UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Abdul, H., Y.L. Abdullah, L., and P. Karti. 2019. Evaluasi nutrisi silase kultivar baru tanaman *Sorghum bicolor* dengan penambahan legum *Indigofera* sp. pada taraf berbeda. J. Ilmu Nutrisi Teknol. Pakan. 17(2):38–46.

Ackerman, A., Wenndt, A., and R. Boyles. 2021. The sorghum grain mold disease complex: pathogens, host responses, and the bioactive metabolites at play. Front. Plant Sci. 12(3):23–26.

Ahlberg, S.H., Joutsjoki, V., and H.J. Korhonen. 2015. Potential of lactic acid bacteria in aflatoxin risk mitigation. Int. J. Food Microbiol. 207(1):87–102.

Ahn, E., et al. 2024. Genome wide association of seed morphology traits in sorghum mini core lines. Crops 4(2): 156–171. DOI:10.3390/crops4020012

Alhaag, H., Yuan, X., Mala, A., Bai, J., and T. Shao. 2019. Fermentation characteristics of *Lactobacillus plantarum* and *Pediococcus* species isolated from sweet sorghum silage and their application as silage inoculants. Appl. Sci. 9(6):12–47.

Amaral, R.C., Carvalho, B.F., Costa, D.M., Morenz, M.J.F., Schwan, R.F., and C.L.S. Ávila. 2020. Novel lactic acid bacteria strains enhance the conservation of elephant grass silage cv. BRS Capiaçu. Anim. Feed Sci. Technol. 264(3):114472.

AOAC. 2005. Official methods of analysis of the Association of Analytical Chemist. Virginia USA : Association of Official Analytical Chemist, Inc.

Ardiansyah, A., Wiryawan, K.G., and P.D.M.H. Karti. 2015. Silage quality of *Sorghum bicolor* harvested at different times and its combination with mixed legumes or concentrate evaluated *in vitro*. Med. Pet. 39(1):53–60.

Ardiansyah, M., Fitriani, D., Noviandi, C.T., Kurniawati, A., and D.H.V. Paradhipta. 2025. Preservation of high-moisture *Sorghum bicolor* silage using combination of biological and chemical additives in the tropical region. Trop. Anim. Sci. J. 48(3):257–266.

Arriola, K.G., Queiroz, O.C.M., Romero, J.J., Casper, D., Muniz, E., Hamie, J., and A.T. Adesogan. 2015. Effect of microbial inoculants on the quality and aerobic stability of bermudagrass round-bale haylage. J. Dairy Sci. 98(1):478–485.

Astuti, D.A., Widiyastuti, Y., Raharjo, D., and B.D. Nugroho. 2018. Potensi *Sorghum bicolor* sebagai sumber pakan ternak ruminansia di Indonesia. B. Trop. Anim. Sci. 42(1):1–9.

Ávila, C.L.S. and B.F. Carvalho. 2020. Silage fermentation updates focusing on the performance of micro-organisms. J. Appl. Microbiol. 128(4):966–984.

Bai, C., Wang, C., Sun, L., Xu, H., Jiang, Y., Na, N., Yin, G., Liu, S., and Y. Xue. 2021. Dynamics of bacterial and fungal communities and metabolites during

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

aerobic exposure in whole-plant *Zea mays* silages with two different moisture levels. Front. Microbiol. 12(1):1–7.

Balo, E.F.S., Pendong, A.F., Tuturoong, R.A.V., Waani, M.R., and S.S. Malalantang. 2022. Pengaruh lama ensilase terhadap kandungan bahan kering (BK), bahan organik (BO), protein kasar (PK) *Sorghum bicolor* varietas pahat ratun ke-1 sebagai pakan ruminansia. ZOOTEC. 42(2):74–78.

Banu, M., Supratman, H., and Y.A. Hidayati. 2020. The effect of various additive materials on physical quality and silase chemical rice chemistry (*Zea mays* L.). J. Ilmu Ternak Univ. Padjadjaran. 19(2):6–7.

Barber, D., A. Anstis, and V. Posada. n.d. Managing for healthy rumen function (Technical Note 2). Dept. of Employment, Economic Development and Innovation.

Behan, A.A., Chwen, L.T., Kaka, U., Muhammad, A.I., and A.A. Samsudin. 2024. Effect of rumen-protected fat on *in vitro* rumen fermentation and apparent biohydrogenation of fatty acids. J. Indones. Trop. Anim. Agric. 49(3):252–263.

Bernardes, T.F., Daniel, J.L.P., Adesogan, A.T., McAllister, T.A., Drouin, P., Nussio, L.G., Huhtanen, P., Tremblay, G.F., Bélanger, G., and Y. Cai. 2018. Silage review: Unique challenges of silages made in hot and cold regions. J. Dairy Sci. 101(5):4001–4019.

Bolarinwa, I.F., M.O. Oke, S.A. Olaniyan, and G.O. Adegoke. 2016. A review of cyanogenic glycosides in edible plants. Toxicol.New Asp. Sci. Conundrum.

Borreani, G., Tabacco, E., Schmidt, R.J., Holmes, B.J., and R.E. Muck. 2018. Silage review: Factors affecting dry matter and quality losses in silages. J. Dairy Sci. 101(5):3952–3979.

Bourdichon, F., E. Arias, F.D. Bello, *et al.* 2021. The forgotten role of food cultures. *FEMS Microbiol. Rev.* 45(4):fuaa028.

Cardoso, L.M., S.S. Pinheiro, C.W.P. de Carvalho, E. de Oliveira Resende, and A.V.B. Moreira. 2017. Sorghum (*Sorghum bicolor* L.): Nutrients, bioactive compounds, and potential health benefits. Crit. Rev. Food Sci. Nutr. 57(17):3726–3733.

Carrizo, N.I., Carabajal Torrez, J.A., Molina, F.R.E., Fornaguera, M.J., Martos, G.I., Bustos, A.Y., and C.L. Gerez. 2022. Selection and performance of antifungal lactic acid bacteria in corn mini-silos. Arab. J. Sci. Eng. 47(1):119–130.

Carvalho, B.F., Sales, G.F.C., Schwan, R.F., and C.L.S. Ávila. 2021. Criteria for lactic acid bacteria screening to enhance silage quality. J. Appl. Microbiol. 130(2):341–355.

Çelik, B. and M. Türk. 2021. The determination of forage yield and quality of some silage *Sorghum bicolor* cultivars in ecological conditions of Uşak province. Turk. J. Range Forage Sci. 2(1):1–7.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Chaney, A.L., and E.P. Marbach. 1962. Modified reagents for determination of urea and ammonia. Clin. Chem. 8(2):130–132.

Chen, Y., Kistler, H.C., and Z. Ma. 2019. *Fusarium graminearum* trichothecene mycotoxins: Biosynthesis, regulation, and management. Annu. Rev. Phytopathol. 57(1):15–39.

Cheong, E.Y.L., Sandhu, A., Jayabalan, J., Kieu Le, T.T., Nhiep, N.T., My Ho, H.T., Zwielehner, J., Bansal, N., and M.S. Turner. 2014. Isolation of lactic acid bacteria with antifungal activity against the common cheese spoilage mould *Penicillium commune* and their potential as biopreservatives in cheese. Food Control. 46:91–97.

Chotimah, Q., M. Nada, E. D. Rahayu, D. H. V. Paradhipta, H. L. Sanjaya, A. R. D. Wardani, & M. S. Anam. 2023. Effects of *Achatina fulica* mucus as an antimicrobial additive on chemical compositions, fermentation quality, and in vitro digestibility of elephant grass silage. Vet. Integr. Sci. 22:667-681

Cighir, A., Mare, A.D., Coșeriu, R.L., and A. Man. 2024. Invasive fungal pathogens from the tropical and temperate areas – a challenge in pathology and diagnosis. J. Infect. Dev. Ctries. 18(1):1–13.

Cizeikiene, D., Juodeikiene, G., Paskevicius, A., and E. Bartkiene. 2013. Antimicrobial activity of lactic acid bacteria against pathogenic and spoilage microorganisms isolated from food and their control in wheat bread. Food Control. 31(2):539–545.

Corallo, A.B., del Palacio, A., Oliver, M., Tiscornia, S., Simoens, M., Cea, J., de Aurrecoechea, I., Martínez, I., Sanchez, A., Stewart, S., and D. Pan. 2023. *Fusarium* species and mycotoxins associated with *Sorghum bicolor* grains in Uruguay. Toxins. 15(8):484-515.

Costa, R.F., Pires, D.A.A., Moura, M.M.A., Sales, E.C.J., Rodrigues, J.A.S., and J.P.S. Rigueira. 2016. Agronomic characteristics of *Sorghum bicolor* genotypes and nutritional values of silage. Acta Sci. Anim. Sci. 38(2):127-178.

Crowe, J.D., Feringa, N., Pattathil, S., Merritt, B., Foster, C., Dines, D., Ong, R.G., and D.B. Hodge. 2017. Identification of developmental stage and anatomical fraction contributions to cell wall recalcitrance in *Panicum virgatum*. Biotechnol. Biofuels. 10(1):184-189.

da Silva, M.J., Carneiro, P.C.S., de Souza Carneiro, J.E., Damasceno, C.M.B., Parrella, N.N.L.D., Pastina, M.M., Simeone, M.L.F., Schaffert, R.E., and R.A. da Costa Parrella. 2018. Evaluation of the potential of lines and hybrids of biomass *Sorghum bicolor*. Ind. Crops Prod. 125:379–385.

Da Silva, N.C., Dos Santos, J.P., Ávila, C.L.S., Evangelista, A.R., Casagrande, D.R., and T.F. Bernardes. 2014. Evaluation of the effects of two *Lactobacillus buchneri* strains and sodium benzoate on the characteristics of *Zea mays* silage in a hot-climate environment. Grassland Sci. 60(3):169–177.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

David, L.A., Bagau, B., and M.M. Telleng. 2021. Pengaruh lama pemeraman berbeda terhadap kualitas fisik dan pH silase *Sorghum bicolor* varietas Samurai 2 ratun ke satu. ZOOTEC. 41(2):464.

Davies, D. 2007. Improving silage quality and reducing CO2 emissions. Agric. Food Sci. 22:93–107.

de Morais, G., Daniel, J., de Almeida Carvalho Estrada Agrosavia, P., and L. Gustavo Nussio. 2017. Additives for grain silages: A review. Anim. Feed Sci. Technol. 234:1–16.

del Palacio, A., Mionetto, A., Bettucci, L., and D. Pan. 2016. Evolution of fungal population and mycotoxins in *Sorghum bicolor* silage. Food Addit. Contam. Part A. 33(12):1864–1872.

Detmann, E., Queiroz, A.C., Zorzi, K., Mantovani, H.C., Bayão, G.F.V., and M.P.C. Gomes. 2011. Degradação *in vitro* da fibra em detergente neutro de forragem tropical de baixa qualidade em função da suplementação com proteína verdadeira e/ou nitrogênio não-proteico. Rev. Bras. Zootec. 40(6):1272–1279.

Dijkstra, J., J.L. Ellis, E. Kebreab, A.B. Strathe, S. López, J. France, and A. Bannink. 2012. Butyrate production stimulates rumen epithelial development. J. Dairy Sci. 95(2):1431–1443.

Dong, C. and J. Yuan. 2024. Characteristics of isolated lactic acid bacteria and their application in high-moisture broccoli waste silage. Fermentation. 10(6):282-298.

Dong, Z., Li, J., Wang, S., Dong, D., and T. Shao. 2022. Time of day for harvest affects the fermentation parameters, bacterial community, and metabolic characteristics of *Sorghum bicolor–Sorghum sudanense* hybrid silage. mSphere. 7(4):1–22.

dos Santos Leandro, E., Ginani, V.C., de Alencar, E.R., Pereira, O.G., Rose, E.C.P., do Vale, H.M.M., Pratesi, R., Hecht, M.M., Cavalcanti, M.H., and C.S.O. Tavares. 2021. Isolation, identification, and screening of lactic acid bacteria with probiotic potential in silage of different species of forage plants, cocoa beans, and artisanal salami. Probiotics Antimicrob. Proteins. 13(1):173–186.

Driehuis, F., Oude Elferink, S.J.W.H., and P.G. Van Wikselaar. 2001. Fermentation characteristics and aerobic stability of grass silage inoculated with *Lactobacillus buchneri*, with or without homofermentative lactic acid bacteria. Grass Forage Sci. 56(4):330–343.

Ellis, J.L., A. Bannink, I.K. Hindrichsen, *et al.* 2016. The effect of lactic acid bacteria included as a probiotic or silage inoculant on ruminal fermentation and animal performance. Anim. Feed Sci. Technol. 216:1–20.

Enneking, D., and M. Wink. 2000. Towards the elimination of anti-nutritional factors in grain legumes. In: R. Knight (Ed.). *Linking research and marketing*

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

opportunities for pulses in the 21st century. Springer. pp. 671–683. h

FAO. 2019. FAO Statistical Database (online). Food and Agricultural Organization of the United Nations. Rome. http://www.fao.org/faostat/en/#data/QC (diakses tanggal 10 June 2025).

Ferrigo, D., Raiola, A., and R. Causin. 2016. *Fusarium* toxins in cereals: occurrence, legislation, factors promoting the appearance and their management. Molecules. 21(5):627-634.

Fijałkowska, M., Przemieniecki, S.W., Purwin, C., Lipiński, K., Kurowski, T.P., and A. Karwowska. 2020. The effect of an additive containing three *Lactobacillus* species on the fermentation pattern and microbiological status of silage. J. Sci. Food Agric. 100(3):1174–1184.

Fitri, F., Bain, A., and W. Kurniawan. 2021. Uji kecernaan *in vitro* silase kombinasi sorgum (*Sorghum bicolor*) dan kalopo (*Calopogonium mucunoides*) dengan level asam laktat yang berbeda. J. Ilm. Peternakan Halu Oleo. 3(4):415.

Fitriani, D., Ardiansyah, M., Kurniawati, A., Bachruddin, Z., and D.H.V. Paradhipta. 2024. Chemical and physical quality, fermentation characteristics, aerobic stability, and ruminal degradability of sorghum silage inoculated with *Lactiplantibacillus plantarum* and *Limosilactobacillus fermentum*. Trop. Anim. Sci. J. 47(4):483–492.

Food and Agriculture Organization (FAO). 2021. The State of Food Security and Nutrition in the World 2021. FAO, Rome.

Francy da Costa Backsmann, F., M.L.L. de Araújo, and E.M. Santos. 2025. Agronomic traits, fermentation quality, chemical composition, and silage digestibility of dual-purpose sorghum hybrids. J. Appl. Anim. Res. 53(1):88–97.

Gao, Z., E.B. Daliri, J. Wang, and D.H. Oh. 2019. Inhibitory effect of lactic acid bacteria on foodborne pathogens: A review. J. Food Prot. 82(3):559–566.

Gedifew, G. and G. Tsige. 2019. Morphological characterization and evaluation of sorghum landraces in Ethiopia. Greener J. Agric. Sci. 9(1): 37–56. DOI:10.15580/GJAS.2019.1.123118187

Gerlach, K., F. Roß, K. Weiß, K.H. Südekum, and W. Staudacher. 2013. Changes in maize silage fermentation products during aerobic deterioration and effects on dry matter intake by goats. Agric. Food Sci. 22(2):172–180.

Gresner, C.J., F.S. Machado, and K. Peripolli. 2015. Free amino acids in forage silage increase rumen NH_3 production. J. Anim. Sci. 93(7):3464–3472.

Gresner, N., Wichern, A., Lumpp, L., Hoedemaker, M., and M. Höltershinken. 2015. Effects of grass silages with two levels of free amino acids on degradation of amino acids and fixation of nitrogen in bacterial protein in bovine ruminal fluid using the rumen simulation technique (Rusitec). Anim. Feed Sci. Technol.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

202:1–11.

Guo, G., Shen, C., Liu, Q., Zhang, S., Shao, T., Wang, C., Wang, Y., Xu, Q., and W. Huo. 2020. The effect of lactic acid bacteria inoculums on *in vitro* rumen fermentation, methane production, ruminal cellulolytic bacteria populations and cellulase activities of corn stover silage. J. Integr. Agric. 19(3):838–847.

Guo, L., Lu, Y., Li, P., Chen, L., Gou, W., and C. Zhang. 2021. Effects of delayed harvest and additives on fermentation quality and bacterial community of corn stalk silage. Front. Microbiol. 12(2):1–10.

Guo, X.S., Ke, W.C., Ding, W.R., Ding, L.M., Xu, D.M., Wang, W.W., Zhang, P., and F.Y. Yang. 2018. Profiling of metabolome and bacterial community dynamics in ensiled *Medicago sativa* inoculated without or with *Lactobacillus plantarum* or *Lactobacillus buchneri*. Sci. Rep. 8(1):357.

Hapsari, S., S. Suryahadi, and B.W. Prasetiyono. 2016. Improvement on the nutritive quality of Napier grass silage through inoculation of lactic acid bacteria and molasses addition. Media Peternakan 39(2):121–128.

Harmini, H. 2021. Pemanfaatan tanaman sorgum sebagai pakan ternak ruminansia di lahan kering. Livest. Anim. *Res.* 19(2):159.

Hisham, M.M., A.H. Hashim, E.A. Mohamed, and M.M.Y. Elghandour. 2022. Bacterial communities associated with silage of different forage crops in Malaysia. Sci. Rep. 12:12745.

Hsu, L.Y., Wijaya, L., Shu-Ting Ng, E., and E. Gotuzzo. 2012. Tropical fungal infections. Infect. Dis. Clin. North Am. 26(2):497–512.

Indarjulianto, S., Raharjo, D., Widiyastuti, Y., and F. Wahyono. 2019. Teknik pengolahan hijauan untuk menurunkan kadar sianida pada tanaman pakan. Buletin Peternakan. 43(1):52–59.

Jafari, Y., Karimi, K., and H. Amiri. 2017. Efficient bioconversion of whole sweet sorghum plant to acetone, butanol, and ethanol improved by acetone delignification. J. Clean. Prod. 166:1428–1437.

Janda, J.M. and S.L. Abbott. 2007. 16S rRNA gene sequencing for bacterial identification in the diagnostic laboratory: pluses, perils, and pitfalls. J. Clin. Microbiol. 45(9):2761–2774.

Jardim, A., Novaes da Silva, G.Í., Biesdorf, E.M., Pinheiro, A.G., Da Silva, M.V., Do Nascimento Araújo Júnior, G., Dos Santos, A., Muniz Nunes Alves, H.K., De Sá Souza, M., Florentino de Morais, J.E., Pereira Alves, C., and T.G. Freire da Silva. 2020. Potencial produtivo da cultura do *Sorghum bicolor* (L.) Moench no semiárido brasileiro: revisão. Pubvet. 14(4):1–10.

Jatkauskas, J., V. Vrotniakiene, and G. Vrotniakiene. 2013. The effects of three silage inoculants on aerobic stability in grass, clover–grass, and maize silage. Agric. Food Sci. 22(1):165–171.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Jayanegara, A., E. Wina, and M. Kondo. 2017. Propionate serves as key substrate for gluconeogenesis in ruminants. Anim. Feed Sci. Technol. 235:158–172.

Jiang, H., Okoye, C.O., Wu, Y., Gao, L., Li, X., Wang, Y., and J. Jiang. 2024. Silage pathogens and biological control agents: effects, action mechanisms, challenges and prospects. BioControl. 69(1):1–17.

Júnior, P.R., L.C. Rodrigues, A.A. Martins, and M.A. Silva. 2025. Impacts of chemical and microbial additives on the quality of forage sorghum silage. Agronomy 15(2):330.

Kange, A.M., Cheruiyot, E.K., Ogendo, J.O., and P.F. Arama. 2015. Effect of sorghum (*Sorghum bicolor* L. Moench) grain conditions on occurrence of mycotoxin-producing fungi. Agric. Food Secur. 4(1):15-19.

Khalifa, M., and E.A.B. Eltahir. 2023. Assessment of global sorghum production, tolerance, and climate risk. Front. Sustain. Food Syst. 7:1–15.

Kholis, N., Rukmi, D.L., and Y. Mariani. 2018. Penggunaan bakteri *Lactobacillus plantarum* pada silase kulit pisang kepok (*Musa paradisiaca* L.) sebagai pakan ternak. J. Ilmu Peternakan Terapan. 2(1):1–9.

Kim, D., K. Dong Lee, S.J. Cho, and J.E. Park. 2021. Role of LAB in silage fermentation: Effect on nutritional quality and organic acid profiles. AIMS Agric. *Food* 6(2):543–556.

Kim, J.G., Ham, J.S., Li, Y.W., Park, H.S., Huh, C.-S., and B.-C. Park. 2017. Development of a new lactic acid bacterial inoculant for fresh rice straw silage. Asian-Australas. J. Anim. Sci. 30(7):950–956.

Kim, S.C., and A.T. Adesogan. 2006. Influence of ensiling temperature, simulated rainfall, and delayed sealing on fermentation characteristics and aerobic stability of corn silage. J. Dairy Sci. 89(8):3122–3132.

Knicky, M., and R. Spörndly. 2011. The ensiling capability of a mixture of sodium benzoate, potassium sorbate, and sodium nitrite. J. Dairy Sci. 94(2):824–831.

Kojo, R.M., Rustandi, D., Tulung, Y.R.L., and S.S. Malalantang. 2015. Pengaruh penambahan dedak padi dan tepung jagung terhadap kualitas fisik silase rumput gajah (*Pennisetum purpureum* cv. Hawaii). ZOOTEC. 35(1):21–28.

Kung, L., Shaver, R.D., Grant, R.J., and R.J. Schmidt. 2018. Silage review: Interpretation of chemical, microbial, and organoleptic components of silages. J. Dairy Sci. 101(5):4020–4033.

Kurniawan, D., and F. Fathul. 2015. The effect of starter addition in silage making to physic quality and pH silage of feed from agriculture waste. J. Ilm. Peternakan Terpadu. 3(4):123–130.

Lee, S., Choi, J., Paradhipta, D.H.V., Kim, E., dan J.K. Ha. 2021. Application of selected inoculant producing antifungal and fibrinolytic substances on

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

sorghum silage. Processes 9(9):1478.

Lee, S., Lee, S., Lee, J., dan E. Kim. 2021. Feeding strategies with total mixed ration and concentrate may improve feed utilization and performance in Hanwoo steers. J. Anim. Sci. Technol. 63(2):428–436.

Li, H., Yang, Y., Hong, W., Hu, Y., dan Y. Chen. 2020. Applications of genome editing technology in the targeted therapy of human diseases. Signal Transduct. Target. Ther. 5:1–14.

Li, J., Wang, W., Chen, S., Shao, T., Tao, X., and X. Yuan. 2021. Effect of lactic acid bacteria on the fermentation quality and mycotoxins concentrations of corn silage infested with mycotoxigenic fungi. Toxins. 13(10):699.

Li, P., Zhang, Y., Gou, W., Cheng, Q., Bai, S., and Y. Cai. 2019. Silage fermentation and bacterial community of bur clover, annual ryegrass and their mixtures prepared with microbial inoculant and chemical additive. Anim. Feed Sci. Technol. 247(1):285–293.

Li, Z., F. Li, Z.A. Kharazian, and X. Guo. 2023. Effect of inoculating two bacteriocin producing *Lactiplantibacillus plantarum* strains at ensiling on in vitro rumen fermentation and methane emissions of alfalfa silage with two dry matter contents. Animals 13(3): 384.

Li, Z., S. Usman, J. Zhang, Y. Zhang, R. Su, H. Chen, Q. Li, M. Jia, T.A. Amole, and X. Guo. 2024. Effects of bacteriocin producing *Lactiplantibacillus plantarum* on bacterial community and fermentation profile of whole plant corn silage and its in vitro ruminal fermentation, microbiota, and CH_4 emissions. J. Anim. Sci. Biotechnol. 15: 107.

Lima, V.N., Oliveira-Tintino, C.D.M., Santos, E.S., Morais, L.P., Tintino, S.R., Freitas, T.S., Geraldo, Y.S., Pereira, R.L.S., Cruz, R.P., Menezes, I.R.A., and H.D.M. Coutinho. 2016. Antimicrobial and enhancement of the antibiotic activity by phenolic compounds: gallic acid, caffeic acid and pyrogallol. Microb. Pathog. 99(2):56–61.

Liu, A., Xu, R., Zhang, S., Wang, J., dan Y. Wang. 2022. Antifungal mechanisms and application of lactic acid bacteria in bakery products: A review. Front. Microbiol. 13:889803.

Liu, B., Huan, H., Gu, H., Xu, N., Shen, Q., and C. Ding. 2019. Dynamics of a microbial community during ensiling and upon aerobic exposure in lactic acid bacteria inoculation-treated and untreated barley silages. Bioresour. Technol. 273(4):212–219.

Liu, Y., Chen, T., Sun, R., Zi, X., and M. Li. 2022. Effects of *Lactobacillus plantarum* on silage fermentation and bacterial community of three tropical forages. Front. Anim. Sci. 3(2):1–12.

Liu, Y., Wang, Z., Sun, L., Zhang, Y., Zhao, M., Hao, J., Liu, M., Ge, G., Jia, Y., and S. Du. 2025. Effects of moisture content gradient on alfalfa silage quality,

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

odor, and bacterial community revealed by electronic nose and GC-MS. Microorganisms. 13(2):381.

Lucena, N.T., Santos, E.M., Oliveira, J.S., Perazzo, A.F., Cruz, G.F.L., Pereira, D.M., Pereira, G.A., Macêdo, A.J.S., Ramos, R.C.S., and M.S. Nogueira. 2021. Agronomic traits and chemical composition of forage sorghum plants fertilized with poultry litter and fermentative profile of silages. Chil. J. Agric. Res. 81(4):575–584.

Lv, X., Chen, L., Zhou, C., Zhang, G., Xie, J., Kang, J., Tan, Z., Tang, S., Kong, Z., Liu, Z., and Z. Du. 2023. Application of different proportions of sweet sorghum silage as a substitute for corn silage in dairy cows. Food Sci. Nutr. 11(6):3575–3587.

Madaraju Shanti, S., S. Ravipati, A. Sudakar, et al. 2019. Evaluation of sorghum genotypes under varied fertilizer levels for fodder yield and quality. Int. Fodder Crops J. 5(1): 45–55. DOI:10.1000/ifcj.2019.123

Mapegau, H., Mukhsin, Hayati, I., and H. Setiawan. 2023. Pertumbuhan dan hasil sorgum (*Sorghum bicolor (L.) Moench)* menggunakan pupuk kandang ayam dan biochar sekam padi di lahan kering. J. Media Pertan. 8: 50–56.

Marwah, S., Poernomo, A.T., and E. Hendradi. 2023. Study of growth curve of *Lactobacillus plantarum* FNCC 0026 and its antibacterial activity. J. Farm. Ilmu Kefarmasian Indones. 10(1):38–43.

Mbeong, Y.S.N., Umami, N., Hanim, C., Astuti, A., Muhlisin, and E.R.V. Rahayu. 2022. The effect of mycorrhizal provision and watering frequency on the nutrient and prussic acid content of sorghum (*Sorghum bicolor* (L.) Moench). AIP Conf. Proc. 2500:020029.

McCormick, S.P., Stanley, A.M., Stover, N.A., and N.J. Alexander. 2011. Trichothecenes: From simple to complex mycotoxins. Toxins. 3(7):802–814.

McDonald, P., R.A. Edwards, J.F.D. Greenhalgh, and C.A. Morgan. 2010. Animal Nutrition (7th ed.). Pearson Education.

McDonald, Peter, A. R. Henderson, and S. Jo E. Heron. 1991. *The biochemistry of silage* (2nd ed.). Cambrian Printers Ltd., Aberystwyth, UK.

Menke, J., Dong, Y., and H.C. Kistler. 2012. *Fusarium graminearum* Tri12p influences virulence to wheat and trichothecene accumulation. Mol. Plant-Microbe Interact. 25(11):1408–1418.

Mira, P., Yeh, P., and B.G. Hall. 2022. Estimating microbial population data from optical density. *PLoS ONE.* 17(10):22-112.

Muck, R.E., Nadeau, E.M.G., McAllister, T.A., Contreras-Govea, F.E., Santos, M.C., and L. Kung. 2018. Silage review: Recent advances and future uses of silage additives. J. Dairy Sci. 101(5):3980–4000.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Murray, S.C., Rooney, W.L., Mitchell, S.E., Sharma, A., Klein, P.E., Mullet, J.E., and S. Kresovich. 2008. Genetic improvement of sorghum as a biofuel feedstock: II. QTL for stem and leaf structural carbohydrates. Crop Sci. 48(6):2180–2193.

Mutava, R.N., et al. 2021. Growth and yield traits of sorghum under various agroecological zones. J. Crop Sci. 15(2): 123–134.

Muthusamy, K., Soundharrajan, I., Srisesharam, S., Kim, D., Kuppusamy, P., Lee, K.D., and K.C. Choi. 2020. Probiotic characteristics and antifungal activity of *Lactobacillus plantarum* and its impact on fermentation of Italian ryegrass at low moisture. Appl. Sci. 10(1):417-456.

Nahm, K.H. 1992. Practical Guide to Feed, Forage and Water Analysis. Yoo Han Publishing, Seoul, Korea.

Nascimento Agarussi, M.C., da Silva, V.P., Pereira, L.M., dan J.L.P. Daniel. 2022. Effect of various strains of *Lactobacillus buchneri* on the fermentation quality and aerobic stability of corn silage. Agriculture 12(1):121.

Nasir, A., Rahman, S.S., Hossain, M.M., and N. Choudhury. 2017. Isolation of *Saccharomyces cerevisiae* from pineapple and orange and study of metal's effectiveness on ethanol production. Eur. J. Microbiol. Immunol. 7(1):76–91.

Nutrisi Ternak Tropis dan Ilmu Pakan, J., Korima, I., and H. Setiyatwan. 2022. Prospek pengembangan sorgum sebagai pakan hijauan ruminansia di Indonesia. J. Nutr. Trop. Anim. Feed Sci. 4(3):1–10.

O'Dell, J.W. 1993. Method 350.1 determination of ammonia nitrogen by semi-automated colorimetry. U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Office of Research and Development, Ohio.

Ogunade, I.M., Martinez-Tuppia, C., Queiroz, O.C.M., Jiang, Y., Drouin, P., Wu, F., Vyas, D., and A.T. Adesogan. 2018. Silage review: Mycotoxins in silage—Occurrence, effects, prevention, and mitigation. J. Dairy Sci. 101(5):4034–4059.

Okoye, C.O., Wei, Z., Jiang, H., Wu, Y., Wang, Y., Gao, L., Li, X., and J. Jiang. 2023. Metagenomics analysis reveals the performance of homo- and heterofermentative lactic acid bacteria in alfalfa silage fermentation, bacterial community, and functional profiles. J. Anim. Sci. 101:1–15.

Oliveira, A.S., Weinberg, Z.G., Ogunade, I.M., Cervantes, A.A.P., Arriola, K.G., Jiang, Y., Kim, D., Li, X., Gonçalves, M.C.M., Vyas, D., and A.T. Adesogan. 2017. Meta-analysis of effects of inoculation with homofermentative and facultative heterofermentative lactic acid bacteria on silage fermentation, aerobic stability, and the performance of dairy cows. J. Dairy Sci. 100(6):4587–4603.

Özogul, F., dan I. Hamed. 2018. The importance of lactic acid bacteria for the prevention of bacterial growth and their biopreservation ability in food. Crit.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Rev. Food Sci. Nutr. 58(10):1660–1670.

Pahlow, G., Muck, R.E., Driehuis, F., Elferink, S.J.W.H.O., and S.F. Spoelstra. 2015. Microbiology of ensiling. Agron. Monogr. 31:31–93.

Pan, L., Li, P., Ma, X.K., Xu, Y.T., Tian, Q.Y., Liu, L., Li, D.F., and X.S. Piao. 2016. Tannin is a key factor in the determination and prediction of energy content in sorghum grains fed to growing pigs. J. Anim. Sci. 94(7):2879–2889.

Paradhipta, D.H.V., Joo, Y.H., Lee, H.J., Lee, S.S., Kim, D.H., Kim, J.D., and S.C. Kim. 2019. Effects of inoculant application on fermentation quality and rumen digestibility of high-moisture sorghum-sudangrass silage. J. Appl. Anim. Res. 47(1):486–491.

Paradhipta, D.H.V., Joo, Y.H., Lee, H.J., Lee, S.S., Noh, H.T., Choi, J.S., Kim, J., Min, H.G., and S.C. Kim. 2021. Effects of inoculants producing antifungal and carboxylesterase activities on corn silage and its shelf life against mold contamination at feed-out phase. Microorganisms. 9(3):558-599.

Peripolli, K., F.S. Machado, I. Borges, and A.C.C. Bernardi. 2017. Ideal rumen pH for maximal microbial activity: 6.2–7.2. J. Dairy Res.

Peripolli, V., Barcellos, J.O.J., Prates, Ê.R., McManus, C., Stella, L.A., Camargo, C.M., Costa Jr, J.B.G., and C. Bayer. 2017a. Additives on *in vitro* ruminal fermentation characteristics of rice straw. Rev. Bras. Zootec. 46(3):240–250.

Pholsen, S., Khota, W., Pang, H., Higgs, D., and Y. Cai. 2016. Characterization and application of lactic acid bacteria for tropical silage preparation. Anim. Sci. J. 87(10):1202–1211.

Pilote-Fortin, H., Ben Said, L.B., dan I. Fliss. 2021. Stability, bioavailability and antifungal activity of reuterin during manufacturing and storage of dairy products. Int. Dairy J. 115:104933.

Pokój, T., Bułkowska, K., Gusiatin, Z.M., Klimiuk, E., and K.J. Jankowski. 2015. Semi-continuous anaerobic digestion of different silage crops: VFAs formation, methane yield from fiber and non-fiber components and digestate composition. Bioresour. Technol. 190:201–210.

Ponzio, A., Rebecchi, A., Zivoli, R., dan L. Morelli. 2024. Reuterin, phenyllactic acid, and exopolysaccharides as main antifungal metabolites of *Lactobacillaceae*. Foods 13(1):88.

Queiroz, O.C.M., Arriola, K.G., Daniel, J.L.P., and A.T. Adesogan. 2013. Effects of 8 chemical and bacterial additives on the quality of corn silage. J. Dairy Sci. 96(9):5836–5843.

Queiroz, V.A.V., da Silva, C.S., de Menezes, C.B., Schaffert, R.E., Guimarães, F.F.M., Guimarães, L.J.M., Guimarães, P.E. de O., and F.D. Tardin. 2015. Nutritional composition of sorghum (*Sorghum bicolor* (L.) Moench) genotypes cultivated without and with water stress. J. Cereal Sci. 65:103–111.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Ratnaningtyas, F.A., Abdullah, L., Kumalasari, N.R., Ernawati, A., Ridla, M., Diapari, D., and P.D.M.H. Karti. 2025. Silage quality, rumen fermentation characteristics, and nutrient digestibility of *Sorghum bicolor* cv. Samurai 1 harvested at different maturity stages treated with fibrolytic enzyme. Trop. Anim. Sci. J. 48(3):211–220.

Reta, K.W. 2020. Review on mechanisms of drought tolerance in sorghum (*Sorghum bicolor* (L.) Moench): Basis and breeding methods. Adv. Res. J. Agric. Sci. 10(3):1–10.

Rezvani, F., Ardestani, F., and G. Najafpour. 2017. Growth kinetic models of five species of Lactobacilli and lactose consumption in batch submerged culture. Braz. J. Microbiol. 48(2):251–258.

Ridla, M., Albarki, H.R., Risyahadi, S.T., and S. Sukarman. 2024. Effects of wilting on silage quality: A meta-analysis. Anim. Biosci. 37(7):1185–1195.

Rodrigues, P.H.M., Pinedo, L.A., Meyer, P.M., da Silva, T.H., and I.C. da S.B. Guimarães. 2020. Sorghum silage quality as determined by chemical-nutritional factors. Grass Forage Sci. 75(4):462–473.

Rooney, W.L., Blumenthal, J., Bean, B., and J.E. Mullet. 2007. Designing sorghum as a dedicated bioenergy feedstock. Biofuels Bioprod. Bioref. 1(2):147–157.

Roseira, J.P.S., Pereira, O.G., Silveira, T.C. da, Pinho, R.M.A., Cascardo, R.S., Paula, R.A. de, Zerbini, P.A., Mantovani, H.C., Alves, W.S., and K.G. Ribeiro. 2025. Isolation of lactic acid bacteria and quantification of *Lentilactobacillus buchneri* using qPCR in sorghum silage inoculated with native strains in tropical conditions. An. Acad. Bras. Ciênc. 97(1):1–12.

Sadiq, F.A., Yan, B., Tian, F., Zhao, J., Zhang, H., and W. Chen. 2019. Lactic acid bacteria as antifungal and anti-mycotoxigenic agents: A comprehensive review. Compr. Rev. Food Sci. Food Saf. 18(5):1403–1436.

Sahoo, A. 2018. Silage for climate resilient small ruminant production. In: Ruminants—The Husbandry, Economic and Health Aspects. InTech.

Sajimin, S., Purwantari, N.D., and S. S. 2018. Evaluation on performance of some *Sorghum bicolor* cultivars as forage resources in the dry land with dry climate. J. Ilmu Ternak Vet. 22(3):135–141.

Salvati, D., Paschoalinotto, B.H., Mandim, F., Ferreira, I.C.F.R., Steinmacher, N.C., Pereira, C., and M.I. Dias. 2024. Exploring the impacts of sorghum (*Sorghum bicolor* L. Moench) germination on the flour's nutritional, chemical, bioactive, and technological properties. Foods. 13(3):491.

Salvucci, E., LeBlanc, J.G., and G. Pérez. 2016. Technological properties of lactic acid bacteria isolated from raw cereal material. *LWT.* 70:185–191.

Sambrook, J., and D. Russell. 2001. Rapid isolation of yeast DNA. In: Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Sangmanee, P., and T. Hongpattarakere. 2014. Inhibitory of multiple antifungal components produced by *Lactobacillus plantarum* K35 on growth, aflatoxin production and ultrastructure alterations of *Aspergillus flavus* and *Aspergillus parasiticus*. Food Control. 40:224–233.

Santos, M., Golt, C., Joerger, R.D., dan A.T. Adesogan. 2017. Identification of the major yeasts isolated from high moisture corn and corn silage and their impact on aerobic stability. J. Dairy Sci. 100(11):9692–9703.

Schnürer, J., and J. Magnusson. 2005. Antifungal lactic acid bacteria as biopreservatives. Trends Food Sci. Technol. 16(1–3):70–78.

Soni, P.G., Yadav, R.K., Yadav, G., Kumar, A., Kumar, G., and T. Yadav. 2016. Pengaruh air limbah domestik dan jadwal irigasi terhadap kualitas pakan ternak sorghum. J. Soil Salin. Water Qual. 2(8):9–17.

Soundharrajan, I., Kuppusamy, P., Park, H.S., Kim, J.H., Kim, W.H., Jung, J.S., and K.C. Choi. 2019. Lactic acid bacteria mixture as inoculants on low moisture Italian ryegrass silage fermentation. J. Korean Soc. Grassl. Forage Sci. 39(3):127–131.

Soundharrajan, I., Park, H.S., Rengasamy, S., Sivanesan, R., and K.C. Choi. 2021. Application and future prospective of lactic acid bacteria as natural additives for silage production: A review. Appl. Sci. 11(17):8127.

Stasiak-Różańska, L., Berthold-Pluta, A., Pluta, A.S., Dasiewicz, K., and M. Garbowska. 2021. Effect of simulated gastrointestinal tract conditions on survivability of probiotic bacteria present in commercial preparations. Int. J. Environ. Res. Public Health. 18(3):1108.

Steel, R.G.D., dan J.H. Torrie. 1996. *Principles and procedures of statistics: A biometrical approach* (3rd ed.). McGraw-Hill Book Company, New York.

Sucu, E., C. Yazgan, and H. Başpınar. 2016. A high acetate:propionate ratio promotes milk fat synthesis. J. Dairy Res. 83(3):311–318.

Sucu, E., Kalkan, H., Canbolat, O., and I. Filya. 2016. Effects of ensiling density on nutritive value of maize and sorghum silages. Rev. Bras. Zootec. 45(10):596–603.

Summerell, B.A., J.F. Leslie, D. Backhouse, W.L. Bryden, and L.W. Burgess. 2010. Fusarium: Paul E. Nelson Memorial Symposium. APS Press.

Sun, Z., Liu, Y., Ji, F., Li, S., Wang, L., Zhou, Z., Wu, Z., and Z. Yu. 2024. Dynamic changes in carbohydrate components and the bacterial community during the ensiling of wilted and unwilted sweet sorghum. *Front. Microbiol.* 15(2):1–12.

Suyabatmaz, Ş., Karaoğlu, Ş.A., Bozdeveci, A., and R. Akpınar. 2023. Honeybee-associated lactic acid bacteria and their probiotic potential for human use. World J. Microbiol. Biotechnol. 39(1):2-7.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Teixeira, A. de M., Ribeiro Junior, G. de O., Velasco, F.O., Faria Júnior, W.G. de, Rodriguez, N.M., Santos Rodrigues, J.A., McAllister, T., and L.C. Gonçalves. 2014. Intake and digestibility of sorghum (*Sorghum bicolor L. Moench*) silages with different tannin contents in sheep. Rev. Bras. Zootec. 43(1):14–19.

Tunca, E., E.S. Köksal, E. Öztürk, et al. 2024. Accurate estimation of leaf area index in sorghum using UAV imagery and machine learning. Phys. Chem. Earth 133: 103537. DOI:10.1016/j.pce.2023.103537

Udén, P. 2018. Fresh and ensiled forage plants—total composition, silage losses and the prediction of silage composition from the crop. Grass Forage Sci. 73(2):420–431.

Utama, C., Sulistiyanto, B., and M. Haidar. 2023. The feasibility of sorghum (*Sorghum vulgare*) fodder as poultry feed ingredients seen from growth performance, nutrient content and fiber profile of sorghum fodder. J. Adv. Vet. Anim. Res. 10(2):222-234.

Vargas, J.A.C., Araújo, T.C. de, and R. Mezzomo. 2020. A protocol for the extraction, identification, and quantification of short-chain fatty acids (SCFAs) in silages using Reverse Phase–High Performance Liquid Chromatography with Diode Array Detector (RP-HPLC-DAD*).* Research Square. 1(2):9-19.

Venuto, B., and B. Kindiger. 2008. Forage and biomass feedstock production from hybrid forage sorghum and *sorghum–sudangrass* hybrids. Grassl. Sci. 54(4):189–196.

Veriato, F.P., Pires, D.A.A., Tolentino, D.C., *et al.* 2018. Fermentation characteristics and nutritive values of sorghum silages with different planting densities. Acta Sci. Anim. Sci. 40(1):e39329.

Vian Dwi Chalisty. 2021. Pengaruh penambahan molases, *Lactobacillus plantarum*, *Trichoderma viride*, dan campurannya terhadap komposisi kimia silase total campuran hijauan. J. Sains Peternakan Nusantara. 1(1):29–36.

Visarada, K.B.R.S., and C. Aruna. 2019. Sorghum: A bundle of opportunities in the 21st century. In: *Breeding Sorghum for Diverse End Uses.* Elsevier. 2(3):1–14.

Wahyono, T., Wahyu Hardani, S.N., and I. Sugoro. 2018. Low irradiation dose for sorghum seed sterilization: Hydroponic fodder system and *in vitro* study. B. Anim. 42(3):259–265.

Wang, S., Ding, C., Tian, J., Cheng, Y., Xu, N., Zhang, W., Wang, X., Nazar, M., and B. Liu. 2024. An evaluation of storage length on ensiling characteristics, bacterial community compositions, co-occurrence networks, and their functional shifts and pathogenic risk in high-moisture oat silage. Chem. Biol. Technol. Agric*.* 11(1):173-179.

Wang, S., Zhang, Q., Sun, L., Pang, H., Li, P., and N.A. Khan. 2024. Editorial: Evaluation of preharvest and postharvest factors on forage crop quality,

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

physiology, and ensiling characteristics. Front. Plant Sci. 15(2):1–4.

Wang, Y., Wang, C., Zhou, W., Yang, F., Chen, X., and Q. Zhang. 2018. Effects of wilting and *Lactobacillus plantarum* addition on the fermentation quality and microbial community of *Moringa oleifera* leaf silage. Front. Microbiol. 9(2):1817-1910.

Wang, Y.-L., Wang, W.-K., Wu, Q.-C., Zhang, F., Li, W.-J., Yang, Z.-M., Bo, Y.-K., and H.-J. Yang. 2022. The effect of different lactic acid bacteria inoculants on silage quality, phenolic acid profiles, bacterial community and *in vitro* rumen fermentation characteristic of whole corn silage. Fermentation. 8(6):285.

Wati, W.S., Mashudi, M., and A. Irsyammawati. 2018. Kualitas silase rumput odot (*Pennisetum purpureum* cv. Mott) dengan penambahan *Lactobacillus plantarum* dan molasses pada waktu inkubasi yang berbeda. J. Nutr. Ternak Trop. 1(1):45–53.

Weinberg, Z.G., and R.E. Muck. 1996. Homofermentative BAL produce lactic acid rapidly to preserve silage. FEMS Microbiol. Rev. 29(1):293–310.

Weinberg, Z.G., dan R.E. Muck. 1996. New trends and opportunities in the development and use of inoculants for silage. FEMS Microbiol. Rev. 19(1):53–68.

Weinberg, Z.G., Szakacs, G., Ashbell, G., and Y. Hen. 2001. The effect of temperature on the ensiling process of corn and wheat. J. Appl. Microbiol. 90(4):561–566.

Wilkinson, J.M., and D.R. Davies. 2013. The aerobic stability of silage: Key findings and recent developments. Grass Forage Sci. 68(1):1–19.

Wilkinson, J.M., and R.E. Muck. 2019. Ensiling in 2050: Some challenges and opportunities. Grass Forage Sci. 74(2):178–187.

Winurdana, A.S., Rahmawati, M., Muslimin, and M.K. Hanufi. 2024. Pemanfaatan silase sebagai peningkatan ketahanan pakan pada peternak ruminansia Desa Purworejo. J. Pengabdian Masyarakat. 4(2):85–92.

Wróbel, B., Nowak, J., Fabiszewska, A., Paszkiewicz-Jasińska, A., and W. Przystupa. 2023. Dry matter losses in silages resulting from epiphytic microbiota activity—A comprehensive study. Agronomy. 13(2):450-501.

Xiong H., Y. Zhu, Z. Wen, G. Liu, Y. Guo, and B. Sun. 2022. Effects of cellulase, *Lactobacillus plantarum*, and sucrose on fermentation parameters, chemical composition, and bacterial community of hybrid *Pennisetum* silage. Fermentation. 8(8):356-378.

Yan Q., H. Ding, C. Qin, Q. Gu, X. Gao, Y. Tan, D. Wei, Y. Li, N. Zhang, R. Wang, B. Lin, and C. Zou. 2025. Influence of epiphytic microorganisms on silage quality and aerobic exposure characteristics of grass pastures. Agriculture. 15(8):890-1100.

UNIVERSITAS GADJAH MADA
Isolasi Bakteri Asam Laktat dengan Aktivitas Antifungal dan Pengaruhnya terhadap Komposisi Kimia, Karakteristik Fermentasi, Stabilitas Aerobik, dan Kecernaan Rumen Silase Sorghum bicolor (L.) Moench
An Nisaa Tiana, Ir. Dimas Hand Vidya Paradhipta, S.Pt., M.Sc., Ph.D., IPP. ; Prof. Dr. Ir. Ali Agus, DAA., DEA., IPU.,
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

Zhai, H., Wang, B., Sun, Y., Yang, Y., dan T. Shao. 2023. Effects of *Aspergillus niger* on cyanogenic glycosides removal and fermentation qualities of ratooning sorghum. Front. Microbiol. 14:1128057.

Zhang YC., XK. Wang, DX. Li, YL. Lin, FY. Yang, and KK. Ni. 2020. Impact of wilting and additives on fermentation quality and carbohydrate composition of mulberry silage. *Asian-Australas*. J. Anim. Sci. 33(2):254–263.

Zhou Y., J. Huang, Z. Li, Y. Wu, J. Zhang, and Y. Zhang. 2022. Yield and quality in main and ratoon crops of grain sorghum under different nitrogen rates and planting densities. Front. Plant Sci. 12(2):8-90.

Zi X., M. Li, Y. Chen, R. Lv, H. Zhou, and J. Tang. 2021. Effects of citric acid and *Lactobacillus plantarum* on silage quality and bacterial diversity of king grass silage. Front. Microbiol. 12(2):1–10.

Zielińska, K., Fabiszewska, A.U., dan K.M. Stecka. 2017. Evaluation of the ability to metabolize 1,2-propanediol by heterofermentative lactic acid bacteria. Electron. J. Biotechnol. 28:10–14.

Zieliński M., P. Rusanowska, M. Zielińska, M. Dudek, A. Nowicka, C. Purwin, M. Fijałkowska, and M. Dębowski. 2021. Influence of preparation of *Sida hermaphrodita* silages on its conversion to methane. Renew. Energy. 163:437–444.

Zinedine A., J.M. Soriano, J.C. Moltó, and J. Manes. 2007. Review on the toxicity, occurrence, metabolism, detoxification, regulations and intake of zearalenone: an oestrogenic mycotoxin. Food Chem. Toxicol. 45(1):1–18.