

## **Motion for the Release of Experimental UWRD Sainfoin**

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(and Wyoming staff)

### **Motions:**

1. That UWRD sainfoin be released jointly by the Montana Agricultural Experiment Station (AES), Wyoming AES, and the USDA-NRCS Plant Materials Center (Bridger, MT) as a public release variety (Option 2a).
2. Approval that UWRD sainfoin be named 'Delaney' sainfoin (pending approval by WAES).

**Background:** Sainfoin (*Onobrychis viciifolia* Scop.) is a perennial forage legume widely adapted to the western U.S. and Canada<sup>1</sup>. Sainfoin is unique among legumes used both for hay and direct grazing – its standing forage does not cause bloat. Intensive sainfoin breeding and research occurred during the 1960's until the 1980's. In Montana, 'Eski' was released in 1964, followed by 'Remont' in 1971<sup>2</sup>. Other cultivars (Melrose, Nova) were released in Canada. In Montana production systems, the single-cut types such as Eski are competitive with yield and stand longevity of alfalfa, and the multiple-cut cultivars (Remont) have better regrowth characteristics for high rainfall and short-term irrigated rotations. Despite some unique advantages of sainfoin, the crop was never widely grown. One primary reason for this has been its large seed size and resulting high initial planting costs.

Currently there is renewed interest in sainfoin in Montana and surrounding states<sup>3</sup>. During recent evaluation trials for the release documentation of 'Shoshone' sainfoin<sup>4</sup> we found that several new sainfoin lines were competitive with alfalfa under both irrigated and dryland conditions, and out-performed birdsfoot trefoil and cicer milkvetch. Shoshone appears to be an excellent single-cut cultivar to replace Eski sainfoin. Experimental UWRD similarly is poised to replace Remont as a multiple-cut cultivar.

### **References:**

<sup>1</sup><http://plants.usda.gov/java/profile?symbol=ONVI>

<sup>2</sup><http://www.montana.edu/wwwpb/pubs/mt9321.pdf>

<sup>3</sup><http://www.tein.net/~msufergus/Ag/forage/2006Sainfoin%20Making%20a%20Comeback%20in%202006.doc>

<sup>4</sup><http://crop.scijournals.org/cgi/content/full/46/2/988>

**Parentage and Breeding:** UWRD traces to a field demonstration planted by Dr. Ron Delaney near Laramie, WY in May, 1973. Nonreplicated and adjacent 0.1-acre strips of Eski, Remont, exp. NK 3220 (identified as "Persian"), exp. M-1678 (NK prostrate breeding line), a Czechoslovakian experimental (unknown PI line), and bulk seed from a previous UW polycross nursery established in 1968. After establishment, the nursery was cut annually for hay prior to mature seed formation, and glyphosate was periodically used for weed control (~ 10 years). By 1997, the stands had severely

thinned, and bulk seed was harvested from the remaining plants. This seed composite (Breeder seed, Syn 1) was identified as “SF-Laramie-73”, and it was tested in several Montana and Wyoming trials starting in 1998. In 2000, a Foundation seed field was established near Powell, WY, and the resulting seed (Syn 2) was tested as “Delaney” or “UWRD” in subsequent trials. No clear pedigree exists for this line due to differential survival of the parental plots and potential seed recruitment at the original site. However based on its forage performance, we feel that this line merits release.

**Forage Performance:** UWRD has been tested in 8 trials with a total of 23 station-years of data (53 total harvests after the year of establishment). Across all trials, UWRD had significantly higher ( $P<0.05$ ) forage yields than Shoshone, Remont and Eski sainfoin, and varieties of birdsfoot trefoil and cicer milkvetch (**Table 1**). In two of three irrigated trials (Kalispell 1999 and Bozeman 2000), UWRD had significantly higher forage yields than Ladak 65 alfalfa. While not significant in all irrigated trials, the competitiveness of sainfoin vs. alfalfa has not previously been reported. In dryland trials, UWRD performed similarly to Remont, but had lower yields than alfalfa.

UWRD appears to be best suited under high rainfall or irrigation as a replacement for Remont. UWRD has better regrowth potential after harvest than Remont. Across irrigated established trials that were harvested for three cuts, UWRD had significantly higher third-cut forage yields than Remont, Shoshone and Eski (**Table 2**). Regrowth-type sainfoin varieties are similar to high-yielding alfalfa varieties in that a larger proportion of the yield is in the second and third harvests.

The persistence of sainfoin (particularly multiple-cut varieties) under irrigated conditions is typically inferior to alfalfa. In the 4<sup>th</sup> production years of the irrigated trials, sainfoin stands and yields had declined. Across irrigated trials, 4<sup>th</sup>-year yields of UWRD was significantly higher than Shoshone, but not different from Remont or Eski (**Table 3**).

Currently, no other data in terms of seed yield, pest resistance, or forage quality are available.

**Seed Increase and Cultivar Release:** Seed production of UWRD will be on a limited generation basis. The recognized classes of seed are Breeder (Syn 1), Foundation (Syn 2 or 3), and Certified (Syn 3 or 4). Production of Syn 3 Foundation seed from Syn2 Foundation seed will be at the discretion of the Foundation Seed Programs of Montana and Wyoming. A limited quantity of Foundation seed is available at the Wyoming Seed Certification Service in Powell, WY for spring 2007 planting of fields for the production of Certified seed. At the request of Ron Delaney, the developer of UWRD sainfoin, the variety is intended to be released as a public unprotected variety.

## **Variety Description**

*UWRD is a broadbased sainfoin cultivar derived from bulk seed harvested on surviving plants in a 25-year-old field planting near Laramie, WY. The original parentage of UWRD trace to Eski, Remont, exp. NK 3220 (identified as "Persian"), exp. M-1678 (NK prostrate breeding line), a Czechoslovakian experimental (unknown PI line), and bulk seed from a previous UW polycross nursery established in 1968. No clear estimates of contributions from these sources to UWRD are available due to differential survival and potential seed recruitment at the original site. The original seed composite (Syn 1) was identified as "SF-Laramie-73", and it was tested in Montana and Wyoming.*

*UWRD is a multiple-cut sainfoin, with a growth habit similar to Remont. Across Montana forage yield trials, UWRD had significantly higher ( $P < 0.05$ ) yields than Shoshone, Remont and Eski sainfoin, and cultivars of birdsfoot trefoil and cicer milkvetch. Under dryland conditions, UWRD is superior to Eski, but similar to Remont. The regrowth potential of UWRD is improved; across irrigated trials, 3<sup>rd</sup>-cut yields were significantly higher than those of Remont, Eski and Shoshone. Persistence of UWRD appears to be similar to Remont and Eski under irrigated conditions.*

*UWRD is intended for hay, pasture and hay-stockpile production in Montana and Wyoming as a sole forage or in mixtures. UWRD is best suited under high rainfall or irrigated conditions where Remont has previously been used. Flowering date, flower color and seed characteristics are very similar to Remont. Seed yields, reaction to pests and forage quality have not been tested.*

*UWRD is a joint release from the Montana and Wyoming Agricultural Experiment Stations. Seed production of UWRD will be on a limited generation basis. The recognized classes of seed are Breeder (Syn 1), Foundation (Syn 2 or 3), and Certified (Syn 3 or 4). Production of Syn 3 Foundation seed from Syn 2 Foundation seed will be at the discretion of the Foundation Seed Programs of Montana and Wyoming. A limited quantity of Foundation seed is available at the Wyoming Seed Certification Service in Powell, WY for spring 2007 planting of seed fields for the production of Certified. UWRD sainfoin is released as a public unprotected variety.*

**Table 1. Summary of UWRD sainfoin yields (tons DM/A/year) in Montana trials, 1998-2006.**  
(Forage tons DM/A/year)

Location:	Boz. IRR	Boz. Dry	Boz. IRR	Kal. IRR	Moc. Dry	Boz. IRR	Moc. Dry	Boz. IRR
Seeded:	1998	1998	1999	1999	1999	2000	2000	2004
Harvested:	1998-2001	1998-2001	2000-2001	1999-2002	2000-2002	2001-2003	2001-2002	2005-2006
N harvests:	11	7	6	11	3	10	2	6
UWRD sainfoin	<b>4.89</b>	<b>1.77</b>	<b>4.26</b>	<b>6.45</b>	0.38	<b>5.74</b>	0.89	<b>6.32</b>
Shoshone sainfoin	4.33	<b>1.68</b>	<b>4.11</b>	5.75	0.40	<b>5.43</b>	0.94	5.58
Remont sainfoin	<b>5.03</b>	<b>1.65</b>	<b>3.96</b>	<b>5.81</b>	0.33	5.04	0.85	5.46
97MT-1 sainfoin	<b>4.82</b>	1.49	<b>4.24</b>	<b>5.83</b>	0.42	-	-	-
Nova sainfoin	-	-	-	-	-	5.00	0.92	-
Eski sainfoin	4.30	1.58	3.27	2.75	0.28	4.90	0.81	5.59
AC Grazeland alfalfa	-	-	<b>4.72</b>	5.19	<b>0.81</b>	-	-	-
Ladak 65 alfalfa	-	-	<b>4.36</b>	5.03	<b>0.81</b>	4.70	<b>1.33</b>	-
Shaw alfalfa	-	-	-	-	-	4.78	<b>1.40</b>	-
L-2 Syn1 birdsfoot trefoil	-	-	3.12	3.03	0.36	3.21	0.31	-
Windsor cicer milkvetch	-	-	2.26	4.23	0.20	2.29	0.47	-
Lutana cicer milkvetch	-	-	1.97	3.93	0.28	2.45	0.33	-
Tretana birdsfoot trefoil	-	-	2.87	2.26	0.28	3.16	0.19	-
Monarch cicer milkvetch	-	-	2.18	3.94	0.26	2.07	0.30	-
Trial Mean	4.67	1.63	3.55	4.64	0.45	3.93	0.68	5.97
Isd (0.05)	0.43	0.17	0.46	0.66	0.11	0.41	0.17	0.70
CV%	5.9	6.6	9.1	10.0	22.2	7.3	17.4	6.5

**Bold** values within a column denote values not significantly different from the highest yield.

	Paired comparisons: Entry vs. UWRD sainfoin				
	N trials	N harvests	Entry Mean	UWRD Mean	P>t paired Entry vs. UWRD
UWRD sainfoin	8	56	3.84	3.84	
Shoshone sainfoin	8	56	3.52	3.84	0.0138
Remont sainfoin	8	56	3.51	3.84	0.0212
97MT-1 sainfoin	5	38	3.36	3.55	0.0961
Nova sainfoin	2	12	2.96	3.32	0.2624
Eski sainfoin	8	56	2.94	3.84	0.0343
AC Grazeland alfalfa	3	20	3.57	3.70	0.4229
Ladak 65 alfalfa	5	32	3.24	3.55	0.2413
Shaw alfalfa	2	12	3.09	3.32	0.4041
L-2 Syn1 birdsfoot trefoil	5	32	2.00	3.55	0.0354
Windsor cicer milkvetch	5	32	1.89	3.55	0.0263
Lutana cicer milkvetch	5	32	1.79	3.55	0.0224
Tretana birdsfoot trefoil	5	32	1.75	3.55	0.0348
Monarch cicer milkvetch	5	32	1.75	3.55	0.0249

**Table 2. Regrowth yields of UWRD sainfoin (tons DM/A/year) in irrigated Montana trials, 1999-2002.**

(Forage tons DM/A in cut 3 of established stands)

Location: Seeded: Harvest:	Boz. IRR 1998			Kal. IRR 1999			Boz. IRR 2000		Paired comparisons: Entry vs. UWRD sainfoin			
	c3, 1999	c3, 2000	c3, 2001	cut 3, 2000	cut 3, 2001	cut 3, 2002	c3, 2001	c3, 2002	N trials	Entry Mean	UWRD Mean	<i>P</i> >t paired Entry vs. UWRD
UWRD sainfoin	<b>1.03</b>	<b>0.67</b>	<b>1.31</b>	<b>1.69</b>	<b>1.54</b>	<b>0.50</b>	<b>1.78</b>	<b>0.74</b>	8	1.16	1.16	-
Shoshone sainfoin	0.33	0.22	0.53	1.39	0.73	0.20	<b>1.65</b>	0.50	8	0.69	1.16	0.0008
Remont sainfoin	<b>1.17</b>	<b>0.64</b>	<b>1.05</b>	1.32	<b>1.47</b>	<b>0.44</b>	1.45	0.38	8	0.99	1.16	0.0197
97MT-1 sainfoin	<b>1.08</b>	0.47	0.99	1.37	<b>1.36</b>	<b>0.41</b>	-	-	6	0.95	1.12	0.0138
Eski sainfoin	0.19	0.10	0.56	0.68	0.33	0.10	<b>1.62</b>	<b>0.63</b>	8	0.53	1.16	0.0013
Trial Mean	0.76	0.42	0.89	1.29	1.08	0.45	1.38	0.66				
Isd (0.05)	0.24	0.15	0.30	0.27	0.32	0.11	0.20	0.20				
CV%	20.5	23.1	21.8	13.8	19.4	22.2	11.1	21.6				

**Table 3. Fourth-year yields of UWRD sainfoin (tons DM/A/year) in irrigated Montana trials, 1999-2003.**

(Forage tons DM/A in year 4 as a measure of persistence).

Location: Seeded: Harvested:	Boz. IRR	Kal. IRR	Boz. IRR	Paired comparisons: Entry vs. UWRD sainfoin			
	1998	1999	2000	N trials	Entry Mean	UWRD Mean	<i>P</i> >t paired Entry vs. UWRD
UWRD sainfoin	3.54	<b>7.50</b>	<b>5.62</b>	3	5.55	5.55	-
Shoshone sainfoin	3.01	<b>6.69</b>	4.86	3	4.85	5.55	0.0076
Remont sainfoin	3.43	<b>7.41</b>	4.70	3	5.18	5.55	0.1526
97MT-1 sainfoin	3.25	<b>7.01</b>		2	5.13	5.52	0.0820
Eski sainfoin	3.16	3.80	4.87	3	3.94	5.55	0.1328
Trial Mean	3.28	6.48	4.05				
Isd (0.05)	NS	0.88	0.63				
CV%	11.9	9.0	10.8				

**Bold** values within a column denote values not significantly different from the highest yield.