Melilotus alba Medikus

[with some information on *Melilotus officinalis* - Yellow Sweet Clover]

Home

Photo

Leguminosae **Author: Dr. John Frame**

Synonym

- alba Medik.

The following refers to biennial white sweetclover as representative of the genus but with some reference to other sweetclovers; particularly biennial yellow sweetclover.

Common names

White sweetclover, white melilot, Bokhara clover.

Description

Erect or ascending biennial, up to 1.5 m, with trifoliate leaves. Leaflets obovate, dentate in upper third and with terminal leaflet on longer petiole than lateral leaflets (a feature used to differentiate the plant from lucerne, since both species have a similar appearance in the vegetative state). Single well-branched stem in establishment year but in following year, several stems originate from crown buds. The succulent stems become fibrous with age. Deeply tap-rooted. Considerable root enlargement, together with short rhizomes initiated from the plant crown, takes place in autumn of the establishment year. (In contrast, annual forms have more above-ground forage and less root development in the year of sowing). Inflorescences are elongated one-sided racemes of white flowers, 4-5 mm, borne on long axillary stalks. Indeterminate flowering. Self-fertile, pollinated mainly by honey bees. Seed pod has a reticulated, ridged coat which turns black with ripening and contains a single smooth, kidney-shaped seed, circa 2 mm long, and brownish-yellow to brown in colour.

Distribution

Indigenous to central Europe and north-west Asia. Introduced to many other temperate regions but mainly used in North America, including under irrigation, though its use there has declined in recent years.

Characteristics

Adapted to a wide range of soils, but not acidic soils. Tolerant of alkaline and saline soils. Rapid growth rate but slower rate after defoliation. Upright growth habit. Intolerant of shade.

Season of growth

Spring to autumn.

Frost tolerance

Winterhardy species though utilization in the autumn of the establishment year can result in subsequent winter kill if there has been insufficient time for build-up of root reserves.

Drought tolerance

High degree of tolerance once established though yellow sweetclover is considered to be more drought tolerant.

Tolerance of flooding

Low.

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Soil requirements

Responds to high fertility, particularly of P and K. Optimum pH range, 6.5-7.5 (PLANTS Database, 2000).

Rhizobium relationships

Requires seed inoculation by an effective strain of *Rhizobium meliloti* for successful establishment and performance. For example, at a site in Alaska, yellow sweetclover (uninoculated) yielded 0.56-0.72 t/ha DM whereas inoculated sweetclover yielded 3.25-3.97 t/ha (Sparrow et al., 1993).

Ability to spread naturally

Poor, although it does spread by seed and frequently appears as a weed in disturbed areas in regions where it had previously gone to seed.

Land preparation for establishment

Well-cultivated, uniform and firm seed bed required for good results.

Sowing methods

Seed usually drilled or broadcast directly after conventional seedbed cultivations. Can also be sown under a cereal cover crop. Direct drilling (sod seeding) into the existing grass sward can also be practised.

Sowing depth and soil cover

Optimum depth is 15-20 mm with a firm soil cover.

Sowing time and seed rate

Usually sown in spring but can also be sown in early autumn. Seed rate, 9-12 kg/ha when sown pure but reduced to 4-5 kg/ha if sown in mixture with grasses such as Bahiagrass or perennial ryegrass depending upon the region.

Number of seeds per kg

395 000 to 575 000.

Percentage hard seed

High. In Argentina Zimmermann et al. (1998) found the viability of hard seeds of white sweetclover to be 90%.

Seed treatment before sowing

Normally scarified.

Ability to compete with weeds

Moderate during early establishment but improves with time.

Tolerance of herbicides

Tolerates ‘legume-safe’ herbicides but not less-selective types.

Seedling vigour

Moderate.

Vigour of growth and growth rhythm

Vigorous growth in year after establishment particularly of stands well established the previous year and where autumn management has allowed plants to develop strong root systems with good carbohydrate and nitrogen reserves.

Nitrogen-fixing ability

Good. Historically has been used in North America as a green manure for soil improvement.

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Response to defoliation

Regrowth slow after defoliation.

Grazing management

Lax defoliation by grazing in late autumn of establishment year encourages good root development. Lax grazing also necessary in harvest year since regrowths emerge from stem buds but grazing has to be sufficiently severe to prevent stems becoming mature and coarse.

Breeding system

Self-fertile. Chromosome number 2n = 2x = 16. (Yellow sweetclover is cross-pollinated).

Breeding objectives

Low coumarin content. Increased forage yield. Improved characteristics for grazing. Better disease and pest resistance. Currently there is very little breeding work with this plant.

Dry matter yields

Hay yields up to 7-8 t/ha achievable. In Alaska, yellow sweetclover yielded 7.70-9.03 t/ha on neutral soil at one site but 3.25-3.97 t/ha on acid soil at another cooler site (Sparrow *et al*.,1993). In further work there with yellow sweetclover Panciera and Sparrow (1995) obtained 3.26-5.74 t/ha on the neutral soil, but only 1.35-1.58 on the acidic soil; application of fertilizer N did not elicit a yield response. In England, white sweetclover yielded 9.4 and 5.5 t/ha for first- and second-seasons, respectively (McEwen and Johnston, 1985).

Suitability for hay and silage

Suitable for conservation but the stands are mainly grazed. Necessary to minimise loss of nutritious leaf during handling of hay crop.

Feeding value

High nutritive value at vegetative stage of growth when grazed, at pre-flowering stage for silage, and at early-flowering stage for hay. Compared with red clover, yellow sweetclover had lower N content and higher cell wall and lignin content in the stems but higher N contents in the leaves (Wivstad, 1997).

Acceptability

Good acceptability after stock have become used to the bitter taste caused by the coumarin content of the forage.

Anti-quality factors

Risk of bloat (but conventional preventative methods are available). The feeding of hay or silage spoiled by the development of moulds, due to aeration and heating, produces an anti-coagulant from the coumarin content which can cause ‘bleeding disease’ – hence the past development of low-coumarin cultivars.

Seed harvesting methods

For best results, seed crops cut and windrowed when about half the seed pods have become brown to black (Smith and Gorz, 1965); seed loss can be substantial because of weak attachment of pods and pod shatter during combining. Crops can also be directly combined following application of a desiccant.

Seed yields

225 kg/ha on average (Miller and Hoveland, 1995).

Cultivars

Smith and Gorz (1965) noted that much of the seed on the market was of the unimproved, common type rather than specific cultivars . Nevertheless they listed

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12 biennial cultivars of *M. alba*, with a range of maturity classes, and five annuals, mostly released in the USA or Canada. A more recent release is biennial Polara from Canada; they also listed four biennial cultivars of *M. officinalis* and one each of a biennial and annual *M. suaveolens*, mainly from North American sources, plus they noted an annual yellow sweetclover ecotype of *M. indica* grown in southern USA. Norgold is a more recent release of biennial yellow sweetclover from Canada.

Diseases

Sweetclover may be affected by a number of diseases, the main ones being clover rot (*Sclerotinia trifoliorum*), spring black stem (*Ascochyta meliloti*), summer black stem (*Cercospora davisii*), stem canker (*Ascochyta caulicola*) and root rot (*Phytophthora cactorum*).

Viruses

A number of viruses can cause subclinical or clinical damage.

Pests

Sweetclover weevil (*Sitona cylindricollis*) is a major pest at establishment and infestations can also damage established stands. Other pests are the root-borer (*Walshia miscecolorella*), blister beetles (*Epicauta* spp.) and aphids (*Therioaphis riehmi*).

Main attributes

High forage yields. Drought tolerance. Winter hardiness. Suitability for grazing. Tolerance of alkaline soils.

Main shortcomings

Susceptibility to sweetclover weevil attack during early establishment. Prone to a number of diseases. Risk of bloat. Livestock bleeding disease in mouldy hay or silage.

Links

- King´s American Dispensatory: history, description and uses of *Melilotus*
- Complete Crop Summary of Sweetclover (Melilotus): images, common names and cultural practices
- Reference list on *Melilotus alba* and *Melilotus officinalis*
- Clover and some relatives: article on various species of Clover with very detailed information on Sweetclover
- *Melilotus alba*: detailed description
- *Melilotus officinalis:* detailed description

Main references

Miller D.A. and Hoveland C.S.(1995); Smith W.K. and Gorz H.J. (1965)

Other references

McEwen J. and Johnston A.E. (1985); Panciera M.T. and Sparrow S.D. (1995); Plants Database 2000; Sparrow S.D. et al.(1993); Wivstad M. (1997); Zimmermann L.R. et al.(1998)

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