

Dulal Borthakur
College of Tropical Agriculture and Human Resources
Department of Molecular Biosciences and Bioengineering
FTE Distribution: 0.5 A; 25% I; 25% R

Education

Degree	University	Major
Bachelors	Assam Agricultural University, Jorhat, India	Agriculture
Masters	Punjab Agricultural University, Ludhiana, India	Plant Breeding
PhD	John Innes Institute, University of East Anglia, Norwich, U.K.	Molecular Biology

Professional Appointments

Title	Employer	Dates employed
Chairman	Department of Molecular Biosciences and Bioengineering, University of Hawaii at Manoa, Honolulu	1/2020 to present
Professor	Department of Molecular Biosciences and Bioengineering, University of Hawaii at Manoa, Honolulu	7/20000 to present
Associate Professor	Department of Plant Molecular Physiology, University of Hawaii at Manoa, Honolulu	7/2000 to 6/2000
Assistant Professor	Department of Plant Molecular Physiology, University of Hawaii at Manoa, Honolulu	4/1994 to 6/ 1996
Assistant Researcher	Biotechnology Program, University of Hawaii at Manoa, Honolulu	5/1989 to 3/1994
Postdoctoral Research Associate	Department of Molecular Genetics and Cell Biology, University of Chicago	11/1986 to 5/1989

Courses Taught

Course Number and Title (credits)

MBBE 408 /Biol 408 Molecular Cell Biology (3 cr) Spring semester every year

MBBE/Micro 601 Molecular Cell Biology (3 cr) Fall semester in even number years

MBBE/Micr 602 Molecular Biology and Genetics (3 cr) Fall semester in odd number years

Publications (reverse chronological order)

Refereed Journal Publications

Bageel AM, Kam A, Borthakur D (2022) Transcriptional analyses of genes related to fodder qualities in giant leucaena under different stress environments. *Frontiers in Plant Science*. doi: [10.3389/fpls.2022.885366](https://doi.org/10.3389/fpls.2022.885366)

Borthakur D, Busov V, Cao XH, Du Q, Gailing O, Isik F, Ko J-H, Li C, Li Q, Niu S, Qu G, Vu THG, Wang X-R, Wei Z, Zhang L, Wei H (2022) Current status and trends in forest genomics. *Forestry*

Research. 2:11. <https://doi.org/10.48130/FR-2022-0011>

Honda MDH, Youkhana A, Idol T, Borthakur D. (2022) Maceration of *Leucaena leucocephala* foliage improves its nutritional value by reducing mimosine and condensed tannins, and increasing carbohydrate content. Trop Grasslands-Forrajes Tropicales 10:1-14. doi: 10.17138/TGFT(10)1-14

Rodrigues-Corrêa KCS, Honda MDH, Borthakur D, Fett-Neto G (2022) Methods of mimosine extraction from *Leucaena leucocephala* (Lam.) de Wit Leaves. In: *Plant Secondary Metabolism Engineering: Methods and Protocols* ISBN 978-1-0716-2184-4.

Bageel A, Borthakur D (2022) The effects of pH, salinity, age of leaves, postharvest storage duration, and psyllid infestation on nutritional qualities of giant leucaena fodder. J Crop Sci Biotech. DOI: 10.1007/s12892-021-00139-9

Carrillo JT, Borthakur D (2021b) Do uncommon plant phenolic compounds have uncommon properties? A mini review on novel flavonoids. J Bioresources Bioproducts 6: 279-291

<https://doi.org/10.1016/j.jobab.2021.09.001>

Honda MDH, Borthakur D (2021) Mimosine is a stress-response molecule that serves as both an antioxidant and osmolyte in giant leucaena (*Leucaena leucocephala* subsp. *glabrata*) during environmental stress conditions. Plant Stress 2 (2021) 100015.

<https://doi.org/10.1016/j.stress.2021.100015>

Negi VS, Pal A, Borthakur D (2021) Biochemistry of plants N–heterocyclic non-protein amino acids. Amino Acids. <https://doi.org/10.1007/s00726-021-02990-0>

Carrillo JT, Borthakur D (2021) Methods for Metal Chelation in Plant Homeostasis: review, Plant Physiology and Biochemistry, <https://doi.org/10.1016/j.plaphy.2021.03.045>.

Ishihara KL, Lee EKW, Borthakur D (2021) Induced resistance to *Fusarium oxysporum* in mechanically stressed *Acacia koa* A. Gray seedlings. Physiol Mol Plant Path 113 (2021) 101584.

<https://doi.org/10.1016/j.pmpp.2020.101584>

Honda MDH, Borthakur D (2020) Mimosine facilitates metallic cation uptake by plants through formation of mimosine-cation complexes. Plant Mol Biol. Plant Mol. Biol. 102:431-445.

Doi: <https://doi.org/10.1007/s11103-019-00956-1>

Rodrigues-Corrêa KCS, Honda MDH, Borthakur D, Fett-Neto AG (2019) Mimosine accumulation in *Leucaena leucocephala* in response to stress signaling molecules and acute UV exposure. Plant Phys Biochem. 135: 432-440

Honda MDH, Ishihara KL, Pham DT, Borthakur D. (2019). Genes highly expressed in the foliage of giant leucaena (*Leucaena leucocephala* subsp. *glabrata*). Plant Biosyst. DOI: 10.1080/11263504.2019.1578283.

Honda MDH, Borthakur D (2019). Mimosine content of *Leucaena leucocephala* under various environmental conditions. Trop Grasslands-Forrales Tropicales. 7: 164-172.

Bageel A, Honda MDH, Carrillo JT, Borthakur D (2019) Giant leucaena (*Leucaena leucocephala* subsp. *glabrata*): a versatile tree-legume for sustainable agroforestry. Agroforestry Systems. <https://doi.org/10.1007/s10457-019-00392-6>

Honda MDH, Ishihara KL, Pham DT, Borthakur (2018) Identification of drought-induced genes in giant leucaena (*Leucaena leucocephala* subsp. *glabrata*). Trees 32(2): 571-585. <https://doi.org/10.1007/s00468-018-1657-4>

Ishihara KL, Corpuz M, Morden CW, Borthakur D (2017) Botany, ecology, and diversity of *Acacia koa* in the Hawaiian Islands. Am J Agric Biol Sci 12 (2): 66-78. DOI: 10.3844/ajabssp.2017.66.78

Ishihara K, Lee EKW and Borthakur D (2017) Thigmomorphogenesis: changes in morphology,

- biochemistry, and levels of transcription in response to mechanical stress in *Acacia koa*. *Can. J. For. Res.* 47: 583–593 [dx.doi.org/10.1139/cjfr-2016-0356](https://doi.org/10.1139/cjfr-2016-0356)
- Negi, VS, Borthakur D (2016) Heterologous expression and characterization of mimosinase from *Leucaena leucocephala*. *Methods in Molecular Biology* 1405:59-77. doi: 10.1007/978-1-4939-3393-8_7.
- Ishihara KL, Honda MDH, Pham DT, Borthakur D (2016) Transcriptome analysis of *Leucaena leucocephala* and identification of highly expressed genes in roots and shoots. *Transcriptomics* 4:135. doi:10.4172/2329-8936.1000135
- Negi, VS, Borthakur D (2016) Heterologous expression and characterization of mimosinase from *Leucaena leucocephala*. *Methods in Molecular Biology* 1405:59-77. doi: 10.1007/978-1-4939-3393-8_7.
- Ishihara K, Lee EKW and Borthakur D (2016) An improved method for RNA extraction from woody legume species *Acacia koa* and *Leucaena leucocephala*. *International Journal of Forestry and Wood Sci.* 2: 031-037. <https://premierpublishers.org/ijfws/040220164808>
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Book Chapters

Ishihara KL, Honda MDH, Bageel A, Borthakur D (2018) *Leucaena leucocephala*: a leguminous tree suitable for eroded habitats of Hawaiian Islands. In: Dagar JC (Ed) *Ravine Lands: Greening for Livelihood & Environmental Security*. Nova Publishers, New York, pp 413-431.

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Ishihara KL, Corpuz M, Morden CW, Borthakur D (2017) Evolution of *Acacia koa* on the Hawaiian

Islands. In: Dagar JC and Tewari VP (eds) *Agroforestry*. Springer, Singapore. Pp: 629-643. ISBN: 978-981-10-7649-7

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Borthakur D, and Soedarjo M (1999) Isolation and characterization of a DNA fragment containing genes for mimosine degradation from *Rhizobium* sp. strain TAL1145. In: Martinez, E. and Hernández, G. (eds) *Highlights of Nitrogen Fixation Research*. pp 91-96. Plenum Publishing Corp., New York.

Abaidoo R, Singleton P, Keyser H, Borthakur D, and Dashiell K (1999) Distribution and characteristics of *Bradyrhizobium* spp. nodulating African soybeans. In: Martinez, E. and Hernández, G. (eds) *Highlights of Nitrogen Fixation Research*. pp 77-84. Plenum Publishing Corp., New York.

Gubili, J. and Borthakur, D. (1998) Identification of an uptake hydrogenase gene cluster from *Anabaena* sp. strain PCC7120. In: Zaborsky, O. R. (ed) *Bio-Hydrogen*. pp 181-188. Plenum Publishing Corp., New York.

Johnston AWB, Downie JA, Rossen L, Shearman CA, Firmin JL, Borthakur D, Wood EA, Bradley D, and Brewin NJ (1987) Molecular analysis of *Rhizobium* genes involved in the induction of nitrogen-fixing nodules on legumes. *Phil. Trans. R. Soc. Lond. B* 317:193-207.

Conference Proceedings

Borthakur D, McKincley K, and Bylina EJ (1995) Biophotoproduction: Solar energy conversion with cyanobacteria. In the Proceedings of the Department of Energy Hydrogen Program Annual Review, in Coral Gables, Florida, April 18-21, 1995, pp 141-142.

Haselkorn R, Basche M, Bohme H, Borthakur D, Borthakur PB, Buikema WJ, Mulligan ME and Norris D (1990) Nitrogen fixation in filamentous cyanobacteria. In: Gresshoff PM, Roth LE, Stacey G and Newton WE (ed) *Nitrogen Fixation: achievements and objectives*. Proceedings of 8th International Congress on Nitrogen Fixation, held at Knoxville, Tennessee, May 20-26, 1990 pp 497-504, Chapman and Hall.

Johnston AWB, Rossen L, Shearman CA, Evans IJ, Firman JL, Downie, JA, Lamb JW and Borthakur D (1987) Studies on two sets of symbiotic genes in *Rhizobium*, one involved in early stages of infection and the other in exopolysaccharide synthesis. In: Atnyzen CJ and Ryan C (Ed) *Molecular Strategies for Crop Production*. Proceedings of Dupont-UCLA symposium held in Steamboat Springs, Colorado, March 30-April 6, 1986, pp 169-185, Alan R. Liss, Inc., New York

Leadership Roles (Committees, Boards, Advisory, etc.)

Chairman, Graduate Program in Molecular Biosciences and Bioengineering, University of Hawaii at Manoa (1996 to August 2013).

Member of the Editorial Board, *Applied and Environmental Microbiology* (2001-2009)

Member of the Editorial Board and one of the Editors, *International Journal of Microbiology* (2008 - 2018)

Member of the Editorial Board and Manuscript Editor, *Symbiosis* (2008 to present)

Assistant Editor, *World Journal of Microbiology & Biotechnology*, Kluwer Academic Publishers, Dordrecht, The Netherlands (1999-2004).

Member of the Editorial Board, World Journal of Microbiology & Biotechnology, Kluwer Academic Publishers, Dordrecht, The Netherlands (1996-2005).

Member of the Organizing Committee, CTAHR Symposium from 2001 to 2013

Graduate Students

<u>Category</u>	<u>Current Number of Students</u>	<u>Number Graduated (Career)</u>
Chair of Master's Committees	1	13
Chair of PhD Committees	2	13
Member of Master's Committees	0	>25
Member of PhD Committees	6	>50

Grant Support

Title: Identification and characterization of genes involved in tannin biosynthesis in *Acacia koa*. McIntire-Stennis; \$150,000; Date: 10/2020- 9/2024. P.I.: D. Borthakur

Title: Identification and Characterization of Genes Involved in Lignin Biosynthesis in *Acacia koa*. McIntire-Stennis; \$150,000; Date: 10/2015- 9/2020. P.I.: D. Borthakur.

Title: Producing mimosine-free *Leucaena leucocephala* through metabolic pathway engineering. National Science Foundation; \$ 272,132; Date: 10/2008 – 12/2013; P.I.: D. Borthakur.

Title: Identification of Fusarium Wilt Resistance in *Acacia Koa*. USDA-TSTAR; \$155,572; Date: 10/2009 -9/2012; P.I.: D. Borthakur.

Title: Analysis of hybrid recombinant protein to increase the specificity and coverage of in vitro diagnostic kits for *Mycobacterium tuberculosis*; Hawaii Community Foundation; \$59,630; Duration: 12/ 2005 to 6/ 2009; P.I.: D. Borthakur.

Title: Economic assessment and economic feasibility of a practical strategy for regenerating koa forests in Hawaii. USDA-TSTAR; \$157,390; Date: 10/2005 to 9/2009; P.I.: D. Borthakur.

Title: The invasiveness of the noxious weed gorse (*Ulex europaeus*) influenced by symbiosis in agricultural and natural habitats of Hawaii; USDA-TSTAR; \$233,027; Date: 10/ 2004 – 8/2009.

Title: Biochemical characterization of *Acacia koa* for commercial value and ecological attributes; McIntire-Stennis; \$60,000; Date: 10/2005 – 9/2008; P.I.: D. Borthakur.

Title: Innovation of detection mechanisms for dissolved nitrogen and bicarbonate in agriculture and the environment; USDA-TSTAR; \$239,842; Date: 10/2004-9/2007. P.I.: D.M. Jenkins; co-P.I.: D. Borthakur.

Title: The role of mimosine and mimosine-degrading bacteria in the leucaena rhizosphere; USDA-NRICGP; \$159,350. Date: 12/ 2001 -12/2006. P.I.: D. Borthakur.

Title: *Bradyrhizobium* inoculant for *Acacia koa*; USDA-TSTAR; \$ 149,005; Date: 7/2001-6/2004; P.I.: D. Borthakur.

Title: Dispersal and population genetics of invasive weeds: management implications; USDA-TSTAR; \$254,700; Date: 10/2002 - 9/2005. P.I.: A. Wiczorek; co-P.I.: D. Borthakur.

Title: Recombinant hybrid vaccines against *Mycobacterium tuberculosis*. Hawaii Community Foundation; \$ 66,602; Date: 1/2002 –12/2005. P.I. D. Borthakur.

Title: The role of mimosine in bacteria-plant interaction in the leucaena rhizosphere. USDA-NRICGP;

\$130,000; Date: 11/1998 -11/2001; P.I. D. Borthakur.

Title: Improving skeletal muscle growth by immuno-modulation of myostatin bioactivity. USDA-TSTAR; \$110,868; Date: 7/1999 – 6/2002; P.I. Yong-Soo Kim; co-P.I.: D. Borthakur.

Title: Genetic improvement of the tree-legume *Leucaena* for agroforestry. USDA-CSRS; \$55,000; Date: 10/1998 -9/2001; P.I.: D. Borthakur.

Title: Genetic engineering of cabbage for sustainable pest management. USDA-TSTAR; \$184,000; Date: 7/1995-to 6/1999. P.I.: D. Borthakur.

Title: Developing a PCR method for detecting mimosine-degrading ruminal bacteria from the cattle in Hawaii. USDA-TSTAR; \$144,000; Date: 7/1995- 6/1999; P.I.: Richard Early; co-P.I.: D. Borthakur.

Title: Characterization of rhizobia of a tropical legume in sustainable agro-ecosystem in Guam. USDA-TSTAR; \$133,000; Date: 7/1995-6/1998; P.I. Mari Marutani, co-P.I.: D. Borthakur.

Title: Photobiological hydrogen production; DOE Hydrogen Program; \$50,000; Date: 10/1994-9/1995; co-P.I. D. Borthakur.

Title: Genetics of nodulation competitiveness in *Rhizobium*. USDA-NRICGP; \$120,000; Date: 9/1992-8/1996; P.I. D. Borthakur.

Presentations at Conferences

Honda MDH*, Borthakur D (2018) Mimosine facilitates metallic cation uptake by plants through formation of mimosine-cation complexes. Poster presentation by Michael Honda at the International *Leucaena* Conference 2018 held at the University of Queensland, November 1-3, 2018.

Borthakur D *(2017) Threats to and efforts to protect *Acacia koa* (koa) in Hawaii. Invited oral presentation at the National Academy of Science, Washington, D.C. on December 1, 2017. <https://vimeo.com/246478086>; <http://nas-sites.org/dels/files/2017/11/Dulal-Borthakur-Presentation.pdf>

Honda MDH*, Manami Onitsuka, Yoshimitsu Kakuta, D. Borthakur (2017) Characterization of the *Leucaena leucocephala* enzyme mimosinase by site-directed substitution mutagenesis and inhibitor assays. Plant Biology 2017 held in Honolulu, HI, June 24-28, 2017.

Corpuz M*, Ishihara KL, Borthakur D (2017) Characterization of proanthocyanidins as a biomarker for wood quality in *Acacia koa*. Poster presentation by Maia Corpuz at the at Plant Biology 2017 held in Honolulu, HI, June 24-28 2017.

Ching M*, Honda M, Ishihara KL, Borthakur D (2017) Mimosine-Fe(III) peptide trasporters In *Leucaena leucocephala*. Poster presented by Mc Millan Ching at the American Association for the Advancement of Science (AAAS) Annual Meeting held in Boston from February 16-20, 2017

Ishihara K*, Lee EKW, Borthakur D. (2016) Mechanical stress induces disease resistance against *Fusarium oxysporum* in *Acacia koa*. Poster presentation at the Missouri Natural Resources Conference, held at Osage Beach, Missouri on February 3-5, 2016.

Ishihara K*, Lee EW, Borthakur D (2015) Mechanical stimuli induce expression of genes involved in disease resistance in *Acacia koa*. Poster presentation made by Kazue Ishihara at the 42nd Annual Conference of the Plant Growth Regulation Society of America (PGRSA) held at the Sheraton Kona Resort, Hawaii on July 19-23, 2015.

