Cool Season Pulses (*Pisum sativum, Lens culinaris, Cicer arietinum*)

Prepared by N. Weeden & Fred Muehlbauer  October 5, 2004

**Genome features**
- **Size:**  
  *P. sativum*: 4,400 Mbp/haploid genome  
  *L. culinaris*: 4,200 Mbp/haploid genome  
  *C. arietinum*: 950 Mbp/haploid genome
- **No. of chromosomes**  
  *P. sativum*: n = 7  
  (stocks available for many reciprocal translocations)  
  *L. culinaris*: n = 7  
  (some translocation stocks available)  
  *C. arietinum*: n = 8

**Special biological features**
- Large collection of morphological, developmental and symbiotic mutations
- Broad background knowledge in physiology. Coding sequences identified for plant height, seed shape and size, nodulation control, leaf morphology and flowering time. QTLs identified for many traits.
- Genome comparisons with *Medicago truncatula* have already demonstrated the value of integrated studies among legumes

**Genetic resources**
- **Germplasm collections:**  
  *Pisum*: USDA, Pullman, WA (n = 3,600)  
  John Innes Institute, Norwich, UK (n = 3,030)  
  *Lens*: USDA, Pullman, WA (n = 2,790)  
  ICARDA, Aleppo, Syria (n = 7,400)  
  *Cicer*: USDA, Pullman, WA (n = 4670)  
  ICRISAT, Andhra Pradesh, India (n = 17, 260)
- **Genetic stocks:**  
  *P. sativum*: USDA, Pullman, WA (Marx collection of 100 genetically defined mutations)  
  John Innes Institute, Norwich, UK (Type lines for 250 genetically defined mutations)  
- **Mapping populations:**  
  *P. sativum*: 20-30 RI populations, including two reference mapping populations with over 2000 molecular markers (RFLPs, RAPDs, ISSRs,
microsatellites, and sequence-tagged genes)

\textit{L. culinaris}: at least 20 RI populations, including at least 3 derived from different interspecific crosses. RI populations are in USA, Australia, Israel, and Syria

\textit{C. arietinum}: numerous RI populations, including at least two derived from different interspecific crosses. RI populations being studied at ICARDA, ICRISAT, Melbourne, Horsham and Pullman.

\textbf{BAC libraries}

\textit{P. sativum}: Two libraries (Pullman and Versailles)

\textit{L. culinaris}: none reported, although at least one is in production

\textit{C. arietinum}: Two libraries reported (Rajesh et al. 2004. TAG 108:663, and a second as yet unpublished in Germany).

\textbf{Molecular markers}

\textit{P. sativum}: Broad range of biochemical and molecular markers, allozymes, RFLPs, RAPDs, AFLPs, ISSRs, STSs, RBIPs and microsatellites

\textit{L. culinaris}: Similar to \textit{P. sativum} except fewer RFLPs, RAPDs, RBIPs and almost no microsatellites.

\textit{C. arietinum}: Similar to \textit{P. sativum} except fewer polymorphic allozymes, RFLPs, AFLPs, RBIPs and STSs. Excellent set of microsatellites.

\textbf{Consortium or initiatives}

- Pea Genetics Association: Focused on genetics and germplasm. International coordinating committee. Publishes Pisum Genetics annually.
- International consortium for the development of microsatellites in pea: international collaboration to develop microsatellites—2005 expected completion date
- Chickpea genomics consortium: international collaboration for genomic studies in \textit{Cicer}