

Improvements in Alfalfa subsp. Falcata Germplasms and Their Hybrid Performance
 Heathcliffe Riday, US Dairy Forage Research Center (USDA-ARS), Madison, WI and Steve
 Wagner, Dairyland Seed Co., Clinton, WI

Autotetraploid yellowed flowered alfalfa (falcata) is distinct from purple flowered alfalfa. Collected wild falcata germplasm has poor agronomic performance. Pre-breeding efforts to improve falcata germplasm have occurred over the years, resulting in varieties or germplasms such as: WISFAL, AC Yellowhead, Don, IA3018, and various Dakota populations. Building on previously improved and wild falcata germplasm, a breeding effort was initiated in Iowa in the late 1990s. Initial selections resulted in two germplasm releases: IAMF101 and IAMF102 (Riday and Brummer, 2007). Further selections out of these germplasm in Wisconsin and Iowa have resulted in IAFAL-C3 (Riday and Brummer, 2007) and HC2 (Riday and Brummer, 2012). Falcata breeding continues in Wisconsin with future releases anticipated. Current improved falcata has biomass yields approximately 85%–90% of commercial alfalfa varieties. One falcata improvement impetus was to provide a heterotic germplasm for hybrid alfalfa (Riday and Brummer, 2001; 2005). Current elite falcata halfsib families (five) were test crossed to male-sterile Dairyland Seed (DS♀) lines (four) to gauge progress towards this goal. 20 hybrid seed lots were produced using insect pollinators in California in 2010. Syn 1 seed was also harvested off the falcata plants (DS♀ was male sterile) and used as falcata check germplasm. Two DS♀ x DS♂-bulk seed lots were included in the studies to determine if DS♀ x falcata hybrids had superior performance to DS♀ x DS♂. First disease resistance was examined. Anthracnose (*Collectotrichum trifolii* Bain.) resistance was: 47% DS♀ x DS♂, 50% DS♀ x falcata, and 11% falcata x falcata. Phytophthora root rot (*Phytophthora megasperma* Drechs. f. sp. *medicaginis*) resistance was: 66% DS♀ x DS♂, 41% DS♀ x falcata, and 8% falcata x falcata. For anthracnose the DS♀ provided equivalent resistance to the DS♀ x falcata hybrids. For phytophthora root rot the DS♀ x falcata hybrids were intermediate to parental species. Second biomass dry-matter (DM) yield was evaluated. Entries were seeded in Spring 2011 at three Wisconsin locations (Clinton, Marshfield, and Prairie du Sac). Plots were replicated four or six times per location. Data is available through first harvest 2012 (total of three harvests).

	DS♂ bulk	HC2-2-4	HC2-3-1	HC2-9-6	36-P1	49A-2	Falcata Avg.
	----- Biomass Yield (T/Ac DM) -----						
Falcata♂	.	4.25	4.46	4.51	4.38	4.06	4.33
NA420 (DS♀)	.	4.54	4.78	4.13	4.59	4.53	4.51
NA635 (DS♀)	.	4.62	4.84	4.60	4.73	4.59	4.67
A879W4 (DS♀)	5.35	4.99	5.53	5.26	5.15	5.33	5.25
A104 (DS♀)	4.55	4.65	4.90	4.43	4.65	4.43	4.61
Avg. DS♀	.	4.70	5.01	4.61	4.78	4.72	

Checks: 55V48 (4.60); Rebound 6.0 (4.74); and HybriForce-2400 (5.00)
 Mean (4.71); LSD < 0.05 (0.37); and %CV (10.7)

DS♀ x falcata hybrids did not out-yield DS♀ x DS♂ however the best DS♀ x falcata out-yielded commercially available alfalfa by 16%. Using falcata halfsib families as testing units was satisfactory in achieving good discriminating among falcata germplasms. Previous studies had used falcata populations by DS♀ with minimal observed differences between DS♀ x falcata entries (Riday, unpubl.). Based on this study current improved falcata germplasm can be useful in creating high yielding alfalfa varieties. However, the goal of gaining additional hybrid vigor beyond hybrid vigor observed within sativa x sativa crosses remains as of yet unfulfilled.