

4.

ET VE ET ÜRÜNLERİNDE RENK

Emin Burçin ÖZVURAL¹

Giriş

Renk ve görünüm sığır, domuz, kanatlı ve balık etlerinin tüketiciler tarafından satın alınmasında ana belirleyici faktörlerdir, çünkü tüketiciler etin taze ve sağlıklı olmasını renk bozulmalarına göre değerlendirirler. Örneğin, tüketiciler taze sığır etinde parlak kırmızı rengi tercih ederler ve koyulaşma veya kahverengileşme gibi renk değişimlerine karşı önyargıları vardır. Ayrıca, et rengi genellikle et kesiminin sağlıklı olduğunun bir göstergesi olarak düşünülür, ancak kabul edilebilir et rengi saklama ve sergileme açısından kısa ömürlüdür (Mancini ve Hunt 2005; Jeong vd., 2014; Hughes vd., 2020; Purslow vd., 2020). Et rengi, ette mevcut pigmentlerin (miyogloblin, hemogloblin ve sitokrom c) konsantrasyonu, kimyasal durumları ve etin ışık saçma özelliklerinden kaynaklanmaktadır (Brewer, 2004; Jeong vd., 2014; Wideman vd., 2016). Kastaki pigmentlerin oksidasyonu et rengini etkiler ve et bozulmuş olarak algılandığı için satışı azalır. Yüzeydeki renk değişikliği nedeniyle perakende sığır etinde yaklaşık % 15 oranında fiyat indirimine gidildiği bildirilmiştir (Mancini ve Hunt 2005; Jeong vd., 2014).

Hemogloblin ve miyogloblin, et kalitesini belirleyen önemli faktörlerdir. Bu faktörler etin rengini etkiler ve kas dokusundan veya dolaşım sisteminden sızdığı istenmeyen renk değişikliğine neden olabilirler. Çürükler, kanamalar ve

¹ Doç. Dr. Emin Burçin ÖZVURAL Çankırı Karatekin Üniversitesi Mühendislik Fakültesi Gıda Mühendisliği Bölümü bozvural@karatekin.edu.tr bozvural@gmail.com

lobinin işlevselliğini ve kararlılığını önemli ölçüde etkiler. Miyogloblin, pH 7.4'te pH 5.6'dan daha kararlıdır (Suman vd., 2016).

Kaynaklar

- Abbasi, M.A., Ghazanfari, S., Sharifi, S.D., Gavlighi, H.A. (2020). Effect of rosemary essential oil as nitrite substitute on quality of sausage produced using chicken fed by thymus essential oil and rapeseed oil. *Journal of Food Science and Technology*, <https://doi.org/10.1007/s13197-020-04786-8>.
- Alirezalua, K., Hesari, J., Yaghoubi, M., Khaneghah, A.M., Alirezalu, A., Pateiro, M. ve Lorenzo, J.M. (2021). Combined effects of ϵ -polylysine and ϵ -polylysine nanoparticles with plant extracts on the shelf life and quality characteristics of nitrite-free frankfurter-type sausages. *Meat Science* 172, 108318.
- Bae, S.M., Choi, J.H. ve Jeong, J.Y. (2020). Effects of radish powder concentration and incubation time on the physicochemical characteristics of alternatively cured pork products. *Journal of Animal Science and Technology*, 62, 922-932.
- Bou, R., Llauger, M., Jousse, R. ve García-Regueiro, J.A. (2019). Effect of high hydrostatic pressure on the oxidation of washed muscle with added chicken hemoglobin. *Food Chemistry*, 292, 227-236.
- Brewer, S. (2004). Irradiation effects on meat color-a review. *Meat Science*, 68, 1-17.
- Claus, J.R. ve Du, C. (2013). Nitrite-embedded packaging film effects on fresh and frozen beef color development and stability as influenced by meat age and muscle type. *Meat Science*, 95, 526-535.
- Dawson, P.L. ve Acton, J.C. (2018). Impact of proteins on food color. R.Y. Yada (Der.), *Proteins in Food Processing (Second Edition)*, içinde (ss. 559-638). United Kingdom: Woodhead Publishing.
- Feiner, G. (2016). Color in Cured Meat Products and Fresh Meat. Salami, Practical Science and Processing Technology, Academic Press, London, Pages 89-101.
- Hocquette, J.F., Botreau, R., Picard, B., Jacquet, A., Pethick, D.W. ve Scollan, N.D. (2012). Opportunities for predicting and manipulating beef quality. *Meat Science*, 92, 197-209.
- Honikel, K.O. (2008). The use and control of nitrate and nitrite for the processing of meat products. *Meat Science*, 78, 68-76.
- Hughes, J.M., Clarke, F.M., Purslow, P.P. ve Warner, R.D. (2020). Meat color is determined not only by chromatic heme pigments but also by the physical structure and achromatic light scattering properties of the muscle. *Comprehensive Reviews in Food Science and Food Safety*, 19, 44-63.
- Jeong, J.Y., Kim, G.D., Yang, H.S. ve Joo, S.T. (2014). Pigments and Color of Muscle Foods. R.M.S. Cruz, I. Khmelinskii & M.C. Vieira (Der.), *Methods in food analysis* içinde (ss. 44-61). Boca Raton, FL, United States: CRC Press Taylor & Francis Group.
- Jo, K., Lee, S., Yong, H.I., Choi, Y.S ve Jung, S. (2020). Nitrite sources for cured meat products. *LWT - Food Science and Technology*, 129, 109583.
- Kimyaevi.org (2021). Myoglobin ve Hemoglobin. 15 Şubat 2021 tarihinde <http://www.kimyaevi.org/TR/Genel/BelgeGoster.aspx?F6E10F8892433CFF7EE1F1486EE-5030E56CA6B080E9D981A&Vurgulanacak=myoglobin>

- King, N.J., ve Whyte, R. (2006). Does it look cooked? A review of factors that influence cooked meat color. *Journal of Food Science*, 71, R31–R40.
- Kranen, R.W., Kuppevelt, T.H.V., Goedhart, H.A., Veerkamp, C.H., Lambooy, E. ve Veerkamp, J.H. (1999). Processing and Products, Hemoglobin and myoglobin content in muscles of broiler chickens. *Poultry Science*, 78, 467–476.
- Lynch, M.P., Kerry, J.P., Buckley, D.J., Faustman, C. ve Morrissey, P.A. (1999). Effect of dietary vitamin E supplementation on the colour and lipid stability of fresh, frozen and vacuum-packaged beef. *Meat Science*, 52, 95–99.
- Mancini, R.A. ve Hunt, M.C. (2005). Current research in meat color. *Meat Science*, 71, 100–21.
- Maqsood, S., Benjakul, S. ve Kamal-Eldin, A. (2012). Haemoglobinmediated lipid oxidation in the fish muscle: A review. *Trends in Food Science & Technology*, 28, 33-43.
- Møller, J.K.S. ve Skibsted, L.H. (2006). Myoglobins - The link between discoloration and lipid oxidation in muscle and meat. *Química Nova*, 29 (6), 1270-1278.
- Ordway, G.A. ve Garry, D.J. (2004). Myoglobin: an essential hemoprotein in striated muscle. *The Journal of Experimental Biology*, 207, 3441-3446.
- Ozaki, M.M., Munekata, P.E.S., Jacinto-Valderrama, R.A., Efraim, P., Pateiro, M., Lorenzo, J.M., Pollonio, M.A.R. (2021). Beetroot and radish powders as natural nitrite source for fermented dry sausages. *Meat Science*, 171, 108275.
- Öztaş, A. (2003). Et Bilimi ve Teknolojisi. TMMOB Gıda Mühendisleri Odası Yayınları, No:1, Ankara.
- Parthasarathy, D.K. ve Bryan, N.S. (2012). Sodium nitrite: The “cure” for nitric oxide insufficiency. *Meat Science*, 92(3), 274–279.
- Pegg, R.B. ve Honikel, K.O. (2015). Principles of Curing. F. Toldrá (Der.), *Handbook of Fermented Meat and Poultry, Second Edition* içinde (ss. 19-30). United Kingdom: John Wiley & Sons, Ltd.
- Purslow, P.P., Warner, R.D., Clarke, F.M. ve Hughes, J.M. (2020). Variations in meat colour due to factors other than myoglobin chemistry; a synthesis of recent findings (invited review). *Meat Science*, 159, 107941.
- Ramanathan, R., Suman S.P. ve Faustman, C. (2020). Biomolecular Interactions Governing Fresh Meat Color in Postmortem Skeletal Muscle: A Review. *Journal of Agricultural and Food Chemistry*, 68, 12779-12787.
- Renerre, M. (1990). Factors involved in the discoloration of beef meat. *International Journal of Food Science & Technology*, 25, 613–630.
- Sales, J. ve Koukolova, V. (2011). Dietary vitamin E and lipid and color stability of beef and pork: Modeling of relationships. *Journal of Animal Science*, 89, 2836–2848.
- Sebranek, J.G. (2009). Basic curing ingredients. R. Tarté (Der.), *Ingredients in meat products* içinde (ss. 1–23). New York, NY: Springer.
- Šojić, B., Pavlič, B., Tomović, V., Kocić-Tanackov, S., Đurović, S., Zeković, Z., Belović, M., Torbica, A., Jokanović, M., Urumović, N., Vujadinović, D., Ivić, M. ve Škaljac, S. (2020). Tomato pomace extract and organic peppermint essential oil as effective sodium nitrite replacement in cooked pork sausages, *Food Chemistry*, 330, 127202.
- Suman, S.P. ve Joseph, P. (2013). Myoglobin chemistry and meat color. *Annual Review of Food Science and Technology*, 4, 79-99.
- Suman, S.P., Hunt, M.C., Nair, M.N. ve Rentfrow, G. (2014). Improving beef color stability: Practical strategies and underlying mechanisms. *Meat Science*, 98, 490–504.

- Suman, S.P., Nair, M.N., Joseph, P. ve Hunt, M.C. (2016). Factors influencing internal color of cooked meats. *Meat Science*, 120, 133–144.
- Tang, J., Faustman, C., Mancini, R.A., Seyfert, M. ve Hunt, M.C. (2005). Mitochondrial reduction of metmyoglobin: Dependence on the electron transport chain. *Journal of Agricultural and Food Chemistry*, 53, 5449–5455.
- Wideman, N., O'Bryan, C.A. ve Crandall, P.G. (2016). Factors affecting poultry meat colour and consumer preferences - A review. *World's Poultry Science Journal*, 72(2), 353-366.
- Yang, X., Woerner, D.R., Hasty, J.D., McCullough, K.R., Geornaras, I., Sofos, J.N. ve Belk, K.E. (2016). An evaluation of the effectiveness of FreshCase technology to extend the storage life of whole muscle beef and ground beef. *Journal of Animal Science*, 94, 4911–4920.
- Zhu, Y., Guo, L., Yang, Q. (2020). Partial replacement of nitrite with a novel probiotic *Lactobacillus plantarum* on nitrate, color, biogenic amines and gel properties of Chinese fermented sausages. *Food Research International*, 137, 109351.