Vicia villosa subsp. *varia*

Scientific name

Vicia villosa Roth subsp. *varia* (Host) Corb.

Note: The other three subspecies of *Vicia villosa* Roth, subsp. *eriocarpa* (Hausskn.) P.W. Ball, subsp. *pseudocracca* (Bertol.) Rouy and ssp. *villosa*, have not been used commercially to any extent in warmer climates, and are therefore excluded from this fact sheet.

Synonyms

Basionym: *Vicia varia* Host; *Vicia dasycarpa* Ten.; *Vicia villosa* subsp. *dasycarpa* (Ten.) Cavill.; *Vicia glabrescens* (W.D.J. Koch) Heimerl; *Vicia villosa* var. *glabrescens* W.D.J. Koch; *Vicia villosa* var. *villosa* Roth

Family/tribe

Family: *Fabaceae* (alt. *Leguminosae*) subfamily: *Faboideae* tribe: *Fabeae*.

Morphological description

Herbaceous, self-regenerating, cool season annual (rarely biennial), prostrate when young, 30–70 cm deep in mature sward, scrambling and climbing to 1.2 m on vegetation scaffold. Shallow taproot system with strong lateral branches. Stems finely ridged, glabrescent to pubescent, to 2 m long. Leaves pinnate, with branched terminal tendril. Leaflets hairy, usually 12–16 (–20), alternate to nearly opposite, narrowly oblong, obtuse and mucronate, 10–25 mm long, (2–) 4–6 (–8) mm wide, petiolule 1–2 mm long; stipules 1 cm long, 2 mm broad, often with a small lateral lobe, ciliate margined, appressed pubescent. Raceme to about 10 cm long on peduncle 6 cm long, axillary, dense, (5–) 10–25 (–30)-flowered, secund, pubescent in the bud. Flowers (10–) 12–15 (–18) mm long; calyx irregular, the tube 2.0–4.0 mm long, gibbous at the base on the upper side, the pedicel inserted ventrally, the lower teeth linear-acicular, about 2 mm long; corolla purplish pink (rarely white), standard and wings light to dark purple (sometimes pink or white), keel pale pink to white with a dark purple spot at the tip. Pod oblong-rhomboidal, 20–30 mm long, 7–10 mm broad, beaked, covered with fine appressed hairs; fawn coloured and mostly dehiscent when mature (indehiscent types being selected); (2–) 3–5 (–8) seeds. Seeds globular to compressed globular, 3–5 mm in diameter, blackish brown with obscure mottling; hilum 1–2 mm long, not prominent. 18,000–28,000 seeds per kg.

Mature stand 30-70 cm deep, scrambling and climbing to 1.2 m on vegetation scaffold

Inflorescence a densely flowered raceme (cv. Namoi)

Inflorescence and pinnate leaves showing branched terminal tendril

Senescing flowers and immature pods of cv. Namoi

Seeds globular, 3-5 mm in diameter

Seeds 3 - 5 mm diameter

Sward

Climbing through Napier grass (*Cenchrus purpureus*)

subsp. *varia*: plants glabrate to pubescent with subappressed to spreading hairs shorter than 1 mm; upper lobe of calyx lanceolate to narrow-lanceolate, 1–2 –2.4) mm long; all calyx teeth shorter than calyx tube; raceme usually shorter than or equalling leaf length, commonly with 10–20 loosely arranged flowers.

subsp. *villosa*: plants conspicuously villous with hairs 1–2 mm long; upper lobe of calyx acicular, 2–4 mm long; lower calyx teeth equalling or longer than calyx tube; raceme length similar to or slightly longer than leaf length, commonly with more than 20 crowded flowers.

Common names

Asia: □□□□ ou zhou tiao zi, □□□□□□ chang rou mao ye wan dou ≡ *V. villosa* (China)

English: fodder vetch, smooth vetch, thick fruited vetch, winter vetch, woolly-pod vetch

Eurasia: gorošek šerstistoplodnyj (Armenia); šarena grahorica, ogoljena grahorica, grahor čupavi (Croatia); glat vikke (Denmark); vesce bigarrée, vesce variée (France); ervilhaca, ervilhaca-peluda, ervilhaca-vilosa, vica (Portugal); goroshek izmenchivyi, goroshek sherstistoplodnyi (Russia); arvejilla, garlanda (Spain); kvarnvicker (Sweden)

Note: The numerous other common names used around the world that may refer to *Vicia villosa* Roth or one or more of the 4 subspecies, not necessarily subsp. *varia* (Host) Corb., have not been included in this publication.

Distribution

Native:

Africa: Algeria; Canary Islands; Egypt; Libya; Morocco; Tunisia

Asia: Armenia; Azerbaijan; Cyprus; Georgia; Israel; Jordan; Lebanon; Russian Federation (Checheno-Ingushetia, Dagestan, Kabardino-Balkaria, Karachay-Cherkessia, Krasnodar, North Ossetia, Stavropol); Syria; Turkey

Europe: Albania; Austria; Bulgaria; Czech Republic; France (incl. Corsica); Germany; Greece (incl. Crete); Hungary; Italy (incl. Sardinia, Sicily); Lithuania; Portugal; Romania; Spain (incl. Baleares); Switzerland; Ukraine (incl. Krym)

Cultivated/naturalized: elsewhere

Uses/applications

Forage

Used as a grazing or conserved fodder (hay/silage) crop.

Environment

It has found a role as a green manure, or ground cover in vines and orchards, and in intercropping systems with oats (*Avena sativa*) and maize (*Zea mays*). It reputedly has allelopathic properties that help suppress weeds.

Other

Not suitable for grain due to low seed yields and seed toxicity. *V. villosa* ssp. *varia* can stimulate germination of the hemi-parasitic *Orobanche* (broomrape, a relative of *Striga*), without itself being parasitised. This characteristic can be put to good effect in reducing populations of the parasite in cropping areas.

Ecology

Soil requirements

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.

Moisture

Grown in areas with average annual rainfall (350–) 500–700 (–1,000) mm, often where clovers and medics do not do well. Has moderate drought tolerance, and does not tolerate waterlogging.

Temperature

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.

Light

Moderate shade tolerance.

Reproductive development

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. Flowers are usually cross-pollinated by bumble bees, and although some self-pollination may occur, cross-pollination greatly increases seed production.

Defoliation

The stand should not be cut or grazed before commencement of branching, since early defoliation can kill young plants. The general recommendation is to graze from about the 10–15 node stage through to flowering. Grazing later than this can cause poisoning problems, even death of the grazing animal. If the legume is to be used as a self regenerating annual, it must be managed to facilitate seed set.

This means avoiding or reducing grazing from flowering onwards, particularly in the first year, in order to build up a soil seed reserve. It is very tolerant of mowing, providing it is cut no lower than 12–15 cm, and not within two months of seed set. It is best cut in full bloom for hay production. Leaves and stems dry rapidly and swaths can usually be gathered within a day or two if weather is suitable. In vetch-oats systems in the tropical highlands, cutting twice or even 3 times in a season is better than a single harvest to maximize productivity.

Fire

Not applicable.

Agronomy

Guidelines for establishment and management of sown forages.

Establishment

In cooler climates, *V. villosa* ssp. *varia* is best sown in autumn so young plants are well established before the onset of extreme cold. In warmer environments, it should be sown once the heat of the warm season declines, perhaps late autumn-early winter. In intermediate environments, it can be sown year round providing moisture is available. In very high altitude tropics (>2,000 m), where temperatures are suitable year round for growth of this species, it is best to sow immediately prior to the beginning of the wet season. 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.

Fertilizer

Annual applications of 1–15 kg/ha of phosphorus help maintain soil P levels in more fertile soils, but rates up to 50 kg may be needed on calcareous or ironstone soils, or other soils with inherently low available P levels. Deficiency of sulphur and trace elements can be indicated by foliar symptoms or soil tests if available.

Compatibility (with other species)

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.

Companion species

Grasses*: Avena sativa, Digitaria eriantha, Lolium multiflorum, Panicum coloratum, Phalaris aquatica, Setaria incrassata, Zea mays*

Legumes: other *Vicia* spp., *Medicago* spp.

Pests and diseases

Vicia villosa ssp. *varia* 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 (*Helicoverpa punctigera* Lepidoptera: Noctuidae), lucerne seed web moth (*Etiella behrii* Lepidoptera: Pyralidae) and cowpea aphid (*Aphis craccivora* Homoptera: Aphidae). Lucerne flea (*Sminthurus viridis* Collembola: Sminthuridae) can be a pest in young plants. Reports on susceptibility to bluegreen aphid (*Acyrthosiphon kondoi*) vary. It is resistant to spotted alfalfa aphid (*Therioaphis trifolii* f. *maculata*) and pea weevil (*Sitona lineatus* Coleoptera: Curculionidae) and tolerant of red-legged earth mite (*Halotydeus destructor* 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 *Vicia* spp.: chocolate spot/botrytis (*Botrytis viciae*), rust (*Uromyces vicia-fabae*) and Ascochyta (*Ascochyta fabae*), although botrytis can still affect stands during very wet weather. It can be a host of *Sclerotinia minor*, which causes disease in subsequent alternative crops. Resistance to rootknot (*Meloidogyne* spp.) and cyst (*Heterodera* spp.) nematodes is present, but not universal in the species.

Ability to spread

Seeds are large and not readily dispersed, other than ballistically as seedpods dry and dehisce.

Weed potential

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.

Feeding value

Nutritive value

Crude protein levels of the tops range from about 20 to 30%. IVDMD at pre-flowering has been measured at 82%, NDF at 32%, ADF at 27%.

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.

Toxicity

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 *V. villosa* ssp. *varia*. 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.

Feedipedia link

https://www.feedipedia.org/node/238

Production potential

Dry matter

V. villosa ssp. *varia* has higher dry matter production than *V. sativa*. DM yields of >3 t/ ha have been achieved at 18 weeks and >6 t/ha at 24 weeks, and annual yields of up to 12 t/ha. Annual yields of oats-vetch mixture of 11–17 t DM/ha with crude protein levels of 14–16% have been achieved in the Ethiopian Highlands.

Animal production

Improvements in milk and meat production have been measured comparing vetch-oats systems with traditional feeding systems. However, it is difficult to ascribe the benefit to individual components of the more productive system.

Genetics/breeding

2*n* = 14, 28. *V. villosa* ssp. *varia* is an out-crossing but self-fertile species. Therefore, regeneration of particular genotypes requires the use of procedures that provide isolation from foreign pollen.

Seed production

V. villosa ssp. *varia* has lower grain yield than *Vicia sativa*. Pre-emergent chemicals are available for control of grasses and some broadleaf weeds in seed crops, but there is no satisfactory chemical for post-emergent broadleaf control. Crops can be grazed lightly during autumn and winter, but stock must be removed as soon as flowers appear. Seed crops can be harvested by hand or using conventional open-front headers with crop-lifters, but seed is likely to shatter if harvesting is delayed. The seed is harvested as soon as the plants, pods and seeds are dry enough to thresh. Hand-harvesting is best carried out in the morning before pods dry in the heat of the day. A live trellis such as *Avena sativa* sown at 10–15 kg seed/ha can facilitate harvest by lifting the otherwise prostrate crop. Seed yields of over 1 t/ha have been recorded, but commercial seed crops yield are mostly of the order of (150–) 300–600 kg/ha seed. Insect damage, asynchronous ripening, pod-shatter and difficulties in harvesting tend to reduce yields. Hard seed content in most cultivars is often >80%.

Herbicide effects

V. villosa 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.

Strengths

- Adapted to acid, low fertility soils.
- High nutritive value.
- Good pioneer species.
- Long growing season.
- Low bloat risk in cattle.
- Good for soil improvement.
- Ease of establishment.

Limitations

- Poor palatability, especially when young.
- Slow winter growth.
- Susceptible to heavy grazing pressure at establishment and in the spring.

- Potential weed of winter crops.
- Seed toxicity.
- Allelopathic (can also be an advantage).

Selected references

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Cultivars

'Auburn' Released in USA (1959). Selected and developed by the Alabama Agricultural Experiment Station as a forage and cover crop.

'Capello' Released in Australia (1998). An early maturing, soft-seeded cultivar, bred through induced mutation of germinating seed of 'Namoi' using EMS (ethylmethane sulphonate), followed by recurrent mass selection. In each cycle, spaced plants were selected for vegetative production, flowering time, seed yield and percentage soft seed. The seed parent had 80% hard seed while 'Capello' had 80–90% soft seeds, making it more suitable for short-term cropping rotations. The low percentage of hard seed reduces the likelihood of volunteer plants causing weed problems several years after use in the rotation. Outcrossing has reduced the level of soft-seededness.

'Haymaker Plus' Released in Australia (1998). An early maturing, free-seeding cultivar, bred through recurrent mass selection of 'Namoi'; also selected for strong vegetative growth. 'Haymaker Plus' is distinguished from its seed parent by its earlier and uniform flowering, and higher seed yield.

'Kuhak-96' Released in Pakistan (1997). Selected from ICARDA germplasm, IFLVD-683, to be sufficiently cold tolerant for autumn sowing and productive in the arid highlands of Balochistan. It grows slowly in the autumn, which enabled it to survive extreme cold, and given warm spring temperatures and adequate precipitation, proved a highly productive forage crop, producing 8.3 t/ha of dry matter and 1.1 t/ha of seed.

'Lana' Released in USA (1956). Composite of three elite lines selected from PI 117430 from Adana, Turkey (37°1' N, 20 m asl, rainfall 648 mm). It is an early-maturing variety (about 1 week earlier than 'Auburn'), with good seedling vigour and rapid growth. Selected and developed by the SCS Plant Materials Center, USDA, in cooperation with the Agronomy Department of UC, Davis for rangeland use in California, and now used in other states including Hawaii.

'Namoi' Released in Australia (1972). Derived from CPI 15095, introduced from Izmir, Turkey, and selected in Western Australia from other lines of *V. villosa* ssp. *varia* for early maturity, general vigour, and high seed production.

'Tolse F.C.A.' Released in Argentina (2001). Selected in Córdoba Province from R.I.-250 from USDA, for drought and cold tolerance, vigour, growth period, insect and disease tolerance, and larger seed size.

Promising accessions

None reported.