

Taxon: <i>Vicia villosa</i> Roth	Family: Fabaceae
Common Name(s): fodder vetch hairy vetch Russian vetch sand vetch winter vetch wooly vetch woolypod vetch	Synonym(s): <i>Vicia bivonea</i> Raf.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 27 Apr 2022
WRA Score: 11.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Climbing Annual, Naturalized, Weedy, Fodder, Toxic Seeds

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)	Intermediate
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	y
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		
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	y
304	Environmental weed		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	y
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	y

Qsn #	Question	Answer Option	Answer
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
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	y
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	y
412	Forms dense thickets	y=1, n=0	y
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	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
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	n
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
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
	Kissing Kucek, L., et al. (2020). Pod dehiscence in hairy vetch (<i>Vicia villosa</i> Roth). <i>Frontiers in Plant Science</i> , 11 (82): 1-10	[No evidence] "Hairy vetch, <i>Vicia villosa</i> (Roth), is an outcrossing diploid legume (2n = 14; Chooi, 1971; Yeater et al., 2004). Commonly used as a green manure cover crop (SARE et al., 2015; CTIC et al., 2016; USDA-NASS, 2019), the species excels in winter hardiness (Brandsæter et al., 2002) and nitrogen supply to subsequent cash crops (Parr et al., 2000). With prevalent pod dehiscence (PD) and seed dormancy, hairy vetch does not exhibit a typical domestication syndrome (Meyer and Purugganan, 2013; Abbo et al., 2014)."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	NA

Qsn #	Question	Answer
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Intermediate
	Source(s)	Notes
	<p>USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 25 Apr 2022]</p>	<p>"Native Africa MACARONESIA: Spain [Canarias] NORTHERN AFRICA: Algeria, Egypt, Libya, Morocco, Tunisia Asia-Temperate WESTERN ASIA: Afghanistan, Cyprus, Iran, Iraq, Israel, Lebanon, Syria, Turkey CAUCASUS: Azerbaijan, Georgia, Russian Federation [Checheno-Ingushetia, Dagestan, Krasnodar, Stavropol] MIDDLE ASIA: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan Europe MIDDLE EUROPE: Czechoslovakia, Austria, Switzerland, Germany, Hungary, Poland EASTERN EUROPE: Belarus, Estonia, Lithuania, Latvia, Moldova, Russian Federation [Čuvaškaja Respublika, Kalmykija, Respublika, Mordovija, Respublika, Tatarstan, Belgorod, Bryansk, Kaliningrad, Kursk, Lipeckaja oblast', Orel, Rostov, Saratov, Smolensk, Tambov, Tula, Ulyanovsk, Volgogradskaja oblast', Voronezh, Yaroslavl], Ukraine (incl. Krym) SOUTHEASTERN EUROPE: Former Yugoslavia, Albania, Bulgaria, Greece (incl. Crete), Italy (incl. Sardinia, Sicily), Romania SOUTHWESTERN EUROPE: Spain (incl. Baleares), France (incl. Corsica), Portugal"</p>

202	Quality of climate match data	High
	Source(s)	Notes
	<p>USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 25 Apr 2022]</p>	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"Found naturally at altitudes from 0 to 3,000 m asl, and between about 30° and 50° N. It has been successfully grown elsewhere in areas with 24 hr average temperature as low as 8.4 °C (SD 1.3) (Bolivia, 18°48' S, 3,900 m asl) and up to 19.4 °C (SD 4.2) (Australia 29°40' S, 70 m asl). In warmer climates, it produces most of its growth in autumn, winter and spring. However, it is fairly dormant over winter in colder climates, but can survive freezing conditions for days."
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Hairy vetch is a hardy species, tolerating frost, drought and flooding (Lapina and Carlson, 2013). Although suited to wetter soils and colder winters, it can be susceptible to winter kill in colder climates without snow cover."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Preferred Climate/s: Mediterranean, Subtropical, Tropical"
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Naturalized in upper elevation, tropical island] "in Hawai'i cultivated in pastures, now at least sparingly naturalized in dry areas of Pohakuloa Training Area and probably surrounding pastures, Hawai'i. First naturalized collection made in 1987"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>V. villosa</i> , commonly known as hairy vetch, is now present on all continents. It is considered as native to southern and central Europe, North Africa, West and Central Asia but its native range is difficult to ascertain because of its wide naturalization after cultivation for fodder production and as a cover crop."

301	Naturalized beyond native range	y
	Source(s)	Notes
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"It is recorded as native to North Africa, southern and central Europe, West and Central Asia. Its native range is difficult to ascertain however, as it has been widely cultivated and naturalized and is now present on all continents (Ohwi, 1965; Romero Zarco, 1999; Wiersema and León, 2013; Tison et al., 2014; ILDIS, 2015; Royal Botanic Garden Edinburgh, 2015). It has been widely introduced to the USA in the 1700s and since its arrival it has become one of the most cultivated vetch species."

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 25 Apr 2022]	"widely natzd. elsewhere"
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Hawaii island] "Native to Eurasia, widely planted for fodder and green manure; in Hawai'i cultivated in pastures, now at least sparingly naturalized in dry areas of Pohakuloa Training Area and probably surrounding pastures, Hawai'i. First naturalized collection made in 1987 (Stemmermann 7164, BISH)."

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	Owsley, M. (2011). Plant fact sheet for Hairy Vetch (<i>Vicia villosa</i>). USDA-Natural Resources Conservation Service, USDA NRCS. Americus, GA	"This plant may become weedy or invasive in some regions or habitats and may displace desirable vegetation if not properly managed."
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	[May impact agriculture through allelopathy and poisoning of livestock] "It is primarily a weed of disturbed sites, which can include grain crops following a green manure crop of the legume. It is important to plough the green manure in before seed maturity to avoid this problem."
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potential environmental weed. Here classified as a weed of ambiguous impacts] "Impact on Habitats. <i>V. villosa</i> is able to maintain and extend a stand after establishment, usually in arable land, fallow fields or road sides (Owsley, 2011). It has the potential to affect ecosystem processes, altering the nitrogen content in the soil and also soil water availability. It can cause changes to habitat structure through forming dense herbaceous layers and outcompeting native species for space. In California, it has been evaluated as an invasive plant but its impacts in wildlands are considered minor; it is primarily an agricultural weed (Cal-IPC, 2015). Impact on Biodiversity. It is recognized as an environmental weed and can reduce the number of native species in natural plant communities through competition for space (Lapina and Carlson, 2013). Native bees may also find the flowers of <i>V. villosa</i> more attractive than native plants and so <i>V. villosa</i> may affect the pollination of native plant communities (Lapina and Carlson, 2013). <i>V. villosa</i> causes poisoning in mammals and can affect cattle, horses and poultry (Wiersema and León, 2013; CBIF, 2015). In mammals, symptoms include dermatitis, and mortality has been recorded in cattle and poultry. Occasionally, poisoning has occurred where <i>V. villosa</i> has been used as forage for livestock (CBIF, 2015). "

303	Agricultural/forestry/horticultural weed	y
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"It is primarily a weed of disturbed sites, which can include grain crops following a green manure crop of the legume. It is important to plough the green manure in before seed maturity to avoid this problem."

Qsn #	Question	Answer
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"V. villosa can cause poisoning in mammals, including cattle and horses, and poultry (Wiersema and León, 2013; CBIF, 2015). In mammals symptoms include dermatitis and mortality has been recorded in cattle and poultry (CBIF, 2015). In cattle, two types of syndromes have been suggested. The first syndrome, acute illness followed by death after ingesting raw seeds and the second syndrome, skin lesions, coughing and respiratory problems, and death after two weeks. In horses, symptoms include conjunctivitis and edema around the lips and eyes. Poisoning is most prevalent mid to late spring (CBIF, 2015). This plant can behave as an agricultural or environmental weed (Randall, 2007; HEAR, 2015; HYPPA, 2015)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Cereals, Grapevines, Orchards & Plantations, Pastures"

304	Environmental weed	
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i cultivated in pastures, now at least sparingly naturalized in dry areas of Pohakuloa Training Area and probably surrounding pastures, Hawai'i." [Not a serious environmental weed in Hawaii]
	Alaska Natural Heritage Program. (2011). hairy vetch <i>Vicia villosa</i> Roth. http://aknhp.uaa.alaska.edu . [Accessed 26 Apr 2022]	[May impact natural ecosystems in a number of ways] "Impact on community composition, structure, and interactions: Hairy vetch often overgrows surrounding herbaceous vegetation due to its climbing growth habit (Hultén 1968, Whitson et al. 2000). It has been reported to be both slightly toxic and highly palatable to grazing animals (USDA 2002). Flowers are visited by native bees, and their presence may alter the pollination ecology of the surrounding area (Aarssen et al. 1986). Impact on ecosystem processes: Hairy vetch alters soil conditions by fixing atmospheric nitrogen (USDA 2002)."
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Weed in Alaska] "It is recognized as an environmental weed and can reduce the number of native species in natural plant communities through competition for space (Lapina and Carlson, 2013). Native bees may also find the flowers of <i>V. villosa</i> more attractive than native plants and so <i>V. villosa</i> may affect the pollination of native plant communities (Lapina and Carlson, 2013)."

305	Congeneric weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Aarssen, L. W., Hall, I. V., & Jensen, K. I. N. (1986). The Biology of Canadian Weeds.: 76. <i>Vicia angustifolia</i> L., <i>V. cracca</i> L., <i>V. sativa</i> L., <i>V. tetrasperma</i> (L.) Schreb. and <i>V. villosa</i> Roth. Canadian Journal of Plant Science, 66(3), 711-737</p>	<p>"This paper provides a summary of biological data on five weedy species of vetch (<i>Vicia</i>). All species are naturalized in Canada and are found in a wide range of habitats with their main centers of distribution in Eastern Canada and the south and coastal regions of British Columbia. <i>Vicia cracca</i> is the most common and serious problem and occurs nationwide. <i>Vicia sativa</i> is the most variable of the species; numerous subspecies, varieties, forms and hybrids are described. Tendrils allow vetches to attach to crop plants and form mat-like infestations. Vetch species are sensitive to a number of herbicides but there appears to be differential tolerance among species to chlorthal dimethyl, 2,4-DB and others. <i>Vicia</i> spp. are host to several economically important pathogens and parasites." ... "The perennial <i>Vicia cracca</i> is the most common and serious problem among the five weedy species. It is persistent and difficult to control in perennial crops such as tree fruits, berry crops, ornamental and forestry plantings, and pastures, and it is common along roadsides, fencerows and waste places."</p>

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	<p>Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.</p>	<p>[No evidence] "Climbing annual, biennial, or rarely perennial herbs, glabrous to villous; stems up to 2 m long. Leaflets 8-24, oblong-elliptic to linear-lanceolate or linear, 8-35 mm long, 1-10 mm wide, glabrous or villous, apex acute to obtuse, mucronulate, base abruptly cuneate, stipules 8-12 mm long, ca. 2-3 mm wide, with a lateral lobe smaller than main body, entire. Flowers 15-30 in dense racemes; calyx usually bluish purple toward apex, conspicuously gibbous at base, villous, upper teeth subulate-deltate, 1.5-2 mm long, lateral teeth ca. 2.5-4 mm long, lowest tooth 3.5-5 mm long; corolla bright bluish purple, 12-20 mm long; style flattened, upper part surrounded by short hairs, abaxial surface with longer hairs forming a brush. Pods brown to yellowish brown, oblong, 20-40 mm long, (4-)6-12 mm wide, short-stipitate. Seeds 4-5, 3.5-5 mm in diameter, hilum extending 1/12- 1/5 of the circumference."</p>

402	Allelopathic	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Hill, E. C., Ngouajio, M., & Nair, M. G. (2007). Allelopathic potential of hairy vetch (<i>Vicia villosa</i>) and cowpea (<i>Vigna unguiculata</i>) methanol and ethyl acetate extracts on weeds and vegetables. <i>Weed Technology</i>, 21(2), 437-444</p>	<p>"Bioassay experiments were conducted to determine the phytotoxicity of methanol and ethyl acetate extracts of hairy vetch and cowpea residues on the germination and radicle elongation of three vegetable crops and three weed species. The species tested included common chickweed, redroot pigweed, wild carrot, tomato, corn, and cucumber. The extracts of both species were dissolved in methanol to yield seven concentrations ranging from 0 to 8 g/L. Germination was significantly reduced by methanol and ethyl acetate extracts of hairy vetch extracts except for corn and tomato. Common chickweed and wild carrot were the only species that showed consistent reduction in germination with the methanol and ethyl acetate cowpea extracts. The radicle growth of most species, with the exception of corn and cucumber, was reduced by the extracts of both cover crops. Corn and cucumber radicle elongation was stimulated at low concentrations of the extracts; however, these observations were not significantly different among treatments. This study demonstrated that methanol and ethyl acetate extracts of hairy vetch and cowpea contained allelopathic compounds and that their phytotoxicity is likely species specific. Future studies should focus on the identification and isolation of the allelochemical(s) found in the methanol and ethyl acetate extracts of the hairy vetch and cowpea residues."</p>
	<p>Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html. [Accessed 26 Apr 2022]</p>	<p>"Compatibility with other species may be somewhat compromised by its reputed allelopathic properties, which have the advantage of suppressing weeds, but may also suppress beneficial species."</p>
	<p>Geddes, C. M., Cavalieri, A., Daayf, F., & Gulden, R. H. (2015). The allelopathic potential of hairy vetch (<i>Vicia villosa</i> Roth.) mulch. <i>American Journal of Plant Sciences</i>, 6 (16), 2651-2663</p>	<p>"Hairy vetch (<i>Vicia villosa</i> Roth.) has been recognized as a good candidate for weed suppressive mulch in organic no-till cropping systems. In our study, the allelopathic potential of hairy vetch, fall rye (<i>Secale cereale</i> L.) and winter wheat (<i>Triticum aestivum</i> L.) (extracted species) were evaluated at both vegetative and reproductive developmental stages (extract stage) based on the germination and radicle elongation of five response species using aqueous extracts in soil microcosms. Our study found hairy vetch shoot extract to have little allelopathic potential compared to fall rye or winter wheat, both species for which the allelopathic potential is well documented. Interestingly, hairy vetch was the only extracted species to increase in allelopathic suppression of radicle elongation at the reproductive stage when plant biomass is near maximum. This result was conceivably due to the increased concentration of the putative allelochemical cyanamide in reproductive tissue. Chemical inhibition of radicle elongation in this extract, however, was only observed in the domesticated response species wheat (<i>Triticum aestivum</i> L.) and canola (<i>Brassica napus</i> L.). The allelopathic effect on germination varied and depended on extracted species, extract stage, and response species; whereas the effect on radicle elongation was similar among extracted species, yet unique within response species. This research demonstrated that allelopathy studies should include multiple allelopathic and response species to accurately quantify the magnitude of chemical effects among allelopathic species and to rule out potential phytotoxic chemical defense/detoxification mechanisms that exist in some response species."</p>

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Climbing annual, biennial, or rarely perennial herbs, glabrous to villous; stems up to 2 m long." [Fabaceae. No evidence]
404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Owsley, M. (2011). Plant fact sheet for Hairy Vetch (<i>Vicia villosa</i>). USDA-Natural Resources Conservation Service, USDA NRCS. Americus, GA	"Livestock: Hairy vetch produces high crude protein content and is utilized as forage for livestock."
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"Palatability/acceptability: It is generally considered unpalatable to cattle in the early stages of growth or on first exposure to the plant, but is often well-eaten by sheep at any stage. Cattle may take a few days to accept it."
Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"widely planted for fodder and green manure;"	
405	Toxic to animals	y
	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	"Hairy vetch causes systemic granulomatous inflammation. This plant causes poisoning in cattle, horses, and poultry. Various syndromes occur in cattle, including a dermatitis that resembles photosensitization in many respects, except that the skin lesions appear on pigmented skin as well. Mortality occurs in cattle and poultry."
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>V. villosa</i> causes poisoning in mammals and can affect cattle, horses and poultry (Wiersema and León, 2013; CBIF, 2015). In mammals, symptoms include dermatitis, and mortality has been recorded in cattle and poultry. Occasionally, poisoning has occurred where <i>V. villosa</i> has been used as forage for livestock (CBIF, 2015)."
Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	[Seeds are poisonous] "Vegetative material is generally considered safe for ruminant consumption, but there are many references to poisoning in cattle, pigs and poultry from eating seeds of <i>V. villosa</i> ssp. <i>varia</i> . Seed contains various toxic principles, including high quantities (>2.0 percent) of canavanine, which can reduce feed intake of pigs. Symptoms in cattle include ill-thrift, dermatitis and diarrhoea. Although mortality has been observed in cattle grazing green crops, it predominantly occurs during seed formation. Notwithstanding, the species is still widely valued as a fodder for ruminants. Incidence of bloat is rare."	

Qsn #	Question	Answer
	McKenzie, R. (2020). Australia's Poisonous Plants, Fungi and Cyanobacteria: A Guide to Species of Medical and Veterinary Importance. CSIRO Publishing, Clayton South, VIC	[Toxins attributed to <i>Vicia benghalensis</i> and <i>Vicia villosa</i> subsp. <i>dasycarpa</i>] "Toxin: An unidentified toxin that initiates chronic inflammation of a particular type (eosinophilic granulomatous inflammation). The poisoning is thought to be a hypersensitivity reaction to an antigen in or on the plants, which is widely distributed in the body and persists. This process is an allergic reaction, broadly speaking, in which the affected animal is sensitive to certain chemicals in the plant, and its body defence system (immune system) over-reacts to it."

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	" <i>Vicia villosa</i> ssp. <i>varia</i> is mostly tolerant of or resistant to arthropod pests and the various diseases afflicting other cool season legumes. The only pests to cause much harm are heliothis budworm (<i>Helicoverpa punctigera</i> Lepidoptera: Noctuidae), lucerne seed web moth (<i>Etiella behrii</i> Lepidoptera: Pyralidae) and cowpea aphid (<i>Aphis craccivora</i> Homoptera: Aphidae). Lucerne flea (<i>Sminthurus viridis</i> Collembola: Sminthuridae) can be a pest in young plants. Reports on susceptibility to bluegreen aphid (<i>Acyrtosiphon kondoi</i>) vary. It is resistant to spotted alfalfa aphid (<i>Therioaphis trifolii</i> f. <i>maculata</i>) and pea weevil (<i>Sitona lineatus</i> Coleoptera: Curculionidae) and tolerant of red-legged earth mite (<i>Halotydeus destructor</i> Acari: Tydaeidae). Root rots of seedlings caused by various soil borne fungi can cause poor emergence and reduced establishment of the crop, especially under cold and wet conditions. Some genotypes are resistant to a number of diseases that afflict other <i>Vicia</i> spp.: chocolate spot/botrytis (<i>Botrytis viciae</i>), rust (<i>Uromyces vicia-fabae</i>) and Ascochyta (<i>Ascochyta fabae</i>), although botrytis can still affect stands during very wet weather. It can be a host of <i>Sclerotinia minor</i> , which causes disease in subsequent alternative crops. Resistance to rootknot (<i>Meloidogyne</i> spp.) and cyst (<i>Heterodera</i> spp.) nematodes is present, but not universal in the species."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	[Possibly, although unlikely, unless humans consume seeds] "Vegetative material is generally considered safe for ruminant consumption, but there are many references to poisoning in cattle, pigs and poultry from eating seeds of <i>V. villosa</i> ssp. <i>varia</i> . Seed contains various toxic principles, including high quantities (>2.0 percent) of canavanine, which can reduce feed intake of pigs. Symptoms in cattle include ill-thrift, dermatitis and diarrhoea. Although mortality has been observed in cattle grazing green crops, it predominantly occurs during seed formation. Notwithstanding, the species is still widely valued as a fodder for ruminants. Incidence of bloat is rare."

408	Creates a fire hazard in natural ecosystems	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"Fire - Not applicable."
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	No evidence

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"Moderate shade tolerance."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"Adapted to well-drained sands to heavy clays with pH from (4.5–) 6.0 to 7.0 (–8.2). While tolerant of acid/low fertility with moderate levels of exchangeable soil aluminium, it is intolerant of high exchangeable aluminium levels, and performs best in near neutral soils of at least moderate fertility. It has some degree of salt tolerance. The species regenerates well except on bare, hard-setting soil surfaces."
	Owsley, M. (2011). Plant fact sheet for Hairy Vetch (<i>Vicia villosa</i>). USDA-Natural Resources Conservation Service, USDA NRCS. Americus, GA	"Hairy vetch is a hardy vetch suited to wetter soils and colder winters than other cool-season legumes. Hairy vetch develops best under cool temperatures, on fertile loam soils. It is also productive on sandy or clay soils. It grows well on light soils that are too sandy for crimson clover. It is only moderately sensitive to soil acidity."

411	Climbing or smothering growth habit	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Climbing annual, biennial, or rarely perennial herbs, glabrous to villous; stems up to 2 m long."

412	Forms dense thickets	y
	Source(s)	Notes
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"It can cause changes to habitat structure through forming dense herbaceous layers and outcompeting native species for space."

Qsn #	Question	Answer
	Ibañez, S. G., Travaglia, C. N., Medina, M. I., & Agostini, E. (2021). <i>Vicia villosa</i> Roth: a cover crop to phytoremediate arsenic polluted environments. <i>Environmental Science and Pollution Research</i> , 28(29), 38604-38612	" <i>Vicia villosa</i> (hairy vetch) is a legume species belonging to Fabaceae family, which use as a CC is becoming widespread. In particular, it is extensively used in semi-arid temperate environments, where it forms a very dense cover and presents multiple benefits: it facilitates the biological fixation of atmospheric nitrogen, favors weed control and improves carbon balance, better the structural condition of the soil, boosts its water-holding capacity, and prevents its erosion (Lardone et al. 2013; Renzi et al. 2014; Renzi et al. 2016)."

501	Aquatic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "in Hawai'i cultivated in pastures, now at least sparingly naturalized in dry areas of Pohakuloa Training Area and probably surrounding pastures, Hawai'i."

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). <i>Germplasm Resources Information Network (GRIN-Taxonomy)</i> . National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 25 Apr 2022]	Genus: <i>Vicia</i> Subgenus: <i>Vicilla</i> Section: <i>Cracca</i> Family: Fabaceae (alt. Leguminosae) Subfamily: Faboideae Tribe: Fabeae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	CABI. (2022). <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	[N-fixing, non-woody annual] " <i>V. villosa</i> is able to establish a legume-Rhizobium symbiotic relationship, which allows biological nitrogen fixation (Tikhonovich et al., 1995; Owsley, 2011; Undersander et al., 2015)."

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Cook, B.G., et al. (2022). <i>Tropical Forages: an interactive selection tool</i> – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"Shallow taproot system with strong lateral branches."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes

Qsn #	Question	Answer
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[No evidence] "It is recorded as native to North Africa, southern and central Europe, West and Central Asia. Its native range is difficult to ascertain however, as it has been widely cultivated and naturalized and is now present on all continents (Ohwi, 1965; Romero Zarco, 1999; Wiersema and León, 2013; Tison et al., 2014; ILDIS, 2015; Royal Botanic Garden Edinburgh, 2015). It has been widely introduced to the USA in the 1700s and since its arrival it has become one of the most cultivated vetch species."

602	Produces viable seed	Y
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"Most varieties have high levels of hard seed, making some type of scarification necessary in hand-harvested seed. Seed should be inoculated with pea/vetch inoculum such as Rhizobium leguminosarum strain SU303 used in Australia. Recommended sowing rates vary significantly, from (6–) 10–15 (–30) kg/ha when sown alone, and 4–8 kg/ha in mixtures. Heavier sowing rates are suggested for broadcast [(15–) 30–60 kg/ha] over drilling (10–30 kg/ha). Seed is sown at 1–3 cm depth, with shallower sowings in clay soils and deeper sowings in sandy soils. Broadcast sowings should be harrowed or lightly disked after planting. Seedlings are initially slow to develop."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Pods brown to yellowish brown, oblong, 20-40 mm long, (4-)6-12 mm wide, short-stipitate. Seeds 4-5, 3.5-5 mm in diameter, hilum extending 1/12- 1/5 of the circumference."
	Owsley, M. (2011). Plant fact sheet for Hairy Vetch (<i>Vicia villosa</i>). USDA-Natural Resources Conservation Service, USDA NRCS. Americus, GA	"When grown as a seed crop, hairy vetch is harvested when the lower pods are ripe to avoid shattering. If carefully managed, hairy vetch may be grown with bermudagrass. Hairy vetch volunteers profusely when allowed to disseminate seed."

603	Hybridizes naturally	
	Source(s)	Notes
	Burroughs, GW, Nesor, JA, Kellerman, TS & Van Niekerk, F. A. (1983). Suspected hybrid vetch (<i>Vicia villosa</i> crossed with <i>Vicia dasycarpa</i>) poisoning of cattle in the Republic of South Africa. <i>Journal of the South African Veterinary Association</i> , 54(2), 75-79	"This particular variety of hybrid vetch was certified by a seed merchant as being <i>V. villosa</i> crossed with <i>V. dasycarpa</i> . The cattle developed dermatitis and diarrhoea (often with fatal results) after devouring large quantities of vetch." [Possibly. No other evidence of hybridization found]

604	Self-compatible or apomictic	
	Source(s)	Notes

Qsn #	Question	Answer
	Hassen, H., Zoghلامي-Khelil, A., Ben Youssef, S. Y., Chtewi, K., & El-Bok, S. (2012). Analysis of floral Biology of <i>Vicia villosa</i> Roth.(Fabaceae). International Journal of Agricultural Sciences, 2(3), iii+121-127	"An analysis of the of sexual reproduction ability of <i>Vicia villosa</i> Roth. have been investigated. The biological material consisted of a tunisian cultivar (Sejenane) and two accessions originating from ICARDA (International Center of Agricultural Research in Dry Areas): acc. 2565 and acc. 3615. Pod formation rate (P/F), number of seeds per pod (SPP), and the number of empty pods per plant (NEP) were higher under free pollination than in self-fertilization without release, suggesting that this species is characterized by a preferential allogamy. That Allogamy seems to be ensured by a sporophytic autoincompatibility. The gap between the number of seeds per pod (2.6 seeds on average) and the number of ovaries per gynaecium (4 ovaries on average) may reflect a fertilization malfunctioning in <i>Vicia villosa</i> Roth. The sporophytic auto-incompatibility, associated to both low pollinic germination rate (24 %) and flowers losses caused by gathering bumblebees (<i>Bombus terrestris</i> L.) constitute the main factors explaining the low fertility of this forage species."
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	"Flowers are usually cross-pollinated by bumble bees, and although some self-pollination may occur, cross-pollination greatly increases seed production."
	Zhang, X., & Mosjidis, J. A. (1995). Breeding systems of several <i>Vicia</i> species. Crop Science, 35(4): 1200-1202	" <i>Vicia villosa</i> ssp. <i>villosa</i> accessions did not set any fruits inside cages, whereas PFS for control flowers was 19% (Table 2); hence, this subspecies was deemed cross-fertilizing. These results are consistent with previous reports that <i>V. villosa</i> requires bees for pollination (Mlyniec, 1962). Failure of manually crossed flowers of this subspecies to set fruits may be due to the need in some papilionoid species (and even some genotypes within a species) to have the thick center zone of the stigmatic cuticle disrupted by mechanical means to allow pollen germination (Lord and Heslop-Harrison, 1984). The PFS of crossed flowers in <i>V. villosa</i> ssp. <i>varia</i> was higher than for tripped and isolated (Table 1). turn, tripped flowers had higher PFS than isolated. The PFS for control flowers was significantly ($P < 0.05$) higher than for isolated ones ($P > 0.05$) (Table Therefore, <i>V. villosa</i> ssp. <i>varia</i> was a cross-fertilizing species."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Hassen, H., Zoghلامي-Khelil, A., Ben Youssef, S. Y., Chtewi, K., & El-Bok, S. (2012). Analysis of floral Biology of <i>Vicia villosa</i> Roth.(Fabaceae). International Journal of Agricultural Sciences, 2(3), iii+121-127	"For <i>V. villosa</i> , as for other pasture legumes such as, <i>Lathyrus</i> spp., <i>Medicago</i> spp., <i>Astragalus</i> spp., <i>Trifolium</i> spp., natural pollination is entomophilous. It is mainly ensured by bees and bumblebees (Valero et al., 1985). In a trial studying the efficiency of insect pollination of alfalfa in Tunisia, Hassen and Seklani (1990) showed that the installation of an apiary constituted by 10 colonies of bees per hectare, at flowering stage, had increased alfalfa seed yield from 180 kg ha ⁻¹ (close to national average yield) to 600 kg ha ⁻¹ ."
	Owsley, M. (2011). Plant fact sheet for Hairy Vetch (<i>Vicia villosa</i>). USDA-Natural Resources Conservation Service, USDA NRCS. Americus, GA	"Pollinator: Hairy vetch is utilized during pollination by bumble bees."

606	Reproduction by vegetative fragmentation	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	"Seeds are large and not readily dispersed, other than ballistically as seedpods dry and dehisce." [No evidence of vegetative spread]

607	Minimum generative time (years)	1
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Climbing annual, biennial, or rarely perennial herbs, glabrous to villous; stems up to 2 m long."
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	"In temperate areas, plants flower from late spring to mid-summer, commencing and finishing earlier in the subtropics, with some variation among cultivars. Flowering behaviour in the high altitude tropics appears to be somewhat controlled by wet season onset."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Cattle, Livestock, Sheep, Escapee"
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	"Seeds are large and not readily dispersed, other than ballistically as seedpods dry and dehisce."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>V. villosa</i> is an important fodder crop and has been and still is deliberately introduced for fodder production to countries outside of its native range. It can spread from its site of cultivation to nearby sites (Owsley, 2011; Wiersema and León, 2013) and is a potential contaminant of crop seeds (USDA-ARS, 2015)."

703	Propagules likely to disperse as a produce contaminant	y
	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"
	Norsworthy, J. K., Smith, K. L., Steckel, L. E., & Koger, C. H. (2009). Weed seed contamination of cotton gin trash. <i>Weed Technology</i> , 23(4), 574-580	"Table 1. Weed species emerging from gin trash collected in Arkansas, Mississippi, and Tennessee in 2007 (n = 473)." [Vida villosa Roth - Samples with viable seeds = 2 (0.4); Viable seeds = 16]
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>V. villosa</i> is a potential contaminant of crop seeds (USDA-ARS, 2015)."

Qsn #	Question	Answer
704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	"Seeds are large and not readily dispersed, other than ballistically as seedpods dry and dehisce."

705	Propagules water dispersed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Cattle, Livestock, Sheep, Escapee"
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	"Seeds are large and not readily dispersed, other than ballistically as seedpods dry and dehisce."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Renzi, J. P., Chantre, G. R., & Cantamutto, M. A. (2017). Self-regeneration of hairy vetch (<i>Vicia villosa</i> Roth) as affected by seedling density and soil tillage method in a semi-arid agroecosystem. <i>Grass and Forage Science</i> , 72(3), 524-533	"In this study, we were not able to identify vetch seeds in the faeces of pigeons. Thus, at least for feral pigeons, endozoochory does not seem to be a dispersal mechanism. Similarly, Armke and Scott (1999) indicated that hairy vetch seeds were unable to pass through the ruminant digestive systems and germinate."
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	"Seeds are large and not readily dispersed, other than ballistically as seedpods dry and dehisce."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Pods brown to yellowish brown, oblong, 20-40 mm long, (4-)6-12 mm wide, short-stipitate. Seeds 4-5, 3.5-5 mm in diameter, hilum extending 1/12- 1/5 of the circumference." [No means of external attachment]
	Cook, B.G., et al. (2022). Tropical Forages: an interactive selection tool – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	"Seeds are large and not readily dispersed, other than ballistically as seedpods dry and dehisce."

708	Propagules survive passage through the gut	
	Source(s)	Notes

Qsn #	Question	Answer
	Armke, F. W., & Scott, C. B. (1999). Using cattle to disperse seeds for winter forage plants. <i>Texas Journal of Agriculture and Natural Resources</i> , 12, 26-36	"Engelmann daisy, western wheatgrass, and hairy vetch are not viable choices for fecal seeding. Engelmann daisy and western wheatgrass did not survive the digestive system of cattle: both had significant weight losses during in situ digestion. and hairy vetch had significant weight losses during in vitro digestion. The lack of germination of hairy vetch seeds recovered from feces in the laboratory may have resulted from damage during the collection and washing of seeds. When placed in petri dishes, hairy vetch seeds recovered from feces swelled and ruptured. By the end of the 21 days of the experiment. all fecal-collected hairy vetch seeds had molded and decayed. This supports the observation by Simao, Neto, and Jones (1987) that legume seeds disintegrate more readily than grass seeds when damaged. In addition. only 1 hairy vetch seedling emerged from dung while 9 seedlings emerged from the broadcast seedings."
	Chuong, J., Huxley, J., Spotswood, E. N., Nichols, L., Mariotte, P., & Suding, K. N. (2016). Cattle as dispersal vectors of invasive and introduced plants in a California annual grassland. <i>Rangeland Ecology & Management</i> , 69 (1), 52-58	[Seedlings may rarely emerge from cattle dung, but other studies indicate seeds may be damaged after ingestion] "Table 1. Comparison of seedlings per dung patty with seeds per cattle. Epizoochory data are average values calculated across two time periods collected in June and July of 2014. Endozoochory values are average seed numbers per species from 45 dung patties collected in October 2013. Both dung and live cattle data were taken from adjacent pastures with similar species composition" [<i>Vicia villosa</i> - Endozoochory - Mean seedlings per dung sample (\pm SE) = 0.5 ± 0.1 ; % of total seedlings = 1.8]

801	Prolific seed production (>1000/m2)	y
	Source(s)	Notes
	Renzi, J. P., Chantre, G. R., & Cantamutto, M. A. (2017). Self-regeneration of hairy vetch (<i>Vicia villosa</i> Roth) as affected by seedling density and soil tillage method in a semi-arid agroecosystem. <i>Grass and Forage Science</i> , 72(3), 524-533	"Seedbank determinations on the soil surface, before tillage treatment, showed an average of 1109 ± 305 seeds m ⁻² . Seed counts were not influenced by vetch density (Figure 1b)."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	CABI. (2022). <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	[>1 year to several years] "Information on the persistence of <i>V. villosa</i> seeds in the seed-bank is not consistent; according to Myers (2015) they can remain in the soil seed bank for several years, whereas a study by McKee and Musil (1984; cited by Lapina and Carlson, 2013) affirm that the seeds are viable for less than two years."

Qsn #	Question	Answer
	Renzi, J. P., Chantre, G. R., & Cantamutto, M. A. (2014). Development of a thermal-time model for combinational dormancy release of hairy vetch (<i>Vicia villosa</i> ssp. <i>villosa</i>). <i>Crop and Pasture Science</i> , 65(5), 470-478	[2+ years] "During the field burial experiment in this study, a considerable proportion of seeds exposed to the after-ripening treatment during the summer of 2010 became water-permeable; therefore, most of the seed-bank would be able to germinate during the next autumn if soil moisture was not a restrictive factor for germination. The average soil temperature in summer at this location was ~25°C, and the proportion of non-PY seeds by midautumn averaged 75% of the population, with an estimated upper limit temperature for germination of 16.5–28°C and an average season temperature of 13.48°C. Therefore, under such conditions, it would be expected that <i>V. villosa</i> seeds would remain viable for no more than a couple of years. However, according to Warwick (2011) and Crockett et al. (2012), seedbank persistence of <i>V. villosa</i> seems to be >2 years, with a fast release of dormancy within the first 6 months. According to our results, we might infer a type III persistent seed-bank for <i>V. villosa</i> ssp. <i>villosa</i> (sensu Baskin and Baskin 1998). In the type III seedbank, many seeds germinate soon after dispersal, but a small reserve of viable seed remains ungerminated. However, this behaviour might only be confirmed on seeds exhumed from the field during a more extended burial period (after 230 days of burial); thus, this remains a hypothesis to be tested in future work."

803	Well controlled by herbicides	y
	Source(s)	Notes
	CABI. (2022). <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	"Clopyralid and other selective herbicides can be used to control <i>V. villosa</i> (Minnesota Department of Natural Resources, 2015)."
	Cook, B.G., et al. (2022). <i>Tropical Forages: an interactive selection tool</i> – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 27 Apr 2022]	" <i>V. villosa</i> is susceptible to cloransulam-methyl, flumetsulam, diclosulam, S-metolachlor, and 2,4-D amine, but fairly tolerant of other pre-plant incorporated or pre-emergence herbicides including benefin, diclofop-methyl, imazamox, imazaquin, imazethapyr, pendimethalin, S-ethyl dipropylthiocarbamate, and trifluralin. Susceptible to post-emergence chemicals, glyphosate, paraquat and diquat, as well as to most broad-leaf herbicides used in cereal crops."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Cook, B.G., et al. (2022). <i>Tropical Forages: an interactive selection tool</i> – Digital ISBN 978958694234-8. https://www.tropicalforages.info/text/intro/index.html . [Accessed 26 Apr 2022]	"It is very tolerant of mowing, providing it is cut no lower than 12–15 cm, and not within two months of seed set."
	Owsley, M. (2011). Plant fact sheet for Hairy Vetch (<i>Vicia villosa</i>). USDA-Natural Resources Conservation Service, USDA NRCS. Americus, GA	[May be mechanically controlled with several treatments] "The primary environmental concern with hairy vetch is the ability of this naturalized plant to spread and maintain a stand after establishment. This is usually in crop areas, idle fields, and along roadways. If the stand is no longer desirable, a combination of mowing, and herbicides should eliminate the stand after several treatments. The number of treatments depends on the stand history."

Qsn #	Question	Answer
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Unknown] "in Hawai'i cultivated in pastures, now at least sparingly naturalized in dry areas of Pohakuloa Training Area and probably surrounding pastures, Hawai'i. First naturalized collection made in 1987"

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability (but predominantly grows in temperate climates)
- Naturalized on Hawaii (Hawaiian Islands) and widely naturalized elsewhere
- A disturbance weed that may impact agriculture and the natural environment
- Other *Vicia* species are invasive
- Allelopathic
- Seeds reported to poison grazing animals (although foliage is palatable)
- Moderate shade tolerance
- Tolerates many soil types
- Smothering habit
- May also form dense cover that outcompete and potentially exclude other species
- Reproduces by prolific seed production
- Annual reproductive cycle (reaches maturity in <1 year)
- Seeds dispersed ballistically as seedpods dry and dehisce, as well as a seed contaminant and through intentional cultivation
- Seeds may persist in the soil for 2+ years
- Tolerates mowing and grazing (i.e., mechanical control methods may be ineffective)

Low Risk Traits

- As a predominantly temperate species, may only be a risk at cooler, higher elevations on tropical islands
- Not currently regarded as a detrimental weed in the Hawaiian Islands
- Unarmed (no spines, thorns, or burrs)
- Palatable forage plant (despite seed toxicity)
- Predominantly outcrossing (self-fertilization results in reduced seed set)
- Not reported to spread vegetatively
- Seeds are large and not readily dispersed
- Herbicides may provide effective control