

Taxon: <i>Onobrychis viciifolia</i> Scop.	Family: Fabaceae
Common Name(s): esparcet holy clover sainfoin	Synonym(s): Hedysarum onobrychis L. Onobrychis sativa Lam. Onobrychis vulgaris Gaudin

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 23 Jan 2019
WRA Score: 3.5	Designation: L	Rating: Low Risk

Keywords: Perennial Legume, Naturalized, Fodder, Non-toxic, Animal-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Low
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	n
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	[Cultivars have been bred, but apparently not highly domesticated] "O. viciifolia has been cultivated for hundreds of years in many parts of the world, including Asia, Europe and North America (Frame et al., 1998)." ... "O. viciifolia is native to South Central Asia and was introduced into central Europe in the 15th century (Burton and Curley, 1968). It was first cultivated in Southern France in 1582, following which it spread across Europe (Piper, 1924) and into North America by 1786. It was being cultivated in the UK by the mid 17th century (Hartlib, 1652) and gained popularity in many areas of Britain where it was used to feed the heavy horses, and the aftermath (leafy stubble) was used for grazing lambs (Koivisto and Lane, 2001). Today, it is still popular in Eastern Europe, Italy, Spain, Iran and, especially, Turkey where about 94,000 ha were grown in 2001 (Eken et al., 2004)."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Low
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 19 Jan 2019]	"Native Europe SOUTHEASTERN EUROPE: Bulgaria, Former Yugoslavia SOUTHWESTERN EUROPE: France"
	Roecklein, J.C. & Leung, P. (eds.). (1987). A Profile of Economic Plants. Transaction Publishers, New Brunswick, NJ	"Plants are native to temperate Eurasia."

Qsn #	Question	Answer
202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 19 Jan 2019]	NA

203	Broad climate suitability (environmental versatility)	Y
	Source(s)	Notes
	Dave's Garden. (2019). <i>Onobrychis</i> Species, Common Sainfoin - <i>Onobrychis viciifolia</i> . https://davesgarden.com/guides/pf/go/54545/ . [Accessed 19 Jan 2019]	"Hardiness: USDA Zone 3a: to -39.9 °C (-40 °F) USDA Zone 3b: to -37.2 °C (-35 °F) USDA Zone 4a: to -34.4 °C (-30 °F) USDA Zone 4b: to -31.6 °C (-25 °F) USDA Zone 5a: to -28.8 °C (-20 °F) USDA Zone 5b: to -26.1 °C (-15 °F) USDA Zone 6a: to -23.3 °C (-10 °F) USDA Zone 6b: to -20.5 °C (-5 °F) USDA Zone 7a: to -17.7 °C (0 °F) USDA Zone 7b: to -14.9 °C (5 °F) USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15 °F) USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F)"
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	" <i>O. viciifolia</i> grows in a wide range of climatic conditions in Europe, North America, Asia, Australia and New Zealand, in neutral and alkaline soils of pH 6 or above, in dryland and irrigated areas." ... "Although there is little published data, there is considerable observational evidence that <i>O. viciifolia</i> is tolerant of relatively high temperatures; in 2009 and 2010, it was grown in small plots in northern Greece and southern Spain, where temperatures of .328C were often recorded (Ioannis Hadjigeorgiou, pers. commun., Agricultural University of Athens)."
	Heuzé V., Tran G., & Lebas F. (2015). Sainfoin (<i>Onobrychis viciifolia</i>). Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. https://www.feedipedia.org/node/703 . [Accessed 19 Jan 2019]	"Sainfoin originates from Turkey, Iran and Europe. It was first cultivated in northern France (Delgado Munoz, 2008) and in the United Kingdom (Koivisto et al., 2001). It is now widespread in warm-temperate Europe (as far as Sweden), Asia, Mediterranean countries and western North America. It thrives well in warm-temperate conditions in regions where annual rainfall is above 330 mm. It is tolerant to drought and cold if nitrogen reserves are sufficient. It can be profitably irrigated."
	Bennett, S., Francis, C., & Reid, B. (2001). Minor and under-utilized legumes. In <i>Plant Genetic Resources of Legumes in the Mediterranean</i> (pp. 207-230). Springer, Dordrecht	"Tolerant of frosts to -4.4°C under good snow cover. Altitude; near sea level to 1700m, annual rainfall; 350mm to 1000mm, mean annual temperature; 5.9" to 18.6"C. Flowers from May to August."

204	Native or naturalized in regions with tropical or subtropical climates	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Roecklein, J.C. & Leung, P. (eds.). (1987). A Profile of Economic Plants. Transaction Publishers, New Brunswick, NJ	"Plants are native to temperate Eurasia. There has been interest in Europe and Canada for using sainfoin in honeybee farming."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Preferred Climate/s: Dryland, Mediterranean"
	Hanelt, P. (ed.). 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops, Volume 2. Springer-Verlag, Berlin, Heidelberg, New York	"South, East and subhumid parts of Central and W Europe, SW Asia, often of doubtful indigeneity, naturalized also in North America."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Hanelt, P. (ed.). 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops, Volume 2. Springer-Verlag, Berlin, Heidelberg, New York	"Cultivated in various countries of Europe, in north-western USA and W Canada, even in Latin America (green manure), South Africa and Australia."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Hanelt, P. (ed.). 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops, Volume 2. Springer-Verlag, Berlin, Heidelberg, New York	"South, East and subhumid parts of Central and W Europe, SW Asia, often of doubtful indigeneity, naturalized also in North America."

Qsn #	Question	Answer
	<p>Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall</p>	<p>[N - Naturalised Species has self-sustaining and spreading populations with no human assistance, but does not necessarily impact upon the environment.] "References: Finland-U-42, United States of America-N-101, New Zealand-UW-280, South Africa-AZW-121, Australia-N-176, Europe, eastern-W-272, Australia-N-945, Czech Republic-NI-400, United Kingdom- N-519, Poland-N-619, Ukraine-U-643, Austria-CN-708, Denmark-CN-711, Canada and United States of America-N- 725, Lithuania-I-737, Mediterranean-I-775, Spain-W-807, Belarus-N-817, Czech Republic-N-826, Australia-W-853, Germany-N-907, New Zealand-U-919, Mediterranean-W-951, Australia-N-354, Austria-N-1006, Belgium-N-1006, France- N-1006, Czechoslovakia-N-1006, Estonia- N-1006, France-N-1006, Germany-N-1006, Latvia-N-1006, Liechtenstein-N-1006, Lithuania-N-1006, Netherlands-N-1006, Poland-N-1006, Portugal-N-1006, Slovenia-N-1006, Australia-N-1049, Global-N-1059, Portugal-N-898, Europe- N-819, Spain-N-1149, Poland-AW-1219, Belgium-N-1220, Serbia-W-1238, Norway- N-1243, Canada-U-1252, Italy-N-1265, France-A-1266, Ukraine-N-1297, Ukraine- N-1335, Sardinia-U-1336, Canada-NI- 1340, Sardinia-U-1381, Spain-N-1454, Spain-N-1455, Turkey-A-1459, Turkey-A- 1464, Slovakia-N-1484, Czech Republic- N-1522, Austria-N-1531, Latvia-CN-1598, United States of America-N-1603, United States of America-N-1607, Estonia-W- 1609, Austria-W-1609, Czech Republic-W- 1609, Denmark-W-1609, Russia-W-1609, Lithuania-W-1609, Netherlands-W-1609, Norway-W-1609, Poland-W-1609, Sweden-W-1609, Canadian northwest Territories-N-1011, Poland-N-1040, Global-CD-1611, Russia-N-1006, Czech Republic-N-1731, France-N-1438, United States of America-N-1162, Sweden-N- 1802, France-A-1814, Sardinia-U-1393, Australia-UN-1845, Sardinia-U-1917, Russia-I-1989, Estonia-N-1997, Ukraine- U-2014, New Zealand-U-2048, Ukraine-N-2050, Slovakia-A-2079, Ukraine-N-2112, Australia-W-1977, Austria-W-1977, Belarus-W-1977, Belgium-W-1977, Canada-W-1977, Czech Republic-W-1977, Denmark-W-1977, France-W-1977, Greece-W-1977, Ireland-W-1977, Latvia- W-1977, Liechtenstein-W-1977, Lithuania- W-1977, Luxembourg-W-1977, Netherlands-W-1977, Norway-W-1977, Poland-W-1977, Portugal-W-1977, Slovakia-W-1977, Sweden-W-1977, Ukraine-W-1977."</p>
	<p>Wagner, W.L., Herbst, D.R.& Lorence, D.H. (2019). Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 19 Jan 2019]</p>	<p>No evidence to date</p>

Qsn #	Question	Answer
302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	" <i>O. viciifolia</i> is usually considered to be a non-aggressive crop with slow regrowth after cutting; therefore, weed competition needs to be minimized at establishment; in a study by Moyer (1985), weeds formed 98% of the biomass in the absence of herbicides during the first year."
	Tilley, D., Ogle, D. & St. John, L. (2013). Plant Guide for wild bergamot (<i>Monarda fistulosa</i> L.). USDA, NRCS, National Plant Data Center. https://plants.usda.gov/plantguide/pdf/pg_onvi.pdf . [Accessed 22 Jan 2019]	"Sainfoin has been widely used in reclamation and range enhancement seedings throughout the Great Plains, Rocky Mountains and Intermountain West and has become naturalized in some locations. It is not considered weedy or invasive, but may spread under ideal conditions via seed."

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	" <i>Onobrychis viciifolia</i> ... Weed of: Pastures" [Impacts are unspecified]
	Tilley, D., Ogle, D. & St. John, L. (2013). Plant Guide for wild bergamot (<i>Monarda fistulosa</i> L.). USDA, NRCS, National Plant Data Center. https://plants.usda.gov/plantguide/pdf/pg_onvi.pdf . [Accessed 22 Jan 2019]	"Sainfoin has been widely used in reclamation and range enhancement seedings throughout the Great Plains, Rocky Mountains and Intermountain West and has become naturalized in some locations. It is not considered weedy or invasive, but may spread under ideal conditions via seed."
	Bhattarai, S., Coulman, B., & Biliget, B. (2016). Sainfoin (<i>Onobrychis viciifolia</i> Scop.): renewed interest as a forage legume for western Canada. <i>Canadian Journal of Plant Science</i> , 96(5), 748-756	"Sainfoin is considered to be a non-aggressive crop during seedling establishment. Thus, weed control in the first year is important for good establishment and high forage production in subsequent years. In the first year of establishment, Moyer (1985) found weeds made up 98% of DM yield in sainfoin fields without any weed control measures."

304	Environmental weed	n
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	" <i>O. viciifolia</i> is usually considered to be a non-aggressive crop with slow regrowth after cutting; therefore, weed competition needs to be minimized at establishment; in a study by Moyer (1985), weeds formed 98% of the biomass in the absence of herbicides during the first year."
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Pastures" [No evidence]

305	Congeneric weed	
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	" <i>Onobrychis bungee</i> ... Weed of: Pastures" ... " <i>Onobrychis gracilis</i> ... Weed of: Cereals" [Potential agricultural weeds. Confirmation of impacts needed]

401	Produces spines, thorns or burrs	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2010. Flora of China. Vol. 10 (Fabaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence. Seed with prickles] "Herbs, perennial, 0.5–1.2 m tall. Stems erect, caespitose. Stipules triangular-ovate, 7–9 mm, connate farther than middle. Leaves 10–18 cm, 13–19-foliolate; leaflet blades oblong-lanceolate to lanceolate, 2–3 × 0.4–1 cm, abaxially appressed pubescent, adaxially glabrous. Racemes densely spicate, with many flowers; bracts lanceolate, ca. 2 × as long as pedicel; peduncle conspicuously longer than leaves. Pedicel ca. 1 mm. Calyx campanulate, 6–8 mm, villous; teeth subulate-lanceolate, 2– 2.5 × as long as tube. Corolla pinkish purple; standard obovate, 8–10 mm; wings ca. 1/4 as long as standard; keel ± as long as standard. Ovary densely appressed pubescent. Legume with 1 loment; loment subglobose, 5–6 mm in diam., inflated, margin thickened and adaxially with prickles."

402	Allelopathic	
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	" <i>O. viciifolia</i> is usually considered to be a non-aggressive crop with slow regrowth after cutting; therefore, weed competition needs to be minimized at establishment; in a study by Moyer (1985), weeds formed 98% of the biomass in the absence of herbicides during the first year." [No evidence. Unlikely. Does not suppress weeds]
	Urbano, B., Gonzalez-Andres, F., & Ballesteros, A. (2006). Allelopathic potential of cover crops to control weeds in barley. <i>Allelopathy Journal</i> , 17(1), 53-64	[Unlikely. Not as effective as Sorghum at weed suppression] "The study was done to develop management practices to reduce the use of herbicides, in the semi-arid Mediterranean agricultural ecosystems of Torozos (Valladolid, Spain). The treatments were: (i) grain sorghum (<i>Sorghum bicolor</i>), (ii) Sudan grass (<i>Sorghum sudanense</i>) and (iii) sainfoin (<i>Onobrychis viciifolia</i>), as cover crops, (iv) mechanical removal of weeds and v) leaving unweeded, as control. The herbicides were not used in the experiment. <i>Sorghum bicolor</i> and <i>S. sudanense</i> proved best cover crops for weed control in succeeding barley crop. The reduction in the weeds density with <i>S. sudanense</i> as the cover crop was up to 75% and the increase in the barley yield was from 15.37 Q ha ⁻¹ • Weed control treatments reduced the relative cover value (RCV) and the relative weight value (RWV) of only <i>Sinapis arvensis</i> weed, while RCV and RWV of many weeds were increased many fold over the control. <i>Sorghum sudanense</i> as cover crop gave the highest net profit {€302.27 per hectare) and a 7,692% marginal rate of return. The use of <i>Sorghum sudanense</i> or even <i>S. bicolor</i> as a cover crop can be recommended during the fallow year, to control weeds in the following barley season. Such a cover crop is compatible with the fallow or set-aside periods imposed by E.C. policies."

403	Parasitic	n
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2010. Flora of China. Vol. 10 (Fabaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Herbs, perennial, 0.5–1.2 m tall." [Fabaceae. No evidence]

Qsn #	Question	Answer
404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Roecklein, J.C. & Leung, P. (eds.). (1987). A Profile of Economic Plants. Transaction Publishers, New Brunswick, NJ	"Sainfoin is an erect, perennial herb from 10-80 cm in height grown for forage. It can be used as dryland pasture or hay in regions receiving limited rainfall or irrigation. As forage and hay, sainfoin is palatable to livestock and does not cause bloating if fed green. It is considered a good feed supplement for pigs. Hay yields are high but delays in harvest reduce forage value."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2010. Flora of China. Vol. 10 (Fabaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"This species is a good fodder plant and is also important for water and soil conservation in loess plateau areas."

405	Toxic to animals	n
	Source(s)	Notes
	Roecklein, J.C. & Leung, P. (eds.). (1987). A Profile of Economic Plants. Transaction Publishers, New Brunswick, NJ	"As forage and hay, sainfoin is palatable to livestock and does not cause bloating if fed green. It is considered a good feed supplement for pigs."
	Hanelt, P. (ed.). 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops, Volume 2. Springer-Verlag, Berlin, Heidelberg, New York	[No evidence] "The species is a valuable green and dry forage plant, sown as pasture plant, as pure crop or in legume- or legume-grass mixtures, it is also a valuable honey plant."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	n
	Source(s)	Notes
	CABI. (2019). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Major host of: Adelphocoris lineolatus (lucerne bug); Cirsium arvense (creeping thistle); Pectobacterium carotovorum subsp. carotovorum (bacterial root rot of sweet potato); Philaenus spumarius (meadow froghopper); Phytophthora cryptogea (tomato foot rot); Pseudomonas marginalis pv. marginalis (lettuce marginal leaf blight); Sitona humeralis; Sminthurus viridis (lucerne flea) Minor host of: Acyrthosiphon pisum (pea aphid); Cochliobolus sativus (root and foot rot); Ditylenchus dipsaci (stem and bulb nematode); Gibberella avenacea (Fusarium blight); Hypera postica (lucerne weevil); Leveillula taurica (powdery mildew of cotton); Phytophthora medicaginis (Phytophthora root rot of lucerne); Pratylenchus penetrans (nematode, northern root lesion); Sitona discoideus; Sitona lineatus (pea leaf weevil); Xiphinema americanum (dagger nematode)"
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. Plant Genetic Resources, 9(1), 70-85	"O. viciifolia is relatively free from serious pest and disease problems compared with other legumes (Goplen et al., 1991)." ... "Root-feeding insects can make establishment of new stands difficult and reduce the longevity of established stands." ... "A number of insect species damage seed production in Europe."

407	Causes allergies or is otherwise toxic to humans	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Tilley, D., Ogle, D. & St. John, L. (2013). Plant Guide for wild bergamot (<i>Monarda fistulosa</i> L.). USDA, NRCS, National Plant Data Center. https://plants.usda.gov/plantguide/pdf/pg_onvi.pdf . [Accessed 23 Jan 2019]	[No evidence of increased fire risk. Relative to non-native grasses, probably unlikely to increase fire hazard in natural ecosystems] "Environmental Concerns - Sainfoin has been widely used in reclamation and range enhancement seedings throughout the Great Plains, Rocky Mountains and Intermountain West and has become naturalized in some locations. It is not considered weedy or invasive, but may spread under ideal conditions via seed."
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	No information on increased fire hazard or risk associated with cultivation of this species

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Plants for a Future. (2019). <i>Onobrychis viciifolia</i> . https://pfaf.org/user/Plant.aspx?LatinName=Onobrychis+viciifolia . [Accessed 19 Jan 2019]	"It cannot grow in the shade."
	L&H Seeds. (2019). <i>Onobrychis viciifolia</i> * (Sainfoin). http://www.lhseeds.com/onobrychis-viciifolia-sainfoin/ . [Accessed 20 Jan 2019]	"Shade Tolerance: Intolerant"
	Practical Plants. (2019). <i>Onobrychis viciifolia</i> - Sainfoin. https://practicalplants.org/wiki/Onobrychis_viciifolia . [Accessed 20 Jan 2019]	Sun - full sun Shade - no shade

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Bennett, S., Francis, C., & Reid, B. (2001). Minor and under-utilized legumes. In <i>Plant Genetic Resources of Legumes in the Mediterranean</i> (pp. 207-230). Springer, Dordrecht	"Adapted to range of soil types, even gravely, shallow, and rocky soils. However it prefers good drainage. pH range of 4.9 to 8.2."
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	" <i>O. viciifolia</i> grows in a wide range of climatic conditions in Europe, North America, Asia, Australia and New Zealand, in neutral and alkaline soils of pH 6 or above, in dryland and irrigated areas. In the UK, it has always been linked with calcareous chalky or limestone soil (Frame et al., 1998) and is intolerant of water logging (Sheldrick et al., 1987). Only a thin and patchy sward grew on clay soil at pH 6 with failures on alluvial sand at or below pH 5 in the Thames Valley (Bland, 1971)."

Qsn #	Question	Answer
411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2010. Flora of China. Vol. 10 (Fabaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Herbs, perennial, 0.5–1.2 m tall. Stems erect, caespitose. Stipules triangular-ovate, 7–9 mm, connate farther than middle. Leaves 10–18 cm, 13–19-foliolate; leaflet blades oblong-lanceolate to lanceolate, 2–3 × 0.4–1 cm, abaxially appressed pubescent, adaxially glabrous."

412	Forms dense thickets	n
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	" <i>O. viciifolia</i> is usually considered to be a non-aggressive crop with slow regrowth after cutting; therefore, weed competition needs to be minimized at establishment" [No evidence. Poor competitive ability]
	Bhattarai, S., Coulman, B., & Biliget, B. (2016). Sainfoin (<i>Onobrychis viciifolia</i> Scop.): renewed interest as a forage legume for western Canada. <i>Canadian Journal of Plant Science</i> , 96(5), 748-756	"The decline in stem number in the 3rd year in the 2nd cut intended for forage production was also due to poor persistence, stress susceptibility (exceedingly dry period at the end of the growing season of the 2nd year) and competitive ability of sainfoin (most pronounced in the densest stand)." [Dense stands produced in cultivation]
	WRA Specialist. (2019). Personal Communication	Dense or pure stands reported from cultivation. No evidence found of naturally occurring dense stands

501	Aquatic	n
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	[Terrestrial] " <i>O. viciifolia</i> is an erect or suberect plant, from 40 to 100 cm in height (Frame et al., 1998)."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 19 Jan 2019]	Family: Fabaceae (alt. Leguminosae) Subfamily: Faboideae Tribe: Hedysareae

Qsn #	Question	Answer
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	"Overall, nitrogen fixation rates of <i>O. viciifolia</i> have been measured to be within the range of other forage legumes (Liu, 2006). The rate of nitrogen fixation in <i>O. viciifolia</i> nodules has been described as 'sometimes insufficient', and nitrogen deficiency symptoms can be seen in inoculated plants (Burton and Curley, 1968; Sims et al., 1968)."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2010. <i>Flora of China</i> . Vol. 10 (Fabaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Herbaceous legume] "Herbs, perennial, 0.5–1.2 m tall. Stems erect, caespitose. Stipules triangular-ovate, 7–9 mm, connate farther than middle."

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	"A deep taproot with a few main branches and numerous fine lateral roots forms the root system." [No bulbs, corms or tubers, but may persist from taproot]

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Vörösváry, G., Uzundzhaliyeva, K., Maslovky, O., Vögel, R. & Holubec, V. 2011. <i>Onobrychis viciifolia</i> . The IUCN Red List of Threatened Species 2011: e.T176379A7229548. http://dx.doi.org/10.2305/IUCN.UK.2011-1.RLTS.T176379A7229548.en . [Accessed 20 Jan 2019]	"IUCN Red List Category and Criteria - Least Concern" ... "In its range it is common and frequent in dry sunny meadows. Population trend is stable."

602	Produces viable seed	y
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	" <i>O. viciifolia</i> is generally regarded as an outbreeding species, with a self-incompatibility system (Tasei, 1984). Negri et al. (1987) suggests that the system may not be strict, and that self-fertilization can occur; however, recent studies in Switzerland showed that selfing rates are very low (Beat Boller, pers. commun.)."
	Plants for a Future. (2019). <i>Onobrychis viciifolia</i> . https://pfaf.org/user/Plant.aspx?LatinName=Onobrychis+viciifolia . [Accessed 19 Jan 2019]	"Propagation Seed - pre-soak for 12 hours in warm water and sow in situ in the spring[1, 200]. Seed can also be sown in situ in the autumn. If seed is in short supply then it might be wiser to sow it in pots in a cold frame in early spring. Prick out the seedlings into individual pots as soon as they are large enough to handle and plant them out into their permanent positions in early summer. Division in the spring just before new growth commences[200]. Large divisions can be planted out direct into their permanent positions. We have found that it is better to pot up the smaller divisions and grow them on in light shade in a cold frame until they are well established before planting them out in late spring or early summer."

Qsn #	Question	Answer
603	Hybridizes naturally	
	Source(s)	Notes
	Li, Y. G., Tanner, G. J., Delves, A. C., & Larkin, P. J. (1993). Asymmetric somatic hybrid plants between <i>Medicago sativa</i> L.(alfalfa, lucerne) and <i>Onobrychis viciifolia</i> Scop. (sainfoin). <i>Theoretical and Applied Genetics</i> , 87(4), 455-463	[Artificial somatic hybrids created] "This paper reports on the production of intergeneric somatic hybrid plants between two sexually incompatible legume species. <i>Medicago sativa</i> (alfalfa, lucerne) leaf protoplasts were inactivated by lethal doses of iodoacetamide. <i>Onobrychis viciifolia</i> (sainfoin) suspension-cell protoplasts were gamma-irradiated at lethal doses. Following electrofusion under optimized conditions about 50,000 viable heterokaryons were produced in each test. The fusion products were cultured with the help of alfalfa nurse protoplasts. Functional complementation permitted only the heterokaryons to survive. A total of 706 putative heterokaryon-derived plantlets were regenerated and 570 survived transplantation to soil. Experimentation was aimed at the introduction of proanthocyanidins (condensed tannins) from sainfoin, a bloat-safe plant, to alfalfa, a bloat-causing forage crop; however, no tannin-positive regenerant plants were detected. Most regenerant plants have shown morphological differences from the fusion parents, although, as expected, all resembled the "recipient" parent, alfalfa. Southern analysis using an improved total-genomic probing technique has shown low levels of sainfoin-specific DNA in 43 out of 158 tested regenerants. Cytogenetic analysis of these asymmetric hybrids has confirmed the existence of euploid (2n=32; 17%) as well as aneuploid (2n=30, 33-78; 83%) plants. Pollen germination tests have indicated that the majority of the hybrids were fertile, while 35% had either reduced fertility or were completely sterile."
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	No evidence of natural hybrids reported in this review

604	Self-compatible or apomictic	
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	"Although it is possible to self-pollinate sainfoin plants under controlled conditions, resultant plants lack vigour and produce few if any viable seeds (Beat Boller, pers. commun.)." [Uncertain if natural self pollination can occur]

Qsn #	Question	Answer
605	Requires specialist pollinators	n
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	" <i>O. viciifolia</i> is an outbreeding insect-pollinated species. A range of insect species successfully pollinate flowers, but the most important are <i>Apis mellifera</i> (honey bee), <i>Bombus</i> sp. (bumble bees) and, to a lesser extent, <i>Osmia</i> (solitary). Although it is possible to self-pollinate sainfoin plants under controlled conditions, resultant plants lack vigour and produce few if any viable seeds (Beat Boller, pers. commun.). <i>Onobrychis</i> along with many other members of the Fabaceae is considered to be an obligate insect-pollinated species (Hanley et al., 2008)."
606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	BALKEP. (2019). Sainfoin - <i>Onobrychis viciifolia</i> . http://www.balkep.org/onobrychis-viciifolia.html . [Accessed 20 Jan 2019]	"habit: spreads with rhizomes"
607	Minimum generative time (years)	2
	Source(s)	Notes
	Tilley, D., Ogle, D. & St. John, L. (2013). Plant Guide for wild bergamot (<i>Monarda fistulosa</i> L.). USDA, NRCS, National Plant Data Center. https://plants.usda.gov/plantguide/pdf/pg_onvi.pdf . [Accessed 23 Jan 2019]	"Do not graze for two seasons after planting. Stands should be allowed to naturally reseed every 2 to 3 years for reestablishment." [Indicates that seed production does not begin until second year of growth]
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Heuzé V., Tran G., & Lebas F. (2015). Sainfoin (<i>Onobrychis viciifolia</i>). Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. https://www.feedipedia.org/node/703 . [Accessed 23 Jan 2019]	"Fruits are single seeded pods that bear spikes and can cling to the fur of animals and thus propagate the species." [Potential exists to be dispersed on clothing or footwear if cultivated in heavily trafficked areas]
702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Hanelt, P. (ed.). 2001. <i>Mansfeld's Encyclopedia of Agricultural and Horticultural Crops</i> , Volume 2. Springer-Verlag, Berlin, Heidelberg, New York	"Cultivated in various countries of Europe, in north-western USA and W Canada, even in Latin America (green manure), South Africa and Australia."

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Herbal, Ornamental, Pasture"
	WRA Specialist. (2019). Personal Communication	Cultivated with other pasture plants, so potential to become a crop seed contaminant exists

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Pufal, G., & Klein, A. M. (2013). Post-dispersal seed predation of three grassland species in a plant diversity experiment. <i>Journal of Plant Ecology</i> , 6(6), 468-479	" <i>Onobrychis viciifolia</i> (Fabaceae) is a legume growing to about 70 cm in height and flowers from May until July. Fruit ripening takes place from July until September and the primary dispersal strategies are either exozoochory (fruits are carried on the outside of an animal, clinging with spikes) or endozoochory (seeds are consumed by animals but pass the gut still viable). In our study we used seedpods, which are flattened and indehiscent and have a hard, spiny hull that protects a single kidney-shaped seed. Pods are 6.6 ± 1.6 mm long and 5.5 ± 2.5 mm wide."

705	Propagules water dispersed	n
	Source(s)	Notes
	Pufal, G., & Klein, A. M. (2013). Post-dispersal seed predation of three grassland species in a plant diversity experiment. <i>Journal of Plant Ecology</i> , 6(6), 468-479	" <i>Onobrychis viciifolia</i> (Fabaceae) is a legume growing to about 70 cm in height and flowers from May until July. Fruit ripening takes place from July until September and the primary dispersal strategies are either exozoochory (fruits are carried on the outside of an animal, clinging with spikes) or endozoochory (seeds are consumed by animals but pass the gut still viable). In our study we used seedpods, which are flattened and indehiscent and have a hard, spiny hull that protects a single kidney-shaped seed. Pods are 6.6 ± 1.6 mm long and 5.5 ± 2.5 mm wide."

Qsn #	Question	Answer
706	Propagules bird dispersed	n
	Source(s)	Notes
	Pufal, G., & Klein, A. M. (2013). Post-dispersal seed predation of three grassland species in a plant diversity experiment. <i>Journal of Plant Ecology</i> , 6(6), 468-479	" <i>Onobrychis viciifolia</i> (Fabaceae) is a legume growing to about 70 cm in height and flowers from May until July. Fruit ripening takes place from July until September and the primary dispersal strategies are either exozoochory (fruits are carried on the outside of an animal, clinging with spikes) or endozoochory (seeds are consumed by animals but pass the gut still viable). In our study we used seedpods, which are flattened and indehiscent and have a hard, spiny hull that protects a single kidney-shaped seed. Pods are 6.6 ± 1.6 mm long and 5.5 ± 2.5 mm wide."
	Tilley, D., Ogle, D. & St. John, L. (2013). Plant Guide for wild bergamot (<i>Monarda fistulosa</i> L.). USDA, NRCS, National Plant Data Center. https://plants.usda.gov/plantguide/pdf/pg_onvi.pdf . [Accessed 23 Jan 2019]	[Birds are identified as seed predators] "The foliage is readily eaten by elk, deer and sage grouse, and the seed is eaten by many other birds and rodents."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Heuzé V., Tran G., & Lebas F. (2015). Sainfoin (<i>Onobrychis viciifolia</i>). Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. https://www.feedipedia.org/node/703 . [Accessed 19 Jan 2019]	"Fruits are single seeded pods that bear spikes and can cling to the fur of animals and thus propagate the species."
	Pufal, G., & Klein, A. M. (2013). Post-dispersal seed predation of three grassland species in a plant diversity experiment. <i>Journal of Plant Ecology</i> , 6(6), 468-479	" <i>Onobrychis viciifolia</i> (Fabaceae) is a legume growing to about 70 cm in height and flowers from May until July. Fruit ripening takes place from July until September and the primary dispersal strategies are either exozoochory (fruits are carried on the outside of an animal, clinging with spikes) or endozoochory (seeds are consumed by animals but pass the gut still viable)."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Pufal, G., & Klein, A. M. (2013). Post-dispersal seed predation of three grassland species in a plant diversity experiment. <i>Journal of Plant Ecology</i> , 6(6), 468-479	" <i>Onobrychis viciifolia</i> (Fabaceae) is a legume growing to about 70 cm in height and flowers from May until July. Fruit ripening takes place from July until September and the primary dispersal strategies are either exozoochory (fruits are carried on the outside of an animal, clinging with spikes) or endozoochory (seeds are consumed by animals but pass the gut still viable)."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	"Seed yield per hectare is generally 500–900 kg of clean seeds, but yields of 1100 kg/ha have been obtained with some cultivars in Canada (Goplen et al., 1991)." [Possibly under densely cultivated conditions. Unknown in natural settings]

Qsn #	Question	Answer
	Tilley, D., Ogle, D. & St. John, L. (2013). Plant Guide for wild bergamot (<i>Monarda fistulosa</i> L.). USDA, NRCS, National Plant Data Center. https://plants.usda.gov/plantguide/pdf/pg_onvi.pdf . [Accessed 23 Jan 2019]	"The first seed crop can be harvested the second year after establishment. Seed yields can be as high as 1000 lb/acre under irrigated conditions. Under dryland conditions, seed yields are rarely more than 200 pounds per acre."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Reiné, R., Chocarro, C., & Fillat, F. (2006). Spatial patterns in seed bank and vegetation of semi-natural mountain meadows. <i>Plant Ecology</i> , 186(2), 151-160	"Appendix 1. Seed bank and plant species composition in the vegetation of four meadows: intensive irrigated (II), intensive cut (IC), extensive cut (EC) and extensive uncut (EU)." [Onobrychis viciifolia - Seed bank type = transient. This is in contrast to "short-term persistent" and "long-term persistent", suggesting the seeds do not form a persistent seed bank]
	Priestley, D. A., Cullinan, V. I., & Wolfe, J. (1985). Differences in seed longevity at the species level. <i>Plant, Cell & Environment</i> , 8(8), 557-562	"Table 2. Half-viability periods (P50) in years computed from seed deterioration data recorded at various storage stations. This table lists species for which deterioration data were available from only a single locality." [Onobrychis viciifolia - Observed P50 = 6.74; Estimated P50 = 6.43]
	Royal Botanic Gardens Kew. (2019) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/ . [Accessed 23 Jan 2019]	[Seeds able to be stored for long periods. Does not necessarily reflect persistence in soil seed bank] "Storage Behaviour: Orthodox Storage Conditions: 36% germination following 14 years hermetic storage (Harrington, 1972); seeds are safely stored in liquid nitrogen (Stanwood & Bass, 1981); p50= 6.43 years for seeds under open storage in a temperate climate (Priestley, 1986); long-term storage under IPGRI preferred conditions at RBG Kew, WP. Oldest collection 15 years; germination change 100 to 85%, 14 years, 1 collection"

803	Well controlled by herbicides	
	Source(s)	Notes
	Peel, M. D., Ransom, C. V., & Mott, I. W. (2013). Natural glyphosate tolerance in sainfoin (<i>Onobrychis viciifolia</i>). <i>Crop Science</i> , 53(5), 2275-2282	[Tolerant of glyphosate at certain application rates] "Sainfoin (<i>Onobrychis viciifolia</i> Scop.), a nonbloating forage legume, is purported to have tolerance to glyphosate [N-(phosphonomethyl) glycine]. The effect on biomass yield (BMY) and survival of eight rates of glyphosate on seedlings and mature plants were determined." ... "Based on the LD50 values, sainfoin seedlings are over six times more tolerant, and mature plants over 20 times more tolerant to glyphosate than alfalfa. Based on the GR50 values, glyphosate has a 10-fold greater negative impact on alfalfa BMY than it does on sainfoin; however, the GR15 values indicate a likely reduction in sainfoin BMY at glyphosate rates in the range of 841 g ae ha ⁻¹ ."
	WRA Specialist. (2019). Personal Communication	Somewhat tolerant of glyphosate. Efficacy of other herbicides unknown

804	Tolerates, or benefits from, mutilation, cultivation, or fire	

Qsn #	Question	Answer
	Source(s)	Notes
	Carbonero, C. H., Mueller-Harvey, I., Brown, T. A., & Smith, L. (2011). Sainfoin (<i>Onobrychis viciifolia</i>): a beneficial forage legume. <i>Plant Genetic Resources</i> , 9(1), 70-85	"Regrowth is slow, and it is important to allow enough time to replenish root reserves to maintain its persistence and longevity." [Will persist and regrow after cutting, but unlikely to tolerate repeated cutting and/or grazing]
	Tilley, D., Ogle, D. & St. John, L. (2013). Plant Guide for wild bergamot (<i>Monarda fistulosa</i> L.). USDA, NRCS, National Plant Data Center. https://plants.usda.gov/plantguide/pdf/pg_onvi.pdf . [Accessed 23 Jan 2019]	"Sainfoin is well suited to haying due to its upright growth habit. Regrowth is poor however and it is recommended to be cut once/season at the half- to full-bloom stage."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown. No information on cultivation in the Hawaiian Islands to date

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability
- Naturalized in regions with temperate and Mediterranean climates, but no evidence in Hawaiian Islands to date
- Reported to be a crop weed, but impacts generally unspecified
- Potentially allelopathic to certain plants
- Tolerates many soil types
- Reproduces by seeds and by rhizomes
- Self-compatible forms exist, but seed set is low
- Reaches maturity in second growing season
- Seeds dispersed by external attachment to animals and by internally by passing through animals, as well as intentionally cultivated by humans
- Seeds able to be stored for extended periods but seed bank reported to be transient (longevity unknown)
- Able to regrow slowly after cutting or browsing

Low Risk Traits

- Generally regarded as a desirable pasture plant, with relatively poor competitive ability, despite reports of weediness
- Unarmed (no spines, thorns, or burrs)
- Provides fodder for livestock
- Grows in full sunlight (may limit ability to spread under dense vegetation)
- Primarily self-incompatible, although self-fertile forms exist (with low seed set)

Second Screening Results for Herbs and Low Stature Shrubby Life Forms

(A) Reported as a weed of cultivated lands?> Yes, although impacts are generally unspecified

(B) Unpalatable to grazers or known to form dense stands?> No. Highly palatable, and dense stands only occur in cultivation.

Outcome = Accept (Low Risk)