

# **Sainfoin**

## **An Alternative Forage**

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# Taxonomy of Sainfoin

## ► Taxonomy:

Family Fabaceae (Leguminosae), genus *Onobrychis*, species *viciifolia*

Traditional forage crop in Europe and Russia

French word for sainfoin is “esparcette” meaning wholesome hay

Holy Clover

## Grown in Europe for 500 Years



Sainfoin growing in the calcareous soils of southern France.

# Attributes of Sainfoin

- Non-bloating characteristic of green forage in ruminant animals
- Extremely palatable and nutritional forage
- Resistance to the alfalfa weevil
- Excellent honey production
- Good drought tolerance
- Extremely winterhardy and frost tolerant
- Fixes atmospheric Nitrogen
- Low phosphorus requirement
- Non-invasive species

# Plant Characteristics

- Grows to a height of 3 or more feet
  - Taller than alfalfa
- Stems appear course but are soft and very palatable
- Many leaflets per leaf
- Rose-pink flowers on spike like head called a raceme





Pollen collection is less injurious to honey bees than with alfalfa.

# Seed Characteristics

- Large brown seeds are in single pods that remain intact during harvest and cleaning.
- Seed is larger than most common forage legumes.
- Dehulled sainfoin contains about 32,000seeds/lb
- 21,000 seeds per lb with hull on



Photo by Raina Spence

# History and Variety Development of Sainfoin in North America

## History

Introduced into the Northern Great Plains in the 1800s.

## Variety Development

| <b>Variety</b> | <b>Year<br/>Released</b> | <b>Releasing<br/>Agency</b> |
|----------------|--------------------------|-----------------------------|
| Eski           | 1964                     | Montana State University    |
| Remont         | 1971                     | Montana State University    |
| Melrose        | 1972                     | Agriculture Canada          |
| Renumex        | 1979                     | New Mexico State University |
| Nova           | 1980                     | Agriculture Canada          |

# Newer Releases

- **Shoshone** developed by Dr. Fred Gray, University of Wyoming
- **Delaney** developed by Dr. Ron Delaney, University of Wyoming

**WY-PX-94 was jointly released on January 11, 2005 as **Shoshone** by the University of Wyoming, Montana State University, and the USDA-Natural Resource Conservation Service.**

# Attributes of Shoshone Sainfoin

- **Tolerance to the Northern root-knot nematode.**
- **Resistant to the Alfalfa Stem Nematode.**
- **Higher yield than older varieties**

**Foundation class seed was  
produced on the University of  
Wyoming Powell Research and  
Extension Center beginning in 2004.**

**Certified seed is available from seed  
producers in Wyoming and  
Montana.**

**SF-Laramie-73 was jointly released in 2007 as Delaney by the Montana State University, University of Wyoming,, and the USDA-Natural Resource Conservation Service.**

# Attributes of Delaney Sainfoin

- Reported higher yields than other varieties
- Best suited as a replacement for Remont
- Considered a multiple-cut cultivar

**A small amount of  
Breeder/Foundation class seed was  
produced on the University of  
Wyoming Powell Research and  
Extension Center beginning in 2004.**

**Foundation Seed was planted in  
Montana in 2007. Should be  
available from MSU in 2008.**



**University of Wyoming  
Research and Extension Center  
Powell, Wyoming**

**Irrigated Site**

## Yield trials of Shoshone and Remont sainfoin at the University of Wyoming R&E Center at Powell, (irrigated)<sup>a</sup>

| Entry               | Yield (T/A)<br>(dry matter) |                          |                  | Total<br>yield<br>(T/A)<br>(7 cuts) | Plants/<br>sq ft<br>(2001) | Forage quality <sup>b</sup><br>(1999) |              |              |
|---------------------|-----------------------------|--------------------------|------------------|-------------------------------------|----------------------------|---------------------------------------|--------------|--------------|
|                     | 1997<br>(2 cuts)            | <b>1999<br/>(2 cuts)</b> | 2001<br>(3 cuts) |                                     |                            | CP                                    | ADF          | NDF          |
| <b>Shoshone</b>     | <b>2.09</b>                 | <b>4.14</b>              | <b>4.90</b>      | <b>11.13</b>                        | <b>1.38</b>                | <b>17.48</b>                          | <b>30.13</b> | <b>38.20</b> |
| Remont              | 1.74                        | 3.78                     | 4.92             | 10.44                               | 1.24                       | 16.45                                 | 33.20        | 42.08        |
| Shoshone+Manska     | 2.24                        | 4.13                     | 5.50             | 11.87                               | 1.03                       | 16.30                                 | 31.53        | 46.33        |
| Remont+Manska       | 2.24                        | 4.10                     | 5.64             | 11.98                               | 0.95                       | 15.60                                 | 32.65        | 46.20        |
| <b>Spreador III</b> |                             | <b>3.76</b>              |                  |                                     |                            | <b>19.33</b>                          | <b>31.40</b> | <b>38.03</b> |
| Average             | 2.08                        | 3.98                     | 5.24             | 11.30                               | 1.15                       | 17.03                                 | 31.78        | 42.17        |
| LSD (0.10)          |                             | NS                       |                  |                                     |                            | 2.33                                  | NS           | 6.37         |
| CV (%)              |                             | 15.10                    |                  |                                     |                            | 10.90                                 | 9.00         | 12.00        |

<sup>a</sup> Plots were established in the spring of 1996. Values are the mean of 4 replicates.

<sup>b</sup> 6-16-99. Sainfoin full bloom, alfalfa late bud CP = Crude Protein, ADF = Acid Detergent Fiber, NDF = Neutral Detergent Fiber.

# Miscellaneous legume trial (irrigated), Bozeman, Montana (established April 21, 2000)

| Entry                      | 4 harvest years |                  |                  |                  |                   |
|----------------------------|-----------------|------------------|------------------|------------------|-------------------|
|                            | 2000<br>(1 cut) | 2001<br>(2 cuts) | 2002<br>(3 cuts) | 2003<br>(2 cuts) | Total<br>(8 cuts) |
| Delaney (SF-Laramie-73)    | 4.22            | 8.77             | 5.62             | 4.36             | 22.96             |
| <b>Shoshone (WY-PX-94)</b> | <b>4.17</b>     | <b>8.24</b>      | <b>4.86</b>      | <b>4.43</b>      | <b>21.96</b>      |
| Remont sainfoin            | 3.24            | 7.88             | 4.70             | 4.32             | 20.15             |
| Nova sainfoin              | 4.15            | 7.38             | 4.11             | 4.35             | 19.99             |
| Eski sainfoin              | 3.22            | 7.82             | 4.87             | 3.70             | 19.61             |
| Shaw alfalfa               | 2.82            | 6.60             | 5.45             | 4.25             | 19.11             |
| Forager alfalfa            | 2.98            | 6.50             | 5.55             | 4.05             | 19.08             |
| Ladak 65 alfalfa           | 3.02            | 6.48             | 5.04             | 4.26             | 18.81             |
| Empire birdsfoot trefoil   | 2.29            | 4.27             | 3.47             | 3.23             | 13.24             |
| L2 Syn-1 birdsfoot trefoil | 2.37            | 3.93             | 3.48             | 3.04             | 12.82             |
| Tretana birdsfoot trefoil  | 2.39            | 3.70             | 3.64             | 2.89             | 12.62             |
| Viking birdsfoot trefoil   | 2.08            | 4.06             | 3.70             | 2.73             | 12.57             |
| Leo birdsfoot trefoil      | 2.24            | 3.87             | 2.67             | 2.48             | 11.26             |
| Lutana cicer milkvetch     | 0.98            | 3.07             | 2.63             | 3.10             | 9.78              |
| Windsor cicer milkvetch    | 0.75            | 3.07             | 2.50             | 2.83             | 9.15              |
| Monarch cicer milkvetch    | 0.43            | 2.44             | 2.52             | 2.88             | 8.28              |
| Mean                       | 2.58            | 5.50             | 4.05             | 3.56             | 15.70             |
| <b>LSD .05</b>             | <b>0.37</b>     | <b>0.56</b>      | <b>0.63</b>      | <b>0.66</b>      | <b>1.64</b>       |
| CV%                        | 10.1            | 7.0              | 10.8             | 12.86            | 7.29              |



# 2007 Irrigated Forage Yield Trial of Sainfoin at the University of Wyoming, Powell R&E Center

| Entry                   | Yield (T/A)<br>Dry Matter | Forage quality <sup>b</sup><br>(2007) |             |             |           |            |
|-------------------------|---------------------------|---------------------------------------|-------------|-------------|-----------|------------|
|                         | 2007<br>(August 6)        | CP%                                   | ADF%        | NDF%        | NDFD%     | RFV        |
| <b>Shoshone</b>         | <b>0.93</b>               | <b>22.2</b>                           | <b>28.4</b> | <b>33.5</b> | <b>40</b> | <b>185</b> |
| Delaney                 | 0.93                      | 18.3                                  | 32.0        | 36.1        | 39        | 165        |
| Eski                    | 0.83                      | 20.8                                  | 27.5        | 29.6        | 41        | 212        |
| Rocky Mnt Remont        | 0.82                      | 20.7                                  | 28.2        | 30.4        | 40        | 205        |
| Remont                  | 0.93                      | 22.4                                  | 28.1        | 31.8        | 40        | 196        |
| <b>Alfalfa</b>          | <b>1.43</b>               | <b>20.2</b>                           | <b>34.5</b> | <b>39.2</b> | <b>46</b> | <b>147</b> |
| <b>Sainfoin Average</b> | <b>0.89</b>               | <b>20.7</b>                           | <b>29.8</b> | <b>33.4</b> | <b>41</b> | <b>180</b> |

<sup>a</sup> Plots were established June 4, 2007.

<sup>b</sup> CP = Crude Protein, ADF = Acid Detergent Fiber, NDF = Neutral Detergent Fiber, NDFD = Neutral Detergent Fiber Digestibility, RFV = Relative Feed Value.

# 2007 Irrigated Forage Yield Trial of Sainfoin at the University of Wyoming, Powell R&E Center

|                  | 2007 Yield<br>Tons/acre<br>Dry Matter | 2008 Yield<br>Tons/acre<br>Dry Matter |        |         |               |              |
|------------------|---------------------------------------|---------------------------------------|--------|---------|---------------|--------------|
| Entry            | 8-6-07 <sup>a</sup>                   | 6-18-08                               | 8-1-08 | 10-1-08 | 2008<br>Total | 2yr<br>Total |
| Shoshone         | 0.93                                  | 3.70                                  | 2.31   | 0.78    | 6.79          | 7.72         |
| Delaney          | 0.93                                  | 3.19                                  | 2.28   | 1.12    | 6.59          | 7.52         |
| Eski             | 0.83                                  | 3.78                                  | 2.26   | 0.65    | 6.70          | 7.52         |
| Remont           | 0.93                                  | 3.73                                  | 2.17   | 0.70    | 6.60          | 7.54         |
| Rocky Mnt Remont | 0.82                                  | 3.65                                  | 2.21   | 0.67    | 6.53          | 7.34         |
| Ranger Alfalfa   | 1.43                                  | 3.58                                  | 2.68   | 1.05    | 7.31          | 8.74         |
| Sainfoin Average | 0.89                                  | 3.61                                  | 2.25   | 0.78    | 6.64          | 7.53         |

<sup>a</sup> Plots were established June 4, 2007.

# 2007 Irrigated Forage Yield Trial of Sainfoin at the University of Wyoming, Powell R&E Center

| Entry                   | Yield (T/A)<br>Dry Matter | Forage quality <sup>b</sup><br>(June 18, 2008) |             |             |             |              |
|-------------------------|---------------------------|------------------------------------------------|-------------|-------------|-------------|--------------|
|                         | 6-18-08                   | CP%                                            | ADF%        | NDF%        | TDN%        | RFV          |
| <b>Shoshone</b>         | <b>3.70</b>               | <b>15.5</b>                                    | <b>33.6</b> | <b>43.1</b> | <b>62.7</b> | <b>135.0</b> |
| Delaney                 | 3.19                      | 15.7                                           | 34.0        | 42.2        | 62.3        | 138.0        |
| Eski                    | 3.78                      | 17.0                                           | 35.1        | 43.3        | 61.2        | 132.0        |
| Remont                  | 3.73                      | 18.9                                           | 31.7        | 41.4        | 64.7        | 144.0        |
| Rocky Mnt Remont        | 3.65                      | 16.7                                           | 34.2        | 44.5        | 62.1        | 130.0        |
| <b>Alfalfa</b>          | <b>3.58</b>               | <b>17.4</b>                                    | <b>35.2</b> | <b>41.8</b> | <b>61.0</b> | <b>136.8</b> |
| <b>Sainfoin Average</b> | <b>3.61</b>               | <b>16.8</b>                                    | <b>33.7</b> | <b>42.9</b> | <b>62.6</b> | <b>135.6</b> |

<sup>a</sup> Plots were established June 4, 2007.

<sup>b</sup> CP = Crude Protein, ADF = Acid Detergent Fiber, NDF = Neutral Detergent Fiber, TDN = Total Digestible Nutrients, RFV = Relative Feed Value.

# Establishment

- Best suited to soils that are neutral to slightly alkaline (pH 7.0 to 8.0)
- Prefers well drained soils
- Amend with adequate levels of P and K
- Uniform, firm seedbed
- Plant early in the spring
- Important to inoculate seed
  - Use rhizobium specific for Sainfoin

# Establishment cont.

- Depth of  $\frac{1}{2}$  to  $\frac{3}{4}$  inch
  - Drills with depth bands work good
  - Sainfoin does not emerge from deep planting
- May be seeded as solid stand in 7-12 inch rows or in wide rows (22 in).
  - May be planted with grain drill
- Recommended seeding rates vary
  - Irrigated
    - 45 PLS/acre = 31 seeds/sqft
    - 25-30 PLS/acre = 10.5 – 12.6 seeds/linear row foot
    - Have established seed production fields on 22in rows with 10 lbs/acre

# Establishment cont.

- The seedlings are vigorous but do not compete well with companion crops or weeds
- Plant pure stand or with grass mixture
  - Reduce sainfoin seeding rate by 1/3 w/ grass



Mike Killen in newly planted Foundation seed field in 2004.



# Weed Management

- Most important during establishment year
  - After establishment year crop competes well with weeds
- Mowing or grazing
- Chemical options include:
  - Pre emergence (dormant treatment)
  - Post emergence

# Labeled Chemical options

- Preplant
  - NA
- Pre-emergence (established fields)
  - Sencor, Kerb
- Post-emergence
  - Poast or Poast Plus
  - Select

# Other ideas

- It has been reported that Sainfoin shows some resistance to Glyphosate at low rates (4-6 oz)
- Some herbicides used on Alfalfa have potential with Sainfoin

## Sainfoin response to preplant and post herbicide treatments.

| Treatments                              | Application |            | Sainfoin |            |
|-----------------------------------------|-------------|------------|----------|------------|
|                                         | Rate        | Timing     | Injury   | Seed Yield |
|                                         | oz/A        | --         | %        | lb/A       |
| <b>Balan + Treflan</b>                  | 26 + 16     | PPI        | 0        | 805        |
| <b>Balan + Eptam</b>                    | 26 + 32     | PPI        | 0        | 855        |
| <b>Balan + Prowl H<sub>2</sub>O</b>     | 26 + 24     | PPI        | 0        | 990        |
| <b>Balan + Outlook</b>                  | 26 + 14     | PPI        | 0        | 850        |
| <b>Balan + Sonalan</b>                  | 26 + 32     | PPI        | 0        | 995        |
| <b>Balan / Basagran</b>                 | 26 / 16     | PPI / Post | 3        | 800        |
| <b>Balan / Raptor + Nis</b>             | 26 / 4      | PPI / Post | 0        | 800        |
| <b>Balan / Pursuit + Nis</b>            | 26 / 3      | PPI / Post | 7        | 715        |
| <b>Balan / Basagran + Raptor + Nis</b>  | 26 / 16+4   | PPI / Post | 0        | 800        |
| <b>Balan / Basagran + Pursuit + Nis</b> | 26 / 16+3   | PPI / Post | 10       | 721        |
| <b>Balan / Buctril</b>                  | 26 / 11     | PPI / Post | 5        | 785        |
| <b>Balan / Butyrac</b>                  | 26 / 16     | PPI / Post | 10       | 626        |
| <b>Balan / MCPA-amine</b>               | 26 / 8      | PPI / Post | 15       | 630        |
| <b>Balan / Thistrol</b>                 | 26 / 16     | PPI / Post | 15       | 692        |
| <b>Balan</b>                            | 26          | PPI        | 0        | 678        |

Nis; nonionic surfactant (Preference) at 0.25%. PPI; 4/26. Post; 6/29.



# Irrigation Management

- Drought tolerant
- Deep rooted
- Does not like being wet for long periods
- Observed yellowing and stand loss in areas that hold water or around leaky irrigation gates

# Observations

- Rapid spring growth
  - Two weeks earlier than alfalfa
- Very attractive to wildlife

# Concerns

- Stand persistence?
- Poor growth if soil fertility is low
- Lygus bugs in seed production fields
- May lodge under high fertility and water

# Seed Production

- Excellent Yields: 1000-1800 lbs/acre
- Shatters very easily
- Need to control Lygus bugs
- Good re-growth after seed harvest
- Potential for seed and forage crop in same year







# Questions?



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