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REFERENCES

Agne, M., Valones, A., Guimarães, R., Brandao, L., Eleutério De Souza, P., De Albuquerque, A., Carvalho, T., & Crovela, S. (2009). Principles and applications of polymerase chain reaction in medical diagnostic fields: A review. *Brazilian Journal of Microbiology*, *40*, 1–11. https://doi.org/10.1590/S1517-83822009000100001

Ahuya, C. O., Ojango, J. M. K., Mosi, R. O., Peacock, C. P., & Okeyo, A. M. (2009). Performance of Toggenburg dairy goats in smallholder production systems of the eastern highlands of Kenya. *Small Ruminant Research*, *83*(1–3), 7–13. https://doi.org/10.1016/j.smallrumres.2008.11.012

Ajibike, A. B., Ilori, B. M., Awotunde, E. O., Adegboyega, A. R., Osinbowale, A. D., Bemji, M. N., Durosaro, S. O., & Adebambo, A. O. (2016). Genetic diversity and effect of selection at the mitochondrial hypervariable region in major Nigerian indigenous goat breeds. *Asian-Australasian Journal of Animal Sciences*. https://doi.org/10.5713/ajas.15.0775

Allaby, R. G., Woodwark, M., & Park, A. (2004). Phylogenetics in the bioinformatics culture of understanding. *Comparative and Functional Genomics*, *5*(2), 128–146. https://doi.org/10.1002/cfg.381

Anggraeni, A., Hafid, A., Asepriyadi, & Anggraini, E. (2024). Environmental and genetic influences on milk composition of Sapera goat. In *Technological Innovations in Tropical Livestock Development for Environmental Sustainability and Food Security* (pp. 19–25). CRC Press. https://doi.org/10.1201/9781003468943-4

Ardiansyah, E. A., Suranindyah, Y. Y., Maharani, D., & Arif Darmawan, M. (2022). Korelasi Antara Ukuran Tubuh dan Karakteristik Ambing Terhadap Produksi Susu Kambing Saanen di Daerah Tropis. *Journal of Applied Agriculture, Health, and Technology*, *1*(1). https://doi.org/10.20961/jaht.v1i1.281

Baenyi Simon, P., Owino Junga, J., Tarekegn, G. M., Machuka, E., Tiambo, C. K., Kabange, D., Musale M. Dieudinné, K., Vumilia Kizungu, R., Ochieng, J. W., & Pelle, R. (2022). Haplotype analysis of the mitochondrial DNA d-loop region reveals the maternal origin and historical dynamics among the indigenous goat populations in east and west of the Democratic Republic of Congo. *Ecology and Evolution*, *12*(3). https://doi.org/10.1002/ece3.8713

Batubara, A., Noor, R. R., Farajallah, A., Tiesnamurti, B., & Doloksaribu, D. M. (2012). *Molecular characterization of six sub population Indonesian local goats based on mitochondrial DNA D-loop*. http://ncbi.nlm.nih.gov

Baxevanis, A. D., & Ouellette, B. F. Francis. (2004). *Bioinformatics: a Practical Guide to the Analysis of Genes and Proteins*. Wiley.

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GADJAH MADA
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https://www.perlego.com/book/2752951/bioinformatics-a-practical-guide-to-the-analysis-of-genes-and-proteins-pdf

Benson, D. A., Cavanaugh, M., Clark, K., Karsch-Mizrachi, I., Lipman, D. J., Ostell, J., & Sayers, E. W. (2013). GenBank. *Nucleic Acids Research*, *41*(D1). https://doi.org/10.1093/nar/gks1195

Berihulay, H., Abied, A., He, X., Jiang, L., & Ma, Y. (2019). Adaptation mechanisms of small ruminants to environmental heat stress. In *Animals* (Vol. 9, Number 3). MDPI AG. https://doi.org/10.3390/ani9030075

BPS - Statistics Indonesia. (2024). *Peternakan dalam Angka 2024*. https://www.bps.go.id/id/publication/2024/12/20/522e07b24c7bbeb1c19b0a4e/peternakan-dalam-angka-2024.html

Cai, Y., Fu, W., Cai, D., Heller, R., Zheng, Z., Wen, J., Li, H., Wang, Xiaolong, Alshawi, A., Sun, Z., Zhu, S., Wang, J., Yang, M., Hu, S., Li, Y., Yang, Z., Gong, M., Hou, Y., Lan, T., … Russo, C. (2020). Ancient Genomes Reveal the Evolutionary History and Origin of Cashmere-Producing Goats in China. *Molecular Biology and Evolution*, *37*(7), 2099–2109. https://doi.org/10.1093/molbev/msaa103

Câmara, T. S., Nunes, J. F., Diniz, F. M., Silva, G. R., & Araújo, A. M. (2017). Genetic diversity and relatedness between Canindé and British alpine goat breeds in Northeastern Brazil accessed by microsatellite markers. *Genetics and Molecular Research*, *16*(1). https://doi.org/10.4238/gmr16019569

Castellana, S., Vicario, S., & Saccone, C. (2011). Evolutionary patterns of the mitochondrial genome in Metazoa: Exploring the role of mutation and selection in mitochondrial protein-coding genes. *Genome Biology and Evolution*, *3*(1), 1067–1079. https://doi.org/10.1093/gbe/evr040

Chen, S., Fan, B., Liu, B., Yu, M., Zhao, S., Zhu, M., Xiong, T., & Li, K. (2006). Genetic variations of 13 indigenous Chinese goat breeds based on cytochrome b gene sequences. *Biochemical Genetics*, *44*(3–4), 89–99. https://doi.org/10.1007/s10528-006-9013-6

Cheng, J., Kao, H., & Dong, S. (2020). Population genetic structure and gene flow of rare and endangered Tetraena mongolica Maxim. revealed by reduced representation sequencing. *BMC Plant Biology*, *20*(1). https://doi.org/10.1186/s12870-020-02594-y

Chiejina, S. N., Behnke, J. M., Nnadi, P. A., Ngongeh, L. A., & Musongong, G. A. (2009). The responses of two ecotypes of Nigerian West African Dwarf goat to experimental infections with Trypanosoma brucei and Haemonchus contortus. *Small Ruminant Research*, *85*(2–3), 91–98. https://doi.org/10.1016/j.smallrumres.2009.07.004

Colli, L., Milanesi, M., Talenti, A., Bertolini, F., Chen, M., Crisà, A., Daly, K. G., Del Corvo, M., Guldbrandtsen, B., Lenstra, J. A., Rosen, B. D., Vajana, E., Catillo, G., Joost, S.,

UNIVERSITAS
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Nicolazzi, E. L., Rochat, E., Rothschild, M. F., Servin, B., Sonstegard, T. S., … Stella, A. (2018). Genome-wide SNP profiling of worldwide goat populations reveals strong partitioning of diversity and highlights post-domestication migration routes. *Genetics Selection Evolution*, *50*(1). https://doi.org/10.1186/s12711-018-0422-x

Collins, M., & Pearce, B. (2025). Untangling the mitochondrial web: an in-silico analysis of genetic mutations, protein interactions, and tRNA dynamics in oxidative phosphorylation and disc degeneration. *Journal of Proteins and Proteomics*, *16*(3), 305–329. https://doi.org/10.1007/s42485-025-00189-5

Davidović, S., Marinković, S., Kukobat, M., Mihajlović, M., Tanasić, V., Hribšek, I., Tanasković, M., & Stamenković-Radak, M. (2022). Genetic Diversity Analysis of Mitochondrial Cytb Gene, Phylogeny and Phylogeography of Protected Griffon Vulture (Gyps fulvus) from Serbia. *Life*, *12*(2). https://doi.org/10.3390/life12020164

De, A. K., Sunder, J., Muthiyan, R., Sawhney, S., Ponraj, P., Chakurkar, E. B., & Bhattacharya, D. (2023). Andaman local goat: mitochondrial genome characterization and lineage analysis. *Biologia*, *78*(1), 241–253. https://doi.org/10.1007/s11756-022-01234-0

De Araújo, A. M., Guimarães, S. E. F., Mírian, T., Machado, M., Lopes, P. S., Pereira, C. S., Luiz, F., Da Silva, R., Rodrigues, M. T., De Souza Columbiano, V., & Graça Da Fonseca, C. (2006). *Genetic diversity between herds of Alpine and Saanen dairy goats and the naturalized Brazilian Moxotó breed*. https://www.sbg.org.br/

Deniskova, T., Bakoev, N., Dotsev, A., Selionova, M., & Zinovieva, N. (2020). Maternal origins and haplotype diversity of seven russian goat populations based on the d-loop sequence variability. *Animals*, *10*(9), 1–13. https://doi.org/10.3390/ani10091603

Deviandini, G., Noor, R. R., Taufik, E., & Asmarasari, S. A. (2023). Analysis of CSN2 Exon 7 gene diversity and its association with Sapera goat milk composition. *J. Indonesian Trop. Anim. Agric*, (3), 161–168. https://doi.org/10.14710/jitaa.48.3

Ditjenpkh. (2024). *Livestock and Animal Health Statistics 2024*. *3*. https://ditjenpkh.pertanian.go.id/

Diwedi, J., Singh, A. W., Ahlawat, S., Sharma, R., Arora, R., Sharma, H., Raja, K. N., Verma, N. K., & Tantia, M. S. (2020). Comprehensive analysis of mitochondrial DNA based genetic diversity in Indian goats. *Gene*, *756*. https://doi.org/10.1016/j.gene.2020.144910

Dogan, I., & Dogan, N. (2016). Genetic Distance Measures: Review. *Turkiye Klinikleri Journal of Biostatistics*, *8*(1), 87–93. https://doi.org/10.5336/biostatic.2015-49517

Dosseh, H. K., Anihouvi, S. E., Kere, M., Diogo, R. V. C., Hounzangbé-Adoté, M. S., & Dossa, L. H. (2026). Comparative evaluation of milk yield and composition in three

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
MATHEW MGOGO, Prof. Ir. Dyah Maharani, S.Pt., M.P., Ph.D., IPM; Prof. Ir. Diah Tri Widayati, MP., Ph.D., IPU., AS
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

indigenous West African goat breeds under semi-intensive management. *Veterinary and Animal Science*, *31*. https://doi.org/10.1016/j.vas.2025.100560

El Akbar, R. R., Indrijani, H., & Salman, L. B. (2019). Reproduction of Saanen and Peranakan Etawa Goat Performance Comparative Analysis (Case Study at BBPTU-HPT Baturaden). *Journal of Animal Husbandry Science (JANHUS)*, *3*, 27–32. www.journal.uniga.ac.id

Excoffier, L., & Lischer, H. (2010). *ARLEQUIN VER 3.5.1.2 USER MANUAL An Integrated Software Package for Population Genetics Data Analysis*. http://cmpg.unibe.ch/software/arlequin35

Fan, P., Song, G., Qiao, H., Zhang, D., Ji, Y., Qu, Y., Fjeldså, J., & Lei, F. (2025). Revaluation of the genetic diversity–area relationship by integrating nucleotide and haplotype diversity. *Current Zoology*, *71*(5), 645–651. https://doi.org/10.1093/cz/zoae078

Fang, D. A., Luo, H., He, M., Mao, C., Kuang, Z., Qi, H., Xu, D., Tan, L., & Li, Y. (2022). Genetic Diversity and Population Differentiation of Naked Carp (Gymnocypris przewalskii) Revealed by Cytochrome Oxidase Subunit I and D-Loop. *Frontiers in Ecology and Evolution*, *10*. https://doi.org/10.3389/fevo.2022.827654

FAO. (2007). *The second report on the state of the world's animal genetic resources for food and agriculture*. https://www.fao.org/3/i4787e/i4787e00.pdf

FAO. (2010). *Breeding strategies for sustainable management of animal genetic resources* (Vol. 3). Commission on Genetic Resources for Food and Agriculture, Food and Agriculture Organization of the United Nations. https://www.fao.org/4/i1103e/i1103e.pdf

Fatmawati, M., Suwanti, L. T., Mufasirin, Hambarrukmi, W., Sukesi, L. E., Rofiah, Novianto, E., & Wahyutyas, B. K. (2022). A comparative study among dairy goat breeds in Lumajang and Malang (East Java, Indonesia) based on milk organoleptic and milk composition. *Biodiversitas*, *23*(6), 2899–2903. https://doi.org/10.13057/biodiv/d230616

Figura, A., Gryzinska, M., & Jakubczak, A. (2024). Comparison of Universal mtDNA Primers in Species Identification of Animals in a Sample with Severely Degraded DNA. *Animals*, *14*(22). https://doi.org/10.3390/ani14223256

Floridia, V., Bionda, A., Arias, K. D., Amato, A., Cavallo, C., Chiofalo, V., Cortellari, M., Lopreiato, V., Virga, A. N., Crepaldi, P., Liotta, L., & Barbato, M. (2025). Genomic insights on the history and selection trajectories of the Comune di Sicilia goat. *BMC Genomic Data*, *26*(1). https://doi.org/10.1186/s12863-025-01368-5

Flydal, M. I., & Martinez, A. (2013). Phenylalanine hydroxylase: Function, structure, and regulation. In *IUBMB Life* (Vol. 65, Number 4, pp. 341–349). https://doi.org/10.1002/iub.1150

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Fridman, C., Gonzalez, R. S., Pereira, A. C., & Cardena, M. M. S. G. (2014). Haplotype diversity in mitochondrial DNA hypervariable region in a population of southeastern Brazil. *International Journal of Legal Medicine*, *128*(4), 589–593. https://doi.org/10.1007/s00414-014-1023-z

Fuchs, E. J., Huang, X. J., & Miller, J. S. (2010). HLA-Haploidentical Stem Cell Transplantation for Hematologic Malignancies. *Biology of Blood and Marrow Transplantation*, *16*(1), S57–S63. https://doi.org/10.1016/j.bbmt.2009.10.032

Geneaid Biotech Ltd. (2017). *Instruction Manual: gSYNC™ DNA Extraction Kit (Ver. 02.10.17)*. http://www.geneaid.com

Ghanatsaman, Z. A., Mehrgardi, A. A., Nanaei, H. A., & Esmailizadeh, A. (2023). Comparative genomic analysis uncovers candidate genes related with milk production and adaptive traits in goat breeds. *Scientific Reports*, *13*(1). https://doi.org/10.1038/s41598-023-35973-0

Gipson, T. A. (2019). — Special Issue — Recent advances in breeding and genetics for dairy goats. *Asian-Australasian Journal of Animal Sciences*, *32*(8), 1275–1283. https://doi.org/10.5713/ajas.19.0381

Goodwin, S., McPherson, J. D., & McCombie, W. R. (2016). Coming of age: Ten years of next-generation sequencing technologies. In *Nature Reviews Genetics* (Vol. 17, Number 6, pp. 333–351). Nature Publishing Group. https://doi.org/10.1038/nrg.2016.49

Grant, W. S., & Bowen, B. W. (1998). Shallow population histories in deep evolutionary lineages of marine fishes: Insights from sardines and anchovies and lessons for conservation. *Journal of Heredity*, *89*(5), 415–426. https://doi.org/10.1093/jhered/89.5.415

Green, M. R., & Sambrook, J. (2012). *Molecular Cloning: A Laboratory Manual (4th Edition). Cold Spring Harbor Laboratory Press.* https://www.cshlpress.com/default.tpl?cart=17592085612287575677&fromlink=T&linkaction=full&linksortby=oop_title&--eqSKUdatarq=934

Guerrero, L. F. N., Rogberg-Muñoz, A., Rodríguez, N., & Herrera, L. G. G. (2024). Genomic diversity study of highly crossbred cattle population in a Low and Middle Tropical environment. *Tropical Animal Health and Production*, *56*(8). https://doi.org/10.1007/s11250-024-04011-0

Hartatik, T., Utomo, R., & Mira Yusiati, L. (2015). Genetic Variation and Phylogenetic Tree of Indonesian domestic Goat. *The 6th International Seminar on Tropical Animal Production Integrated Approach in Developing Sustainable Tropical Animal Production October 20-22, 2015, Yogyakarta, Indonesia*, 464–469. https://jurnal.ugm.ac.id/istapproceeding/article/view/30693

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GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Hartatik, T., Volkandari, D. S., Sumadi, & Widodo. (2013). *The Application of Polymerase Chain Reaction-Restriction Fragment Polymorphisms (PCR-RFLP) to Determine Genetic Diversity of Madura Cattle in Sapudi Island*. https://jurnal.ugm.ac.id/ijbiotech/article/view/7869/6110

Haryanto, A., Pantoro, R. C., Purwaningrum, M., Andrian, K. N., Amalia, R., Yuriati, & Atmojo, T. (2025). Genetic Diversity and Phylogenetic Analysis of Bligon Goats Using Partial Mitochondrial Cytochrome B Gene. *Journal of Animal Health and Production*, *13*(3), 609–616. https://doi.org/10.17582/journal.jahp/2025/13.3.609.616

Henkel, J., Saif, R., Jagannathan, V., Schmocker, C., Zeindler, F., Bangerter, E., Herren, U., Posantzis, D., Bulut, Z., Ammann, P., Drögemüller, C., Flury, C., & Leeb, T. (2019). Selection signatures in goats reveal copy number variants underlying breed-defining coat color phenotypes. *PLoS Genetics*, *15*(12). https://doi.org/10.1371/journal.pgen.1008536

Hermes, T. R., Frachetti, M. D., Voyakin, D., Yerlomaeva, A. S., Beisenov, A. Z., Doumani Dupuy, P. N., Papin, D. V., Matuzeviciute, G. M., Bayarsaikhan, J., Houle, J. L., Tishkin, A. A., Nebel, A., Krause-Kyora, B., & Makarewicz, C. A. (2020). High mitochondrial diversity of domesticated goats persisted among Bronze and Iron Age pastoralists in the Inner Asian Mountain Corridor. *PLoS ONE*, *15*(5). https://doi.org/10.1371/journal.pone.0233333

Hopkins, K., & Reid, D. (2022). Evaluation of lactation performance identifies superior sire in Anglo Nubian dairy goat herd. *Animal Production Science*, *62*(11), 82–83. https://doi.org/10.1071/anv62n10-11abs

Huang, K., Li, Y., Dunn, D. W., Zhang, P., & Li, B. (2019). *A generalized framework of AMOVA with any number of hierarchies and any level of ploidies*. https://doi.org/10.1101/608117

Hundertmark, K. J., Bowyer, R. T., Terry Bowyer, R., & Schwartz, C. C. (2002). Genetic Relationships Deduced from Cytochrome-B Sequences Among Moose. In *ALCES* (Vol. 38). https://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/propubs/hundertmark.pdf

Iglesias-Ramas, A., Lipani, S. P., & Allen, R. (2024). Population genetics: An introduction for physicists. *SciPost Physics Lecture Notes*, 89. https://doi.org/10.21468/SciPostPhysLectNotes.89

Irwin, D. M., Kocher, T. D., & Wilson, A. C. (1991). Evolution of the cytochrome b gene of mammals. *Journal of Molecular Evolution*, *32*(2), 128–144. https://doi.org/10.1007/BF02515385

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Jiyanto, Kurnianto, E., & Sutupo. (2014). The genetic diversity of Kejobong goat based on cytochrome b gene. *Journal of the Indonesian Tropical Animal Agriculture-JITAA*, *39*(2), 75–82. https://ejournal.undip.ac.id/index.php/jitaa/article/view/8361

Joshi, M., & Deshpande, J. D. (2010). *Polymerase Chain Reaction: Methods, Principles and Application.* www.ssjournals.com

Joy, A., Dunshea, F. R., Leury, B. J., Clarke, I. J., Digiacomo, K., & Chauhan, S. S. (2020). Resilience of small ruminants to climate change and increased environmental temperature: A review. In *Animals* (Vol. 10, Number 5). MDPI AG. https://doi.org/10.3390/ani10050867

Kanaka, K. K., Sukhija, N., Goli, R. C., Singh, S., Ganguly, I., Dixit, S. P., Dash, A., & Malik, A. A. (2023). On the concepts and measures of diversity in the genomics era. In *Current Plant Biology* (Vol. 33). Elsevier B.V. https://doi.org/10.1016/j.cpb.2023.100278

Kartavtsev, Y. P., & Lee, J. S. (2006). Analysis of nucleotide diversity at the cytochrome b and cytochrome oxidase 1 genes at the population, species, and genus levels. In *Russian Journal of Genetics* (Vol. 42, Number 4, pp. 341–362). https://doi.org/10.1134/S1022795406040016

Kawaguchi, F., Yamamoto, Y., Bakhtin Meirat, Kazymbet, P., Meldevekob, A., Suleimanov, M. Z., & Mannen, H. (2019). The Eurasian Steppe is an important goat propagation route: A phylogeographic analysis using mitochondrial DNA and Y-chromosome sequences of Kazakhstani goats. *Animal Science Journal*, *90*(3), 317–322. https://doi.org/10.1111/asj.13144

Kem Githui, E. (2018). Mitochondrial DNA Indicate that Kenyan Indigenous Goat (Capra hircus) Population is Diverse. *Agricultural Research & Technology: Open Access Journal*, *18*(1). https://doi.org/10.19080/ARTOAJ.2018.18.556044

Khandoker, M., Afini, N., & Azwan, A. (2018). Productive and reproductive performance of Saanen goat at AZZahra farm of Sandakan in Malaysia. *Bangladesh Journal of Animal Science*, *47*(1), 1–12. https://doi.org/10.3329/bjas.v47i1.39395

Kim, J.-H., Byun, M.-J., Ko, Y.-G., Kim, Sung-Woo, Kim, Sang-Woo, Do, Y.-J., Kim, M.-J., Yoon, S.-H., & Choi, S.-B. (2012). Phylogenetic Analysis of Korean Native Goats Based on the Mitochondrial Cytochrome b Gene. *Journal of Animal Science and Technology*, *54*(4), 241–246. https://doi.org/10.5187/jast.2012.54.4.241

Kimura, M. (1980). A Simple Method for Estimating Evolutionary Rates of Base Substitutions Through Comparative Studies of Nucleotide Sequences. *Journal of Molecular Evolution*, *16*, 111–120. https://doi.org/10.1007/BF01731581

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Kindt, R. (2020). *Analysis of Molecular Variance (AMOVA) with vegan and BiodiversityR, including a graphical method to identify potential migrants*. https://cgspace.cgiar.org/items/e055b736-f84e-47e1-8c42-575d6b29bc22

Krajewski, C., & King, D. G. (2000). *Molecular Divergence and Phylogeny: Rates and Patterns of Cytochrome b Evolution in Cranes*. https://academic.oup.com/mbe/article/13/1/21/1055495

Kurnianto, E., Sutopo, S., Purbowati, E., Setiatin, E. T., Samsudewa, D., & Permatasari, T. (2010). *Multivariate Analysis of Morphological Traits of Local Goats in Central Java, Indonesia*. www.ijas.ir

Kusminanto, R. Y., Alawiansyah, A., Pramono, A., Sutarno, & Cahyadi, M. (2020). Body Weight and Body Measurement Characteristics of Seven Goat Breeds in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *478*(1). https://doi.org/10.1088/1755-1315/478/1/012039

Lallo, C., Rollings, D., Pinder, K., & Thomas, G. (2019). *Kidding and Milk Performance of Saanen, Toggenburg and British Alpine Goats in the Tropical Climate of Barbados to enhance food security*. https://www.researchgate.net/publication/332743063

Latifah, Maharani, D., Hartatik, T., Warih, A., Nurjannah, A. S., & Kustantinah. (2019). The effect of sex on nutritional status of post-weaned Bligon goats under controlled feeding management. *IOP Conference Series: Earth and Environmental Science*, *387*(1). https://doi.org/10.1088/1755-1315/387/1/012057

Leigh, J. W., & Bryant, D. (2015). POPART: Full-feature software for haplotype network construction. *Methods in Ecology and Evolution*, *6*(9), 1110–1116. https://doi.org/10.1111/2041-210X.12410

Lestari, D. A., Purbowati, E., Sutopo, S., & Kurnianto, E. (2018). Amino acid sequence based on Cytochrome b gene in Kejobong goat and its genetic relationships among several local goats in Asia. *Veterinary World*, *11*(8), 1196–1202. https://doi.org/10.14202/vetworld.2018.1196-1202

Lestari, D. A., Sutopo, & Kurnianto, E. (2017). Amino acid diversity on the basis of cytochrome b gene in kacang and ettawa grade goats. *Journal of the Indonesian Tropical Animal Agriculture*, *42*(3), 135–146. https://doi.org/10.14710/jitaa.42.3.135-146

Li, B., Malyarchuk, B., He, X., & Derenko, M. (2013). Molecular evolution and adaptation of the mitochondrial cytochrome b gene in the subgenus Martes. *Genetics and Molecular Research*, *12*(3), 3944–3954. https://doi.org/10.4238/2013.September.23.13

Li, J., Merkler, D. J., & Han, Q. (2023). Editorial: Aromatic amino acid metabolism–Volume II. In *Frontiers in Molecular Biosciences* (Vol. 9). Frontiers Media S.A. https://doi.org/10.3389/fmolb.2022.1122151

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Librado, P., & Rozas, J. (2009). DnaSP v5: A software for comprehensive analysis of DNA polymorphism data. *Bioinformatics*, *25*(11), 1451–1452. https://doi.org/10.1093/bioinformatics/btp187

Linacre, A., Lee, J., James, &, & Lee, C.-I. (2005). *Species determination: The role and use of the cytochrome b gene*. https://www.researchgate.net/publication/8157677

Liu, H., Liu, Y., & Hu, Y. (2025). Mitochondrial Impostors: Prevalence and Impacts of NUMTs on Genetic and Evolutionary Studies in Carnivora. *Genome Biology and Evolution*, *17*(10). https://doi.org/10.1093/gbe/evaf174

Liu, R.-Y. ' ~, Gong-She', Y., & Chu-Zhao', L. (2006). The Genetic Diversity of mtDNA D-loop and the Origin of Chinese Goats. *Acta Genetica Sinica*, *33*(5), 42–70. https://doi.org/10.1016/S0379-4172(06)60069-3

Loftus, R. T., MacHugh, D. E., Bradley, D. G., Sharp, P. M., & Cunningham, P. (1994). Evidence for two independent domestications of cattle. *Proceedings of the National Academy of Sciences*, *91*(7), 2757–2761. https://doi.org/10.1073/pnas.91.7.2757

Lohani, M., & Bhandari, D. (2021). *The Importance of Goats in the World*. https://tuspubs.tuskegee.edu/pawj

Longwell, J. H., Turner, C. W., Racsdale, A. C., & Garrison, E. R. (1937). *Dairy Goats in Missouri COLUMBIA, MISSOURI*. https://core.ac.uk/download/pdf/62792589.pdf

Lopez-Oceja, A., Gamarra, D., Borragan, S., Jiménez-Moreno, S., & De Pancorbo, M. M. (2016). New cyt b gene universal primer set for forensic analysis. *Forensic Science International: Genetics*, *23*, 159–165. https://doi.org/10.1016/j.fsigen.2016.05.001

Luikart, G., Gielly, L., Excoffier, L., Vigne, J.-D., Bouvet, J., & Taberlet, P. (2001). *Multiple maternal origins and weak phylogeographic structure in domestic goats*. www.pnas.orgcgidoi10.1073pnas.091591198

Magistrama, M. E., Diatmono, D. F. F., Masruroh, M. T., Padmawati, F. G., Sitaresmi, P. I., Suranindyah, Y. Y., & Widayati, D. T. (2024). Optimizing Estrus Detection Techniques in Tropical Saanen Does (Capra aegagrus hircus): A Comparative Study. *Pakistan Journal of Agricultural Research*, *37*(4), 355–362. https://doi.org/10.17582/journal.pjar/2024/37.4.355.362

Mannen, H., Iso, K., Kawaguchi, F., Sasazaki, S., Yonezawa, T., Dagong, M. I. A., & Bugiwati, S. R. A. (2020). Indonesian native goats (Capra hircus) reveal highest genetic frequency of mitochondrial DNA haplogroup B in the world. *Animal Science Journal*, *91*(1). https://doi.org/10.1111/asj.13485

Martínez, A. M., Delgado, J. V, Rodero, A., & Vega-Pla, J. L. (2000). *Genetic structure of the Iberian pig breed using microsatellites*. www.tiho-hannover.de/einricht/zucht/

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
MATHEW MGOGO, Prof. Ir. Dyah Maharani, S.Pt., M.P., Ph.D., IPM; Prof. Ir. Diah Tri Widayati, MP., Ph.D., IPU., AS
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Meadows, J. R. S., Cemal, I., Karaca, O., Gootwine, E., & Kijas, J. W. (2007). Five ovine mitochondrial lineages identified from sheep breeds of the near east. *Genetics*, *175*(3), 1371–1379. https://doi.org/10.1534/genetics.106.068353

Metzker, M. L. (2010). Sequencing technologies the next generation. In *Nature Reviews Genetics* (Vol. 11, Number 1, pp. 31–46). https://doi.org/10.1038/nrg2626

Miller, B. A., & Lu, C. D. (2019). Current status of global dairy goat production: An overview. *Asian-Australasian Journal of Animal Sciences*, *32*(8), 1219–1232. https://doi.org/10.5713/ajas.19.0253

Millipore, E. (2012). *PCR Protocols & Guides*. www.emdbiosciences.com.

Minter, M., Nielsen, E. S., Blyth, C., Bertola, L. D., Kantar, M. B., Morales, H. E., Orland, C., Segelbacher, G., & Leigh, D. M. (2021). What Is Genetic Diversity and Why Does it Matter? *Frontiers for Young Minds*, *9*. https://doi.org/10.3389/frym.2021.656168

Mukhina, V., Svishcheva, G., Voronkova, V., Stolpovsky, Y., & Piskunov, A. (2022). Genetic Diversity, Population Structure and Phylogeny of Indigenous Goats of Mongolia Revealed by SNP Genotyping. *Animals*, *12*(3). https://doi.org/10.3390/ani12030221

Mullis, K. B., & Fallona, F. A. (1987). *mullis1987_PCR*. https://doi.org/10.1016/0076-6879(87)55023-6

Murray, P., Murray-Prior, R., Atsir, A., Asja, M., Nurhayu, A., & Shearer, D. (2011). *Final report: Improving goat production in integrated estate cropping systems South Sulawesi*. https://www.aciar.gov.au/sites/default/files/2022-09/SMAR-2007-201-final-report.pdf

Naderi, S., Rezaei, H. R., Taberlet, P., Zundel, S., Rafat, S. A., Naghash, H. R., El-Barody, Mohamed A.A., Ertugrul, O., Pompanon, F., Abo-Shehada, M., Ajmone, P. M., Al Tarrayrah, J., Angiolillo, A., Baret, P., Baumung, R., Beja-Pereira, A., Bertaglia, M., Bordonaro, S., Bruford, M., … Zundel, S. (2007). Large-scale mitochondrial DNA analysis of the domestic goat reveals six haplogroups with high diversity. *PLoS ONE*, *2*(10). https://doi.org/10.1371/journal.pone.0001012

Naderi, S., Rezaeia, H.-R., Pompanon, F., Blum, M., Negrini, R., Naghash, H. R., & Mashkour, O. (2008). The goat domestication process inferred from large-scale mitochondrial DNA analysis of wild and domestic individuals. *PNAS*, *105*, 17659–17664. https://doi.org/10.1073/pnas.0804782105

Naqvi, A. N., Bukhari, J. F., Vahidi, S. M. F., Utsunomiya, Y. T., Garcia, J. F., Babar, M. E., Han, J. L., Pichler, R., & Periasamy, K. (2017). Microsatellite based genetic diversity and mitochondrial DNA D-Loop variation in economically important goat breeds of Pakistan. *Small Ruminant Research*, *148*, 62–71. https://doi.org/10.1016/j.smallrumres.2016.12.031

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Notter, D. R. (1996). National Animal Germplasm Program. In *at the ASAS 88th Annu. Meet* (Vol. 77). https://academic.oup.com/jas/article/77/1/61/4625321

Nugraha, W. T., Murti, T. W., & Novitasari, I. S. (2023). *Physical performance, milk production and milk quality of Bligon goat as dairy goat*. 030007. https://doi.org/10.1063/5.0154521

Nur, D., Hariyono, H., & Endrawati, E. (2023). Correspondence Indigenous Goat Genetic Resources in Indonesia: Current Status and Future Improvement. *Journal of Advanced Veterinary Research*, *13*(1), 141–149. https://advetresearch.com/index.php/AVR/article/view/1111

Nurani, S. S., Amrawaty, A., Rahim, L., Dagong, I., Lahay, N., Bahsar Demmalinno, E., & Hijjang, P. (2023). *Development of Goat Population in Jeneponto Regency, South Sulawesi Province, Indonesia*. www.migrationletters.com

Obvintseva, O., Erimbetov, K., Mikhailov, V., Sofronova, O., & Polyakova, L. (2022). The role and metabolic functions of the branched-chain amino acids: a review. *E3S Web of Conferences*, *363*. https://doi.org/10.1051/e3sconf/202236303054

Okoro, V. M. O., Chikereuba, U., Iheanacho, G., Ogundu, A., Chukwuocha, C., Chikaodinaka, F., Ifediba, C., Kadurumba, O. E., Ogundu, U., & Iloeje, M. (2023). West African Dwarf goat populations of tropical rainforest zone: application of multivariate analysis tools on their characterization using morpho-biometric traits. *Tropical Animal Health and Production*, *55*(3). https://doi.org/10.1007/s11250-023-03641-0

Owaid, J. M., Yousief, M. Y., Abdulrda, A. J., & Ayied, A. Y. (2023). Study of Local Black Iraqi Goats Genotypes for the Cytb Gene. *Archives of Razi Institute*, *78*(3), 915–921. https://doi.org/10.22092/ARI.2022.359888.2499

Pakpahan, S., Artama, W. T., Widayanti, R., & Gede Suparta, I. (2015). Genetic variations and the origin of native Indonesian goat breeds based on mtDNA D-loop sequences. *Asian Journal of Animal Sciences*, *9*(6), 341–350. https://doi.org/10.3923/ajas.2015.341.350

Pakpahan, S., Artama, W. T., Widayanti, R., & Gede Suparta, I. (2016). Genetic characteristics and relationship in different goat populations of indonesia based on cytochrome B gene sequences. *Asian Journal of Animal Sciences*, *10*(1), 29–38. https://doi.org/10.3923/ajas.2016.29.38

Pakpahan, S., Artama, W. T., Widayanti, R., & Suparta, I. G. (2016). Molecular phylogenetic of Hutan Sumatera goat (Sumatran serow) and domestic goat (Capra hircus) in Indonesia based on analysis mitochondrial cytochrome b gene. *Asian Journal of Animal and Veterinary Advances*, *11*(6), 331–340. https://doi.org/10.3923/ajava.2016.331.340

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Pakpahan, S., Widayanti, R., Artama, W. T., Budisatria, I. G. S., Raadsma, H. W., & Margawati, E. T. (2023). Genetic diversity analysis of Indonesian indigenous goat breeds based on microsatellite markers. *Small Ruminant Research*, *225*. https://doi.org/10.1016/j.smallrumres.2023.107011

Pal, Aruna, Pal, Abantika, Banerjee, S., Batabyal, S., & Chatterjee, P. N. (2019). Mutation in Cytochrome B gene causes debility and adverse effects on health of sheep. *Mitochondrion*, *46*, 393–404. https://doi.org/10.1016/j.mito.2018.10.003

Pegolo, S., Bisutti, V., Mota, L. F. M., Cecchinato, A., Amalfitano, N., Dettori, M. L., Pazzola, M., Vacca, G. M., & Bittante, G. (2025). Genome-wide landscape of genetic diversity, runs of homozygosity, and runs of heterozygosity in five Alpine and Mediterranean goat breeds. *Journal of Animal Science and Biotechnology*, *16*(1). https://doi.org/10.1186/s40104-025-01155-3

Pemberton, J. M., Slate, J., Bancroft, D. R., & Barrett, J. A. (1995). *Nonamplifying alleles at microsatellite loci: A caution for parentage and population studies*. https://doi.org/10.1111/j.1365-294x.1995.tb00214.x

Peng, D., Wang, N., Zang, Y., Liu, Zhiyong, Liu, Zhentang, Geng, J., Cong, B., Sun, H., & Wu, R. (2024). Concurrent genotyping of mitochondrial DNA and nuclear DNA in rootless hair shafts and blood samples for enhanced analysis. *Forensic Science International: Genetics*, *75*. https://doi.org/10.1016/j.fsigen.2024.103176

Peng, W., Zhang, Yiyuan, Gao, L., Feng, C., Yang, Y., Li, B., Wu, L., Wu, A., Wang, S., Ren, X., Chen, Z., Zhang, M., Cai, D., Wang, X., Lv, M., Zhang, Yitong, Li, Simeng, Zhang, Yunxia, Huang, L., & Li, Shiwei. (2022). Analysis of World-Scale Mitochondrial DNA Reveals the Origin and Migration Route of East Asia Goats. *Frontiers in Genetics*, *13*. https://doi.org/10.3389/fgene.2022.796979

Peng, W., Zhang, Yiyuan, Gao, L., Wang, S., Liu, M., Sun, E., Lu, K., Zhang, Yunxia, Li, B., Li, G., Cao, J., Yang, M., Guo, Y., Wang, M., Zhang, Yuming, Wang, Z., Han, Y., Fan, S., & Huang, L. (2025). Investigation of selection signatures of dairy goats using whole-genome sequencing data. *BMC Genomics*, *26*(1). https://doi.org/10.1186/s12864-025-11437-9

Pereira, R., Oliveira, J., & Sousa, M. (2020). Bioinformatics and computational tools for next-generation sequencing analysis in clinical genetics. In *Journal of Clinical Medicine* (Vol. 9, Number 1). MDPI. https://doi.org/10.3390/jcm9010132

Petretto, E., Dettori, M. L., Pazzola, M., Manca, F., Amills, M., & Vacca, G. M. (2022). Mitochondrial DNA diversity of the Sardinian local cattle stock. *Scientific Reports*, *12*(1). https://doi.org/10.1038/s41598-022-06420-3

Praharani, L. (2015). Production Performance and Economic Efficiency of Young Anglo-Nubian Goat Fed Different Protein and Energy. *The 6 Th International Seminar on*

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
MATHEW MGOGO, Prof. Ir. Dyah Maharani, S.Pt., M.P., Ph.D., IPM; Prof. Ir. Diah Tri Widayati, MP., Ph.D., IPU., AS
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Tropical Animal Production, 203–207. https://journal.ugm.ac.id/istapproceeding/article/view/30614

Prayitno, E., Hartanto, R., & Harjanti, D. W. (2021). Physicochemical and Microbiological Appearance of Sapera Goat's Milk on Frozen Storage. *Jurnal Sain Peternakan Indonesia*, *16*(4), 308–314. https://doi.org/10.31186/jspi.id.16.4.308-314

Prihandini, P. W., Primasari, A., Luthfi, M., Efendy, J., & Pamungkas, D. (2020). Genetic Diversity of Mitochondrial DNA Cytochrome b in Indonesian Native and Local Cattle Populations. *Jurnal Ilmu Ternak Dan Veteriner*, *25*(2), 39–47. https://doi.org/10.14334/jitv.v25i2.2496

Purbowati, E., Lestari, D., Sutopo, S., & Kurnianto, E. (2018). *Phylogenetical Relationships between Kejobong Goat and Other Goats Based on mtDNA D-loop Sequence Analysis*. https://journal.ipb.ac.id/tasj/article/download/22420/14880/68586

Putri Aditya, A., Prabasari, K., & Candramila, W. (2025). Original Research Phylogenetic and Genetic Distance Analysis of the Mangrove Worm (Namalycastis) Based on the 18S rRNA Gene Using in Silico Methods. In *TROPICAL GENETICS* (Vol. 5, Number 2). https://ojs.genetikawan-muda.com/index.php/tg

Rahmawati, R. D., Atmoko, B. A., Budisatria, I. G. S., Ngadiyono, N., & Panjono. (2022). Exterior characteristics and body measurements of Bligon goat on the different agro-ecological zones in Bantul District, Yogyakarta, Indonesia. *Biodiversitas*, *23*(1), 143–150. https://doi.org/10.13057/biodiv/d230118

Rodionov, A. V., Dobryakova, K. S., & Punina, E. O. (2018). Polymorphic Sites in ITS1-5.8S rDNA-ITS2 Region in Hybridogenic Genus × Elyhordeum and Putative Interspecific Hybrids Elymus (Poaceae: Triticeae). *Russian Journal of Genetics*, *54*(9), 1025–1039. https://doi.org/10.1134/S1022795418090120

Ruano, G., & Kidd, K. K. (1991). Genotyping and haplotyping of polymorphisms directly from genomic DNA via coupled amplification and sequencing (CAS). *Nucleic Acids Research*, *19*(24), 6877–6882. https://doi.org/10.1093/nar/19.24.6877

Saiki, R. K., Scharf, S., Faloona, F., Mullis, K. B., Horn, G. T., Erlich, H. A., & Arnheim, N. (1988). *Enzymatic Amplification of P-Globin Genomic Sequences and Restriction Site Analysis for Diagnosis of Sickle Cell Anemia*. https://www.mun.ca/biology/scarr/Saiki,_Mullis_et_al_1985_Science_230,1250.pdf

Santosa, S. A., Hindratiningrum, N., Purwantini, D., Susanto, A., & Candrasari, D. P. (2022). Goat Saanen Productivity at the Dairy and Forage National Breeding Centre Baturraden, Central Java, Indonesia. *KnE Life Sciences*. https://doi.org/10.18502/kls.v0i0.11813

Sato, M., & Sato, K. (2013). Maternal inheritance of mitochondrial DNA by diverse mechanisms to eliminate paternal mitochondrial DNA. In *Biochimica et Biophysica*

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
MATHEW MGOGO, Prof. Ir. Dyah Maharani, S.Pt., M.P., Ph.D., IPM; Prof. Ir. Diah Tri Widayati, MP., Ph.D., IPU., AS
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Acta - Molecular Cell Research (Vol. 1833, Number 8, pp. 1979–1984). https://doi.org/10.1016/j.bbamcr.2013.03.010

Seddigh, S., & Darabi, M. (2018). Functional, structural, and phylogenetic analysis of mitochondrial cytochrome b (cytb) in insects. *Mitochondrial DNA Part A: DNA Mapping, Sequencing, and Analysis*, *29*(2), 236–249. https://doi.org/10.1080/24701394.2016.1275596

Shuvarikov, A. S., Pastukh, O. N., Zhukova, E. V., & Zheltova, O. A. (2021). The quality of milk of goats of Saanen, Alpine and Nubian breeds. *IOP Conference Series: Earth and Environmental Science*, *640*(3). https://doi.org/10.1088/1755-1315/640/3/032031

Stemmer, A., Siegmund-Schultze, M., Gall, C., & Zárate, A. V. (2009). Development and Worldwide Distribution of the Anglo Nubian Goat. *Tropical and Subtropical Agroecosystems*, *11*, 185–188. https://www.researchgate.net/publication/269220099_Development_and_worldwide_distribution_of_the_Anglo_Nubian_goat

Sudarman, A. (2017). *Dairy goats in Indonesia: potential opportunities and challenges*. https://www.researchgate.net/publication/285667909

Sujarwanta, R. O., Afidah, U., Suryanto, E., Rusman, Triyannanto, E., & Hoffman, L. C. (2024). Review: Goat and Sheep Meat Production in Indonesia. In *Sustainability (Switzerland)* (Vol. 16, Number 11). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/su16114448

Sumarmono, J. (2022). Current goat milk production, characteristics, and utilization in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1041*(1). https://doi.org/10.1088/1755-1315/1041/1/012082

Susilorini, T. E., Maylinda, S., & Surjowardojo, P. (2014). *Importance of Body Condition Score for Milk Production Traits in Peranakan Etawah Goats*. *4*(3). www.iiste.org

Susilorini, T. E., Wulandari, D., Furqon, A., Septian, W. A., Saputra, F., & Suyadi, S. (2022). Genetic Diversity of Various Goat Breeds in East Java Based on DNA Microsatellite Markers. *Tropical Animal Science Journal*, *45*(3), 247–254. https://doi.org/10.5398/tasj.2022.45.3.247

Sutopo, S., Purbowati, E., & Kurnianto, E. (2018). *Genetic Variation of Cytochrome b Gene in Three Local Goat Breeds in Central Java of Indonesia*. www.ijas.ir

Suyadi, S., Murtika, I. L., Susilorini, T. E., Septian, W. A., Saputra, F., & Furqon, A. (2022). Genetic diversity of goats in East Java through analysis of the cytochrome B and cytochrome oxidase I genes in mitochondrial DNA. *Small Ruminant Research*, *209*. https://doi.org/10.1016/j.smallrumres.2022.106659

UNIVERSITAS
GADJAH MADA
Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Taberlet, P., Coissac, E., Pansu, J., & Pompanon, F. (2011). Conservation genetics of cattle, sheep, and goats. In *Comptes Rendus - Biologies* (Vol. 334, Number 3, pp. 247–254). Elsevier Masson SAS. https://doi.org/10.1016/j.crvi.2010.12.007

Tamura, K., Stecher, G., & Kumar, S. (2021). MEGA11: Molecular Evolutionary Genetics Analysis Version 11. *Molecular Biology and Evolution*, *38*(7), 3022–3027. https://doi.org/10.1093/molbev/msab120

Tang, Q., Liu, H., Mayden, R., & Xiong, B. (2006). Comparison of evolutionary rates in the mitochondrial DNA cytochrome b gene and control region and their implications for phylogeny of the Cobitoidea (Teleostei: Cypriniformes). *Molecular Phylogenetics and Evolution*, *39*(2), 347–357. https://doi.org/10.1016/j.ympev.2005.08.007

Tarekegn, G. M., Ji, X. Y., Bai, X., Liu, B., Zhang, W., Birungi, J., Djikeng, A., & Tesfaye, K. (2018). Variations in mitochondrial cytochrome b region among Ethiopian indigenous cattle populations assert Bos taurus maternal origin and historical dynamics. *Asian-Australasian Journal of Animal Sciences*, *31*(9), 1393–1400. https://doi.org/10.5713/ajas.17.0596

Taylor, R. W., & Turnbull, D. M. (2005). Mitochondrial DNA mutations in human disease. In *Nature Reviews Genetics* (Vol. 6, Number 5, pp. 389–402). https://doi.org/10.1038/nrg1606

Tobe, S. S., Kitchener, A. C., & Linacre, A. M. T. (2010). Reconstructing mammalian phylogenies: A detailed comparison of the cytochrome b and cytochrome oxidase subunit i mitochondrial genes. *PLoS ONE*, *5*(11). https://doi.org/10.1371/journal.pone.0014156

Toro, M. A., Fernández, J., & Caballero, A. (2009). Molecular characterization of breeds and its use in conservation. *Livestock Science*, *120*(3), 174–195. https://doi.org/10.1016/j.livsci.2008.07.003

Torres-Hernandez, G., Maldonado-Jaquez, J. A., Granados-Rivera, L. D., Salinas-Gonzalez, H., & Castillo-Hernandez, G. (2022). Status quo of genetic improvement in local goats: A review. In *Archives Animal Breeding* (Vol. 65, Number 2, pp. 207–221). Copernicus GmbH. https://doi.org/10.5194/aab-65-207-2022

Tri, N., Widitya, T., Wisnu, T., & Sri, N. (2023). Physical performance, milk production and milk quality of Bligon goat as dairy goat. *American Institute of Physics Conference Series*, *2765*. https://doi.org/10.1063/5.0154521

Tron, T., Crimi, M., Colson, A., & Degli Esposti, M. (1991). Structure/function relationships in mitochondrial cytochrome b revealed by the kinetic and circular dichroic properties of two yeast inhibitor-resistant mutants. *European Journal of Biochemistry*, *199*(3), 753–760. https://doi.org/10.1111/j.1432-1033.1991.tb16180.x

UNIVERSITAS
GADJAH MADA

Genetic Diversity and Phylogenetic Relationships of Seven Dairy Goat Breeds in Yogyakarta and Central Java Based on Cytochrome B Gene.
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

United Nations Statistics Division. (2023). *Indonesia data mart - UN COMTRADE*. http://data.un.org/Data.aspx?q=indonesia+datamart%5BComTrade%5D&d=ComTrade&f=_l1Code%3A1%3BrtCode%3A360

Vostra-Vydrova, H., Hofmanova, B., Moravcikova, N., Rychtarova, J., Kasarda, R., Machova, K., Brzakova, M., & Vostry, L. (2020). Genetic diversity, admixture and the effect of inbreeding on milk performance in two autochthonous goat breeds. *Livestock Science*, *240*. https://doi.org/10.1016/j.livsci.2020.104163

Wang, G. Z., Chen, S. S., Chao, T. L., Ji, Z. B., Hou, L., Qin, Z. J., & Wang, J. M. (2017). Analysis of genetic diversity of chinese dairy goats via microsatellite markers. *Journal of Animal Science*, *95*(5), 2304–2313. https://doi.org/10.2527/jas2016.1029

Wen, J.-J., & Garg, N. J. (2010). Mitochondrial Complex III Defects Contribute to Inefficient Respiration and ATP Synthesis in the Myocardium of Trypanosoma cruzi–Infected Mice. *Antioxidants & Redox Signaling*, *12*(1), 27–37. https://doi.org/10.1089/ars.2008.2418

Whannou, H. R. V., Spanoghe, M., Dayo, G. K., Demblon, D., Lanterbecq, D., & Dossa, L. H. (2023). Genetic diversity assessment of the indigenous goat population of Benin using microsatellite markers. *Frontiers in Genetics*, *14*. https://doi.org/10.3389/fgene.2023.1079048

Wilson, R. T. (2021). *When is a "breed" not a breed: the myth of the Mpwapwa cattle of Tanzania*. https://doi.org/10.1007/s11250-021-02669-4/Published

Xiong, J., Bao, J., Hu, W., Shang, M., & Zhang, L. (2023). Whole-genome resequencing reveals genetic diversity and selection characteristics of dairy goat. *Frontiers in Genetics*, *13*. https://doi.org/10.3389/fgene.2022.1044017

Xue, L., Moreira, J. D., Smith, K. K., & Fetterman, J. L. (2023). The Mighty NUMT: Mitochondrial DNA Flexing Its Code in the Nuclear Genome. In *Biomolecules* (Vol. 13, Number 5). MDPI. https://doi.org/10.3390/biom13050753

Yordanov, G., Kalaydzhiev, G., Palova, N., Salkova, D., Lozanova, L., Dundarova, H., Odjakova, T., Todorov, P., Radoslavov, G., & Hristov, P. (2024). Genetic Differentiation and Population Structure of Two Bulgarian Local Goat Breeds Using Microsatellite Markers. *Diversity*, *16*(7). https://doi.org/10.3390/d16070388

Zein, A. S. M., Sulandari, S., Mulando, Subandriyo, & Riwantoro. (2012). *Genetic diversity and phylogenetic relationship of Indonesian local goats using microsatellite DNA markers*. https://www.researchgate.net/publication/285820929