**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**

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| --- | --- | --- |
| **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**

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 Agic 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

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

Dudley NS, Jones TC, James RL, Sniezko RA, Cannon P, and Borthakur D (2015) Applied disease screening and selection program for resistance to vascular wilt in Hawaiian *Acacia koa*, Southern Forests: Journal of Forest Science, 77: 65-73, DOI: 10.2989/20702620.2015.1007263

Pal A, and Borthakur D (2016) Transgenic overexpression of *Leucaena* β-carbonic anhydrases in tobacco does not affect carbon assimilation and overall biomass. Plant Biosystems 5: 932-941. DOI:10.1080/11263504.2014.993739

Ishihara K, Lee EW, Rushanaedy I, and Borthakur D (2015). Illumina-based de novo transcriptome analysis and identifications of genes involved in the monolignol biosynthesis pathway in *Acacia koa*. American Journal of Bioinformatics, 4(1): 7-27. doi: 10.3844/ajbsp.2015.7.27 Open Access.

Negi VS, Bingham J-P, Li QX, Borthakur D (2014) A carbon-nitrogen lyase from *Leucaena leucocephala* catalyzes the first step of mimosine degradation. (Plant Physiology 164: 922-934 (Published online before print on December 2013, doi: http:/ / dx. doi. org/10. 1104/ pp. 113. 230870) Open Access.

Yafuso JT, Negi VS, Bingham J-P, Borthakur D (2014) An O-acetylserine (thiol) lyase from *Leucaena leucocephala* is a cysteine synthase but not a mimosine synthase. Applied Biochemistry and Biotechnology 173:1157**–**1168 DOI: 10.1007/s12010-014-0917-z

Pal A, Borthakur D (2014) Tissue-specific differential expression of two β-carbonic anhydrases in *Leucaena leucocephala* under abiotic stress conditions. J Appl Biotechnol 2: 43-64

Negi VS, Bingham J-P, Li QX, Borthakur D (2013) *midD*-encoded ‘rhizomimosinase’ from *Rhizobium* sp. strain TAL1145 is a C–N lyase that catabolizes L-mimosine into 3-hydroxy-4-pyridone, pyruvate and ammonia. Amino Acids 44(6):1537-47. DOI 10.1007/s00726-013-1479-z.

Adamski DJ, Dudley NS, Morden CW, Borthakur D (2013) Cross-amplification of non-native *Acacia* species in the Hawaiian Islands using microsatellite markers from *Acacia koa.* Plant Biosystems 146: 24–32. DOI: 10.1080/11263504.2012.749958.

Pal A, Negi VS, Khanal S, Borthakur D (2012) Immunodetection of curcin in seed meal of Jatropha curcas using polyclonal antibody developed against curcin-L. Current Nutrition & Food Science 8: 213-219.

Rushanaedy I, Jones TC, Dudley NS, Liao RJF, Agbayani R, Borthakur D (2012) Chitinase is a potential molecular biomarker for detecting resistance to *Fusarium oxysporum* in *Acacia koa*. Tropical Plant Biol. 5:244**–**252. DOI 10.1007/s12042-012-9108-7.

Adamski DJ, Dudley NS, Morden CW, Borthakur D (2012) Genetic differentiation and diversity of *Acacia koa* populations in the Hawaiian Islands. Plant Species Biology. 27: 181-190 (with cover page photo from our work) DOI: 10.1111/j.1442-1984.2011.00359.x

Pal A, Negi VS, Borthakur D (2012) Efficient in vitro regeneration of *Leucaena leucocephala* using immature zygotic embryos as explants. Agroforestry Systems 84:131–140 (DOI 10.1007/s10457-011-9438-8).

Negi VS, Pal A, Singh R, Borthakur D (2011) Identification of species-specific genes from *Leucaena leucocephala* using interspecies suppression subtractive hybridization. Annals of applied Biology 159: 387–398 (doi:10.1111/j.1744-7348.2011.00506.x).

Walton CB, Jube S, Schrlemmer A, Patek PQ, Zimmerman DH, Rosenthal KS, Borthakur D (2010) *Ex vivo* stimulation assay for T-cell responses for tuberculosis using LEAPS-peptide heteroconjugates. Current Trends in Microbiology 6:1-12.

Jube SLR, Borthakur D (2010) Transgenic *Leucaena leucocephala* expressing the *Rhizobium* gene *pydA* encoding a meta-cleavage dioxygenase shows reduced mimosine content. Plant Physiol Biochem 48 (2010) 273-278

Jube S, Awaya J, Borthakur D (2009) Expression of *Rhizobium* *pydA-pydB* fusion gene in *Nicotiana tabacum* confers resistance to the toxic aromatic compound 3-hydroxy-4-pyridone. Biologia Plantarum 53 (2): 355-359, 2009

Jube S, Borthakur D (2009) Development of an *Agrobacterium*-mediated transformation protocol for the recalcitrant tree-legume *Leucaena leucocephala* using immature zygotic embryos. Plant Cell, Tissue and Organ Culture (PCTOC): Journal of Plant Biotechnology 96: 325-333.

Fredua-Agyeman R, Adamski D, Liao RJ, Morden C, Borthakur D (2008) Development and characterization of microsatellite markers for analysis of population differentiation in the tree legume *Acacia koa* (Fabaceae: Mimosoideae) in the Hawaiian Islands. Genome 51: 1001-1015.

Walton CB, Inos ABH, Andres OA, Jube S, de Couet HG, Douglas JT, Patek PQ, Borthakur D (2008) Immunization with hybrid recombinant *Mycobacterium tuberculosis* H37Rv proteins increases the TH1 cytokine response in mice following a pulmonary instillation of irradiated mycobacteria**.** Vaccine **26** 26,4396-4402.

Kutin RK, Jenkins DM, Borthakur D (2008) Characterization of a *Corynebacterium* strain that can reduce nitrate from high strength nitrate medium. Bioremediation Journal. 12(3):168-172.

Awaya JD, Tittabutr P, Li QX, Borthakur D (2008) Pyruvate carboxylase is involved in metabolism of mimosine by *Rhizobium* sp. strain TAL1145. Archives of Microbiology190: 409-415. DOI:10.1007/s00203-008-0384-4.

Tittabutr P, Awaya JD, Li QX, Borthakur D (2008) The cloned 1-aminocyclopropane-1-carboxylate (ACC) deaminase gene from *Sinorhizobium* sp. strain BL3 in *Rhizobium* sp. strain TAL1145 promotes nodulation and growth of *Leucaena leucocephala.* Systematic and Applied Microbiology 31:141-150*.*

Jube S, Borthakur D (2007) Expression of bacterial genes in transgenic tobacco: methods, applications and future prospects. Electronic J Biotechnol. 10 (3): 452-467. DOI: 10.2225/vol10-issue3-fulltext-4 http://www.ejbiotechnology.info/content/vol10/issue3/full/4/4.pdf

Awaya JD, Walton C, Borthakur D (2007) The *pydA-pydB* gene produces an active dioxygenase-hydrolase that degrades 3-hydroxy-4-pyridone, an intermediate of mimosine metabolism. Appl. Microbiol. Biotechnol 75(3):583-588. DOI 10.1007/s00253-007-0858-3

Tittabutr P, Payakapong W, Teaumroong N, Boonkerd N, Singleton PW, Borthakur D (2006) The alternative sigma factor RpoH2 is required for salt tolerance in *Sinorhizobium* sp. strain BL3. Res Microbiol.157: 811-818.

Leary JK, Singleton PW, Scowcroft PG, Borthakur D (2006) Symbiotic diversity in the cosmopolitan genus *Acacia.* Symbiosis 41 (3): 107-117

Payakapong W, Tittabutr P, Teaumroong N, Boonkerd N, Singleton PW, Borthakur D (2006) Identification of two clusters of genes involved in salt tolerance in *Sinorhizobium* sp. strain BL3. Symbiosis 41: 47-51

Tittabutr P, Payakapong W, Teaumroong N, Boonkerd N, Singleton PW, Borthakur D (2006) A histidine kinase sensor protein gene is necessary for induction of low pH tolerance in *Sinorhizobium* sp. strain BL3. Antonie Van Leeuwenhoek 89 (1): 125-134 (Online: December 8, 2005; DOI: 10.1007/s10482-005-9015-0)

Leary JK, Hue NV, Singleton PW, D. Borthakur (2006) Soil acidification, nutrient depletion, and symbiotic nitrogen fixation are the major features of gorse (*Ulex europaeus*) infestation on volcanic soils in Hawaii. Biol. Fertility Soils. 42:215-223.  Published online: 28 June 2005

Awaya JD, Fox PM, Borthakur D (2005) *pyd* genes of *Rhizobium* sp. strain TAL1145 are required for degradation of 3-hydroxy-4-pyridone, an aromatic intermediate in mimosine metabolism. J. Bacteriol. 187 (13): 4480-4487.

Kaufusi PH, Forsberg LS, Tittabutr P, and Borthakur D (2004) Regulation of exopolysaccharide synthesis in *Rhizobium* sp*.* strain TAL1145 involves an alternative sigma factor gene, *rpoH2*. *Microbiology* 150: 3473-3482.

Leary JK, Singleton PW and Borthakur D (2004) Canopy nodulation of the endemic tree legume *Acacia koa* in the mesic forests of Hawaii. Ecology 85:3151-3157.

Jin H-J, Dunn MA, Borthakur D, and Kim YS (2004) Refolding and purification of unprocessed porcine myostatin. Protein Expression and Purification 35:1-10.

Borthakur D, Soedarjo, Fox PM, and Webb DT (2003) The *mid* genes of *Rhizobium* sp. strain TAL1145 are required for degradation of mimosine into 3-hydroxy-4-pyridone and are inducible by mimosine. Microbiology 149: 537-546.

Awaya J, Fox PM and Borthakur D (2003) Genes encoding a fructose-1,6-bisphosphate aldolase and a fructose-1,6-bisphosphatase are present within the gene cluster for mimosine degradation in *Rhizobium* sp. strain TAL1145. Plant Soil 257: 11-18*.*

Saafi H and Borthakur D (2002) In vitro plantlet regeneration from cotyledon of the tree legume *Leucaena leucocephala*. Plant Growth Regulation 38:279-285.

You S, Marutani M and Borthakur D (2002) Diversity among *Bradyrhizobium* isolates nodulating Yardlong Bean and Sunhemp in Guam. J. Appl. Microbiol. 93(4):577-84.

Abaidoo RC, Keyser HH, Singleton PW and Borthakur D (2002) Comparison of molecular and antibiotic resistance profile methods for the population analysis of *Bradyrhizobium* spp. (TGx) isolates that nodulate the new TGx soybean cultivars in Africa. J. Appl. Microbiol. 92(1):109-17.

Fox PM and Borthakur D. (2001) Selection of several classes of mimosine-degradation-defective Tn3Ho*gus*-insertion mutants of *Rhizobium* sp. strain TAL1145 on the basis of mimosine-inducible GUS activity. Can J. Microbiol. 47: 488-494.

Shigaki T, Gabriel DW, Patil SS, Borthakur D, Choi JH and Alvarez A. (2001) Blight-associated epitope and DNA fragment from *Xanthomonas capestris* pv *campestris* are not required for blight. Plant Biology 3: 106-112.

Jin R-G, Liu Y-B, Tabashnik BE and Borthakur D. (2000) Development of transgenic cabbage (*Brassica oleracea* var. *capitata*) for insect resistance by *Agrobacterium* *tumefaciens*-mediated transformation. In Vitro Cellular Dev Biol Plant 36(4): 231-237.

Abaidoo R, Keyser H, Singleton PW, and Borthakur D (2000) *Bradyrhizobium* spp. (TGx) Isolates nodulating the new soybean cultivars in Africa are diverse and distinct from bradyrhizobia that nodulate North American soybeans. Int. J. Syst. Evol. Microbiol. 50:225-234.

Jin R-G., Liu Y-B, Tabashnik BE and Borthakur D. (1999) Tissue culture and *Agrobacterium-*mediated transformation of watercress. Plant Cell, Tissue and Organ Culture 58:171-176*.*

Marutani M, Richardson J, Edirveerasingam V, Taitano D and Borthakur D (1999) Indigenous *Rhizobium* strains from Guam contain a mimosine-degrading gene. Micronesia 31:379-385.

Yang J, Du N, Carpenter JS, and Borthakur D (1999) PCR detection of the pyridinediol-degrading ruminal bacterium, Synergistes jonesii, in the rumen fluid of cattle. Symbiosis 26: 25-38.

You Z Gao X, Ho MM, and Borthakur D (1998) A stomatin-like protein encoded by the *slp* gene of *Rhizobium etli* is required for nodulation competitiveness on the common bean. Microbiology 144: 2619 - 2627

Gubili J and Borthakur D (1998) Organization of the *hupDEAB* genes within the hydrogenase gene cluster of *Anabaena* sp. strain PCC7120. J. Appl. Phycol. 10: 163-167.

Soedarjo M, and Borthakur D (1998) Mimosine, a toxin produced by the tree-legume *Leucaena* provides a nodulation competition advantage to mimosine-degrading *Rhizobium* strains. Soil Biol. Biochem. 30: 1605-1613.

Parveen N, Webb DT and Borthakur D (1997) The symbiotic phenotypes of exopolysaccharide-defective mutants of *Rhizobium* sp. strain TAL1145 do not differ on determinate- and indeterminate-nodulating tree legumes. Microbiology 143: 1959-1967.

Gubili J and Borthakur D (1996) The use of a PCR cloning and screening strategy to identify lambda clones containing the *hupB* gene of *Anabaena* sp. strain PCC7120. J. Microbiol. Methods 27: 175-182.

Soedarjo M, and Borthakur D (1996) Mimosine produced by the tree-legume *Leucaena* provides growth advantages to some *Rhizobium* strains that utilize it as a source of carbon and nitrogen. Plant and Soil 186: 87-92

Soedarjo M, and Borthakur D (1996b) Simple procedures to remove mimosine from young leaves, pods and seeds of *Leucaena leucocephala* used as food. Int. J. Food Sci. Technol. 31: 97-103

Borthakur D and Gao X (1996) A 150-Mda plasmid in *Rhizobium etli* strain TAL182 contains genes for nodulation competitiveness on *Phaseolus vulgaris* L. Can J. Microbiol. 42: 903-910.

Tabashnik BE, Malvar T, Liu Y-B, Finson N, Borthakur D, Shin B-S, Park S-H, Masson L, Maagd RA, and Bosch D (1996) *Bacillus thuringiensis* toxins: cross-resistance in diamondback moth and amino acid sequence similarity. Appl Env Microbiol. 62: 2839-2644.

Parveen N, Webb DT, and Borthakur D (1996) *Leucaena leucocephala* nodules formed by a surface polysaccharide defective mutant of *Rhizobium* sp. strain TAL1145. Mol. Plant-Microbe Interact. 9: 364-372

Gao, X and Borthakur, D. (1995) Discrete differences between strains of different *Rhizobium* spp. for competitive nodule occupancy on beans. World J. Microbiol. Biotechnol. 11: 681-682.

Tragut V, Xiao J, Bylina E, and Borthakur D (1995) Characterization of DNA restriction-modification systems in *Spirulina platensis* strain pacifica. J. Appl. Phycol. 7 : 561-564.

Pooyan S, George MLC, and Borthakur D. (1994) Isolation and characterization of a gene for nodule development linked to the *ndvA* and *ndvB* genes in *Rhizobium* sp. strain TAL1145. Symbiosis 17: 201-205.

Soedarjo M, Hemscheidt TK, and Borthakur D (1994) Mimosine, a toxin present in the tree legume *Leucaena*, induces a mimosine-degrading enzyme activity in some strains of *Rhizobium*. Appl. Env. Microbiol. 60: 4268-4272

George MLC, Young JPW, and Borthakur D. (1994) Genetic characterization of *Rhizobium* sp. strain TAL1145 that nodulates tree legumes. Canadian J. Microbiol. 40: 208-215.

Mimmack ML, Borthakur D, Jones MA, Downie JA, and Johnston AWB (1994) The *psi* operon of *Rhizobium leguminosarum* biovar phaseoli : identification of two genes whose products are located at the bacterial cell surface. Microbiology 140: 1223 - 1229

Parveen N and Borthakur D (1994) Construction of a single-transposon mutant in *Rhizobium* sp. strain TAL1145 from a double-insertion mutant. Lett. Appl. Microbiol. 19: 142-145.

Pooyan S, George MLC, and Borthakur D. (1994) Characterization of a *Rhizobium etli* chromosomal gene required for nodule development on *Phaseolus vulgaris* L. World J. Microbiol. Biotechnol. 10: 583-589

George MLC, Robert FM, and Borthakur D (1992) Genetic analysis of *Rhizobium leguminosarum* bv. *phaseoli* mutants defective in nodulation and nodulation suppression. Appl. Env. Microbiol. 58 :1050-1053

Latchford JW, Borthakur D, and Johnston AWB (1991) The products of *Rhizobium* genes, *psi* and *pss*, which affect exopolysaccharide production, are associated with the bacterial cell surface. Mol. Microbiol . 5:2107-2114

Borthakur D, Basche M, Buikema WJ, Borthakur P and Haselkorn R (1990) Expression, nucleotide sequence and mutational analysis of two heterocyst-specific genes in *Anabaena* sp. strain PCC 7120. Mol. Gen. Genet. 221:227-234.

Borthakur D and Haselkorn R (1989) Nucleotide sequence of the gene encoding 33 kDa water oxidizing polypeptide of *Anabaena* sp. strain PCC 7120. Plant Mol. Biol. 13:427-439

Borthakur D and Haselkorn R (1989) Tn5 mutagenesis of *Anabaena* sp. strain PCC 7120: isolation of a new mutant unable to grow without combined nitrogen. J. Bacteriol. 171:5759-5761

Borthakur D Latchford JW, Barker R and Johnston AWB (1988) Analysis of *pss* genes of *Rhizobium leguminosarum* required for exopolysaccharide (EPS) synthesis and nodulation of peas; their primary structure and their interaction with *psi* and other nodulation genes. Mol. gen. Genet. 213:155-162.

Borthakur D and Johnston AWB (1987) Analysis of *psi*, a gene on symbiotic plasmid of *Rhizobium phaseoli*, which inhibits exopolysaccharide synthesis and nodulation: determination of its sequence and demonstration that its transcription is inhibited by *psr*, another gene on the symbiotic plasmid. Mol. Gen. Genet. 207:149-154

Borthakur D, Lamb JW, Johnston AWB (1987) Identification of two classes of *Rhizobium phaseoli* genes required for melanin synthesis: one of which is required for nitrogen fixation and activates transcription of the other. Mol. Gen. genet. 207: 155-160.

Borthakur D, Barber CE, Lamb JW, Daniels MJ, Downie JA and Johnston AWB (1986) A mutation that blocks exopolysaccharide synthesis prevents nodulation of peas by *Rhizobium leguminosarum* but not of beans by *R. phaseoli* and is corrected by cloned DNA from *Rhizobium* or the phytopathogen *Xanthomonas*. Mol. Gen Genet. 203: 320-323.

Borthakur D, Downie JA, Johnston AWB and Lamb JW (1985) *psi* plasmid-linked *Rhizobium phaseoli* gene that inhibits exopolysaccharide production and which is required for symbiotic nitrogen fixation. Mol. Gen. Genet. 200: 278-282.

**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. https://doi.org/10.1007/978-981-10-8043-2\_18

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

Ishihara K, Adamski D, Morden C, Borthakur D (2016) The Importance of *Acacia koaia* in Agroforestry of Hawaii. In: Dagar JC (ed) *Agroforestry Research* Development. Nova Publishers, New York. Pp 513-521. ISBN 978-1-63485-046-9.

Jube S, and Borthakur D (2006) Recent advances in food biotechnology research. *In*: Hui YH, Nip W-K, Nollet LML, Paliyath G, Sahlstrøm S, and Simpson BK (eds) Food Biochemistry and Food Processing. pp 35-70, Blackwell Publishing, Oxford, U.K.

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, ShearmanCA, 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: achivements 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**

Category Current Number of Students Number Graduated (Career)

*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. Wieczorek; 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.