เอกสารอ้างอิง

กาญจนา ชาญสง่าเวช. 2552. วิธีคัดเลือกไรโซเบียมถั่วเหลืองเพื่อผลิตเป็นปุ๋ยชีวภาพสำหรับถั่วเหลืองที่เก็บรักษาได้ที่อุณหภูมิห้อง (สถาบันทรัพย์สินทางปัญญาแห่งจุฬาลงกรณ์มหาวิทยาลัยขอจดสิทธิบัตรเมื่อวันที่ 25 มิถุนายน 2552 เลขที่คำขอจดสิทธิบัตร 0901002866)

ณิชานันท์ กาบเกษร และ กาญจนา ชาญสง่าเวช. 2552. การใช้มัลติเพล็กซ์พีซีอาร์ทำนายศักยภาพการเข้าสร้างปมของไรโซเบียมถั่วเหลือง **บทความวิจัยตีพิมพ์ในหนังสือรวมบทความการประชุมวิชาการระบบเกษตรแห่งชาติ ครั้งที่ 5 "พลังงานขาดแคลนและความมั่นคงทางอาหารเพื่อมนุษยชาติ"** วันที่ 2-4 กรกฎาคม 2552 ณ โรงแรมอุบลอินเตอร์เนชั่นแนล จ. อุบลราชธานี. หน้า 481-458.

ธันปภา จันทเพ็ชร และ กาญจนา ชาญสง่าเวช. 2552. การใช้ลายพิมพ์ดีเอ็นเอตรวจความสามารถของไรโซเบียมถั่วเหลืองในการแข่งขันเข้าสร้างปมภาคสนาม **บทความวิจัยตีพิมพ์ในหนังสือรวมบทความการประชุมวิชาการระบบเกษตรแห่งชาติ ครั้งที่ 5 "พลังงานขาดแคลนและความมั่นคงทางอาหารเพื่อมนุษยชาติ"** วันที่ 2-4 กรกฎาคม 2552 ณ โรงแรมอุบลอินเตอร์เนชั่นแนล จ. อุบลราชธานี. หน้า 234-243.

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ภาคผนวก ก

Multiple alignments of *nodD1* of fast-growing (*S. fredii*) and slow-growing soybean rhizobia. (*B. elkanii* USDA 194 and *B. japonicum* USDA110).

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B elkaniiUSDA194nodD1   1    ---------- ---------- ---------- ---------- ---------- ----------  1
USDA110-nodD1           1    ---------- ---------- ---------- ---------- ---------- ----------  1
S fredii-nodD1          1    CGCGAGGAAC GGCGAAAAGG CGGCGCCGAA GCCCCTGCAT TGTTAGTGGC AAGGCTGTTG  60
Clustal Consensus

B elkaniiUSDA194nodD1   1    ---------- ---------- ---------- ---------- ---------- ----------  1
USDA110-nodD1           1    ---------- ---------- ---------- ---------- ---------- ----------  1
S fredii-nodD1          61   CGGTGGGCGT TGACGGTTTC GCTCCGGCTC GACCCTACGG TCGAAAAGAC GAAATGGCAG  120
Clustal Consensus

B elkaniiUSDA194nodD1   1    ---------- ---------- ---------- ---------- ---------- ----------  1
USDA110-nodD1           1    ---------- ---------- ---------- ---------- ---------- ----------  1
S fredii-nodD1          121  GAGCGGTCGG CCGTCTTGCC ACAAAGCCTG ATCTTCAGGA GGCGCATGTA AGAGGGCGGG  180
Clustal Consensus

B elkaniiUSDA194nodD1   1    ---------- ---------- ---------- ---------- ---------- ----------  1
USDA110-nodD1           1    ---------- ---------- ---------- ---------- ---------- ----------  1
S fredii-nodD1          181  CGACGGCATG AGCCGTGAAT GCACTTGACT TCAGATTAAT TAAGCGCTTT CTAACGATTT  240
Clustal Consensus

B elkaniiUSDA194nodD1   1    ---------- ---------- ---------- ---------- ---------- ----------  1
USDA110-nodD1           1    ---------- ---------- ---------- ---------- ---------- ----------  1
S fredii-nodD1          241  GCATAATTGA TCGTTCGGAT GACAACCATC CGCACTGTGG ATTCGCCAGA ACATGCGTTT  300
Clustal Consensus

B elkaniiUSDA194nodD1   1    ---------- ---------- ---------- ---------- ---------- ----------  1
USDA110-nodD1           1    ---------- ---------- ---------- ---------- ---------- ----------  1
S fredii-nodD1          301  TAAGGGCCTT GATCTCAATC TCCTCGTTGC GCTCGACGCA CTGATGACCG AACGCAAACT  360
Clustal Consensus

B elkaniiUSDA194nodD1   1    ---------- -------CTA GCAGCGCCTG CGCGTTGGTA GTTTCCGATC TGCAGATCCC  43
USDA110-nodD1           1    ---------- -------CTA ACAGCGCCTG CGAGTTGGAG GCTCCTGGTC CCCAGATGCC  43
S fredii-nodD1          361  CACGGCCGCT GCACGCAGCA TCAACCTGAG CCAGCCGGCG ATGAGCGCAG CCATCACCCG  420
Clustal Consensus

B elkaniiUSDA194nodD1   44   ATGTTGGA-- CGCCTCCTCC AACAA-TATC CGCCGCATCC AAATGCTCGC CGG-ATCGGT  99
USDA110-nodD1           44   ATGTTGGA-- TGCTTCCTCG AGCAA-TATC CGACGCATCC AGATGCTCGC GGG-GTCGGT  99
S fredii-nodD1          421  GCTTCGGACC TATTTCCGCG ACGAGCTATT TACCATGAAT GGTCGCGAAC TTGTACCAAC  480
Clustal Consensus

B elkaniiUSDA194nodD1   100  ATTGTGGAAC GCAG-GCCAC TGCACGGCCT CGGTAAAAGT GGGCAGTGGG AGTGGTGGCT  158
USDA110-nodD1           100  ATTGTGGAAT GAGG-GCCAC TGCAGGGCCT CTGTGAATGT GGGCAGGGGG AGGGGCGGTT  158
S fredii-nodD1          481  TCCGCGAGCA GAAGCGCTCG CACCCGCAGT CCGCGAAGCC CTGCTGCACA TCCATCTCTC  540
Clustal Consensus

B elkaniiUSDA194nodD1   159  CGACGATCCG CAGGGGCA-- TCCACTTTTC GAAGTGTCTG GCTAGACGTA AGGGCATTGT  216
USDA110-nodD1           159  GGATGATCCG CAACGGCA-- TCCGCTTTTC GAAGTGCCTG GCCAGTCGTA AGGGCATCGT  216
S fredii-nodD1          541  CATCATTTCA TGGGATCCGT TCAACCCAGC GCAGTCAGAT CGCAGTTTCA GGATCATTCT  600
Clustal Consensus

B elkaniiUSDA194nodD1   217  TCCT------ ATGCGGCCCG TGTCGAACAA TATGGCGGA ATCAGGCTAA AGCCCTGCAC  270
USDA110-nodD1           217  GCCG------ ATACGGCTCG TGTCTAGCAA CAGGGGCGGA ATCAGGCTAA AGCCCTGCAC  270
S fredii-nodD1          601  TTCCGACTTC ATGACGCTAA TGTTTTTCGA AAGGGTTGTG GTGAGAGTGG CGCGGGAAGC  660
Clustal Consensus

B elkaniiUSDA194nodD1   271  AACGACCTCG ATGCGCCTTT TCAAGCCGTG CTCGAGCAA- --GAACCACT CCTCGAGGTT  327
USDA110-nodD1           271  GACGACCTCA ATTCGTCTCC TCAGGCCGTG CTCAAGCAA- --AAACCATT CTTCGAGGTT  327
S fredii-nodD1          661  GCCCGCCGTC AGTTTCGAGT TGCTGCCGTT TTCCGATGAG CCAGATGAGC TTCTCCGGCG  720
Clustal Consensus

B elkaniiUSDA194nodD1   328  GGGCCTCAGC GCCCGTCCGA ACTTGGCGGT GACGTGCCCC ATTGAATTGT ATTTCTCGAA  387
USDA110-nodD1           328  CGGTCTCAGT GCGCGTCCGA ACTTGGCAGT AACGTGCCCC ATCGAGATGT ATTGTTCGAA  387
S fredii-nodD1          721  TGGTGATGTC GATTTCCTGA TCCTACCAGA AATGTTCATG TCGCACACGC ATC-CCAGAG  779
Clustal Consensus
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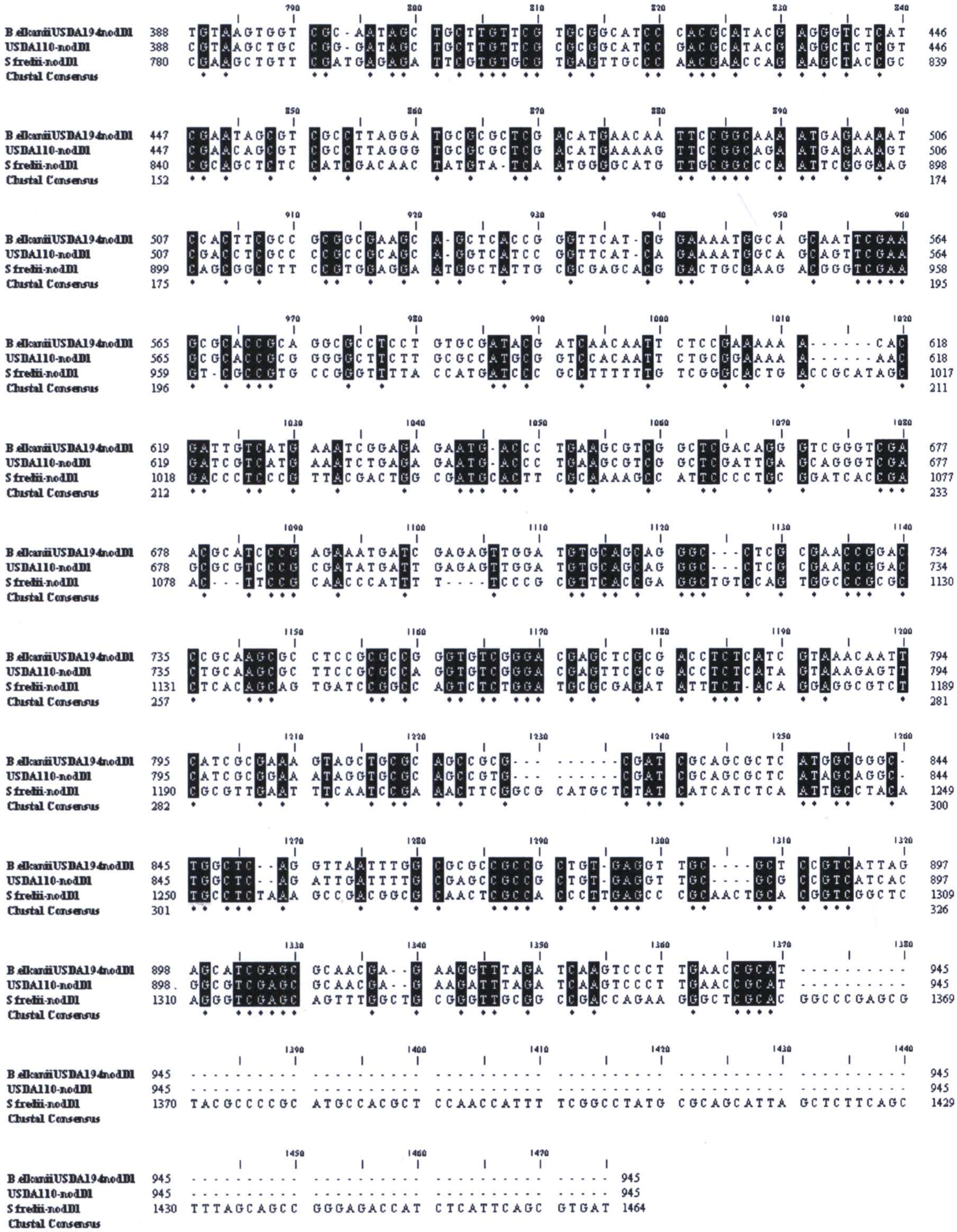

หมายเหตุ

1. เครื่องหมาย * แสดงตำแหน่งนิวคลีโอไทด์ที่เหมือนกันในไรโซเบียมถั่วเหลืองประเภทเพิ่มจำนวนเร็วและประเภทเพิ่มจำนวนช้า

2. ผลการทำ multiple alignments พบลำดับนิวคลีโอไทด์ต่างกันของ *nodD1* ของไรโซเบียมถั่วเหลืองประเภทเพิ่มจำนวนเร็วและเพิ่มจำนวนช้า