UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

VI.DAFTAR PUSTAKA

Allard, R. W. 1960. Principles of Plant Breeding. New York: John Wiley & Sons.

Aryani, R. D., Basuki, I. F., Budisantoso, I., & Widyastuti, A. 2022. Pengaruh ketinggian tempat terhadap pertumbuhan dan hasil tanaman cabai rawit (*Capsicum frutescens* L.). *Agriprima: Journal of Applied Agricultural Sciences* 6(2): 202–211. https://doi.org/10.25047/agriprima.v6i2.180

Arakawa, O., Hori, Y., & Ogata, R. 1985. Relative effectiveness and interaction of ultraviolet and blue light in anthocyanin synthesis of apple fruit. *Scientia Horticulturae* 27(1-2):21–27.

Abdel-Aal, E. S. M., Young, J. C., & Rabalski, I. 2006. Anthocyanin composition in black, blue, pink, purple, and red cereal grains. Journal of Agricultural and Food Chemistry 54(13): 4696–4704. https://doi.org/10.1021/jf0606609.

Ahmed, M., Khan, M. A., & Khan, M. N. 2014. Genetic diversity analysis in chili (*Capsicum annuum* L.) genotypes using RAPD markers. Pakistan Journal of Agricultural Sciences 51(2): 327–331.

Anilkumar, A., Mohan Rao, S., Ramesh, B., Bhavani, & Pranesh, G. 2020. Evaluation of chili pepper (*Capsicum annuum* L.) genotypes for yield and quality traits. International Journal of Current Microbiology and Applied Sciences 9(5): 1234–1240.

Andrews, J. 2008. Peppers: The Domesticated Capsicums (2nd ed.). University of Texas Press.

Aza-González C, H Núñez-Palenius, N Ochoa-Alejo. 2012. Molecular biology of chili pepper anthocyanin biosynthesis. J Mex. Chem. Soc. 56:93–98

Aza-Gonzalez C, Herrera-Isidron L, Núñez-Palenius HG, Martínez De La Vega O, Ochoa-Alejo N. 2013. Anthocyanin accumulation and expression analysis of biosynthesis-related genes during chili pepper fruit development. Biol. Plant. 57:49–55.

Apridamayanti, P., Pratiwi, R., Purwestri, Y. A., Sri Tunjung, W. A., & Rumiyati, R. 2018. Anthocyanin, nutrient contents, and antioxidant activity of black rice bran of *Oryza sativa* L. "*Cempo Ireng"* from Sleman, Yogyakarta, Indonesia. Indonesian Journal of Biotechnology 22(1):49. https://doi.org/10.22146/ijbiotech.26401

Harloff, H. J., Lemcke, S., Mittasch, J., Frolov, A., Wu, J. G., Dreyer, Dreyer, F. Leckband,G. and Jung, C.2012. A mutation screening platform for rapeseed (*Brassica napus* L.) and the detection of sinapine biosynthesis mutants. Theoretical and Applied Genetics, 124(5): 957-969.

Azuma, A., Kobayashi, S., Mitani, N., Shiraishi, M., Yamada, M., Ueno, T., Kono, A., Yakushiji, H., & Koshita, Y. 2008. Genomic and genetic analysis of Myb-related genes that regulate anthocyanin biosynthesis in grape berry skin. Theoretical and Applied Genetics. 117(6): 1009–1019

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Barchenger, D. W., & Bosland, P. W. 2016. Exogenous applications of capsaicin inhibit seed germination of Capsicum annuum. Scientia Horticulturae 203: 29–31. https://doi.org/10.1016/j.scienta.2016.03.011

Badiaraja, B., Kumar, R., & Singh, P. 2021. Morphological and molecular characterization of chili genotypes. Journal of Horticultural Research 29(2): 45–52.

Barboza, G. E., García, C. C., de Bem Bianchetti, L., Romero, M. V., & Scaldaferro, M. 2022. Monograph of wild and cultivated chili peppers (*Capsicum L., Solanaceae*). PhytoKeys, 200, 1.

Barchenger, D. W., Bosland, P. W., & Hilaire, R. S. (2019). Genetic resources of Capsicum. *Horticultural Reviews*, 47, 1–53. https://doi.org/10.1002/9781119625407.ch1.

Barchi, L., Bonnet, J., Boudet, C., Signoret, P., Nagy, I., Lanteri, S.& Lefebvre, V. 2007. A high-resolution, intraspecific linkage map of pepper (*Capsicum annuum* L.) and selection of reduced recombinant inbred line subsets for fast mapping. Genome 50(1); 51-60.

Barchi, L., Lanteri, S., Portis, E., Acquadro, A., Valè, G., & Volante, A.2012. *A RAD* tag derived marker based eggplant linkage map and the location of QTLs determining anthocyanin pigmentation. *PLoS ONE,* *7*(4): e43740. https://doi.org/10.1371/journal.pone.0043740.

Barlow, D. P., & Bartolomei, M. S. 2014. Genomic imprinting in mammals. Cold Spring Harbor perspectives in biology, 6(2), a018382.

Basílio, N., & Pina, F. 2016. Chemistry and photochemistry of anthocyanins and related compounds: a thermodynamic and kinetic approach. Molecules, 21(11): 1502.

Basuki, I. F. 2021. Pengaruh ketinggian tempat terhadap pertumbuhan dan hasil tanam cabai rawit *(Capsicum frutescens L.)* (Skripsi, Universitas Jenderal Soedirman). Universitas Jenderal Soedirman Repository. https://repository.unsoed.ac.id/11503/

Benvenuti, S., Bortolotti, E., and Maggini, R. 2016. Antioxidant power, anthocyanin content and organoleptic performance of edible flowers. Scientia Horticulturae 199: 170-177.

Birky, C. W., Jr. 1995. Uniparental inheritance of mitochondrial and chloroplast genes: Mechanisms and evolution. Proceedings of the National Academy of Sciences of the United States of America *92*(25): 11331–11338. https://doi.org/10.1073/pnas.92.25.11331

Borovsky, Y., M. Oren-Shamir, R. Ovadia, W. deJong, and I. Paran. 2004. The A locus that controls anthocyanin accumulation in pepper encodes a MYB transcription factor homologous to Anthocyanin2 of Petunia. Theor. Appl. Genet. 109:23–29.

Borovsky, Y., Tadmor, Y., Bar, E., Meir, A., Lewin- sohn, E., and Paran, I. 2013. Induced mutation in β-Carotene hydroxylase results in accumulation of β-carotene and conversion of red to orange color in fruit of the pepper. Theor. Appl.Genet. vol. 126, p. 557. https://doi.org/10.1007/s00122-012-2001-9.

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Bosland, P. W. 1993. An effective plant field cage to increase the production of genetically pure chile *(Capsicum spp.) seed*. *HortScience 28*(10): 1053. https://doi.org/10.21273/HORTSCI.28.10.1053

Bosland, P. W., & Votava, E. J. 2012. Peppers: Vegetable and Spice Capsicums (2nd ed.). CABI Publishing.

Brand, M. H., Connolly, B. A., Levine, L. H., Richards, J. T., Shine, S. M., & Spencer, L. E. 2017. Anthocyanins, total phenolics, ORAC and moisture content of wild and cultivated dark-fruited Aronia species. Scientia Horticulturae 224, 332-342.

Brounp. 2005. Transcriptional control of flavonoid biosynthesis: a complex network of conserved regulators involved in multiple aspects of differentiation in Arabidopsis. Curr. Opin Plant Biol. 8(3): 272-279.

Brouillard, R., Mazza, G., Saad, Z., Albrecht-Gary, A. M., & Cheminat, A. 1989. The copigmentation reaction of anthocyanins: A microprobe for the structural study of aqueous solutions. Journal of the American Chemical Society 111(7): 2604–2610. https://doi.org/10.1021/ja00189a039

Byun, J., Kim, T. G., Lee, J. H., Li, N., Jung, S., & Kang, B.C. 2022. Identification of CaAN3 as a fruit-specific regulator of anthocyanin biosynthesis in pepper (*Capsicum annuum*). Theoretical and Applied Genetics, 135(7): 2197–2211

Cahyanti, D. 2006. Pengaruh suhu dan pH terhadap kestabilan antosianin dari bunga rosella (*Hibiscus sabdariffa* L.). Skripsi, Universitas Gadjah Mada.

Chalker-Scott, L. 1999. Environmental significance of anthocyanins in plant stress responses. Photochemistry and Photobiology 70(1): 1–9. https://doi.org/10.1111/j.1751-1097.1999.tb01944.xWiley Online Library+2

Cazassa, T., Silva, A. R., & Oliveira, M. 2019. Antioxidant activity and phenolic compounds in chili peppers (*Capsicum* spp.) from Brazil. Journal of Food Biochemistry 43(1): e12700.

Cevallos-Casals, B. A., & Cisneros-Zevallos, L. 2003. Stoichiometric and kinetic studies of phenolic antioxidants from Andean purple corn and red-fleshed sweetpotato. Journal of Agricultural and Food Chemistry 51(11): 3313–3319. https://doi.org/10.1021/jf034109c.

Chem, F. 2002. Anthocyanins from Black Currants (*Ribes nigrum* L.). 3228–3231. https://doi.org/10.1021/jf011581u.

Cheynier, V., Comte, G., Davies, K. M., Lattanzio, V., & Martens, S. 2013. Plant phenolics: recent advances on their biosynthesis, genetics, and ecophysiology. Plant Physiology and Biochemistry 72:1–20. https://doi.org/10.1016/j.plaphy.2013.05.009.

Christiana,A.L. 1996. Pewarisan sifat ketahanan kedelai terhadap serangan *Ophiomya phaseoli* Tryon di dalam kurungan kasa. Skripsi. Universitas Padjajaran. Bandung.

Crowder, L.V. 1997. Genetika Tumbuhan. Diterjemahkan oleh Lilik Kusdiarti dan Sutarso. Gadjah Mada University Press. Yogyakarta. 499p.

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Dawson, J. C., & Goldringer, I. (2012). Breeding for genetically diverse populations: Variety mixtures and evolutionary breeding populations. *Breeding for diversity*, 103–134.m

Dascalov, S. 1998. Capsicum. Dalam: Banga, S.S., Banga, S.K.,editor. Hybrid Cultivar Development. Nalosa Publishing House. New Delhi. 498-511p.

de Melo, P. C. T. 2011. Genetic improvement of vegetables: development of open-pollinated cultivars. Crop Breeding and Applied Biotechnology, 11: 93-94

Deyto, R. C., & Cervancia, C. R. 2022. Floral biology and pollination of red hot F1 hybrid hot pepper (*Capsicum frutescens* x *Capsicum annuum*) in The Philippines. Philippine Agricultural Scientist, 105(2), 135-148.

Debes, M. M., Krieger, C., & Raskin, I. 2013. Metabolic engineering of anthocyanin biosynthesis in plants. Plant Biotechnology Journal 11(3): 325–336.

Deshpande, R. B. 1935. Studies in Indian chillies. III. The inheritance of some characters in *Capsicum annuum* L. Indian Journal of Agricultural Sciences 5: 219–300.

Djarwaningsih, T. 2005. Capsicum spp.(Cabai): Asal. Persebaran dan Nilai Ekonomi. Biodiversitas, 6(4), 292-296.

Dhamayanthi, K. P. M. And Reddy, V. R. K., 2001, Transfer of clustered and upright fruit characters into two popular chilli cultivars of Tamil Nadu. J. Spices Aromatic Crops, 10 (1): 41 - 43.

Escoto-Sandoval, C., Ochoa-Alejo, N., & Martínez, O. 2021. Transcriptomic analysis of a wild and a cultivated varieties of *Capsicum annuum* during fruit development. *PLOS ONE*, 16(8): e0256319. https://doi.org/10.1371/journal.pone.0256319.

Falconer, D. S., & Mackay, T. F. C. 1996. Introduction to quantitative genetics (4th ed.). Longman. ISBN 0582243025.

Fufa, H., Baenziger, P. S., Beecher, B. S., Graybosch, R. A., Eskridge, K. M., & Nelson, L. A. 2005. Comparison of phenotypic versus marker-assisted selection for grain yield in winter wheat. *Crop Science 45*(2): 500–510.

Filyushin, M. A., E. A. Dzhosa, b, A. V. Shchennikovaa, and E. Z. Kochievaa. 2020. Dependence of pepper fruit color on basic pigments ratio and expression pattern of carotenoid and anthocyanin biosynthesis genes. Russian Journal of Plant Physiology. 67(6): 1054–1062.

Gao, J., Dou, Y., Wang, X., Zhang, D., Wei, M., & Li, Y. (2023). Transcriptome analysis reveals the mechanism for blue-light-induced biosynthesis of delphinidin derivatives in harvested purple pepper fruit. Frontiers in Plant Science*, 14*, Article 1289120. https://doi.org/10.3389/fpls.2023.1289120.

Gordon, J. J., Griesbach, R. J., Novotny, J. A., Clevidence, B. A., Rao, D. D., & Stommel, J. R. (2008). Effects of anthocyanin and carotenoid combinations on foliage and immature fruit color of *Capsicum annuum* L. *Journal of Heredity, 99*(2), 105–111.

Greenleaf, W.H. 1986. Pepper Breeding in Breeding Vegetable Crops (edited by Mark J. Basset). Vegetable Crops Department University of Florida, Geenesuille. Florida. 134p.

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Griffing, B. 1950. An analysis of quantitative gene action by constant parent regression and related techniques. Genetics 35: 303-321.

Griffith, M., Timonin, M., Wong, A. C. E., Gray, G. R., Akhter, S. R., Saldanha, M., & Moffatt, B. A. 2006. The role of the Arabidopsis ice gene family in cold acclimation. Plant Physiology 141(1): 50–60.

Giusti, M. M., & Wrolstad, R. E. 2001. Anthocyanins: Characterization and measurement with UV–visible spectroscopy. In R. E. Wrolstad (Ed.), Current Protocols in Food Analytical Chemistry (Unit F1.2.1–F1.2.13). John Wiley & Sons. https://doi.org/10.1002/0471142913.faf0102s00

Gould, K. 2009. Functional role of anthocyanins in the leaves of Quintinia serrata A Cunn, J. Exp. Bot. 51: 1107-11.

Grotewold, E. 2006. The genetics and biochemistry of floral pigments. Annual Review of Plant Biology 57:761–780. https://doi.org/10.1146/annurev.arplant.57.032905.105248

Hagiwara, T., K. Hanagata and T. Takano. 1959. Inheritance of fruit colour in *Capsicum annuum*. Jap. J. Breed. 9: 49-50.

Hapshoh, S., Syukur, M., & Wahyu, Y. 2016. Pewarisan karakter kualitatif cabai hias hasil persilangan cabai besar dan cabai rawit. Jurnal Hortikultura, 26(2): 123–130.

Hessayon, D.G. 1993. The House Plant Expert. 5th edition. Transworld Publishing Ltd. Auckland. 256p.

He, J., & Giusti, M. M. 2010. Anthocyanins: Natural colorants with health-promoting properties. Annual Review of Food Science and Technology *1* :163–187. https://doi.org/10.1146/annurev.food.080708.100754

Hichri I, Barrieu F, Bogs J, Kappel C, Delrot S, Lauvergeat V. 2011. Recent advances in the transcriptional regulationof the flavonoid biosynthetic pathway. J Exp Bot. 62(8):2465–83.

Hilmayanti, I., Dewi, W., Murdaningsih, Rahardja, M., Rostini, N., dan Setiamihardja, R. 2006. Pewarisan karakter umur berbunga dan ukuran buah cabai merah (*Capsicum annuum*). Zuriat 17(1): 86-93.

Holton, T. A., & Cornish, E. C. 1995. Genetics and biochemistry of anthocyanin biosynthesis. The Plant Cell 7(7): 1071–1083.

Huang, W., Zhu, Y., Li, C., Sui, Z., & Min, W. 2016. Effect of blueberry anthocyanins malvidin and glycosides on the antioxidant properties in endothelial cells. Oxidative Medicine and Cellular Longevity 2016. https://doi.org/10.1155/2016/1591803.

Hurtado, N. H., Morales, A. L., González-Miret, M. L., Escudero-Gilete, M. L., & Heredia, F. J. 2012. Anthocyanin identification and composition of wild and cultivated Andes berries (*Rubus glaucus* Benth.) from Colombia. Food Research International, 46(1):151–160. https://doi.org/10.1016/j.foodres.2011.11.020

Isnaini, I., Syukur, M., & Yunianti, R. 2020. Identifikasi karakter morfologi dan warna buah pada cabai rawit (*Capsicum frutescens* L.). Jurnal Hortikultura, 30(1): 9–18.

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Jaakola, L., Maatta, K., Pirttila, A. M., Torronen, R., Karenlampi, S., & Hohtola, A. 2002. Expression of genes involved in anthocyanin biosynthesis in relation to anthocyanin, proanthocyanidin, and flavonol levels during bilberry fruit development. Plant Physiology *130*(2): 729–739.

Jaakola, L. 2013. New insights into the regulation of anthocyanin biosynthesis in fruits. Trends in plant science, 18(9): 477-483.

Jaiswal, V., Rawoof, A., Gahlaut, V., Ahmad, I., Chhapekar, S. S., Dubey, M., & Ramchiary, N. 2022. Integrated analysis of DNA methylation, transcriptome, and global metabolites in interspecific heterotic Capsicum F1 hybrid. Iscience, 25(11).

Jiang, Y., Yao, J., Ge, C., Yang, X., Li, Z., & Wang, H. 2016. UDP-glucose: flavonoid 3-O-glucosyltransferase gene is involved in anthocyanin biosynthesis during fruit development in strawberry. **Gene 578**(2): 200–207.

Jones, C. M., Rick, C. M., Adams, D., Jernstedt, J., & Chetelat, R. T. 1991. Cytological characterization of Solanum lycopersicoides introgression lines of tomato. Genome 34(3): 437–443. https://doi.org/10.1139/g91-067

Jeong, H. B., Jang, S. J., Kang, M. Y., Kim, S., Kwon, J. K., & Kang, B. C. 2020. Candidate gene analysis reveals that the fruit color locus C1 corresponds to PRR2 in pepper (*Capsicum frutescens*). Frontiers in Plant Science 11 : 399.

Kabir, M. Y., Nambeesan, S. U., & Díaz-Pérez, J. C. 2023. Mineral nutrients, physiological disorders, postharvest water loss, and PR gene expression in bell pepper (*Capsicum annuum* L.) fruit under shade nets. Journal of Horticultural Research. Advance online publication. https://doi.org/10.2478/johr-2022-0019

Karim, A. N. M. S., Ahmed, S., Talukder, Z. A., Alam, M. K., & Billah, M. M. 2022. Combining ability and heterosis study for grain yield and yield contributing traits of maize (*Zea mays* L.). *Bangladesh Journal of Agricultural Research*, *47*(1), 81-90.

Kamiloglu, S., Capanoglu, E., Grootaert, C., & Camp, J. V. 2015. Anthocyanin absorption and metabolism by human intestinal caco-2 cells-a Review. International Journal of Molecular Sciences 16: 21555 – 21574. ISSN: 1422-0067.

Kearsey, M. J. 1998. The principles of QTL analysis (a minimal mathematics approach). Journal of Experimental Botany, 49(327): 1619-1623.

Kistriyani, L., Ramadhani, A. A., & Resphaty, D. P. 2019. Encapsulation of anthocyanin and flavonoid from watermelon rind *(Citrullus lanatus)* as a natural food preservative. Key Engineering Materials *818*: 50–55. https://doi.org/10.4028/www.scientific.net/KEM.818.50

Kim, S., Park, M., Yeom, S. I., Kim, Y. M., Lee, J. M., Lee, H. A., Seo, E., Choi, J., Cheong, K., Kim, K. T., Jung, K., Lee, G. W., Oh, S. K., Bae, C., Kim, S. B., dan Kang, B. C. 2014. Transcriptome analysis of green and purple fruited pepper provides insight into novel regulatory genes in anthocyanin biosynthesis. Nature Genetics 46(3):270–278. https://doi.org/10.1038/ng.2877

Khoo, H. E., Azlan, A., Tang, S. T., & Lim, S. M. 2017. Anthocyanidins and anthocyanins: Colored pigments as food, pharmaceutical ingredients, and the potential health

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

benefits. Food and Nutrition Research 61(1): 1361779. https://doi.org/10.1080/16546628.2017.1361779

Kocic, B., Filipovic, S., Nikolic, M., and Petrovic, B. 2011. Effects of anthocyanins and anthocyanin-rich extracts on the risk for cancers of the gastrointestinal tract. J. buon 16: 602-608.

Koryati, T., Ningsih, H., Erdiandini, I., Paulina, M., Firgiyanto, R., Junairiah, J., & Sari, V. K.2022). Pemuliaan Tanaman. Yayasan Kita Menulis.

Kondo, S., Ueda, J., & Tamura, F. 2014. Light-controlled flavonoid biosynthesis in fruits. Frontiers in Plant Science 5:534. https://doi.org/10.3389/fpls.2014.00534

Kusandriani, Y. 1996. Botani Tanaman Cabai Merah. Dalam A.S. Duriat, A.Widjaja, W. Hadisoeganda, T.A. Soetiarso, L. Prabaningrum (eds). Teknologi Produksi Cabai Merah. Balai Penelitian Tanaman Sayuran. Lembang. 20-26p.

Kusandriani, Y. dan Permadi, A.H. 1996. Pemuliaan Tanaman Cabai. Dalam A.S. Duriat, A.Widjaja, W.Hadisoeganda, T.A. Soetiarso, L.Prabaningrum (eds). Teknologi Produksi Cabai Merah. Balai Penelitian Tanaman Sayuran. Lembang. 27-35p.

Kumar, O. A., & Tata, S. S. 2009. Ascorbic acid contents in chili peppers (*Capsicum* L.). Notulae Scientia Biologicae 1(1): 50-52.

Kumawat, S., Rana, N., Bansal, R., Vishwakarma, G., Mehetre, S. T., Das, B. K., Kumar, M., Kumar Yadav, S., Sonah, H., Sharma, T. R., & Deshmukh, R. 2019. *Expanding avenue of fast neutron mediated mutagenesis for crop improvement*. *Plants (Basel)*, 8(6):164. https://doi.org/10.3390/plants8060164

Kobayashi S, Yamamoto N.G., Hirochika H. Association of VvmybA1 gene expression with anthocyanin production in grape (*Vitis vinifera*) skincolor mutants. 2016. Hortic Sci. 74:196–203.

Koes, R., Quattrocchio, F., & Mol, J. (2005). The flavonoid biosynthetic pathway in plants: function and evolution. BioEssays, 27(2):123–132.

Kwon, Y., Oh, J. E., Noh, H., Hong, S.-W., Bhoo, S. H., & Lee, H. 2011. The ethylene signaling pathway has a negative impact on sucrose-induced anthocyanin accumulation in Arabidopsis. Journal of Plant Research *124*(1):193–200. https://doi.org/10.1007/s10265-010-0354-1

Kraaijveld, R., Lammerts van Bueren, E. T., Löschmann, T., van Veen, J., & van Eekeren, N. 2020. Capturing genetic diversity from open-pollinated varieties for hybrid breeding. *Sustainability, 12*(5): 2138.

Lee, J., Durst, R. W., & Wrolstad, R. E. 2008. Impact of juice processing on blueberry anthocyanins and polyphenolics: Comparison of two pretreatments. Journal of Food Science, 73(5):H223–H230. https://doi.org/10.1111/j.1750-3841.2008.00757.x

Lee, M., Runkle, E. S., & Kelly, K. A. 2023. Ultraviolet A and blue light transiently regulate total phenolic and anthocyanin concentrations in indoor-grown red-leaf lettuce. HortScience *58*(12):1595–1602. https://doi.org/10.21273/HORTSCI16174-23.

León-Chan, R. G., Lightbourn-Rojas, L. A., López-Meyer, M., Amarillas, L., Heredia, J. B., Martínez-Bastidas, T. F. & León-Félix, J. 2020. Differential gene expression of

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

anthocyanin biosynthetic genes under low temperature and ultraviolet-B radiation in bell pepper (*Capsicum annuum*). Int. J. Agric. Biol.23: 501-508.

Lestari, D. A., Kusuma, A. M., & Santosa, D. A. 2014. Genetic diversity of chili pepper (*Capsicum annuum* L.) genotypes based on RAPD markers. Indonesian Journal of Agricultural Science, 15(1): 1–8. https://doi.org/10.21082/ijas.v15n1.2014.p1–8

Li, Z., Wang, S., Gui, X.L., Chang, X.B., and Gong, Z.H. 2013. A further analysis of the relationship between yellow ripe fruit color and the capsanthin-capsorubin synthase gene in pepper (*Capsicum* sp.) indicated a new mutant variant in C. annuum and a tandem repeat structure in promoter region, PLoS ONE.

Li, T., Yamane, H., and Tao, R. 2021. Preharvest long-term exposure to UV-B radiation promotes fruit ripening and modifies stage-specific anthocyanin metabolism in highbush blueberry. *Horticulture Research,* *8*(1), 67. https://doi.org/10.1038/s41438-021-00503-4.

Li, J., Wu, K., Li, L., Chen, Y., Chen, J., & Chen, G. 2023. Transcriptomic analysis reveals biosynthesis genes and transcription factors related to leaf anthocyanin biosynthesis in *Aglaonema commutatum*. BMC Genomics *24*. Article 28. https://doi.org/10.1186/s12864-022-09107-1.

Lippman, Z. B., & Zamir, D. 2007. Heterosis: revisiting the magic. Trends in Genetics *23*(2): 60–66. https://doi.org/10.1016/j.tig.2006.12.006

Liu,Y.,Tikunov,Y.,Schouten, R.E.,and Marcelis,L.F.M., Visser, R.G.F., and Bovy, A. 2018. Anthocyanin biosynthesis and degradation mechanisms in Solanaceous vegetables: A review, Front. Chem. 6. p. 52. https://doi.org/10.3389/fchem.2018.00052.

Lightbourn, G. J., Griesbach, R. J., Novotny, J. A., Clevidence, B. A., Rao, D. D., Stommel, J. R. 2007. Effects of anthocyanin and carotenoid combinations on foliage and immature fruit color of *Capsicum annuum* L. Journal of Heredity 98(6): 442–450. https://doi.org/10.1093/jhered/esm068

Lightbourn, G.J., J.R. Stommel dan R.J. Griesbach. 2008. Epistatic interaction influencing antosianin gene expression in *Capsicum annuum*. J. Amer. Soc. Hort. Sci. 132(6): 824-829.

Liu, Y., Tikunov, Y., Schouten, R. E., Marcelis, L. F. M., Visser, R. G. F., & Bovy, A. G. 2018. Anthocyanin biosynthesis and degradation mechanisms in Solanaceous vegetables: A review. Frontiers in Chemistry, 6, 52. https://doi.org/10.3389/fchem.2018.00052.

Liu, Y. 2016. Functional characterization of R2R3-MYB transcription factors in anthocyanin biosynthesis. Dissertation.

Lin, Y. T., & Potter, J. D. 2016. Anthocyanins: Chemical properties and health benefits. In Watson, R. R., & Preedy, V. R. (Eds.), Bioactive Food as Dietary Interventions for Cardiovascular Disease (2nd ed., pp. 89–100). Academic Press.

Livak, K. J., & Schmittgen, T. D. 2001. Analysis of relative gene expression data using real-time quantitative PCR and the $2^{-\Delta\Delta CT}$ method. Methods, 25(4), 402–408. https://doi.org/10.1006/meth.2001.1262

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Lippert, L. F., et al. 1965. Inheritance of fruit color in *Capsicum frutescens*. Proceedings of the American Society for Horticultural Science, 86, 461–468.

Lukitasari, D. M., Indrawati, R., Chandra, R. D., & Limantara, L. 2017. Mikroenkapsulasi Pigmen Dari Kubis Merah: Studi Intensitas Warna Dan Aktivitas Antioksidan. Journal of Food Technology & Industry/Jurnal Teknologi & Industri Pangan, 28(1): 1-19.

Lönnig, W. E., & Saedler, H. 2001. Chromosome rearrangements and transposable elements. Annual Review of Genetics, 35(1): 301–333.

Ma, X., Qiao, Y., Li, W., Yu, M., & Gong, Z. 2022. Molecular insights into the anthocyanin biosynthesis pathway in chili pepper (*Capsicum* spp.): A review. Frontiers in Plant Science 13: 876541.

Mangoendidjojo, W. 2003. Dasar-Dasar Pemuliaan Tanaman. Kanisius. Yogyakarta. 182p.

Martínez, O. 2021. Functional genomics and transcriptional regulation of secondary metabolites in plants. Dissertation.

Matus, J. T., Aquea, F., & Arce-Johnson, P. 2009. A group of grapevine MYBA transcription factors interacts with basic helix-loop-helix proteins to activate anthocyanin biosynthesis. The Plant Journal 57(6):980–995. https://doi.org/10.1111/j.1365-313X.2008.03746.x

Meng, Y., Zhang, H., Fan, Y., & Yan, L. 2022. Anthocyanin accumulation analysis of correlated genes by metabolome and transcriptome in green and purple peppers (*Capsicum annuum*). BMC Plant Biology, 22. https://doi.org/10.1186/s12870-022-03746-y.

Mekapogu, M., Vasamsetti, B. M. K., Kwon, O. K., Ahn, M. S., Lim, S. H., & Jung, J. A. 2020. Anthocyanins in floral colors: biosynthesis and regulation in chrysanthemum flowers. International journal of molecular sciences, 21(18): 6537.

Micke, A. (2011). Strategies for utilization of open-pollinated varieties in plant breeding. *Plant Breeding Reviews, 35*, 79–94.

Modesto, J., E. N., Martins, M. G., Pereira, G. A., Chisté, R. C., & Pena, R. d. S. 2023. Stability kinetics of anthocyanins of grumixama berries *(Eugenia brasiliensis Lam.)* during thermal and light treatments. Foods, 12(3), 565. https://doi.org/10.3390/foods12030565

Moriwaki, S., Suzuki, K., Muramatsu, M., Nomura, A., Inoue, F., Into, T., Yoshiko, Y., & Niida, S. 2014. Delphinidin, one of the major anthocyanidins, prevents bone loss through the inhibition of excessive osteoclastogenesis in osteoporosis model mice. PLoS ONE 9(5). https://doi.org/10.1371/journal.pone.0097177.

Moscone, E. A., Scaldaferro, M. A., Grabiele, M., Cecchini, N. M., Sanchez García, Y., Jarret, Davina, J.R., Ducasse, D.A., Barboza, G.E., and& Ehrendorfer, F. 2007. The evolution of chili peppers (*Capsicum*-Solanaceae): a cytogenetic perspective. In VI International Solanaceae Conference: Genomics Meets Biodiversity 745: 137-170.

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Movahed, N., Pastore, J. J., & Collakova, E. 2016. Developmental regulation of anthocyanin biosynthesis and the role of MYB transcription factors in Solanaceae. Plant Cell Reports 35(4): 773–786.

Munos, S., Ranc, N., Botton, E., Bérard, A., Rolland, S., Duffé, P. & Causse, M. 2011. Increase in tomato locule number is controlled by two SNPs located near WUSCHEL1 and CLAVATA3. PLoS Genetics 7(9): 1002344.

Murti, R. H., & Trisnowati, M. 2001. Pemuliaan tanaman hortikultura. Jakarta: Penebar Swadaya.

Murti, R. H., Trisnowati, M., & Hidayat, A. 2000. Evaluasi galur cabai merah berdasarkan sifat agronomi dan morfologi buah. Jurnal Hortikultura 10(2):123–129.

Murti, R. H., Trisnowati, M., & Sutarno, H. 2004. Variabilitas morfologi dan agronomi genotipe cabai merah lokal Indonesia. Jurnal Hortikultura 14(3): 178–185.

Naik, M., Patil, A. A., Gasti, V. D., Shirol, A. M., & Mulge, R. 2010. Variability studies in chilli (*Capsicum annuum* L.). Karnataka Journal of Agricultural Sciences 23(2): 252–255. https://epubs.icar.org.in/index.php/KJAS/article/view/15536

Nakatsuka, T., Nishihara, M., Mishiba, K., & Yamamura, S. 2005. Temporal expression of flavonoid biosynthesis-related genes regulates flower pigmentation in gentian plants. Plant Science 168(6): 1309–1318. https://doi.org/10.1016/j.plantsci.2005.01.009 en.wikipedia.org+12

Napitupulu, D., & Damanhuri, E. 2018. Karakterisasi fenotipik dan genetik cabai rawit lokal. Jurnal Agroteknologi Tropika, 6(1): 17–25.

Nasir, M. 2001. Analisis Data. Ghalia Indonesia.307p.

Naktuinbouw. 2010. Descriptors for Capsicum spp. Netherlands Inspection Service for Horticulture.

Naves, E. R., Scossa, F., Araújo, W. L., Nunes-Nesi, A., Fernie, A. R., & Zsögön, A. 2022. Plant secondary metabolism: diversity, function, and regulation. Frontiers in Plant Science 13: 876442. https://doi.org/10.3389/fpls.2022.876442.

Navhale, G. R., Dalvi, S. D., Wakode, B. D., Bhave, S. G., & Burondkar, M. M. 2017. Biochemical characterization of anthocyanin pigment in fruit skin of mango (*Mangifera indica* L.). Indian Journal of Agricultural Sciences 87(7): 927–930.

Nwofia, G. E., Ojimelukwe, P., & Eji, C. 2014. Chemical composition of leaves, fruit pulp and seeds in some *Carica papaya* (L.) morphotypes. International Journal of Medicinal and Aromatic Plants *2*(1): 200–206.

Niu, J., Zhang, Y., Tian, Y., Chen, C., & Fang, Z. 2017. Identification and expression analysis of MYB transcription factors related to anthocyanin biosynthesis in pepper (*Capsicum annuum* L.). Frontiers in Plant Science 8: 2129.

Anonim. 2024. https://www.nuevoestilo.es/recetas-trucos-cocina/a61283784/pimientos-chiles-variedades/Diakses 26 Agustus 2024.

Oancea, S. 2011. Anthocyanins, from Biosynthesis in Plants to Human Health Benefits. Romania. University of Sibiu.

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Onus, A. N., & Pickersgill, B. 2004. Unilateral incompatibility in Capsicum (Solanaceae): occurrence and taxonomic distribution. *Annals of botany* 94(2): 289-295.

Oren-Shamir, M. 2009. Does anthocyanin degradation play a significant role in determining pigment concentration in plants. Plant Science 177(4): 310–316.

Ovando, C. A., de Carvalho, J. E. U., Pereira, M. G., & Ribeiro, C. S. C. 2009. Anthocyanin characterization in pepper (*Capsicum* spp.) genotypes. Acta Horticulturae, 841: 223–228.

Oktarisna, F.A., A. Soegianto dan A.N. Sugiharto. 2013. Pola Pewarisan Sifat Warna Polong Pada Hasil Persilangan Tanaman Buncis (*Phaseolus vulgaris* L.) Varietas Introduksi dengan Varietas Lokal. Jurnal Produksi Tanaman 2(1): 81-89.

Passeri V, Koes R, Quattrocchio FM. 2016. New challenges for the design of high value plant products: stabilization of anthocyanins in plant vacuoles. Front Plant Sci 7:153 Hichri I, Barrieu F, Bogs J, Kappel C, Delrot S, Lauvergeat V. Recent advances in the transcriptional regulation of the flavonoid biosynthetic pathway. J Exp Bot. 2011.62(8):2465–83.

Paran, I., & Van der Knaap, E. 2007. Genetic and molecular regulation of fruit and plant domestication traits in tomato and pepper. Journal of experimental botany 58(14): 3841-3852.

Peterson, R. L. 1959. Seed dormancy and germination in wild species of tomato. Botanical Gazette 121(2): 77–83.

Petroni, K., & Tonelli, C. 2011. Recent advances on the regulation of anthocyanin synthesis in reproductive organs. Plant Science 181(3): 219–229.

Pickersgill, B., Agostini, J. P., & Heiser, C. B. 2020. Capsicum–domestication, diversity and breeding. In M. R. Gebhardt & R. Ortiz (Eds.). Genetic resources, chromosome engineering, and crop improvement: Vegetable crops (pp. 107–139). CRC Press.

Pimenta, T. M., et al. 2020. Chemical composition and antioxidant activity of colored peppers (*Capsicum* spp.) from Brazilian germplasm. Journal of Food Science and Technology, 57: 1378–1385.

Qian, Q., Zhang, H., Zhang, P., Lan, Z., Wang, H., & Hou, D. 2024. Integrated transcriptomics and metabolomics provide new insights into the leaf coloration of a bamboo variant Phyllostachys violascens var. Flavistriatus. Scientia Horticulturae *334:* 113330. https://doi.org/10.1016/j.scienta.2024.113330

Quattrocchio, F., Wing, J. F., van der Woude, K., Mol, J. N. M., & Koes, R. 2006. The complexity of transcriptional regulation of anthocyanin biosynthesis. Current Opinion in Plant Biology 9(3):311–317. https://doi.org/10.1016/j.pbi.2006.03.005

Rao, J., Xie, J., & Giusti, M. M. 2012. Effect of high-pressure processing and milk on the anthocyanin composition and antioxidant capacity of strawberry-based beverages. Journal of Agricultural and Food Chemistry, 60(23): 5795–5802. https://doi.org/10.1021/jf2035059.

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Rattunde, H. F. W., Weltzien, E., & Diallo, B. 2009. Developing open-pollinated varieties using recurrent selection. In Plant Breeding and Farmer Participation (pp. 259–273). FAO

Rêgo, E. R., Rêgo, M. M., & Finger, F. L. 2015. Ornamental pepper. In: Ornamental Plants. Springer, 83–100.

Ritonga, F. N., Syahputra, I., & Nasution, M. A. 2017. The effect of light intensity on anthocyanin accumulation in red chili (*Capsicum annuum* L.). International Journal of Scientific & Technology Research, 6(8): 1–5.

Rubatzky, V. E. dan M. Yamaguchi. 1999. Sayuran Dunia: Prinsip, Produksi dan Gizi Jilid 3. C. Herison (penerjemah); S. Niksolihin (ed.). Penerbit ITB. Bandung. 320 hal. Terjemahan dari: World Vegetables; Principles, Production and Nutritive Value.

Sadilova, E., Stintzing, F. C., and Carle, R. 2006. Anthocyanin color and antioxidant properties of eggplant (*Solanum melongena* L.) and violet pepper (Capsicum *annuum* L.) peel extracts. Z Naturforsch C 61, 527-35.

Seppälä, M., & Langeloh, T. 2016. Plant coloration and its biochemical background. Nordic Plant Science Review, 18(3): 45–53.

Seeram, N. P., Momin, R. A., Nair, M. G., & Bourquin, L. D. 2001. Cyclooxygenase inhibitory and antioxidant cyanidin glycosides in cherries and berries. Phytomedicine, 8(5):362–369. https://doi.org/10.1078/0944-7113-00053.

Sendri, N., & Bhandari, P. (2024). Anthocyanins: A comprehensive review on biosynthesis, structural diversity, and industrial applications. Phytochemistry Reviews, 23(6), 1913-1974.

Setiyoko, W., Purwantoro, A., & Supriyanta, S. 2015. Evaluasi Karakter Tanaman Cabai Hias (*Capsicum annuum* L.) Generasi F1 Hasil Persilangan 'Peter Pepper'dengan 'Royal Black'. Vegetalika 4(3): 112-126.

Sirojuddin, A., Syukur, M., & Yusnita, Y. 2015. Keragaman karakter morfologi dan kandungan capsaicin beberapa galur cabai merah. Jurnal Agronomi Indonesia 43(1):16–22.

Soler, J., Elices, M., Franquesa, A., Barker, S., Friedlander, P., Feilding, A., & Riba, J. 2016. Exploring the therapeutic potential of Ayahuasca: acute intake increases mindfulness-related capacities. Psychopharmacology 233(5): 823-829.

Song, Z., Xu, X., Chen, X., Chang, J., Li, J., Cheng, J., & Zhang, B. (2024). Multi-omics analysis provides insights into the mechanism underlying fruit color formation in Capsicum. Frontiers in Plant Science 15. https://doi.org/10.3389/fpls.2024.1448060

Smith, F., & Wilcox, W. H. 1950. The structure of the helix of deoxypentose nucleic acid. The Journal of Molecular Biology 3(1): 1–5.

Sutanto, A., & Adie, M. M. 2008. Pengujian galur cabai untuk toleransi terhadap cekaman lingkungan. Buletin Plasma Nutfah 14(2): 49–55.

Sreelathakumary, I., & Rajamony, L. 2004. Genetic variability and character association in chilli (*Capsicum annuum* L.). Indian Journal of Horticulture, 61(2):132–136.

UNIVERSITAS
GADJAH MADA
**Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada
Cabai Hias**
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Strygina, K. V., & Khlestkina, E. K. 2010. Structural and functional organization of plant MYB transcription factors. Russian Journal of Genetics, 46(8): 901–909. https://doi.org/10.1134/S1022795410080114

Shang, Y., Venail, J., Mackay, S., Bailey, P. C., Schwinn, K. E., Jameson, P. E., Martin, C. R., Davies, K. M. 2010. The molecular basis of temperature-modulated anthocyanin biosynthesis in Arabidopsis thaliana. Plant Cell and Environment, 33(3):375–386. https://doi.org/10.1111/j.1365-3040.2009.02080.x

Siemonsma, J. S., & Piluek, K. 1994. Vegetable production training manual. FAO, Bangkok.

Siregar, A. H. 2016. Pembuatan Zat Warna Alam dari Tumbuhan Berasal dari Daun. Bina Teknika 12 (1): 103 – 110.

Silva, G. R., et al. (2015). Genetic divergence among Capsicum annuum accessions based on agronomic and biochemical traits. Genetics and Molecular Research 14(4): 12149–12159.

Silfianah, S., Hartatik, W., & Sumarni, W. 2012. Keragaman genetik plasma nutfah cabai berdasarkan marka RAPD. Jurnal AgroBiogen 8(2): 55–60.

Singh, R.K. and B.D. Chaudhary. 1977. Biometrical methods in quantitative genetic analysis.

Simonne, A. H., Simonne, E. H., Eitenmiller, R. R., Mills, H. A., & Green, N. R. 1997. Ascorbic acid and provitamin a contents in unusually colored bell peppers (*Capsicum annuum* L.). Journal of Food Composition and Analysis, 10(4): 299-311.

Somos, A. 1984. The Paprika. Akademi Kiadio. Budapest: p. 49-97.

Sobir & Syukur, M. 2015. Genetik dan pemuliaan tanaman hortikultura. IPB Press.

Suryo, H. 1995. *Genetika*. Yogyakarta: Gadjah Mada University Press.

Snyder, R. G., & David, L. B. 1957. Cytological studies in Solanaceae. Botanical Review 23(3): 289–336.

Spiegel-Roy P, Assaf R. 1980. Inheritance of some characters in progeny of *Vitis vinifera* from crosses with Dabouki and Alphonse Lavallee. In: Proceedings of the third intenational symposium on grape breeding. 15–18 June 1980, Davis, CA. Department of Viticulture and Enology, University of California, Davis. 210–219 pp.

Srivastava, A., Sharma, V. R., Dishri, M., Dikshit, A., Mangal, M., & Kalia, P. 2019. Inheritance of fruit attributes in chilli pepper. Indian Journal of Horticulture 76(1): 86-93.

Stansfield, W.D. 1991. Genetika. Edisi kedua. Diterjemahkan oleh Machidin Apandi dan Lanny T.Hardy. Erlangga.Jakarta.

Stommel, J.R. and P.W. Bosland. 2006. Ornamental pepper, *Capsicum annuum*, In: N.O. Anderson (ed.). Flower breeding and genetics: Issues, challenges, and opportunities for the 21st century. Springer-Verlag, Berlin. p. 561–599.

Stommel, J. R., & Bosland, P. W. 2007. Capsicum: The genus Capsicum. CRC Press.

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Stommel, J. R., & Griesbach, R. J. 2008. Inheritance of fruit color in Capsicum. Journal of Heredity 99(5): 452–457.

Stommel, J. R., Griesbach, R. J., & Whitaker, B. D. 2008. Genetics of fruit color and carotenoid composition in Capsicum. Plant Breeding Reviews 30: 361 - 388.

Stommel J.R., Lightbourn GJ, Winkel BS, Griesbach RJ. 2009. Transcription factor families regulate the anthocyanin biosynthetic pathway in *Capsicum annuum*. J Hortic.Sci.134:244–51.

Stommel, J. R., Pushko, M. P., Haynes, K. G., & Whitaker, B. D. 2014.Inheritance of pigment and phenolic content in Capsicum. HortScience, 49(9), 1144–1150.

Strygina KV, Kochetov AV, Khlestkina EK. 2019. Genetic control of anthocyanin pigmentation of potato tissues. BMC Genet. 20(1):27–31.

Sutarya & Grubben, G. J. H. (1995). Capsicum annuum L. In: Grubben, G.J.H. & Denton, O.A. (Eds.), Plant Resources of Tropical Africa 2. Vegetables. PROTA Foundation.

Tanaka, Y., Sasaki, N., & Ohmiya, A. 2008. Biosynthesis of plant pigments: anthocyanins, betalains and carotenoids. The Plant Journal 54(4): 733–749.

Tanaka, Y., & Brugliera, F. 2013. *Flower colour and cytochromes P450*. Philosophical Transactions of the Royal Society B: Biological Sciences, 368(1612), Article 20120432. https://doi.org/10.1098/rstb.2012.0432

Tang, B., Li, L., Hu, Z., Chen, Y., Tan, T., Jia, Y., Xie, Q., & Chen, G. 2020. Genome-wide analysis of the bHLH gene family in pepper (Capsicum spp.) and expression profiles in response to anthocyanin biosynthesis. Genes 11(11): 1326.

Tang, P., Huang, J., Wang, J., Wang, M., Huang, Q., Pan, L., & Liu, F. 2024. Genome-wide identification of CaWD40 proteins reveals the involvement of a novel complex (CaAN1-CaDYT1-CaWD40-91) in anthocyanin biosynthesis and genic male sterility in *Capsicum annuum*. BMC genomics, 25(1): 851

Thul, R., Thurley, K., & Falcke, M. 2009. Toward a predictive model of Ca^{2+} puffs. Chaos: An Interdisciplinary Journal of Nonlinear Science *19*(3): 037108. https://doi.org/10.1063/1.3183809.

Tripodi, P., Rabanus-Wallace, M. T., Barchenger, D. W., & Rieseberg, L. H. 2021. Genetic and genomic resources for pepper breeding: An overview. *Horticulture Research*, 8, 230. https://doi.org/10.1038/s41438-021-00687-0.

Tsaftaris, A. S., & Polidoros, A. N. 2000. DNA methylation and plant breeding. Plant breeding reviews 18:87-176.

Sukmawati, K. D., Syukur, M., & Ritonga, A. W. 2019. Evaluasi karakter kualitatif dan kuantitatif cabai hias (*Capsicum annuum* L.) IPB. *Jurnal Hortikultura*, *3*(1), 54–62. https://doi.org/10.29244/chj.1.1.54-62

Sumarni, N., & Muharam, A. 2005. Budidaya tanaman cabai merah. Balai Penelitian Tanaman Sayuran.

Sun, H., Zhang, P., Zhu, Y., Lou, Q., & He, S. 2018. Antioxidant and prebiotic activity of five peonidin-based anthocyanins extracted from purple sweet potato (*Ipomoea*

UNIVERSITAS GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

batatas). Scientific Reports, March, 1–12. https://doi.org/10.1038/s41598-018-23397-0.

Soler, M., Plasencia, A., Lepikson-Neto, J., Camargo, E. L., Dupas, A., Ladouce, N., & Grima-Pettenati, J. (2016). The woody-preferential gene EgMYB88 regulates the biosynthesis of phenylpropanoid-derived compounds in wood. Frontiers in Plant Science, 7, 1422.

Vivas, M., Gil-Muñoz, R., Martínez-Cutillas, A., & Gómez-Plaza, E. 2020. Anthocyanin content and genetic variability in pepper varieties. Journal of Agricultural and Food Chemistry 68(12): 3512–3520.

Van der Knaap, E., & Tanksley, S. D. 2003. The making of a bell pepper-shaped tomato fruit: identification of loci controlling fruit morphology in tomato. Genetics, 165(2): 843–850.

Wahyuni, Y., Ballester, A.-R., Sudarmonowati, E., Bino, R. J., & Bovy, A. G. 2011. Metabolite biodiversity in pepper (*Capsicum*) fruits of thirty-two diverse accessions: Variation in health-related compounds and implications for breeding. Phytochemistry 72(11–12): 1358–1370.

Wahyuni, Y., Ballester, A. R., Tikunov, Y. M., de Vos, R. C. H., Pelgrom, K. T. B., Maharijaya, A., Sudarmonowati, E., Bino, R. J., & Bovy, A. G. 2013. Metabolomics and molecular marker analysis to explore pepper (Capsicum sp.) biodiversity. Metabolomics 9(1):130–144. https://doi.org/10.1007/s11306-012-0432-6

Wang, D., & Bosland, P. W. 2006. The genes of Capsicum. HortScience, 41(5):1169–1187.

Wang, L. S., and Stoner, G. D. 2008. Anthocyanins and their role in cancer prevention. Cancer Lett 269: 281-90.

Wang, Y., Liu, S., Wang, H., Zhang, Y., Li, W., Liu, J. & Shen, H. 2022. Identification of the regulatory genes of UV-B-induced anthocyanin biosynthesis in pepper Fruit. International Journal of Molecular Sciences, 23(4): 1960.

Wang, L., Zhong, Y., Liu, J., Ma, R., Miao, Y., Chen, W., & Wan, H. 2023. Transcriptome analysis reveals anthocyanin biosynthesis pathways in purple pepper fruits. BMC Plant Biology 23: 123.

Wei, Y. Z., Hu, F. C., Hu, G. B., Li, X. J., Huang, X. M., & Wang, H. C. 2011. Differential expression of anthocyanin biosynthetic genes in relation to anthocyanin accumulation in the pericarp of Litchi chinensis Sonn. PloS one, 6(4): e19455.

Welch, C. R., Wu, Q., and Simon, J. E. 2008. Recent Advances in Anthocyanin Analysis and Characterization. Curr Anal Chem 4: 75-101.

Weber, F., & Larsen, L. R. 2017. Influence of fruit juice processing on anthocyanin stability. Food Research International 100: 354-365.

White, J. W. 2007. Concepts in open-pollinated cultivar development. In: Plant Breeding Reviews, Vol. 29 (pp. 135–172). John Wiley & Sons, Inc. https://doi.org/10.1002/9780470168011.ch4

Wirasti, C. A. Pola Pewarisan Karakter Generatif dan Tipe Tumbuh pada Cabai Hias. 2013. Tesis, Universitas Gadjah Mada.

UNIVERSITAS
GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Winkel-Shirley, B. 2001a. Flavonoid Biosynthesis. A Colorful Model for Genetics, Biochemistry, Cell Biology, and Biotechnology. Plant Physiol 126, 485-93.

Winkel-Shirley, B. 2001b. It Takes a Garden. How Work on Diverse Plant Species Has Contributed to an Under- standing of Flavonoid Metabolism. Plant Physiol 127: 1399-404.

Wolf, L., & Wade, M. 2016. Anthocyanin pigment pathways and genetic expression in Solanaceae crops. Journal of Experimental Botany 67(15): 4567–4578.

Yamada, Y., Nakayama, M., Shibata, H., Kishimoto, S., & Ikeda, T. 2019. Genetic analysis of flower pigmentation in Japanese ornamental plants. Horticultural Journal 88(2): 157–163.

Xu, W., Dubos, C., & Lepiniec, L. 2014. Transcriptional control of flavonoid biosynthesis by MYB–bHLH–WDR complexes. Trends in Plant Science, 20(3), 176–185. https://doi.org/10.1016/j.tplants.2014.01.002.

Xue, H., Zhao, J., Wang, Y., Shi, Z., Xie, K., Liao, X., & Tan, J. 2024. Factors affecting the stability of anthocyanins and strategies for improving their stability: A review. Food Chemistry: X, 24, 101883.

Yuan, H., Wang, X., Li, Y., Zhang, Z., Chen, J., & Liu, S. 2021. Epigenetic regulation and maternal effects in anthocyanin biosynthesis in Capsicum annuum L. BMC Plant Biology 21: 373. https://doi.org/10.1186/s12870-021-03573-6.

Yang, J., Mezmouk, S., Baumgarten, A., Buckler, E. S., Guill, K. E., McMullen, M. D., ... & Ross-Ibarra, J. 2021. Incomplete dominance of deleterious alleles contributes substantially to trait variation and heterosis in maize. *PLOS Genetics*, 17(9), e1009825.

Yang, X., Xu, Y., Zhang, S., & Li, H. 2021. Genetic analysis of quantitative traits reveals incomplete dominance and epistasis in plant architecture. Frontiers in Plant Science, 12, 650321. https://doi.org/10.3389/fpls.2021.650321

Zipor, G., Ovadia, R., Eyal, Y., & Irihimovitch, V. 2015. Regulation of pigment accumulation in fruit of ornamental pepper. Journal of Experimental Botany 66(14): 4351–4362.

Zifkin, M., Jin, A., Ozga, J. A., Zaharia, L. I., Schernthaner, J. P., Gesell, A. & Abrams, S. R. 2012. Gene expression and metabolite profiling of developing highbush blueberry fruit indicates transcriptional regulation of flavonoid metabolism and activation of abscisic acid metabolism. Plant Physiology 158(1): 200–224.

Zhang, Y., Xu, S., Cheng, Y., Peng, Z., Han, J., & Li, X. 2010. Expression of anthocyanin biosynthetic genes and accumulation of anthocyanin in red and green-leaf lettuce. Journal of Agricultural and Food Chemistry 58 (19): 10819–10826. https://doi.org/10.1021/jf102364n.

Zhang, Z., Li, D. W., Jin, J. H., Yin, Y. X., Zhang, H. X., Chai, W. G., & Gong, Z. H. 2015. VIGS approach reveals the modulation of anthocyanin biosynthetic genes by CaMYB in chili pepper leaves. Frontiers in plant science, 6, 500.

UNIVERSITAS
GADJAH MADA
Studi Pewarisan Karakter Tipe Buah, Warna Buah dan Ekspresi Gen Terkait Biosintesis Antosianin pada Cabai Hias
Christina Astri Wirasti, Prof. Dr. Aziz Purwantoro, M.Sc.; Prof. Dr. Rudi Hari Murti, S.P., M.P.; Prof. Dr. Yekti Asih Pur
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Zhang, Y., Hu, Z., Chu, G. Anthocyanin accumulation and molecular analysis of anthocyanin bio-synthesis-associated genes in eggplant (Solanum melongena L.), J. Agric. Food Chem. 2015. 62(13): 2906—2912.

Zhang, L., Tao, R. Y., Wang, S. M., Gao, Y. H., Wang, L., Yang, S. L., Zhang, X., Yu, W. J., Wu, X. Y., Li, K. F., Ni, J. B., Teng, Y. W., & Bai, S. L. 2022. *PpZAT5* suppresses the expression of a B-box gene PpBBX18 to inhibit anthocyanin biosynthesis in the fruit peel of red pear. Frontiers in Plant Science, 13, Article 1022034. https://doi.org/10.3389/fpls.2022.1022034.

Zhao, X., Zhang, Y., Long, T., Wang, S., & Yang, J. 2022. Regulation mechanism of plant pigments biosynthesis: Anthocyanins, carotenoids, and betalains. Metabolites, *12*(9): 871. https://doi.org/10.3390/metabo12090871

Zhang, Z., Li, D. W., Jin, J. H., Yin, Y. X., Zhang, H. X., Chai, W. G., and Gong, Z. H. 2015. VIGS approach reveals the modulation of anthocyanin biosynthetic genes by CaMYB in chili pepper leaves. Front Plant Sci 6 (1).

Zorzetto, E., Motta, L. B., Morais, L. K., Kiihl, T. A. M., & Silva, W. J. 2008. Genetic diversity among chili pepper (*Capsicum* spp.) accessions based on morphological and molecular markers. Crop Breeding and Applied Biotechnology, 8(1): 1–9. https://doi.org/10.12702/1984-7033.v08n01a01.

Zou, M., Duan, S., Ma, Y., & Wang, Y. 2024. Regulation of meiotic recombination in plants: From mechanisms to applications. *Frontiers in Plant Science*, 15, 1357694. https://doi.org/10.3389/fpls.2024.1357694