BASALT MILKVETCH

Astragalus filipes Torr. ex A. Gray

Plant Symbol = ASFI

Common Names: Threadstalk milkvetch
Scientific Names: *A. macgregorii, A. steonphyllus*

Figure 1. Basalt milkvetch. Photo by Clint Shock. Oregon State University.

Description
General: Legume family (Fabaceae). Basalt milkvetch is a perennial legume with multiple upright stems forming a large, 18 to 36 inch tall semi-shrub. The leaves are 1 to 4 inches long divided into 9 to 21 leaflets. The inflorescence is a loose raceme with 8 to 30 cream colored flowers, each about ½ inch long (Welsh et al., 2003). The plants bloom late spring (USDA-NRCS, 2017). The fruit is a pendulous, stipitate, narrowly oblong pod, ½ to 1 inch in length with 12 to 20 ovules (Cronquist et al., 1989). There are approximately 120,000 seeds/lb (USDA-NRCS, 2017). Basalt milkvetch is a tetraploid (2n=24) (Johnson et al., 2008).

Distribution: Basalt milkvetch is possibly one of the most widely distributed species of *Astragalus* (Isley, 1998). It can be found in Western North America from northern Mexico to southern British Columbia (Bhattarai, 2007) from 200 to 2,500 m elevation in sites receiving 5 to 30 inches annual precipitation (Bhattarai, 2007). Basalt milkvetch is locally abundant in the Columbia Basin and Great Basin, particularly in the Owyhee Desert, Snake River Plains and Lahontan Basin through the Humboldt River valley (Cronquist et al., 1989). For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Habitat: Basalt milkvetch is found in juniper and sagebrush plant communities in arid to semi-arid sites of western North America (Welsh et al., 2003). It can also be found in ponderosa pine forests and chaparral ecosystems (Johnson et al., 2008).

Adaptation
Basalt milkvetch occurs commonly on basalt-derived, sandy, loamy, or gravelly soils (Johnson et al., 2008). It is adapted to soils with pH levels of 5.8-7.3 in areas receiving 8-30 inches annual precipitation (USDA-NRCS, 2017).

Uses
Restoration: Basalt milkvetch is one of the few native legumes that is adapted for use in restoration in the semi-arid west. As a legume, it has the ability to add nitrogen to rangeland plantings, and it is known to resprout readily after fire making it a valuable species for the fire-prone west. The I-49 strain of rhizobium from Nitragin Company (Milawukee, WI) was found to create the highest nodule weight and number of nodules among six accessions of basalt milkvetch from CA, OR, NV, ID and BC (Bhattarai, 2007). Greenhouse trials involving a single accession of basalt milkvetch indicated that plants inoculated with I-49 also developed a higher nitrogen pool and greater number of nodules compared to other tested rhizobium strains (Bhattarai, 2007).

Basalt milkvetch is safe to be used in grazing areas. Unlike many milkvetch and locoweed species, basalt milkvetch does not pose any threat to livestock from toxicity. Unpublished data from ARS Poisonous Plants Lab in Logan, UT indicate nitrotoxins, selenium and swainsonine were not present, or were present in extremely low levels, in field samples of basalt milkvetch (Bhattarai, 2007). Among 67 accessions from ID, UT, NV, CA, OR and WA, crude protein ranged from 95 to 202

g/kg (Bhattarai, 2007). Basalt milkvetch can also produce new shoots from lateral roots; which may help basalt milkvetch persist under grazing (Bhattarai, 2007).

Status

Threatened or Endangered: None.

Wetland Indicator: None.

Weedy or Invasive: None.

Planting Guidelines

Basalt milkvetch has physical seed dormancy due to a hard seed coat which inhibits water imbibition (Shock, 2008; Jones et al., 2016). Shock (2008) found that lightly mechanically scarifying the seed for 7.5 seconds in a hand-made scarifier with 220-grit sandpaper significantly improved germination when compared to a non-scarified control or seed that was scarified for 15 or 30 seconds. Seed germination; however, was low overall, with the highest germination rate of 10.8%. Jones et al. (2016) found that scarification for 6 seconds with a Forsberg Line debearder (Fred Forsberg & Sons, Inc., Thief River Falls, MN) modified with four internal paddles and lined with medium-grit emery paper increased tetrazolium imbibition by 8.6%, yet the percentage of hard seed was still very high following scarification (74.7%).

Acid scarification, in which Basalt milkvetch seeds are soaked in 98% sulfuric acid for five minutes, rinsed with tap water for three minutes, and air dried resulted in increases in germination and seedling emergence, however germination of acid scarified seeds was still relatively low at 20% in greenhouse studies (Bushman et al. 2015). Field trials conducted by the authors in cooperation with NRCS, Utah State University, USFS-RMRS, ARS and BYU (results in preparation), using the buried seed bag technique (Abbot and Roundy 2003) showed acid scarification leading to significant increases in rates of germination and establishment.

Planting medium has also been shown to affect germination of basalt milkvetch. Bushman et al. (2015) saw a 20% increase in emergence when seeding into soils with higher clay content compared with sandy soils. Basalt milkvetch seed also germinated significantly better in a sandy medium than on blotter paper in a laboratory setting (Jones, 2016).

Management

Basalt milkvetch should be used as a minor component of restoration seed mixtures. Management strategies should be based on the key species in the established plant community. Grazing should be deferred on seeded lands for at least two growing seasons to allow for full stand establishment (Ogle et al., 2011).

Pests and Potential Problems

Youtie and Miller (1986) observed more than 80% seed predation in 1980 and 60% in 1981. Study plots of basalt milkvetch at Millville, UT treated with Imidacloprid insecticide yielded significantly higher seed production than non-treated control plots in 2006 but not in 2005 (Bhattarai, 2007). The authors suggest this may have been due to a lower level of infestation in the early portion of the study.

Environmental Concerns

Basalt milkvetch is native to western North America. It will spread under favorable conditions but does not pose any environmental concern to native plant communities under proper management.

Control

Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method. Trade names and control measures appear in this document only to provide specific information. USDA NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

Seeds and Plant Production

Reliable seed production of basalt milkvetch has been problematic. The upright stems of basalt milkvetch make seed much easier to harvest than low-growing *Astragalus* species (Johnson et al., 2008); however, high rates of plant mortality in test plots in Utah had significant effects on seed production (Bhattarai, 2007). High density plantings using transplanted tubelings are often chosen over direct seeding due to poor establishment from seed.

Seed shatter has been a serious obstacle with seed production. Pod sealing agents may be useful in holding pods together and reducing losses from shatter. Basalt milkvetch could also be grown on fabric to allow for sweeping of shattered seed.

Cultivars, Improved, and Selected Materials (and area of origin)
NBR-1 Germplasm basalt milkvetch was released in 2008 by the USDA-ARS Forage and Range Research Lab in cooperation with the Utah Agricultural Experiment Station and Utah State University. It is intended for conservation uses including post-fire reclamation, rangeland restoration, wildlife habitat improvement and plant diversity enhancement in the Northern Basin and Range Ecoregion (Johnson et al., 2008). Based on the original collection site descriptions, NBR-1 is anticipated to be adapted to sagebrush steppe and pinyon-juniper woodland communities in areas receiving 8 to 18 inches annual precipitation.

Cultivars should be selected based on the local climate, resistance to local pests, and intended use. Consult with your local land grant university, local extension or local USDA NRCS office for recommendations on adapted cultivars for use in your area**.**

Literature Cited

Abbott, L.B. and B.A. Roundy. (2003). Available water influences field germination and recruitment of seeded grasses. Journal of Range Management 56**:** 56-64.

Bhattarai, K. 2007. Potential of basalt milkvetch (*Astragalus filipes*) populations and rhizobial strains for revegetation and restoration of intermountain west rangelands. Master's Thesis. Utah State University. 128p.

Bushman, B.S., Johnson, D.A., Conners, K.J. and T.A. Jones. 2015. Germination and seedling emergence of three semiarid western North American legumes. Rangeland Ecology and Management. 68: 501-506.

Cronquist, A., Holmgren, A.H., Holmgren N.H., Reveal, J.L., and P.K. Holmgren. 1989. Intermountain Flora: Vascular Plants of the Intermountain West, U.S.A. Volume 3, Part B. Fabales. The New York Botanical Garden. Bronx, New York. 279p.

Fund, A. 2017. Personal communication. Graduate student. Utah State University. Logan, Utah.

Isley, D. 1998. Native and naturalized Leguminosae (Fabaceae) of the United States. Provo, UT. Brigham Young University. 1007p.

Johnson, D.A., Jones, T.A., Conners, K.J., Bhattarai, K. Bushman, B.S. and K.B. Jensen. 2008. Notice of release of NBR-1 Germplasm basalt milkvetch. Native Plants Journal. 9(2): 127-132.

Jones, T.A., Johnson, D.A., Bushman, S.B., Conners, K.J. and R.C. Smith. 2016. Seed dormancy mechanisms in basalt milkvetch and western prairie clover. Rangeland Ecology and Management. 69: 117-122.

Ogle, D., St. John, L. Stannard, M. and L. Holzworth. 2011. Technical Note 24: Conservation plant species for the Intermountain West. USDA-NRCS, Boise, ID-Salt Lake City, UT-Spokane, WA. ID-TN 24. 57p.

Shock, C., Feibert, E., Saunders, L. 2008. Scarification of basalt milkvetch (*Astragalus filipes*) seed for improved emergence. Ontario, OR: Oregon State University Agricultural Experiment Station. Special Report 1087: 204-205.

USDA-NRCS. 2017. The PLANTS Database (http://plants.usda.gov, 31 March 2015). National Plant Data Team, Greensboro, NC 27401-4901 USA.

Welsh, S.L., Atwood, N.D., Goodrich, S., and L.C. Higgins. 2003. A Utah Flora. Third Edition, revised. Brigham Young University, Provo, UT.

Youtie, B.A. and R.F. Miller. 1986. Insect predation on *Astragalus filipes* and *A. purshii* seeds. Northwest Science. 60: 42-46.

Citation
Tilley, D., Fund. A. and T. Pickett. 2017. Plant Guide for basalt milkvetch (*Astragalus filipes).* USDA-Natural Resources Conservation Service, Aberdeen Plant Materials Center. Aberdeen, ID 83210.

Published: May 2017

Edited:

For more information about this and other plants, please contact your local NRCS field office or Conservation District at http://www.nrcs.usda.gov/ and visit the PLANTS Web site at http://plants.usda.gov/ or the Plant Materials Program Web site:
http://plant-materials.nrcs.usda.gov.

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the bases of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program, or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases will apply to all programs and/or employment activities.)

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (PDF) within 45 days of the date of the alleged discriminatory act, event, or in the case of a personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form (PDF), found online at http://www.ascr.usda.gov/complaint_filing_cust.html, or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter to us by mail at U.S. Department of Agriculture, Director, Office of Adjudication, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, by fax (202) 690-7442 or email at program.intake@usda.gov. Individuals who are deaf, hard of hearing or have speech disabilities and you wish to file either an EEO or program complaint please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

Persons with disabilities who wish to file a program complaint, please see information above on how to contact us by mail directly or by email. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.) please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

For any other information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, persons should either contact the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish or call the State Information/Hotline Numbers. For any other information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices for specific agency information.