Dulal Borthakur
College of Tropical Agriculture and Human Resilience
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 12/31/24
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/MICR 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

MBBE 401/BIOL 401 Molecular Biotechnology (3 cr) Spring semester every year until 2019

MBBE 375 Essential Biochemistry (3 cr) Fall 2022

Awards

2004 CTAHR Excellence in Teaching Award

2004 ‘North American Colleges and Teachers of Agriculture Teaching Award of Merit’.
2003 ‘Most Motivational CTAHR Faculty’ Award.

Graduate students

Ph.D.:

1. **James Carrillo** (2019-24) Ph.D., Thesis title: Developing a recombinant system using leucaena genes for production of nicotianamine from L-methionine.
2. **Ahmed Bageel** (2015-22) Ph.D., Thesis title: Biochemical and molecular analysis of giant and common leucaena.
3. **Michael Honda** (2013-2021) Ph.D., Thesis title: Mimosine metabolism in *Leucaena luciocephalid*
4. **Kazue Ishihara** (2012-2016) Ph.D. Thesis title: Mechanical stress induces disease resistance against *Fusarium oxysporum* in *Acacia koa*
5. **Archana Pal** (2009-2013) Ph.D. Dissertation title: Functional characterization of chloroplastic and cytoplasmic β-carbonic anhydrase isoforms from *Leucaena leucocephala*
6. **Vishal Negi** (2007-2012) Ph.D. Dissertation title: Biochemistry of mimosine catabolism by enzymes from *Rhizobium* sp. TAL1145 and *Leucaena leucocephala*.
7. **Sandro Jube** (2005-2009) Ph.D. Dissertation title: Genetic transformation of *Leucaena leucocephala.*
8. **Rudolph Fredua-Agyeman** (2005-2008) Ph.D. Dissertation title: Genetic diversity in *Acacia koa* in Hawaiian Islands.
9. **Chad Walton** (2002-06) PhD. Dissertation title: Recombinant hyrbrid vaccine development against *Mycobacterium tuberculosis*.
10. **James Leary** (2001-07) Ph.D. Dissertation title: *Bradyrhizobium inoculant of Acacia koa*.
11. **Jonathan Awaya** (2001-05) Ph.D. Dissertation title: Analysis of *pyd* gene cluster in *Rhizobium.*
12. **Pakieli Kafusi** (1999-05) Ph.D. Dissertation title: Regulation of exopolysaccharide synthesis in *Rhizobium* by an alternate sigma factor.
13. **Paul Fox** (1999-02) Ph.D. Dissertation title: Biochemistry and genetics of mimosine degradation in *Rhizobium*.
14. **Rongguan Jin** (1995-1999) Ph.D. Dissertation title: Genetic engineering of cabbage and watercress with B.T. *cry* genes for insect resistance.
15. **Muchdar Soedarjo** (1993-1997) Ph.D. Dissertation title: Genetics of mimosine degradation by *Rhizobium* sp. strain TAL1145 that nodulates *Leucaena*.
16. **Nikhat Parveen** (1991-1995) Ph.D. Dissertation title: Genetics of exopolysaccharide synthesis in *Rhizobium* sp. strain TAL1145 that nodulates tree legumes.

M.S. plan-A (with thesis):

1. **Jadd Correia** (2012-14) M.S. Thesis title: Genetic transformation of *Leucaena leucocephala.*
2. **Jannai Yafuso** (2010-2013) M.S. Thesis title: Cysteine and mimosine biosynthesis catalyzed by cysteine/mimosine synthase from *Leucaena leucocephala*.
3. **Dung Pham** (2011-2013) M.S. Thesis title: Transcriptome analysis, biochemical characterization and tissue culture regeneration of *Leucaena leucocephala*.
4. **Tyler Jones** (2009-2011) M.S. Thesis title: Developing *Fusarium* wilt-resistant *Acacia koa*.
5. **Daniel Adamski** (2006-2008) M.S. Thesis title: Molecular phylogenetics and diversity of the *Acacia koa* complex based on DNA sequences and microsatellite markers.
6. **Masaki Nasu** (2003-2006) M.S. Thesis title: Developing molecular markers for detection of homozygous lyretail fin type in sword fish.
7. **Sandro Jube** (2002-2005) M.S. Thesis title: Expression of *Rhizobium* dioxygenase and hydrolase genes in tobacco.
8. **Joy Anamizu** (1999-2002) M.S. Thesis title: Isolation, identification and characterization of mimosine-degrading soil bacteria isolated from the rhizosphere of *Leucaena leucocephala*.
9. **Havila Saafi** (2000-2001) M.S. Thesis title: Tissue culture of *Leucaena leucocephala.*
10. **Zerong You** (1996-1998) M.S. Thesis title: A stomatin-like protein from *Rhizobium etli* is required for nodulation competition on *Phaseolus* bean.
11. **Jyothirmai Gubili** (1995-1997) M.S. Thesis title: Isolation and characterization of uptake hydrogenase genes from *Anabaena* sp. strain PCC7120.
12. **Xuefeng Gao** (1992-1995) M.S. Thesis title: Genetic analysis of nodulation competitiveness in *Rhizobium* e*tli.*
13. **Shahriar Pooyan** (1990-1992): M.S Thesis title: Identification and characterization of chromosomal genes in *Rhizobium* required for nitrogen fixation in beans.

MS (plan-B)

1. **Tomomi Ida** MS 2012. Characterization of a gene for stress tolerance from *Leucaena leucocephala*. (Advisor: Dulal Borthakur)
2. **Eric K. W. Lee** MS 2012. Tissue culture and genetic transformation of *Leucaena leucocephala*. (Advisor: Dulal Borthakur)
3. **Asmahan Y. Abdallah** MS. 2005. Recombinant vaccine against *Mycobacterium tuberculosis*. (Advisor: Dulal Borthakur)
4. **Carie Tome** MS 2002. Isolation of mimosine-degradation defective mutants of *Rhizobium* sp. strain TAL1145. (Advisor: Dulal Borthakur)
5. **Thomas Bui** 1999. Construction of cDNA library *Leucaena leucocephala*. (Advisor: Dulal Borthakur)
6. **Benjamin Tran** 1998. Tissue culture of watercress. (Advisor Dulal Borthakur)

7. **Christopher Nakano** (2021) M.S., Thesis title: Identification and characterization of *Acacia koa* genes containing SSR sequence in the coding

Publications (reverse chronological order)

Refereed Journal Publications

Honda MDH, Borthakur D (2024) Mimosine concentration in giant leucaena (*Leucaena leucocephala* subsp. glabrata) fluctuates with age and plant part. Trop Grasslands-Forrajes Tropicales 12: 11-23. doi: 10.17138/TGFT(12)11-23

Carrillo JT, Borthakur D (2024) Characterization of a plant S-adenosylmethionine synthetase from *Acacia koa*. Plant Physiology and Biochemistry 210: 108618. https://doi.org/10.1016/j.plaphy.2024.108618

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

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 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. https://premierpublishers.org/ijfws/040220164808

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* H_{37}Rv proteins increases the T_H1 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