

Scientific Name: *Melampyrum lineare* Desr. **Family:** Orobanchaceae

Common Names: cow-wheat, narrowleaf cow-wheat



M. lineare in bloom

Plant Description

Annual, reaching 1 to 4 dm high, usually with a few slender branches; stem downy or nearly glabrous; leaves 2 to 5 cm long, opposite, lanceolate or linear-lanceolate, mostly entire, the uppermost often aristate-toothed near the base, usually somewhat glandular-hairy; flowers solitary in the leaf axils or in the terminal leafy spikes; bracts usually with a few divergent teeth near the base; calyx 4-lobed, somewhat glandular-hairy; corolla 8 to 12 mm long, tubular, whitish to purplish and yellow-tipped, 2-lipped: upper hooded and mostly entire, lower 3-lobed; 4 stamens (Moss 1983, Tannas 2004).

Fruit: A flat, oblong, beaked capsule; partially enclosed in the calyx; 6 to 10 mm long; contains 1 to 4 seeds (Vance et al. 1984).

Seed: 2 to 4 mm long, blackish with light coloured tips when mature (Moss 1983).

Habitat and Distribution

Commonly found in the Boreal forest, occasionally in the foothills and montane regions; grows in moist, boggy wooded areas, mossy coniferous forests and often in drier, sandy, jack pine forests (Tannas 2004). Gibson (1993) describes *M. lineare* as occurring mostly in acidic, nutrient poor, fire-prone habitats.

Species of the genus *Melampyrum* have been linked to moss and reindeer lichen microsites, and the seedling niche for *M. lineare* has been characterized as prevalently high in moss and lichen cover, high in light intensity, and relatively far from shrubs (instead with herbs as the nearest neighbour); light intensity is the most important physical habitat factor that effects *M. lineare* survival and growth (Gibson 1993).

Seral Stage: Early successional (Tannas 2004).

Soil: Sandy, well-drained (Vance et al 1984).

Distribution: British Columbia to Newfoundland south to Washington, Idaho, Montana, Minnesota, Wisconsin, Indiana, Tennessee, Georgia, South Carolina (Moss 1983).

Phenology

In northern Michigan, blooming occurs from early July through September and fruiting from late July to mid-October (Gibson 1993).

Pollination

Plants are pollinated by insects and are capable of self-pollination (Cantlon et al. 1963).

Seed Dispersal

Seed is carried away from plant intentionally by ants due to its elaiosome (a fleshy structures attached to seed that is rich in proteins and lipids) (Royal Botanic Gardens Kew 2008).

Genetics

$2n=18, 36$ (Moss 1983).

Symbiosis

Mutualism with ants for seed dispersal purposes; plant itself is a hemi-parasite (Gibson 1993).

Seed Processing

Collection: Collect whole plants (Curtis and Cantlon 1968).

Seed Weight: 2.414 g/1,000 seeds (Royal Botanic Gardens Kew 2008).

Harvest Dates: August to September (Malcolm 1964).

Cleaning: Allow plants to air dry for 24 hours. This will cause the ripe capsules to split open and release the seeds (Curtis and Cantlon 1968). Carefully remove and discard the plants, the released seeds should be left behind on the collecting surface (Malcolm 1964).

Storage Behaviour: No literature found.

Storage: Store in a plastic bag with moist litter from the seed collection area, or on a moist blotter (Cantlon et al. 1963). The seeds will become unviable if allowed to dry out (Gibson 1993).

Longevity: Two years if kept moist (Cantlon et al. 1963).

Propagation

Natural Regeneration: From seed. Some of the seed crop will produce roots from resources contained in the seeds during the first autumn, with green shoots emerging the following spring; other seeds can remain dormant for up to five years. Seeds will do best in a moist microenvironment, and also have a higher germination rate when ant-planted (Gibson 1993).

Germination: Germination can vary widely, between 2% and 100% (Cantlon et al. 1963). Baskin and Baskin (2001) list the optimum germination temperature for *M. lineare* as 3°C. Desiccated seeds will not germinate (Gibson 1993).

Germination will begin after 60 to 80 days in cold storage, and can continue for up to 120 days; germination will cease if the seeds are removed to room temperature (Cantlon et al. 1963).

Pre-treatment: Seeds display intermediate physiological dormancy which can be broken by 60 to 80 days of cold stratification; preceding cold stratification with 1 month of moist storage at 20°C increases germination to about 30% (Baskin and Baskin 2001, Cantlon et al. 1963). Treatment with gibberellic acid (GA) can substitute for the 1 month of warm stratification, and can increase the germination percentage to up to 100% (Baskin and Baskin 2001, Cantlon et al. 1963). For this method,

Malcolm (1964) suggests soaking freshly harvested seeds in a 1,000 ppm GA solution for 24 hours, and then using the same solution to keep the seeds moist during the cold stratification period. Seedling survival requires an extra 20 to 30 days cold storage after emergence of the radicle (Cantlon et al. 1963).

Direct Seeding: Plants can be grown from seed in a greenhouse or a field setting (Cantlon et al. 1963; Gibson 1993).

Gibson (1993) hand-planted *M. lineare* seeds in Michigan by lifting clumps of ground cover (mosses, lichens, or leaf litter), and depositing seeds directly onto the soil surface underneath. He found that seeds deposited under lichens had the highest success rate; however his hand-planted seeds under all cover types had lower germination rates and plant survival than naturally ant-planted seeds.

Planting Density: Cantlon et al. (1963) seeded 5-inch diameter clay pots in a greenhouse with three seeds per pot.

Seed Rate: No literature found.

Vegetative Propagation: No literature found.

Micro-propagation: No literature found.

Aboriginal/Food Uses

Food: No literature found.

Medicinal: An infusion from the plant was used by the Ojibwa as an eye medicine (Smith 1932).

Other: No literature found.

Wildlife/Forage Usage

Wildlife: No literature found.

Livestock: Poor forage value; does not produce enough foliage for forage (Tannas 2004).

Grazing Response: Increaser in adapted range (Tannas 2004).

Reclamation Potential

Although *M. lineare* is characterized as non-aggressive, it is capable of providing immediate cover on disturbances; for this reason it is considered of some value in the early successional phases of site restoration (Tannas 2004). It is capable of maturing without host plants, however will be stunted and more susceptible to drought and disease (Malcolm

1964). Jack pine is a possible host for *M. lineare* (Malcolm 1964).

Commercial Resources

Availability: Not commercially available.

Cultivars: No literature found.

Uses: No literature found.

Photo Credits

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