

COMMENTARY

Henbit is an attainable cover crop

David M. Brenner 

College of Agriculture and Life Sciences,
North Central Regional Plant Introduction
Station, Iowa State University, Ames, Iowa,
USA

Correspondence

David M. Brenner, College of Agriculture
and Life Sciences, North Central Regional
Plant Introduction Station, Iowa State
University, 1305 State Avenue, Ames, IA
50014, USA. Email: dbrenner@iastate.edu

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Abstract

Henbit (*Lamium amplexicaule* L.) is a potential cover crop in the Central United States, but in agronomic literature it is a weed. Henbit is unusual for germinating in the fall, growing through the winter, maturing seeds, and then dying out in mid-May. The short winter-annual duration favors it for the role of a winter cover crop in rotation with summer field crops such as corn (*Zea mays* L. subsp. *mays*), cotton (*Gossypium hirsutum* L.), and soybeans (*Glycine max* (L.) Merr.). This common plant is an opportunity for regenerative farming progress. The cost for seeds and management once henbit populations establish will be less than the cost for other cover crops since henbit volunteers readily from seeds at no expense. However, new research is needed to better evaluate the effects of henbit on soil health, cash-crop yields, and soybean cyst nematodes and to optimize management as a cover crop.

Plain Language Summary

Henbit is a common field weed that can be helpful as a cover crop. In the Central United States, it germinates in the fall and dies out in May, so it is not really a problem for corn, cotton, or soybean crops. It covers fields with small purple flowers in April. Henbit is low cost because of reseeding naturally in fields. Henbit can improve our lives by reducing erosion and improving soil. But scientists have studied henbit as a weed and not as a useful cover crop. We need best management practices to know how to grow henbit well. New henbit research can help.

1 | INTRODUCTION

The use of henbit (*Lamium amplexicaule* L.) as a cover crop is an opportunity to improve soil health, and ecosystem services, but it is thus far a neglected research area. On many farms, henbit already covers fields with volunteer plants in the winter (DeFelice, 2005), followed in the summer by cash crops including corn (*Zea mays* L. subsp. *mays*), cotton (*Gossypium*

hirsutum L.), and soybeans (*Glycine max* (L.) Merr.). Unfortunately, the benefits of henbit on soil health are not measured, although substantial benefits are modeled for weeds in general (Moreau et al., 2020; Wortman, 2016). Some farmers already have experience with henbit functioning as a cover crop, but the research should catch up with farmer practices. There are online videos about on-farm henbit experience (JW, 2025; Miles, 2025). In the spring henbit fields are briefly vibrant purple from mass flowering. Images of the mass floral displays are posted online with extension service discussion (Lancaster, 2021; Missouri Department of Conservation, n.d.;

Abbreviations: NCRPIS, North Central Regional Plant Introduction Station; SCN, soybean cyst nematode.

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VanGessel, 2021; Vittetoe, 2016). Henbit is a common field-covering plant, filling the role of a cover crop, but in extension literature, it is a weed (Holm, 1997; Mohler et al., 2021).

Cover crops of several species are encouraged to improve tillage and reduce fertilizer and soil runoff (Bergtold et al., 2017; Clark, 2007), but adoption is poor because many farmers are skeptical about the return on investment and effort (Duke et al., 2022; Plastina et al., 2024; Van Eerd et al., 2023). It is proposed that henbit could break through the cover crop adoption gap by requiring less expense and effort than the available recommended cover crops since established populations generate seeds at no cost and self-sow (Mohler et al., 2021; Wortman, 2016).

1.1 | Proposed annual farming cycle for henbit as a cover crop

The main management practice for henbit farming is adjusting herbicides and tillage so henbit can grow from October to April. Farmers can favor henbit by limiting use of residual herbicides and utilizing conservation tillage (no-till) (Conley & Bradley, 2005; Hill et al., 2014). In Iowa, henbit germinates in autumn during or after the corn and soybean harvests. Henbit grows through the winter, but the winter foliage is tarnished-green, and the plants are small, about 1 cm tall and 5 cm wide, so they are nearly invisible at a distance. In April, the plants grow vertically, bloom, and become visible from a distance as purple fields from the mass effect of many small purple flowers. During the purple flowering stage, seeds are already maturing, so if the crop is terminated, the seed bank will be replenished for germination in the following October. Henbit dies in May or June with the onset of hot dry weather, with or without deliberate termination, and is intolerant of drought and shade (Baskin & Baskin, 1981, 1984). During the summer, henbit seeds are dormant in the soil and resistant to non-residual herbicides (Monnig & Bradley, 2007).

2 | BIOLOGY OF HENBIT

2.1 | Description and distinctive traits

The distinctive henbit traits that serve it best as a cover crop are its short winter-annual growing cycle and that it is already present in many fields as a volunteer, showcasing the ease of establishment. These traits and the general biology are reviewed by weed scientists (DeFelice, 2005; Hill et al., 2014; Holm, 1997; Mohler et al., 2021). Henbit is common in temperate and Mediterranean climates worldwide (Holm, 1997). Its geographic distribution covers most of the farmland from Mexico into Canada. Within the United States, the distribu-

Core Ideas

- Henbit already functions as a cover crop in many fields from free-of-charge volunteer seeds.
- Competition with summer crops is minimal since it grows in the winter.
- The pros and cons of cover cropping with henbit need investigation.
- Best management agronomy practices are lacking.

tion is mapped by Reed (1971). Conservation tillage practices, reduction in residual herbicides use, and mild winters are believed to explain the recent prevalence of henbit and other winter-annual weeds in crop fields (Hill et al., 2014).

Henbit plants grow 10–40 cm tall with square weak stems and pink to dark purple flowers (Mohler et al., 2021). There are two similar species, henbit and purple dead nettle (*Lamium purpureum* L.). Of these two, henbit is the common field weed in Central Iowa, but the two species are similar enough that most of what is presented here could apply to mixed populations or places where purple dead nettle is the common species. Henbit germination is in autumn, after rain, and can be delayed by dry weather (Baskin et al., 1986; Hill et al., 2014). Dormant seeds persist and seedlings emerge in tilled field soil for at least 3 years (Baskin et al., 1986). Seed mortality is 20% per year in untilled fields as reviewed by Mohler et al. (2021). Plants bear cleistogamous flowers early in the season and chasmogamous flowers later in the season (Mohler et al., 2021; Stojanova et al., 2014, 2016). Stojanova et al. (2014) estimated outcrossing of the chasmogamous flowers as 25%. Stojanova et al. (2020) did not find inbreeding depression in seedlings from the cleistogamous flowers. Hill et al. (2014) estimated seed production as 800–40,000 seeds per m² at densities of 10–65 plants per m² with competition from other weeds.

2.2 | Yield suppression and role in farming systems

Weedy henbit growing in the winter causes minimal or no yield suppression in the following summer crops, and Nelson et al. (2006) have supporting yield data from nontreated control plots compared with fall herbicide-treated plots. It does not rank as a troublesome weed of cotton, soybeans (Van Wyche, 2025), or corn (Van Wyche, 2023). Henbit is troublesome in winter crops and turf (DeFelice, 2005; Van Wyche, 2023, 2025). The yield suppression effect of henbit on wheat (*Triticum aestivum* L. subsp. *aestivum*) varies between studies from less than 1% as reviewed by DeFelice

(2005) to 38% yield reduction with 155 weedy henbit plants per m² observed by Conley and Bradley (2005) in Missouri.

Henbit is cold tolerant, but it does not tolerate heat, shade, or drought (Baskin & Baskin, 1981, 1984). In Midwestern agriculture, these adaptations make henbit successful when the shade of cash crops is removed in autumn. Within henbit globally, there are plants that grow through the summer, especially in Sweden (Mohler et al., 2021). In France, there are two flowering cohorts: spring and fall (Stojanova et al., 2016). But, in the Central United States, the winter-annual, spring-flowering, life cycle is the most frequent (Mohler et al., 2021) and the most relevant for cover crop use.

As a cover crop, henbit is most like pennycress (*Thlaspi arvense* L.) because pennycress is also a weedy winter annual (Verhoff et al., 2022; Wortman, 2020). However, henbit is a shorter season winter annual than pennycress (Hill et al., 2014) and therefore better suited to alternating with summer cash crops.

2.3 | Variation within henbit

Wild henbit varies for traits that are useful as a cover crop. The genetic variation within henbit populations and morphological variation are consistent with pollination of outcrossing flowers (Azimishad et al., 2018), and vary between populations (Stojanova et al., 2014). Mennema (1989) recognizes five taxonomic varieties of *Lamium amplexicaule*. Stojanova et al. (2024) found that henbit germplasm moved from contrasting locations, in common gardens, grew into plants of differing sizes and ratios of cleistogamous to chasmogamous flowers. This observed variation could be useful for selecting improved resilient varieties for cover crop use.

2.4 | Host of pests and beneficials

DeFelice (2005) reviews the issue of henbit hosting pests in agricultural fields. Henbit is reported to host two-spotted spider mites (*Tetranychus urticae*), corn earworm (*Helioverpa zea*), sclerotinia blight (*Sclerotinia minor*), and tomato spotted wilt virus (*Orthotospovirus*). Rocha et al. (2021) review the soybean cyst nematode (SCN) (*Heterodera glycines*) interaction with henbit, and finds a range of results, with at least one study showing henbit as an SCN host, another which indicated it is a poor host, and other studies showing an association with increasing SCN. Perhaps early termination of henbit could help control SCN because soil below 10°C is unfavorable to SCN. The association between henbit and SCN is a concern and should be part of a cost and benefit analysis.

Encouraging henbit growth in crop fields should be generally beneficial for ecosystem services. Henbit is a host for beneficial organisms, including predatory bugs (*Oris* spp.)

that control western flower thrips (*Frankliniella occidentalis*) (Atakan, 2010), and in Japan, many other beneficial ground-dwelling arthropods (Inagaki et al., 2025). Ants (Formicidae) and other insects use the seeds of henbit (Tanaka et al., 2015). The flowers are visited by honeybees (*Apis mellifera*) (Mohler et al., 2021) and bumblebees (*Bombus*) (Schoenemann et al., 2025). Henbit is valued by beekeepers for early-season honeybee fodder (JW, 2025).

2.5 | Manage and establish

Henbit can be managed as a self-sustaining cover crop with the seeds that mature in the spring, self-seeding the next fall's crop. Recommendations for agronomy such as tillage, herbicides, fertilizing, terminating, or planting into, and establishing new henbit fields would encourage expanded use. But these recommendations are lacking. Preliminary agronomy recommendations are available from Hill et al. (2014). Additional herbicide recommendations could resemble Bishop and Nelson's (2019) conclusion that Acuron (atrazine plus metolachlor plus mesotrione) on corn reduced the following pennycress cover crop populations. Farmers who want to control henbit are advised to time their activities in the fall when henbit is most vulnerable (Krausz et al., 2003; Mohler et al., 2021; Woolam et al., 2018). Thus, the opposite would be true when utilizing henbit as a cover crop.

2.5.1 | Establishment

Establishing new fields of henbit happens spontaneously because the seeds are small, numerous, and likely travel on farm machinery (Mohler et al., 2021). Presumably, soil from fields with established henbit populations could be spread on fields to deliberately found new populations. Wilson et al. (1988) established henbit research plots near Bristol, UK, by broadcasting seeds on September 25. A commercial seed trade may someday be ready to provide seeds and advice from tested establishment methods, but in 2026, henbit seeds are not available for purchase, and establishment is experimental. Equipment developed to harvest seeds of other wild plants by vacuuming might someday be used to harvest henbit seeds at field scale (Kujawski et al., 2001) and overcome the technical issues of harvesting small seeds mixed with the foliage of low-growing plants.

2.5.2 | Termination

Terminating or killing cover crops is a routine practice to prevent competition with the main crop (Clark, 2007; USDA, NRCS, 2019). Henbit could be terminated by the same

practices that control weeds such as horseweed (*Erigeron canadensis* L.), or by strip tillage as depicted by Nelson (2015) in an image. Henbit plants make tremendous numbers of seeds and mature them quickly (DeFelice, 2005; Mohler et al., 2021), so 1 week of flowering before termination may be enough to provide sufficient seeds to sustain the population. Henbit terminates because of intolerance of cultivation, drought, heat, and shade (Baskin & Baskin, 1981, 1984), which accommodates corn and soybean establishment.

2.6 | Potential additional uses of henbit

Henbit could have other uses besides a cover crop. The existing cover crops are also harvested for other products. For example, the emerging cover crop pennycress is also an oilseed crop (Wortman, 2020). Henbit was investigated as an oilseed by Hagemann et al. (1967) but has no obviously marketable oil. In work done in Iran, the essential oil of henbit distilled from the foliage could have value in the food, fragrance, cosmetics, and detergent industries (Sajjadi & Ghannadi, 2012). An Iranian plant sample was high in *trans*-phytol, unlike an Italian sample that was high in germacrene-D (Sajjadi & Ghannadi, 2012). It is unclear if this is due to genetic variability within henbit or environmental effects. Henbit is a vegetable in Japan and a medicinal plant (DeFelice, 2005; Salehi et al., 2019). It is used for gastrointestinal and other disorders in Iran (Sajjadi & Ghannadi, 2012). Henbit makes a nutritious forage (Bosworth et al., 1985) and has the advantage of having production early, during the hay-feeding season for pastured animals. There are reports of toxicity to grazing animals, but the reports are limited to Australia, could not be replicated under controlled conditions, and may be spurious (Burrows & Tyrl, 2013).

3 | OBSERVATIONS AND ESTABLISHMENT EXPERIMENT

The author observed that henbit emerges later in the fall, then flowers and dies earlier in the spring than the other winter-annual field weeds. In this study, hundreds of thousands of seeds were collected in Ames, IA, on the grounds of the North Central Regional Plant Introduction Station (NCRPIS) with a battery-powered home-use leaf vacuum modified by removing the leaf mulcher blade from the impeller. The seeds, harvested on April 26, 2025, were accessioned into the US National Plant Germplasm System as PI 708414 (USDA, ARS, National Plant Germplasm System, 2026). Other freshly harvested seeds from the same source were planted in Pilot Mound, IA, on no-till farm ground, that was without henbit, by

hand broadcasting. Seedlings emerged the following fall after a corn crop. In 2025, it was assumed that the seeds would ferment if stored wet and might not break dormancy if fully dried and planted in October. Instead, the seeds were stored in fabric bags with continuous forced air flow, and planted rapidly, to undergo a natural summer seed dormancy release process in field soil (Mohler et al., 2021). Henbit seedlings emerged by September 21, 2025, in Pilot Mound and by October 13, 2025, in fields on the NCRPIS.

Mohler et al. (2021) state that “henbit can tolerate temperatures down to -5°C but suffers some damage at that temperature.” As observed in Ames, IA, henbit tolerates far colder temperatures, below -18°C , with only intermittent protective snow cover. Apparently, henbit has cold-tolerance adequate for the climates where it is found and is more cold tolerant than reported.

4 | FARM POLICY

Henbit is not included in lists of cover crops (Clark, 2007). It would be helpful for soil conservation if henbit and any other weeds could qualify as cover crops if they fit that role (Hill et al., 2014; Wortman, 2016). The existing cover crop termination rules (CFRA, 2022; USDA, NRCS, 2019) could still apply but would favor henbit because henbit matures seeds before other self-seeding weedy plants.

5 | CONCLUSIONS

Henbit, as a cover crop, is an attainable cover crop because it is already present, affordable because the seed expense to farmers is minimal, and scalable because it is already widespread. A new investment of research on this understudied topic is needed to advance henbit or at least understand it as a cover crop. The benefits for regenerative agriculture and farm systems could be tremendous. New research could provide information on the effect of henbit on soil health, nitrogen loss (Wortman, 2016) yields of following cash crops, and best agronomy management practices such as optimal termination and tillage. All the topics in this paper are understudied, but SCN hosting is an important barrier to using henbit as a cover crop and therefore especially needs to be better studied. Existing fields with histories of winter henbit populations should be located and evaluated for cumulative effects. Potentially, henbit will be recommended as other cover crops already are (Clark, 2007) and utilized on an expanded scale.

AUTHOR CONTRIBUTIONS

David M. Brenner: Conceptualization; project administration; visualization; writing—original draft.

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CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

ORCID

David M. Brenner  <https://orcid.org/0000-0003-2355-4471>

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