

**Increasing Alfalfa Seed Size by Recurrent Selection
and by Transfer from *Medicago arborea***

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Alfalfa is a relatively small seeded legume, circa 500 seeds per gram. Research using large seeded parents to recover hybrid seed by grading began in 1982. At that time 6x/8x plants were tested (ca 275 seeds per gram), but seed production on the high ploidy levels was not adequate. Meanwhile, seed size of selected alfalfa lines was increased by recurrent selection until seeds were as large or larger than the 6x/8x material. This was accomplished in as few as three cycles of recurrent selection in some backgrounds, and five cycles in others. Large seeded lines can be planted in mixed stand with desired normal lines for seed production, and the large seeds containing an enhanced frequency of hybrids can be recovered by grading in the seed cleaning process.

Medicago arborea has the largest seeds of any perennial *Medicago* (ca 100 seeds per gram). Alfalfa has been hybridized with *M. arborea* by electrofusion (Nenz et al. 1996), and sexually by making large numbers of crosses (Bingham 2005), and (Amour et al. 2008). The goal in the Wisconsin project is to transfer *M. arborea* seed size to alfalfa. Seed size is controlled by several genes, and the range in seed size in the F2 generation included plants with double the seed size of alfalfa (ca 250 seeds per gram). Backcrossing a trait controlled by several genes into alfalfa is expected to be difficult, but backcrossing the seed size from *M. arborea* into the large seeded alfalfa from recurrent selection is expected to be more efficient. Moreover, it should be possible to approach the seed size of *M. arborea* by selection during backcrossing. An interesting feature of the large seeded segregates is that yellow flower color can be retained, and permits direct confirmation of hybrid progeny in crosses with alfalfa. It is becoming apparent that some agronomic practices need to be optimized for planting and managing alfalfa grown from large seeds.

References

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