Marker-assisted selection of disease- and pest-resistant mungbean lines using CEL-I genotyping

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BACKGROUND

Mungbean (*Vigna radiata*)

- Short duration legume crop, rotation crop for (sub-)tropical cereal systems
- Good quality protein, iron, zinc, folate
- Triple benefit for farmers: increased food, additional income, improved soil fertility
- Molecular breeding for pest & disease resistance of mungbean: Candidate quantitative trait loci (QTLs) for bruchid and *Mungbean yellow mosaic virus* resistance available

Challenges for molecular breeding in mungbean

- Many candidate QTLs - many single nucleotide polymorphism (SNP) markers to validate
- Costly marker validation - need for SNP genotyping tool with low development costs
- Breeding programs in developing countries lack access to state-of-the-art genotyping facilities

CEL-I

Cleavages at mismatch sites of DNA double strands (Till et al., 2003)

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ATGGTACCTTG
|||||X|||||
TACCAGGGAAC
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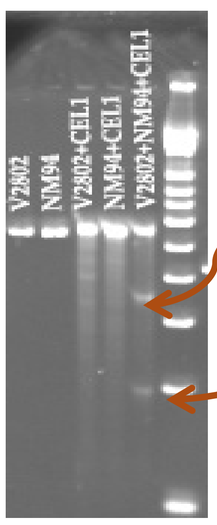
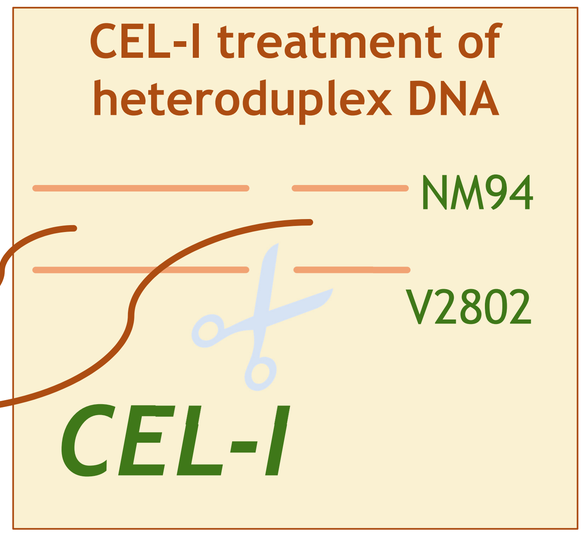
CEL-I purification: 

$(NH_4)_2SO_4$ precipitation → **Reagent for >10,000 assays**

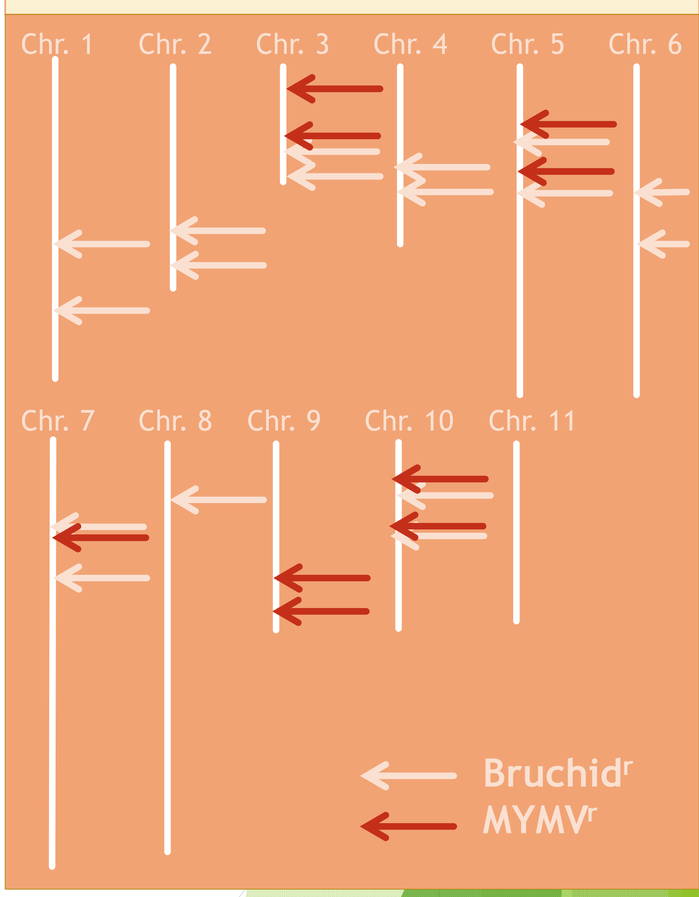
CEL-I assay: PCR on DNA mix (test + standard) → CEL-I digestion (35°C 10 min) → gel

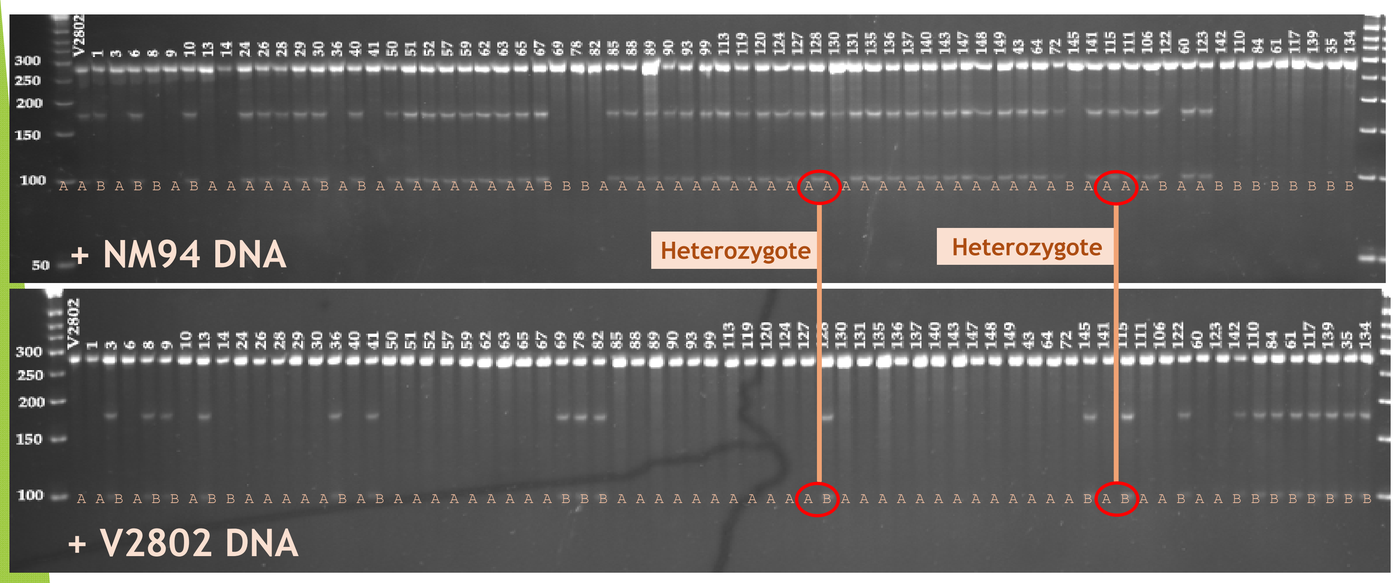


CEL-I treatment of heteroduplex DNA



Candidate resistance QTLs in mungbean





CONCLUSIONS

- CEL-I genotyping is a cheap, quick and accurate method for confirming SNPs
- CEL-I assays using DNA standards can assess homozygous and heterozygous genotypes
- Requires no special equipment

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