

6.

MEYVE SEBZELER VE ÜRÜNLERİNDE RENK

Özlem YALÇINÇIRAY¹

1. Giriş:

Beş duyumuz arasında günlük hayatta tercihlerimizi en çok etkileyen duyumuz görme duyumuzdur. Görme duyumuz sayesinde etrafımızdaki hareket ve renkleri algılarız. Ortalama bir insan, 5.000 tanesi beyaz olmak üzere yaklaşık 350.000 kadar farklı rengi ayırt edebilmektedir (Dufossé vd., 2015). Gözlerimizle yarattığımız algımız sayesinde de günlük yaşantımızda kararlar veririz. Her ne kadar gıda tercihlerimiz üzerine etkili pek çok başka faktör bulunsun da bir gıdayı alıp almama, pişirme ve tüketme konusundaki kararlarımıza en etkili olan faktör o gıdanın görünen kalitesidir. Gıdaların tercih edilme sürecine katkıda bulunan faktörlerin en başında da yiyeceklerin şekil, görünüş ve renginin etkileri yer almaktadır (D.B. MacDougall, 2002).

İnsanların sağlıklı beslenebilmeleri için farklı besinleri belirli oranlarda tüketmeleri gerekmektedir. Meyve ve sebzeler düşük enerji, yüksek vitamin, mineral ve lif içerikleri ile hem bağışıklık sistemini güçlendirerek hastalıklara karşı koruma sağlamakta hem de fonksiyonel özellikleriyle sağlığı geliştirmektedir. Meyve ve sebzeler bu etkileri nedeniyle beslenmede önemli bir gıda grubundadır ve Dünya Sağlık Örgütü (WHO) tarafından günlük 4-5 porsiyon meyve ve sebze tüketilmesi gerektiği belirtilmektedir (Sezgin Ceyhun, 2014). Sağlığımız için benzersiz besin kaynağı olan meyve ve sebzeler doğada pek çok farklı renkte

¹ Dr. Öğretim Üyesi İstanbul Arel Üniversitesi Gastronomi ve Mutfak Sanatları Bölümü ozlemyalcinciray@arel.edu.tr

bir etkisi bulunmamaktadır. O₂'nin hücre içi seviyede mevcudiyeti ve diğer oksidazlar için O₂ afinitesi, renk bozulmasında rol oynayabilmektedir (Varoquaux ve Ozdemir, 2005) .

7. Kaynaklar

- Acar, J., ve Gökmen, V. (2007). Fenolik Bileşikler ve Doğal Renk Maddeleri. In İ. Saldamlı (Ed.), *Gıda Kimyası* (3rd ed., pp. 463–496). Hacettepe Üniversitesi Yayınları .
- Adams, J. B. (2010). Effect of enzymatic reactions on color of fruits and vegetables. In *Enzymes in Fruit and Vegetable Processing: Chemistry and Engineering Applications* (pp. 19–43). <https://doi.org/10.1201/9781420094343-c4>
- Artés, F., Mínguez, M. I., ve Hornero, D. (2002). Analysing changes in fruit pigments. In Douglas B. MacDougall (Ed.), *Colour in Food* (pp. 248–275). CRC Press. <https://doi.org/10.1533/9781855736672.2.248>
- Attokaran, M. (2017). Food Colors. In *Natural Food Flavors and Colorants* (pp. 20–22). John Wiley ve Sons, Ltd. <https://doi.org/10.1002/9781119114796.ch5>
- Azeredo, H. M. C. (2009). Betalains: Properties, sources, applications, and stability - A review. *International Journal of Food Science and Technology*, 44(12), 2365–2376. <https://doi.org/10.1111/j.1365-2621.2007.01668.x>
- Barrett, D. M., Beaulieu, J. C., ve Shewfelt, R. (2010). Color, flavor, texture, and nutritional quality of fresh-cut fruits and vegetables: Desirable levels, instrumental and sensory measurement, and the effects of processing. *Critical Reviews in Food Science and Nutrition*, 50(5). <https://doi.org/10.1080/10408391003626322>
- Bee, S. C., ve Honeywood, M. J. (2002). Colour sorting for the bulk food industry. In Douglas B. MacDougall (Ed.), *Colour in Food* (pp. 115–142). CRC Press. <https://doi.org/10.1533/9781855736672.1.115>
- Burns, J., Fraser, P. D., ve Bramley, P. M. (2003). Identification and quantification of carotenoids, tocopherols and chlorophylls in commonly consumed fruits and vegetables. *Phytochemistry*, 62(6). [https://doi.org/10.1016/S0031-9422\(02\)00710-0](https://doi.org/10.1016/S0031-9422(02)00710-0)
- Carrillo-López, A., ve Yahia, E. M. (2018). Betalains: Chemistry and biological functions. In E. M. Yahia (Ed.), *Fruit and Vegetable Phytochemicals: Chemistry and Human Health: Second Edition* (Second Edition, Vol. 1, pp. 383–392). Willey Blackwell Publishing. <https://doi.org/10.1002/9781119158042.ch17>
- Celli, G. B., ve Brooks, M. S. L. (2017). Impact of extraction and processing conditions on betalains and comparison of properties with anthocyanins — A current review. *Food Research International*, 100. <https://doi.org/10.1016/j.foodres.2016.08.034>
- Cemeroğlu, B., Yemencioğlu, A., ve Özkan, M. (2004). Meyve ve Sebzelerin Bileşimi . In B. Cemeroğlu (Ed.), *Meyve Sebze İşleme Teknolojisi* (2nd ed., Vol. 1, pp. 1–188). Gıda Teknolojisi Derneği Yayınları.
- Chen, C. (2015). Overview of plant pigments. In *Pigments in Fruits and Vegetables* (pp. 1–7). https://doi.org/10.1007/978-1-4939-2356-4_1
- Clement, J. S., ve Mabry, T. J. (1996). Pigment evolution in the caryophyllales: A systematic overview. In *Botanica Acta* (Vol. 109, Issue 5, pp. 360–367). <https://doi.org/10.1111/j.1438-8677.1996.tb00584.x>

- Daood, H. G. (2003). CHLOROPHYL. In B. Caballero (Ed.), *Encyclopedia of Food Sciences and Nutrition* (Second Edition). Elsevier. <https://doi.org/10.1016/B0-12-227055-X/00220-0>
- Daun, H. (2005). Produce Color and Appearance. In O. Lamikanra ve S. H. Imam (Eds.), *Produce Degradation: Pathways and Prevention* (pp. 191–221). CRC Press. <https://doi.org/10.1201/9781420039610>
- Delgado-Vargas, F., Jiménez, A. R., Paredes-López, O., ve Francis, F. J. (2000). Natural pigments: Carotenoids, anthocyanins, and betalains - Characteristics, biosynthesis, processing, and stability. *Critical Reviews in Food Science and Nutrition*, 40(3). <https://doi.org/10.1080/10408690091189257>
- Dufossé, L., Fernández-López, J., Galaup, P., ve Pérez-Alvarez, J. (2015). Color Measurements of Muscle-Based and Dairy Foods. In *Handbook of Food Analysis, Third Edition - Two Volume Set: Vol. Volume 1* (pp. 3–19). <https://doi.org/10.1201/b18668-3>
- Esquivel, P. (2016). Betalains. In C. Reinhold ve S. Ralf M. (Eds.), *Handbook on Natural Pigments in Food and Beverages* (pp. 81–99). Elsevier. <https://doi.org/10.1016/B978-0-08-100371-8.00004-X>
- Finley, J. W., deMan, J. M., ve Lee, C. Y. (2018). Color and Food Colorants. In *Principles of Food Chemistry* (fourth edition, pp. 253–283). https://doi.org/10.1007/978-3-319-63607-8_6
- Hatlestad, G. J., ve Lloyd, A. (2015). The betalain secondary metabolic network. In C. Chen (Ed.), *Pigments in Fruits and Vegetables* (pp. 127–140). Springer. https://doi.org/10.1007/978-1-4939-2356-4_6
- Hutchings, J. (2002). The perception and sensory assessment of colour. In Douglas B. MacDougall (Ed.), *Colour in Food* (pp. 9–32). CRC Press. <https://doi.org/10.1533/9781855736672.1.9>
- İnanç, A. L. (2011). Chlorophyll: Structural Properties, Health Benefits and Its Occurrence in Virgin Olive Oils. *Akademik Gıdatr (A.L. İnanç)*, 9(2), 26–32.
- Kammerer, D. R. (2016). Anthocyanins. In C. Reinhold ve S. Ralf M. (Eds.), *Handbook on Natural Pigments in Food and Beverages* (pp. 61–80). Elsevier. <https://doi.org/10.1016/B978-0-08-100371-8.00003-8>
- Khan, M. I., ve Giridhar, P. (2015). Plant betalains: Chemistry and biochemistry. *Phytochemistry*, 117, 267–295. <https://doi.org/10.1016/j.phytochem.2015.06.008>
- Khoo, H. E., Prasad, K. N., Kong, K. W., Jiang, Y., ve Ismail, A. (2011). Carotenoids and their isomers: Color pigments in fruits and vegetables. In *Molecules* (Vol. 16, Issue 2, pp. 1710–1738). <https://doi.org/10.3390/molecules16021710>
- Kidmose, U., Edelenbos, M., Nørbæk, R., ve Christensen, L. P. (2002). Colour stability in vegetables. In Douglas B. MacDougall (Ed.), *Colour in Food* (pp. 179–232). CRC Press. <https://doi.org/10.1533/9781855736672.2.179>
- MacDougall, D.B. (2002). Introduction. In Douglas B. MacDougall (Ed.), *Colour in Food* (pp. 1–6). CRC Press. <https://doi.org/10.1533/9781855736672.1>
- Manchali, S., Chidambara Murthy, K. N., Nagaraju, S., ve Neelwarne, B. (2012). Stability of betalain pigments of red beet. In *Red Beet Biotechnology: Food and Pharmaceutical Applications* (pp. 55–74). https://doi.org/10.1007/978-1-4614-3458-0_3
- Manickam, S., ve Pare, A. (2019). Effects of Enzymes on Processing of Fruits and Vegetables. In K. A. Khan, M. R. Goyal, ve A. A. Kalne (Eds.), *Processing of Fruits and Vegetables* (1st edition, pp. 23–36). Apple Academic Press. <https://doi.org/10.1201/9780429505775-3>

- Manolopoulou, E., ve Varzakas, T. (2020). Minimally Processed (Fresh-Cut) Fruits and Vegetables: Production, Quality, and Safety. In *Handbook of Food Processing, Two Volume Set* (Vol. 2, pp. 231–282). <https://doi.org/10.1201/b19840-47>
- Maoka, T. (2020). Carotenoids as natural functional pigments. In *Journal of Natural Medicines* (Vol. 74, Issue 1, pp. 1–16). <https://doi.org/10.1007/s11418-019-01364-x>
- Mateus, N., ve de Freitas, V. (2008). Anthocyanins as Food Colorants. In C. Winefield, K. Davies, ve K. Gould (Eds.), *Anthocyanins* (pp. 284–304). Springer New York. https://doi.org/10.1007/978-0-387-77335-3_9
- Moldovan, B., ve David, L. (2014). Influence of temperature and preserving agents on the stability of cornelian cherries anthocyanins. *Molecules*, 19(6), 3–15. <https://doi.org/10.3390/molecules19068177>
- Monica Giusti, M., ve Jing, P. (2007). Natural pigments of berries: Functionality and application. In Y. Zhao (Ed.), *Berry Fruit: Value-Added Products for Health Promotion* (pp. 105–146). CRC Press. <https://doi.org/10.1201/9781420006148-9>
- Özcan, M. (2018). Renklerin Tüketimde ve Sağlıkta Önemi. *Black Sea Journal of Agriculture*, 1(3), 83–88.
- Paciulli, M., Palermo, M., Chiavaro, E., ve Pellegrini, N. (2017). Chlorophylls and colour changes in cooked vegetables. In *Fruit and Vegetable Phytochemicals: Chemistry and Human Health: Second Edition* (Vol. 1, pp. 703–719). <https://doi.org/10.1002/9781119158042.ch31>
- Pareek, S., Sagar, N. A., Sharma, S., Kumar, V., Agarwal, T., González-Aguilar, G. A., ve Yahia, E. M. (2017). Chlorophylls: Chemistry and biological functions. In *Fruit and Vegetable Phytochemicals: Chemistry and Human Health: Second Edition* (Vol. 1, pp. 269–284). <https://doi.org/10.1002/9781119158042.ch14>
- Parihar, A., Grotewold, E., ve Doseff, A. I. (2015). Flavonoid dietetics: Mechanisms and emerging roles of plant nutraceuticals. In *Pigments in Fruits and Vegetables* (pp. 93–126). https://doi.org/10.1007/978-1-4939-2356-4_5
- Petropoulos, S. A., Sampaio, S. L., di Gioia, F., Tzortzakis, N., Roupheal, Y., Kyriacou, M. C., ve Ferreira, I. (2019). Grown to be Blue—Antioxidant Properties and Health Effects of Colored Vegetables. Part I: Root Vegetables. *Antioxidants*, 8(12), undefined. <https://doi.org/10.3390/antiox8120617>
- Razak, U. N. A. A., Taha, R. M., Musa, S. A. N. illa C., ve Mohamed, N. (2017). Detection of betacyanins pigment stability from *Hylocereus polyrhizus* (Weber) Britton ve Rose fruit pulp and peel for possible use as natural coating. *Pigment and Resin Technology*, 46(4). <https://doi.org/10.1108/PRT-11-2016-0104>
- Roca, M., Chen, K., ve Pérez-Gálvez, A. (2016). Chlorophylls. In R. Carle ve R. M. Ralf M. Schweiggert (Eds.), *Handbook on Natural Pigments in Food and Beverages* (pp. 126–158). Elsevier. <https://doi.org/10.1016/B978-0-08-100371-8.00006-3>
- Rodriguez-Amaya, D. B. (2019). Update on natural food pigments - A mini-review on carotenoids, anthocyanins, and betalains. *Food Research International*, 124. <https://doi.org/10.1016/j.foodres.2018.05.028>
- Schieber, A., ve Weber, F. (2016). Carotenoids. In C. Reinhold ve S. Ralf M. (Eds.), *Handbook on Natural Pigments in Food and Beverages* (pp. 101–123). Elsevier. <https://doi.org/10.1016/B978-0-08-100371-8.00005-1>
- Sezgin Ceyhun, A. (2014). Meyve Sebze ve Sağlıkımız (Fruit, Vegetable and our Health). *Journal of Tourism and Gastronomy Studies*, 2(2), 46–51.

- Singh, B., Suri, K., Shevkani, K., Kaur, A., Kaur, A., ve Singh, N. (2018). Enzymatic browning of fruit and vegetables: A review. In *Enzymes in Food Technology: Improvements and Innovations* (pp. 63–78). https://doi.org/10.1007/978-981-13-1933-4_4
- Solovchenko, A., Yahia, E. M., ve Chen, C. (2019). Pigments. In E. M. Yahia (Ed.), *Postharvest Physiology and Biochemistry of Fruits and Vegetables* (pp. 225–252). Elsevier. <https://doi.org/10.1016/B978-0-12-813278-4.00011-7>
- Sturm, B., ve Hensel, O. (2017). Pigments and nutrients during vegetable drying processes, dried products storage, and their associated color changes. In *Handbook of Drying of Vegetables and Vegetable Products* (pp. 257–276). <https://doi.org/10.4324/9781315152677>
- Tanaka, Y., Sasaki, N., ve Ohmiya, A. (2008). Biosynthesis of plant pigments: Anthocyanins, betalains and carotenoids. In *Plant Journal* (Vol. 54, Issue 4, pp. 733–749). <https://doi.org/10.1111/j.1365-313X.2008.03447.x>
- Tzia, C., Giannou, V., Lignou, S., ve Lebesi, D. (2015). Sensory evaluation of foods. In *Handbook of Food Processing: Food Safety, Quality, and Manufacturing Processes*. <https://doi.org/10.1201/b19398>
- Vaclavik, V. A., Christian, E. W., ve Campbell, T. (2021). Vegetables and Fruits. In *Essentials of Food Science* (5th Edition, pp. 89–119). Springer, Cham. https://doi.org/10.1007/978-3-030-46814-9_7
- Varoquaux, P., ve Ozdemir, I. S. (2005). Packaging and produce degradation. In O. Lamiakananra, S. H. Imom, ve D. O. Ukuku (Eds.), *Produce Degradation: Pathways and Prevention* (pp. 117–154). Taylor ve Francis. <https://doi.org/10.1201/9781420039610.ch5>
- Wahyuningsih, S., Wulandari, L., Wartono, M. W., Munawaroh, H., ve Ramelan, A. H. (2017). The Effect of pH and Color Stability of Anthocyanin on Food Colorant. *IOP Conference Series: Materials Science and Engineering*, 193(1). <https://doi.org/10.1088/1757-899X/193/1/012047>