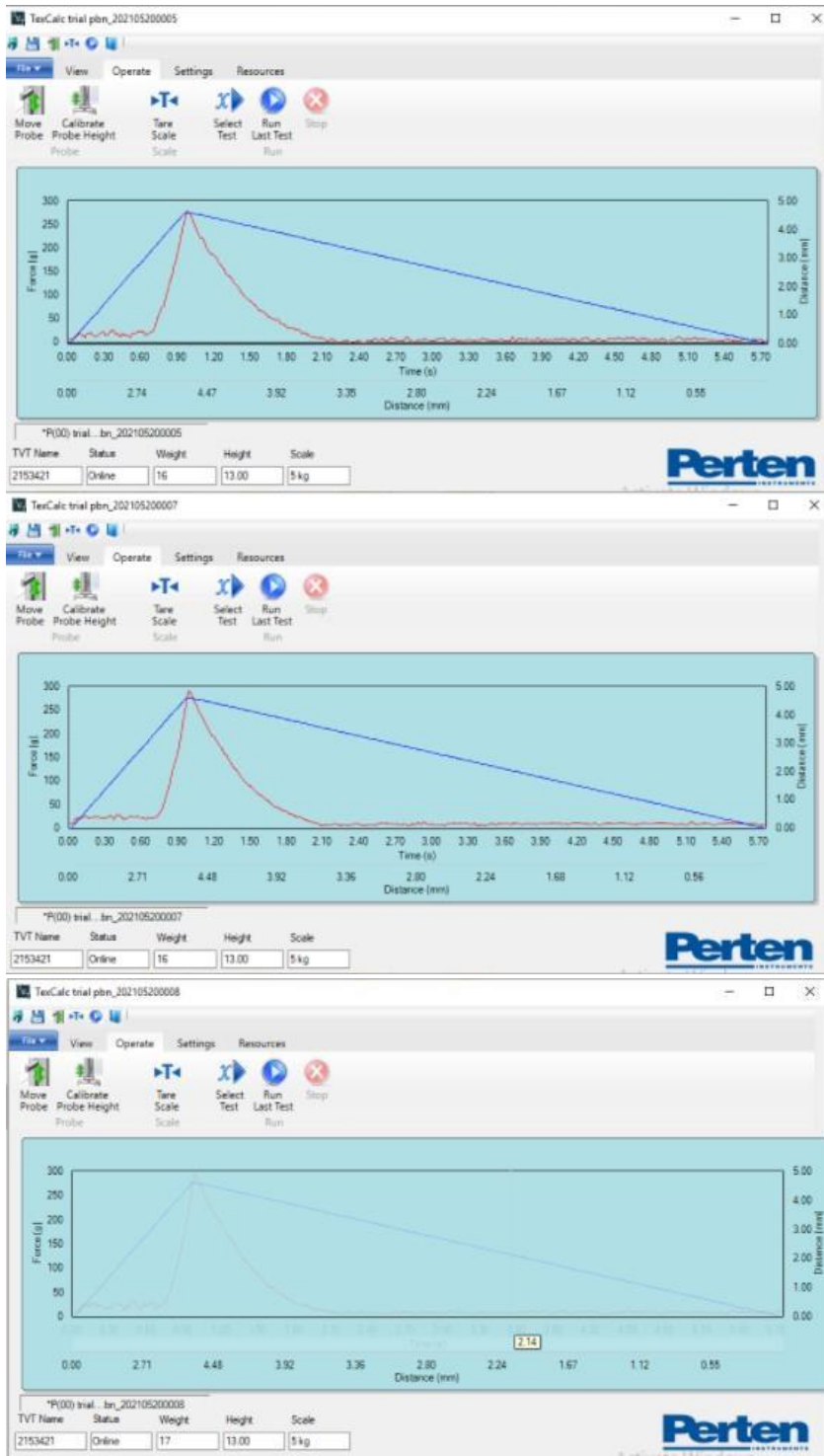
Appendix 2. Texture Analysis Graph (Hardness, Commercial, Batch 1)



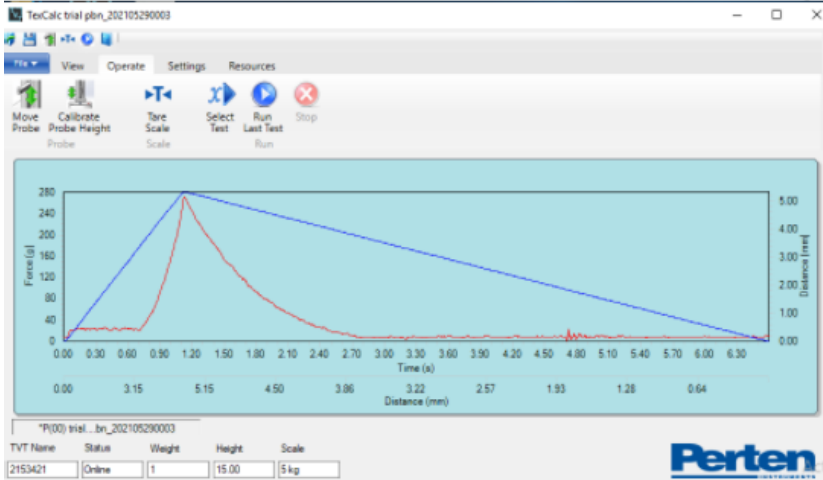
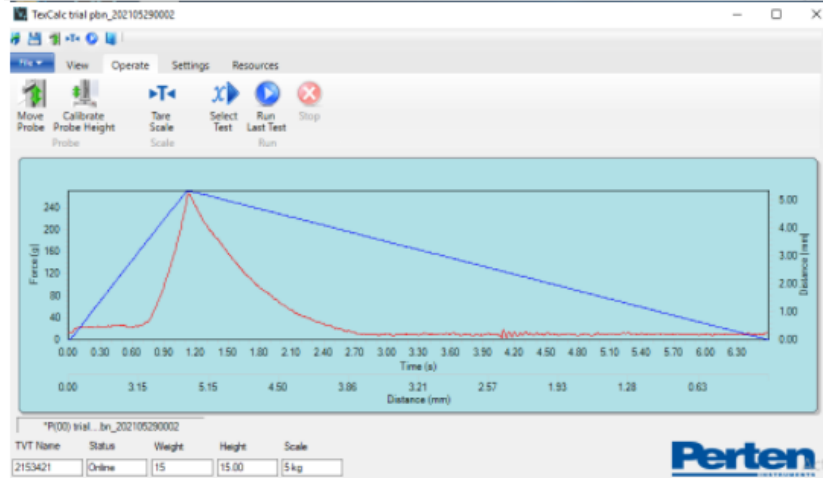
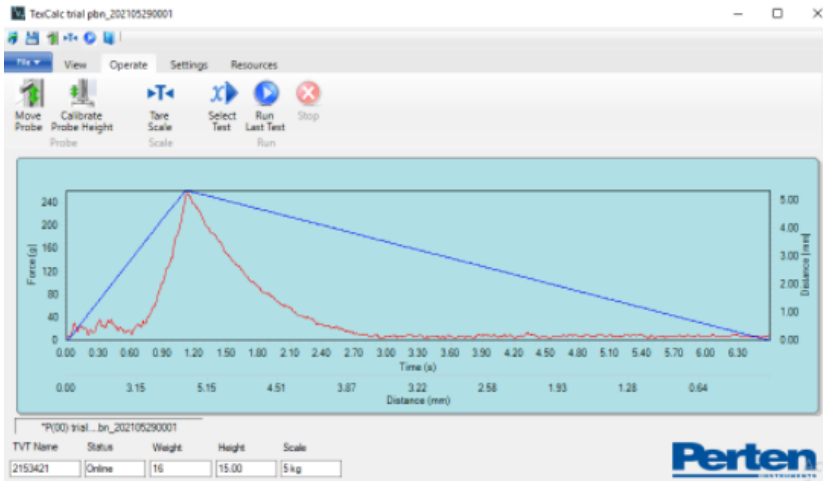
Appendix 3. Texture Analysis Graph (Hardness, Commercial, Batch 2)



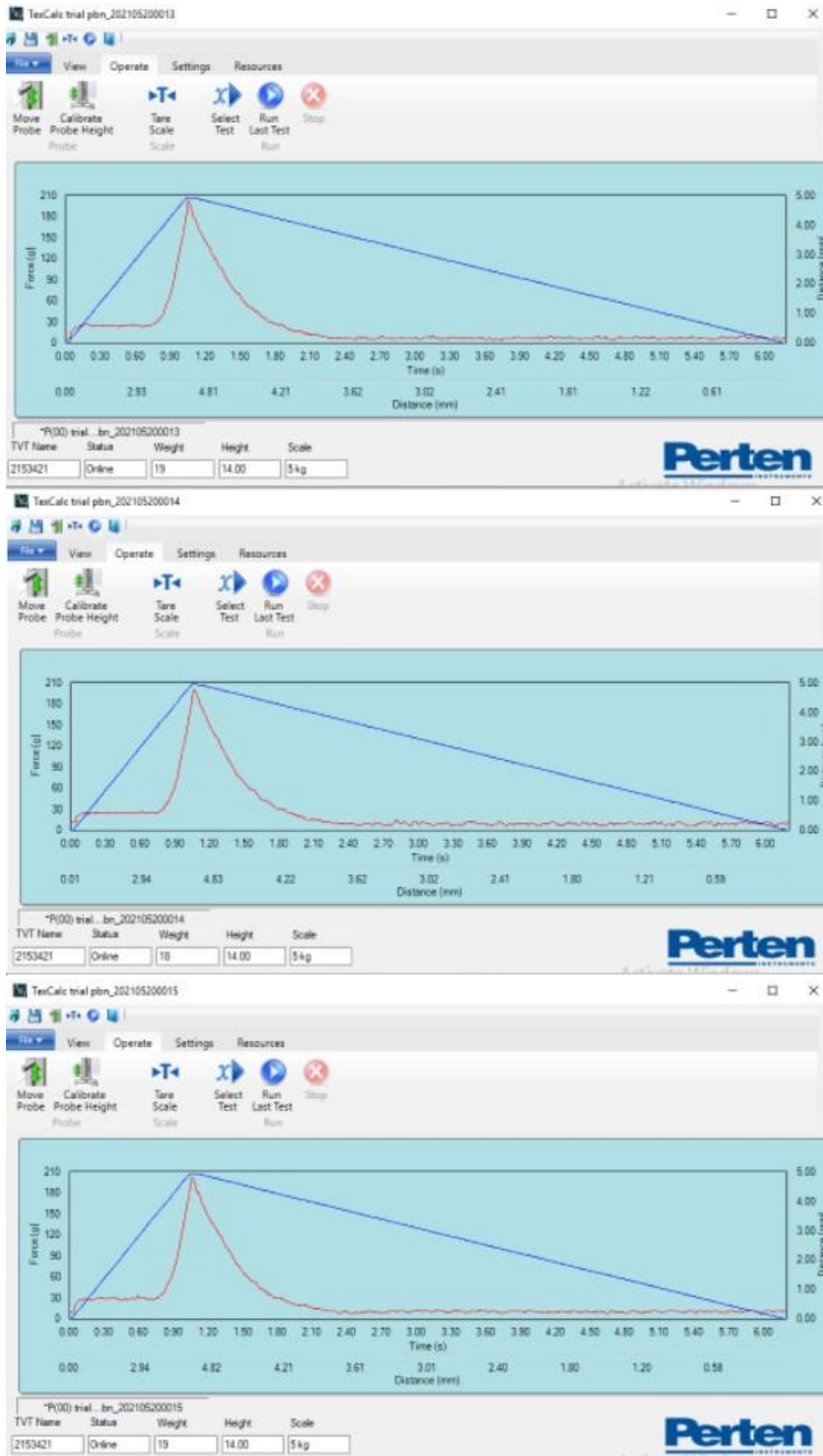
Appendix 4. Texture Analysis Graph (Hardness, Control, Batch 1)



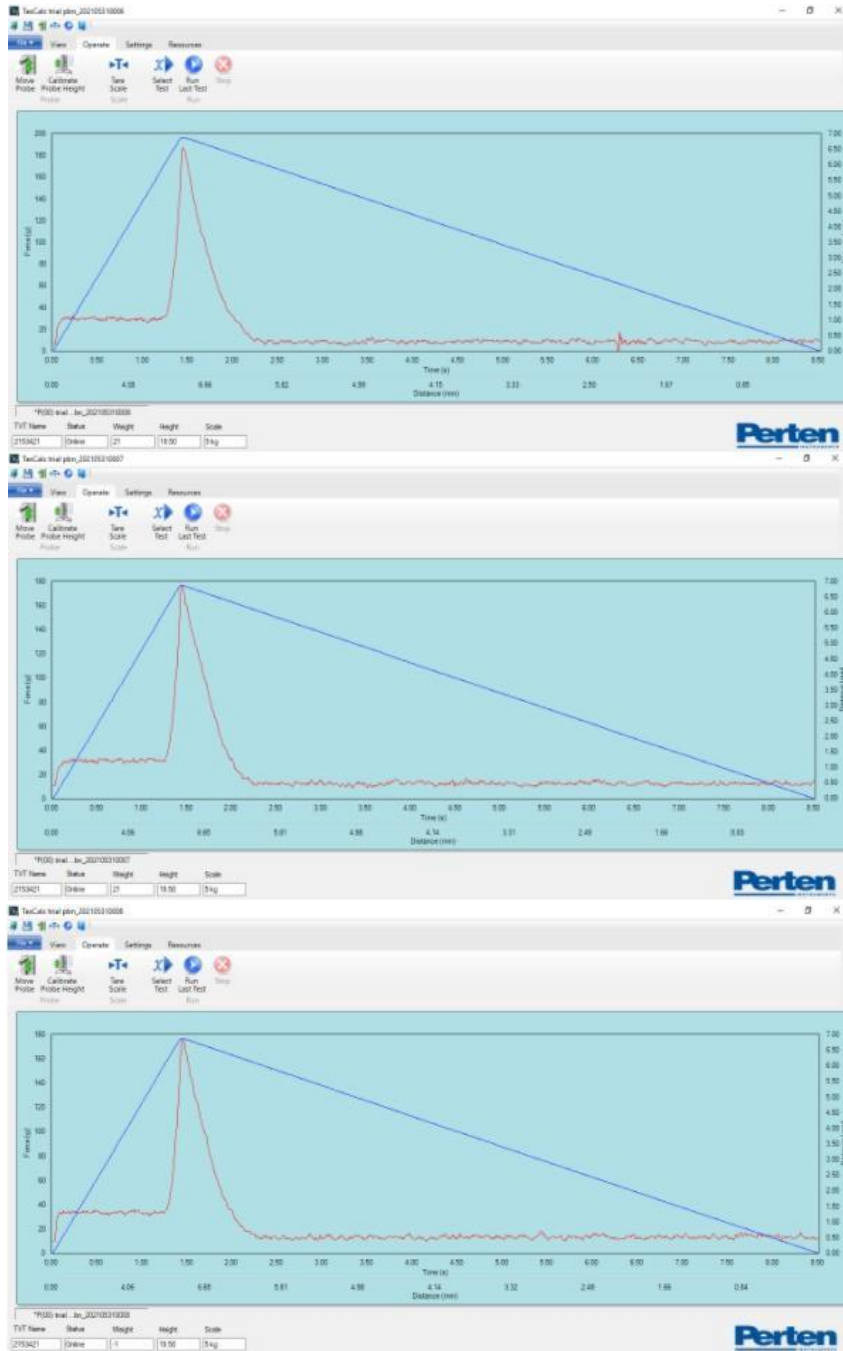
Appendix 5. Texture Analysis Graph (Hardness, Control, Batch 2)



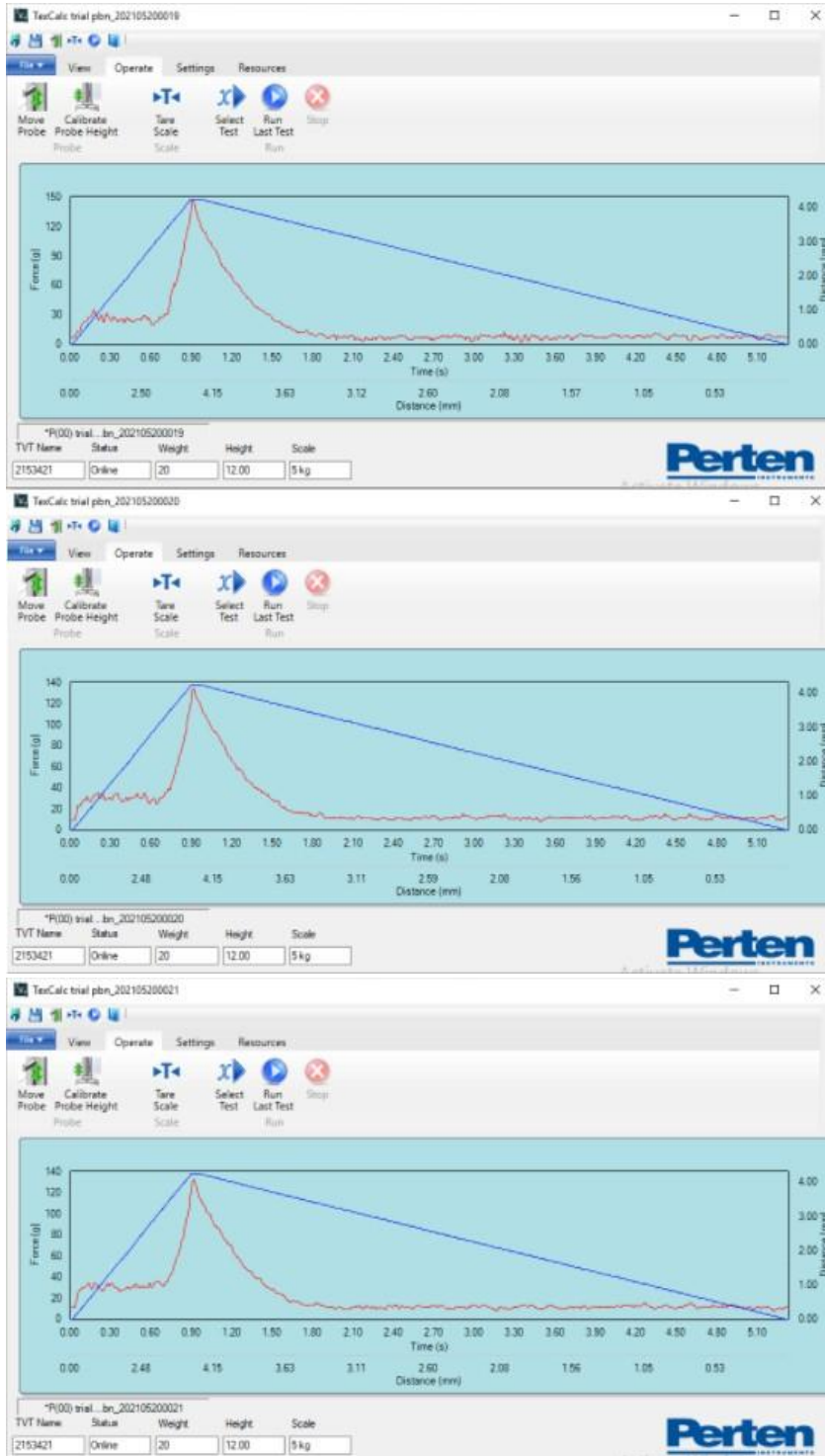
Appendix 6. Texture Analysis Graph (Hardness, Hung TVP + Tempeh, Batch 1)



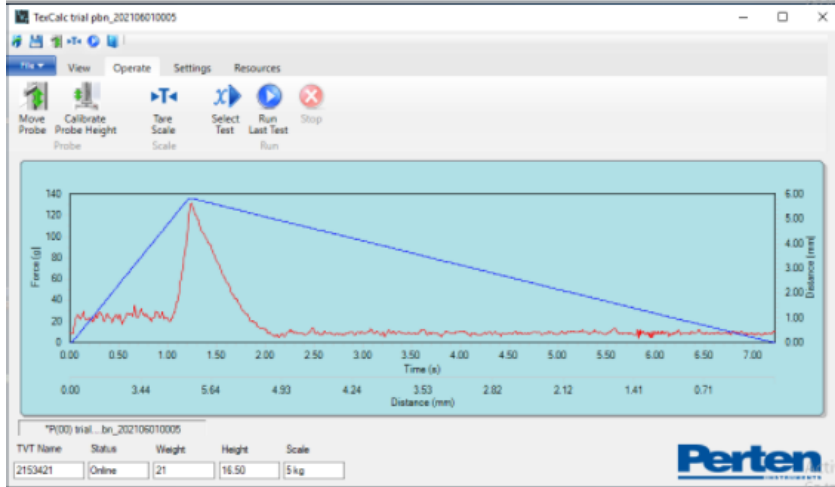
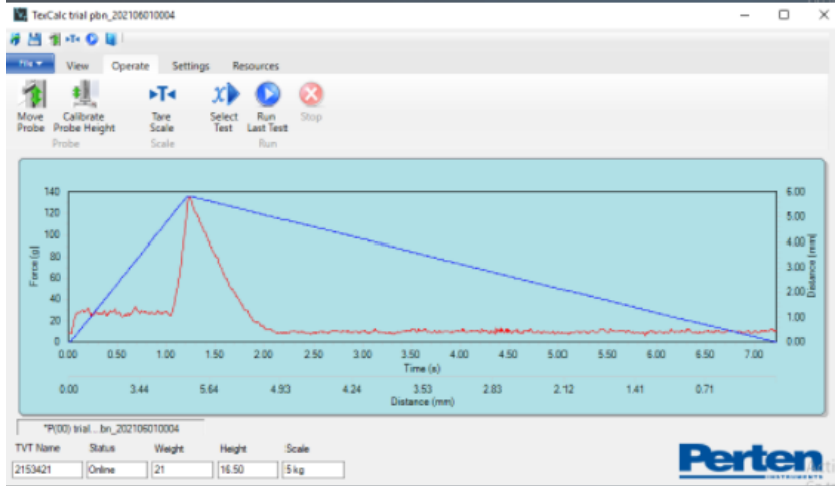
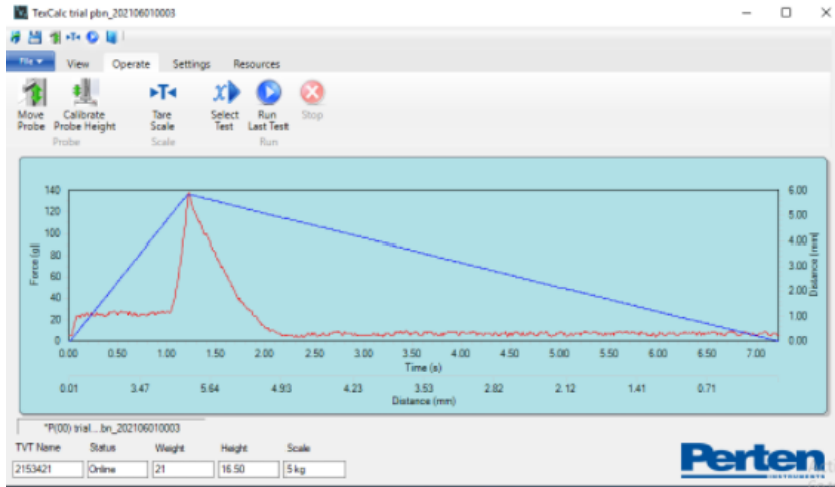
Appendix 7. Texture Analysis Graph (Hardness, Hung TVP + Tempeh, Batch 2)



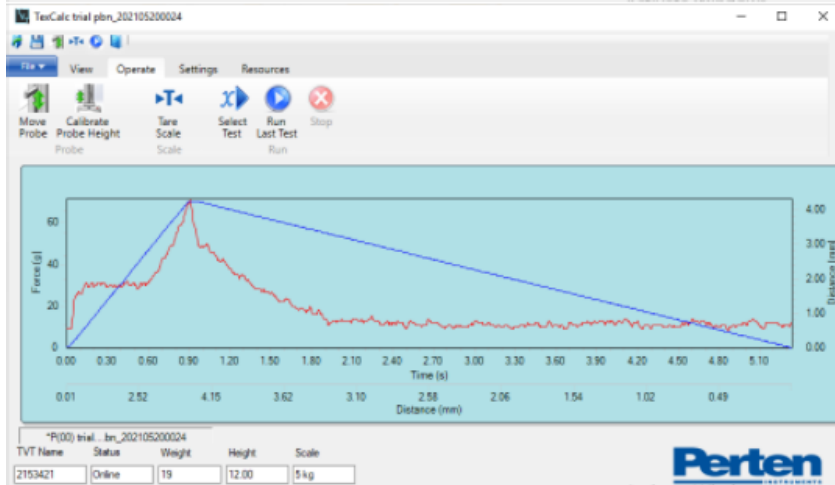
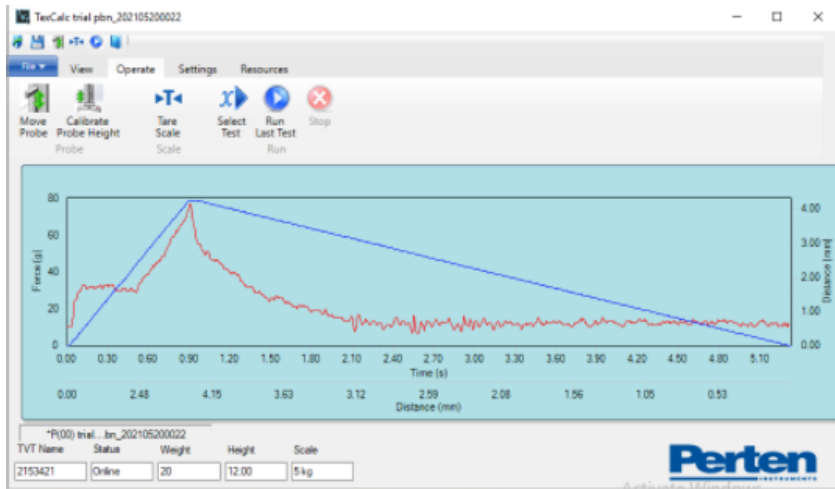
Appendix 8. Texture Analysis Graph (Hardness, Ground TVP + Tempeh, Batch 1)



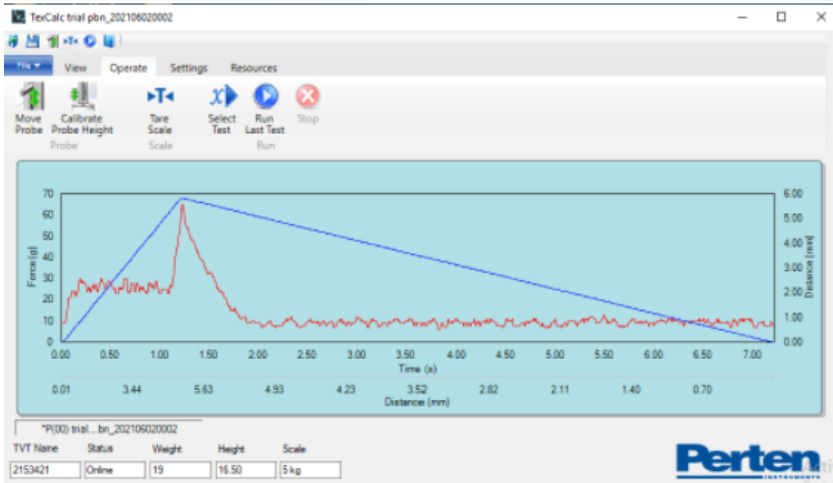
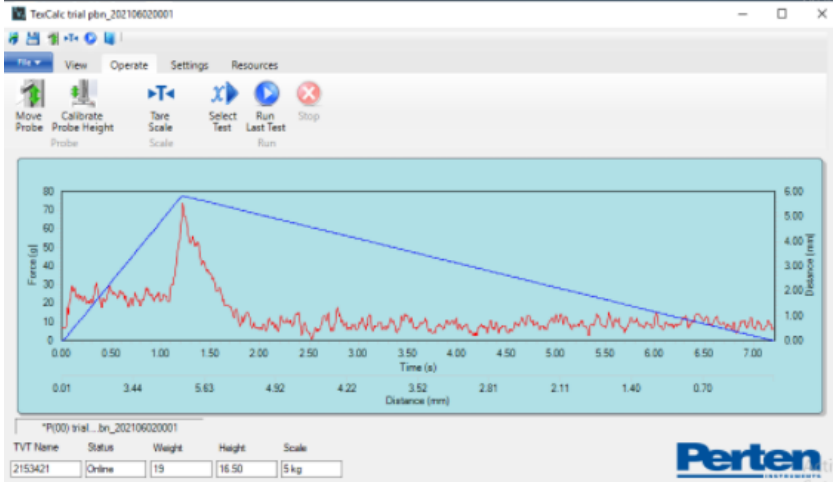
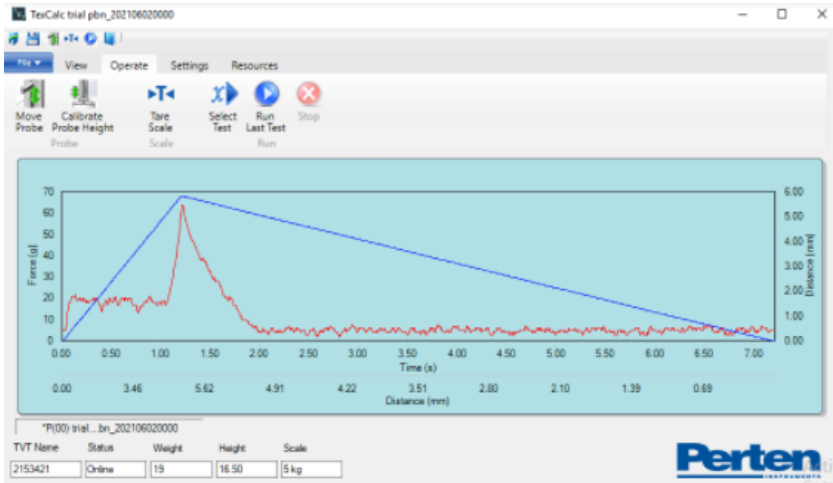
Appendix 9. Texture Analysis Graph (Hardness, Ground TVP + Tempeh, Batch 2)



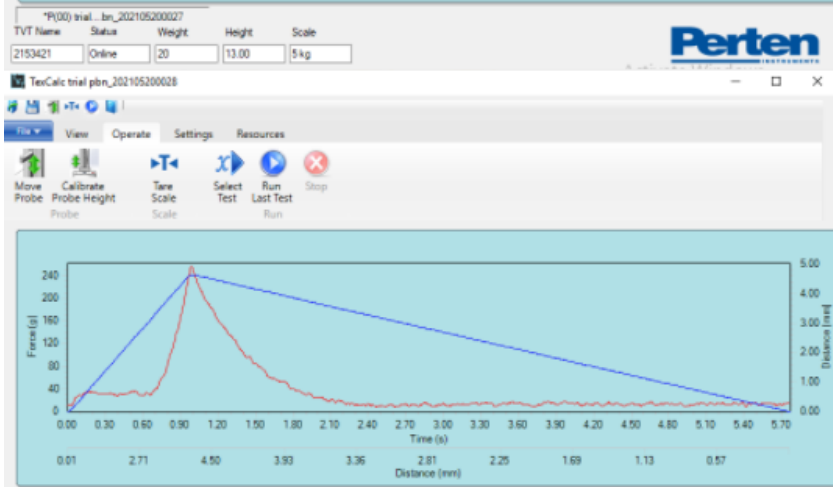
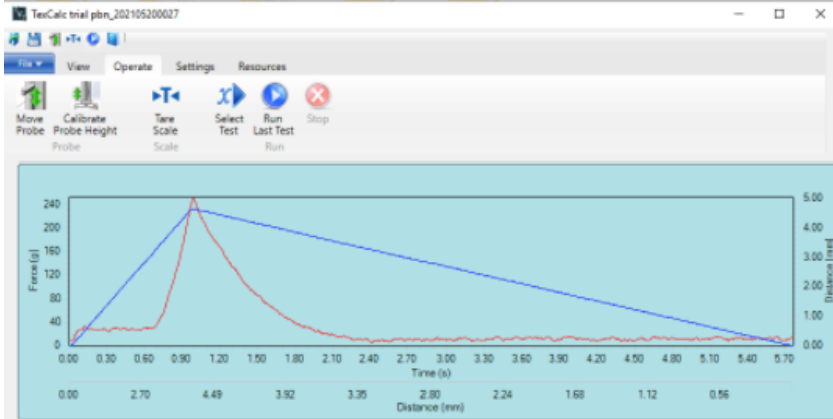
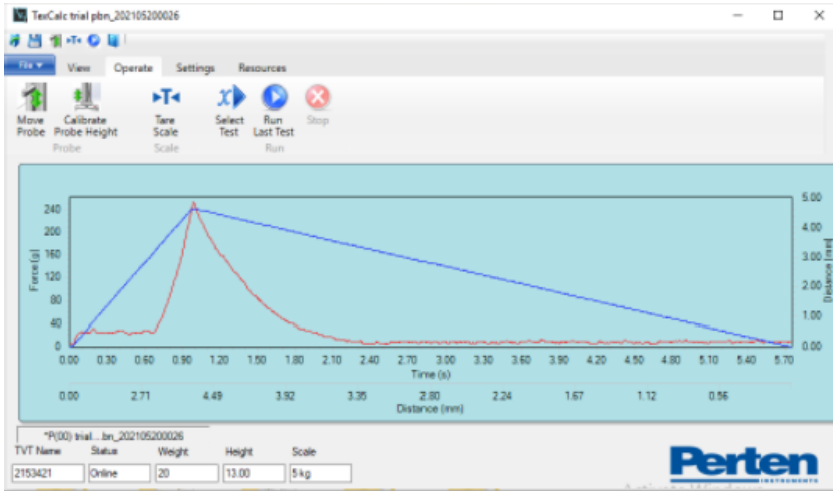
Appendix 10. Texture Analysis Graph (Hardness, Tempeh, Batch 1)



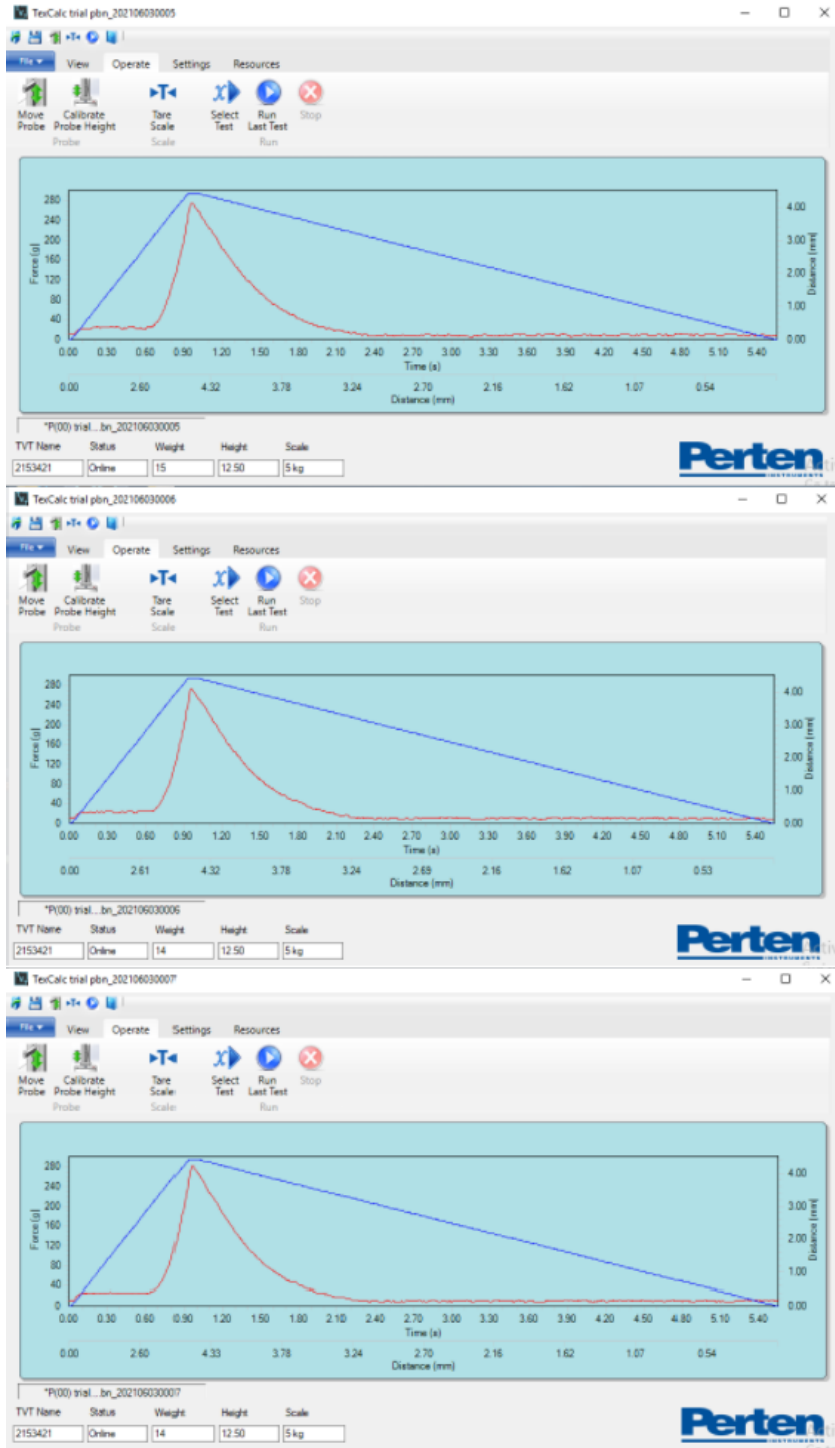
Appendix 11. Texture Analysis Graph (Hardness, Tempeh, Batch 2)



Appendix 12. Texture Analysis Graph (Hardness, Hung TVP + Ground TVP + Tempeh, Batch 1)



Appendix 13. Texture Analysis Graph (Hardness, Hung TVP + Ground TVP + Tempeh, Batch 1)



Appendix 14. Statistical Data Analysis

Kruskal-Wallis H test for each treatment (95% confidence interval):

	Hardness	Moisture	Ash	Protein	Fat	Carbohydrate
Chi-Square	9.769	10.231	10.538	10.154	10.231	8.923
df	5	5	5	5	5	5
Asymp. Sig.	0.082	0.069	0.061	0.071	0.069	0.112