Development of a Purple Seeded No-Leaf-Mark Population of Red Clover

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Red clover (*Trifolium pratense* L.) typically has variegated (leaf mark) leaflets and bi-colored seeds. However, non-variegated plants occur frequently in wild and cultivated populations. Red clover may have monochrome yellow or purple seed coats, but the majority of seeds are bichrome with various portions of both colors. Our objective was to develop a population of red clover through phenotypic recurrent selection that consisted of plants without variegation (no leaf mark) and that produced predominantly monochrome purple seeds.

The population that we started with (developed into the cultivar Remedy) had a color classification (CX) of 3.6 (1=yellow, 5=purple) (1) and a high frequency of the no mark allele (q=0.51) (2). Class 5 seeds were planted in the greenhouse and no-leaf-mark types were transplanted into Cycle 0 isolation. The no mark phenotype is due to a homozygous recessive genotype so that trait was fixed in the first cycle. However, seed coat color took several cycles of selection before the desired CX was met (Table 1).

Table 1. Effect of selection on seed color.

		Color classification (CX)			CX for selected	
Cycle	# plants	Mean	range	# selected	mean	range
0	8	3.37	2.41-4.70	2	4.70	4.69-4.70
1	12	3.64	1.82-4.90	2	4.80	4.69-4.90
2	44	3.87	3.08-4.72	6	4.43	4.27-4.72
3	140	4.01	2.93-4.88	9	4.65	4.31-4.87
4	52	4.10	3.23-4.69	8	4.46	4.20-4.62
5[†]	48	4.36	3.62-4.89	13	4.74	4.63-4.89
SD PSNM[‡]	103	4.38	3.33-4.89	83	4.46	4.01-4.89

[†]Ten class 5 seeds of each of the 9 selections from cycle 3 were bulked and sent off for a winter increase. The mean CX for the increase was 3.87. Five of the 48 plants in cycle 5 came from that increase.
[‡]All plants with CX's of 4.0 or higher (87% of isolation) were bulked to form SD PSNM.

Our population (PSNM) and the cultivars Arlington, Altaswede, Tennessee Purple, Blankleaf, and Remedy (new cultivar released by SDSU in 2005) were established in a sod nursery with 4 replications of 5 plant row^{-1} at two locations in eastern South Dakota in 2005. Forage production in establishment year showed SD PSNM produced less forage averaged across locations than Altaswede and Remedy but was significantly higher in yield than Blankleaf. Spring 2006 showed winter survival ranged from 15 to 75% with SD PSNM at 55%.

The development of SD PSNM should provide red clover breeders and geneticists with an interesting and unique germplasm source. For seed please contact Robin Bortnem at robin.bortnem@sdstate.edu.

References

1. Bortnem and Boe. 2002. Frequency of the No Mark Leaflet Allele in Red Clover. Crop Sci. 42:634-636.
2. Bortnem and Boe. 2003. Color Index for Red Clover Seed Crop Sci. 43:2279-2283.