

IV. KESIMPULAN

4.1. Kesimpulan

Kopi *cold brew* mengacu pada kopi yang diekstraksi pada suhu ruang atau pada suhu yang lebih rendah dari suhu ruang. Terdapat beberapa metode yang dapat digunakan untuk preparasi kopi *cold brew*, yaitu metode imersi/konvensional, metode *cold drip*, metode siklus vakum dan metode *Ultra High Pressure*. Kopi *cold brew* menghasilkan seduhan kopi dengan warna yang lebih merah, viskositas, kadar kafein, total asam, total padatan terlarut, total fenol dan aktivitas antioksidan yang lebih rendah, nilai pH yang lebih tinggi, intensitas rasa *nutty*, pahit dan sensasi sepat yang lebih rendah dibandingkan dengan kopi *hot brew*. Beberapa mikroorganisme yang umumnya dapat mencemari kopi *cold brew*, yaitu khamir, bakteri asam laktat dan bakteri asam asetat. Jumlah mikroorganisme tersebut dapat direduksi hingga $< 1,0 \times 10^0$ CFU/mL melalui pasteurisasi HTST seduhan kopi *cold brew*. *Flavor* yang lebih manis dan *fruity*, serta berkurangnya *flavor* pahit dan sensasi sepat dibandingkan kopi *hot brew* menunjang popularitas kopi yang diseduh dengan metode *cold brew*.

4.2. Saran

Terdapat beberapa parameter fisikokimia yang belum diteliti pada kopi *cold brew* secara umum, serta banyak parameter yang belum diteliti secara khusus untuk tiap metode *cold brewing* yang membuka peluang penelitian tentang kopi *cold brew*.

DAFTAR PUSTAKA

- Agustine, P., Damayanti, R. P., & Putri, N. A. (2021). Karakteristik ekstrak kafein pada beberapa varietas kopi di Indonesia: review. *Jurnal Ilmiah Teknologi dan Industri Pangan UNISRI*, 6(1), 78-89.
- Aisah, N., Aqil, M., Dwiranti, S., & David, W. (2019). Sensory and chemical changes of cold and hot brew arabica coffee at various resting time. *Asia Pacific Journal of Sustainable Agriculture Food and Energy*, 7(2), 23-26.
- Allafaoe, B. H. (2020). Karakteristik Fisik, Kimia dan Sensoris Minuman Kopi Robusta (*Coffea canephora*) Empat Lawang dengan Metode Penyeduhan Dingin, *Skripsi*, Fakultas Pertanian, Universitas Sriwijaya, Indralaya.
- Amri, A. F., Taqiyuddin, M., Atmaka, W., & Herawati, E. R. N. (2021). Karakteristik fisikokimia dan sensoris kopi arabika menoreh dengan teknik seduhan cold brew. *Jurnal Tanaman Industri dan Penyegar*, 8(3), 173-182.
- Angeloni, G., Guerrini, L., Masella, P., Innocenti, M., Bellumori, M., & Parenti, A. (2019). Characterization and comparison of cold brew and cold drip coffee extraction methods. *Journal of the Science of Food and Agriculture*, 99(1), 391-399.
- Batali, M. E., Ristenpart, W. D., & Guinard, J. (2020). Brew temperature, at fixed brew strength and extraction, has little impact on the sensory profile of drip brew coffee. *Scientific Reports*, 10(16450), 1-14.
- Cai, Y., Xu, Z., Pan, X., Gao, M., Wu, M., Wu, J., & Lao, F. (2022). Comparative profiling of hot and cold brew coffee flavor using chromatographic and sensory approaches. *Foods*, 11(19), 1-16.
- Castañeda-Rodríguez, R., Mulik, S., & Ozuna, C. (2020). Brewing temperature and particle size affect extraction kinetics of cold brew coffee in terms of its physicochemical, bioactive, and antioxidant properties. *Journal of Culinary Science & Technology*, 20(4), 1-22.

- Chauhan, P. S., Sharma, P., Puri, N., & Gupta, N. (2014). A process for reduction in viscosity of coffee extract by enzymatic hydrolysis of mannan. *Bioprocess and Biosystems Engineering*, 37(7), 1459-1467.
- Chen, S., Xiao, Y., Tang, W., Jiang, F., Zhu, J., Zhou, Y., & Ye, L. (2023). Evaluation of physicochemical characteristics and sensory properties of cold brew coffees prepared using ultrahigh pressure under different extraction conditions. *Foods*, 12(3857), 1-12.
- Córdoba, N., Moreno, F. L., Osorio, C., Velásquez, S., Fernandez-Alduenda, M., & Ruiz-Pardo, Y. (2021). Specialty and regular coffee bean quality for cold and hot brewing: Evaluation of sensory profile and physicochemical characteristics. *LWT*, 145(111363), 1-10.
- Coriate. 2023. Known by Young People to Old People: History of Cold Brew Coffee. <https://www.fnb.co.id/known-by-young-people-to-old-people-history-of-cold-brew-coffee/>. Tanggal akses 13 Maret 2024.
- Edwards, Q. A., Lunat, I., Garner-O'Neale, L. D., & Kulikov, S. M. (2015). *Int. J. Chem. Sci.*, 13(3), 1218-1226.
- Fernlöf, A. (2020). Microbial Growth in Coffee Grinder and Cold Brewed Coffee Beverage, *Thesis*, Faculty of Natural Resources and Agricultural Sciences, Swedish University of Agricultural Sciences, Uppsala.
- French, R. 2023. Report: Cold Brew Coffee Popularity Spikes 300%. <https://www.foodbeverageinsider.com/market-trends-analysis/report-cold-brew-coffee-popularity-spikes-300->. Tanggal akses 13 Maret 2024.
- Fuller, M., & Rao, N. Z. (2017). The effect of time, roasting temperature, and grind size on caffeine and chlorogenic acid concentrations in cold brew coffee. *Scientific Reports*, 7(17979), 1-9.
- Hamilton Beach Commercial. 2021. Cold Brew Coffee with PrimaVac™ | Hamilton Beach Commercial® |HVC254, HVC305 & HVC406 Series. <https://www.youtube.com/watch?v=UBKos2aTOK8>. Tanggal akses 21 Mei 2024.

- Haryono, R., Ridawati, & Mariani. (2021). Pengaruh lama penyeduhan terhadap kualitas dan jumlah padatan minuman kopi seduh dingin kopi Arabika Flores Bajawa. *Jurnal Sains Boga*, 4(2), 40-46.
- International Coffee Organization. 2023. The Coffee Report and Outlook. https://icocoffee.org/documents/cy2022-23/Coffee_Report_and_Outlook_April_2023_-_ICO.pdf. Tanggal akses 26 Februari 2024.
- Iskandar, R., & Khoirunisa, S. (2022). Proses penggilingan, suhu, ekstraksi, dan jenis kopi pada karakteristik cold brew coffee. *Jurnal Pariwisata Vokasi*, 2(2), 47-55.
- Kwok, R., Ting, K. L. W., Schwarz, S., Claassen, L., & Lachenmeier, D. W. (2020). Current challenges of cold brew coffee—roasting, extraction, flavor profile, contamination, and food safety. *Challenges*, 11(26), 1-3.
- Kyroglou, S., Laskari, R., & Varelzis, P. (2022). Optimization of sensory properties of cold brew coffee produced by reduced pressure cycles and its physicochemical characteristics. *Molecules*, 27(2971), 1-18.
- Kyroglou, S., Thanasouli, K., & Varelzis, P. (2021). Process characterization and optimization of cold brew coffee: effect of pressure, temperature, time and solvent volume on yield, caffeine and phenol content. *Journal of the Science of Food and Agriculture*, 101(11), 4789–4798.
- Le Compte, C. 2015. Cold Brew Wasn't Invented Yesterday, So Here's Some Historical Perspective. <https://dailycoffeenews.com/2015/07/15/cold-brewing-wasnt-invented-yesterday-so-heres-some-historical-perspective/>. Tanggal akses 13 Maret 2024.
- Liu, R., Wang, C., Huang, A., Lv, B. (2018). Characterization of odors of wood by Gas Chromatography-Olfactometry with removal of extractives as attempt to control indoor air quality. *Molecules*, 23(1), 1-10.
- Liu, X., Wang, W., Fei, Y., Zhou, Y., Jin, L., & Xing, Z. (2022). Effect of sterilization methods on the flavor of cold brew coffee. *Beverage Plant Research*, 2(6), 1-7.

- Maksimowski, D., Oziembłowski, M., Kolniak-Ostek, J., Stach, M., Zubaidi, M. A., & Nawirska-Olszańska. (2023). Effect of cold brew coffee storage in industrial production on the physical-chemical characteristics of final product. *Foods*, *12*(3840), 1-13.
- Maksimowski, D., Pachura, N., Oziembłowski, M., Nawirska-Olszańska, A., & Szumny, A. (2022). Coffee roasting and extraction as a factor in cold brew coffee quality. *Applied Science*, *12*(5), 1-23.
- Mendoza, F., Dejmek, P., & Aguilera, J. M. (2007). Colour and image texture analysis in classification of commercial potato chips. *Food Research International*, *40*(9), 1146–1154.
- Mestdagh, F., Glabasnja, A., & Giuliano, P. (2017). The Brew—Extracting for Excellence. In *The Craft and Science of Coffee*, (pp. 355–380). Academic Press.
- Naylor, T. 2014. Coffee: how cold-brew became the hot new thing. <https://www.theguardian.com/lifeandstyle/wordofmouth/2014/sep/09/coffee-cold-brew-hot-new-thing>. Tanggal akses 13 Maret 2024.
- Ngibad, K., Yusmiati, S. N. H., Merlina, D. M., Rini, Y. P., Velenata, & Jannah, E. F. (2023). Comparison of total flavonoid, phenolic levels, and antioxidant activity between Robusta and Arabica coffee. *KOVALEN: Jurnal Riset Kimia*, *9*(3), 2411-249.
- Nida, A. S. (2021) Pengaruh Jenis Kopi dan Metode Penyeduhan terhadap Aktivitas Antioksidan Seduhan Kopi, *Skripsi*, Fakultas Teknik, Universitas Brawijaya, Malang.
- Pajarwati, P., Wijaya, A., & Santoso, B. (2023). The characteristic and sensory evaluation of arabica Semendo coffee in high-speed stirring cold brew and common brew. *World Journal of Advanced Research and Reviews*, *18*(3), 308-314.
- Pan, L., Xiao, Y., Jiang, F., Jiang, T., Zhu, J. Tang, W., Liu, X, Zhou, Y., & Yu, L. (2023). Comparison of characterization of cold brew and hot brew coffee prepared at various roasting degrees. *Journal of Food Processing and Preservation*, *2023*(3175570), 1-15.

- Parker, J. K. (2015). Introduction to aroma compounds in foods. In *Flavour Development, Analysis and Perception in Food and Beverages* (pp. 3-30). Woodhead Publishing.
- Poole, R. L., & Tordoff, M. G. (2017). The Taste of Caffeine. *Journal of Caffeine Research*, 7(2), 39-52.
- Portela, C. S., de Almeida, I. F., Mori, A. L. B., Yamashita, F., & Benassi, M. T. (2021). Brewing Conditions Impact on the Composition and Characteristic of Cold Brew Arabica and Robusta Coffee Beverages. *LWT*, 143(111090), 1-9.
- Portillo, O. R., & Arévalo, A. C. (2022). Coffee's carbohydrates. A critical review of scientific literature. *Revis Bionatura*, 7(3), 1-12.
- Pusat Data dan Sistem Informasi Pertanian. (2022). *Outlook Kopi*. Sekretariat Jenderal - Kementerian Pertanian.
- Putri, M. K., Asshauri, R. U., Rahmadani, N. F., Kurnia, S. I., Mayasari, S., Martatio, R., Prastowo, S. H. B., & Dewi, N. M. (2024). Analisis nilai kecepatan terhadap viskositas pada fluida. *OPTIKA*, 8(1), 89-96.
- Rao, N. Z., & Fuller, M. (2018). Acidity and antioxidant activity of cold brew coffee. *Scientific Reports*, 8(16030), 1-9.
- Rao, N., Fuller, M., & Grim, M. D. (2020). Physiochemical characteristics of hot and cold brew coffee chemistry: The effects of roast level and brewing temperature on compound extraction. *Foods*, 9(7), 1-12.
- Riberio, D. E., Borém, F. M., Nunes, C. A., Alves, A. P. de C., dos Santos, C. M., Taveira, J. H. da S., & Dias, L. L. de C. (2018). Profile of organic acids and bioactive compounds in the sensory quality discrimination of Arabica coffee. *Coffee Science*, 13(2), 187-197.
- Rune, C. J. B., Giacalone, D., Steen, I., Duelund, L., Münchow, M., & Clausen, M. M. (2023). Acids in brewed coffees: Chemical composition and sensory threshold. *Current Research in Food Science*, 6(100485), 1-13.

- Sari, A. P. (2020) Karakteristik Minuman *Cold Brew* Kopi Arabika (*Coffea arabica*) dan Robusta (*Coffea canephora*) dengan Variasi Waktu Ekstraksi dan Ukuran Bubuk Kopi, *Skripsi*, Fakultas Teknologi Pertanian, Universitas Gadjah Mada, Yogyakarta.
- Schwarzmann, E.T., Washington, M. P., & Rao, N. Z. (2022). Physicochemical analysis of cold brew and hot brew peaberry coffee. *Processes*, 10(1989), 1-17.
- Song, J. L., Asare, T. S., Kang, M. Y., & Lee, S. C. (2018). Changes in bioactive compounds and antioxidant capacity of coffee under different roasting conditions. *Korean J. Plant Res.*, 31(6), 704-713.
- Specialty Coffee Association. (2022). The Color in Your Cup: Roast Level and Brew Temperature Significantly Affect the Color of Brewed Coffee. *Research*, 25(17), Cold Brew.
- Specialty Coffee Association & World Coffee Research. 2016. Coffee Taster's Flavor Wheel v.2. https://atlanticspecialtycoffee.com/wp-content/uploads/SCA_TasterWheel_English_8.5x11.pdf. Tanggal akses 17 Juni 2024.
- Stanek, N., Zarębska, M., Biłos, Ł., Barabosz, K., Nowakowska-Bogdan, E., Semeniukm I., Błaszkiwicz, J., Kulesza, R., Matejuk, R., & Szkutnik, K. (2021). Influence of coffee brewing methods on the chromatographic and spectroscopic profiles, antioxidant and sensory properties. *Science Reports*, 11(21377), 1-13.
- Sunarharum, W. B., Williams, D. J., & Smyth, H. (2014). Complexity of coffee flavor: A compositional and sensory perspective. *Food Research International*, 62, 315-325.
- Susilo, E. J., Dharma, U. S., Irawan, D. (2021). Pengaruh viskositas bahan bakar terhadap karakteristik aliran fluida pada pompa sentrifugal. *Artikel Teknik Mesin dan Manufaktur*, 2(1), 27-32.

- The Brainy Insight. 2023. Cold Brew Coffee Market Size by Product (Robusta, Arabica, and Others), Category (Traditional and Decaf), Distribution Channel (Supermarket & Hypermarket, Convenience Stores, Company-Owned Outlets, Online, and Others), Regions, Global Industry Analysis, Share, Growth, Trends, and Forecast 2023 to 2032. <https://www.thebrainyinsights.com/report/cold-brew-coffee-market-13629>. Tanggal akses 17 Maret 2024.
- The Good Scent Company. 2021. 1-acetoxyacetone 2-oxopropyl acetate. <https://www.thegoodscentcompany.com/data/rw1053041.html>. Tanggal akses 18 Juni 2024.
- The Good Scent Company. 2021. 2-acetyl-1-methyl pyrrole. <http://www.thegoodscentcompany.com/data/rw1035381.html>. Tanggal akses 18 Juni 2024.
- The Good Scent Company. 2021. 2,5-dimethyl-3-ethylpyrazine. <http://www.thegoodscentcompany.com/data/rw1426491.html>. Tanggal akses 18 Juni 2024.
- The Good Scent Company. 2021. 2,4,5-trimethyl oxazole. <http://www.thegoodscentcompany.com/data/rw1051411.html>. Tanggal akses 1 Juli 2024.
- The Good Scent Company. 2021. 3-methylbutanoic acid. <http://www.thegoodscentcompany.com/data/rw1056411.html>. Tanggal akses 18 Juni 2024.
- The Good Scent Company. 2021. 5-methyl furfural. <http://www.thegoodscentcompany.com/data/rw1032681.html>. Tanggal akses 18 Juni 2024.
- Wang, X., & Lim, L. (2023). Effects of grind size, temperature, and brewing ratio on immersion cold brewed and French press hot brewed coffees. *Applied Food Research*, 3(100334), 1-8.
- Wang, Y., Wang, W., Zhou, Q., Cheng, C., Xing, Z., Zhou, Y., Liu, X., Hua, S., Wei, W., Tan, J., Yu, Y. (2024). Characterization of key aroma compounds in cold brew coffee prepared by negative-pressure extraction technology and its changes during storage. *LWT*, 197, 115919.

- Widagyo, D. R., Budiman, V. A., Aylilianawati, & Indraswati, N. (2013). Ekstraksi kafeina dari serbuk kopi *Java Robusta* dengan pelarut minyak jagung. *Widya Teknik*, 12(1), 1-10.
- Wijayanti, R., & Anggia, M. (2020). Analisis kadar kafein, antioksidan dan mutu bubuk kopi beberapa industri kecil menengah (IKM) di kabupaten tanah datar. *Jurnal Teknologi & Industri Hasil Pertanian*, 25(1), 1-6.
- Wonorahardjo, S., Yuniawati, N., Molo, A. D. P., Rusdi, H. O., & Purnomo, H. (2019, Juni). Different Chemical Compound Profiles of Indonesian Coffee Beans as Studied Chromatography/Mass Spectrometry. In *IOP Conference Series: Earth and Environmental Science* (Vol. 276, No. 1, p. 012065). IOP Publishing.
- Xi, J., Shen, D., Li, Y., & Zhang, R. (2011). Ultrahigh pressure extraction as a tool to improve the antioxidant activities of green tea extracts. *Food Research International*, 44(9), 2783-2787.
- Yeager, S. E., Batali, M. E., Guinard, J., & Ristenpart, W. D. (2021). Acids in coffee: A review of sensory measurements and meta-analysis of chemical composition. *Critical Reviews in Food Science and Nutrition*, 63(8), 1-27.
- Yust, B. G., Wilkinson, F., Rao, N. Z. (2024). Variables affecting the extraction of antioxidants in cold and hot brew coffee: A review. *Antioxidant*, 13(29), 1-23.
- Zainuri, Paramartha, D. N. A., Fatinah, A., Nofrida, R., Rahayu, N., Anggriani, I. M. D., & Utama, Q. D. (2023). The chemical characteristics of Arabica and Robusta green coffee beans from Geopark Rinjani, Indonesia. *BIOTROPIA*, 30(3), 318-328.