

PLANT MATERIALS TECHNICAL NOTE

LACY PHACELIA *Phacelia tanacetifolia* Benth.

A Native Annual Forb for Conservation Use in Montana and Wyoming

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Honeybee utilizing lacy phacelia (NRCS photo).

General Description

Lacy phacelia, *Phacelia tanacetifolia*, is a cool season annual forb, native to the southwestern United States, (Arizona and California) and northern Mexico, but not native to Montana and Wyoming. It has several alternate common names including lacy scorpion-weed, tansy leaf phacelia, blue tansy, and purple tansy. Phacelia is listed in the top 20 pollen producing flowers for honeybees, and is highly attractive to pollinator insects including bumblebees and hoverflies. It provides a source of high quality nectar and pollen. It also is desired as a cut plant for its persistence in floral arrangements.

Lacy phacelia is in the Hydrophyllaceae (waterleaf) family, and is a rapidly growing broadleaf with branched cyme inflorescences, one-sided with dense buds and flowers on a coiled rachis. Flowers are radial, five-lobed lavender-blue, bell-shaped, with long and feathery stamens. It has a single-sided inflorescence that curves into a fiddlehead shape, producing nectar and pollen. Larger leaves are helically alternate, pinnately compound, with toothed to lobed leaflets, creating a tansy leaf appearance. Stiff hairs are found on the leaves and stem. Rooting depth has been reported from 10 to 30 inches, and the species is considered tap rooted with fibrous side roots. Growth form is a single stem at the base with 2 to 3 ascending branches off the main stem, reaching 6 to 40 inches in height.

Adaptation or Range

Lacy phacelia performs well in many soil types, but grows best in open, fertile, light-textured, and well-drained soils within a pH range of 6.4 to 8.5. It is fairly drought tolerant, and grows well given 7 to 18 inches of annual precipitation or irrigation. Lacy phacelia is not considered winter hardy and suffers winter kill at approximately 18° F. It should be seeded in early spring when attracting pollinators and seed production is desired. It should be planted late fall when used as a winter killed cover crop for biomass production or to scavenge excess nitrates in the soil. Seeds germinate within 15 to 30 days, and germination rates increase with rising soil temperatures above 37° to 68° F. At soil temperatures greater than 68° F, the percentage germination decreases with total germination inhibition at 86° F. It has not been found growing outside of cultivation in Montana or Wyoming.



Lacy phacelia, Bridger Plant Materials Center, Carbon County, Montana (NRCS photo).

Conservation Uses

This non-leguminous forb initiates flowering 45 to 60 days after emergence and has a flowering period lasting from 6 to 8 weeks, making it desirable in pollinator enhancement and cover crop plantings. Lacy phacelia is fairly competitive and establishes well in cover crop and pollinator mixes. It forms arbuscular mycorrhizal fungi associations, and rates “fair” for increasing soil organic matter as its biomass decomposes quickly.

Lacy phacelia is used extensively in Europe in “catch crops” (cover crops), pollinator plantings, and for intercropping for bio-control benefits. When planted as an intercrop it attracts hoverflies which feed on nectar and pollen, and then lay their eggs on the underside of leaves of associated crops. The hoverfly larvae, a predator of leaf aphids, have shown a significant reduction of this insect pest in sugar beets.

Lacy phacelia is considered non-toxic, but it is a nitrate accumulator and should be used in a mix when fed to livestock. Protein content ranges from 6.7% to 19.8% at the pre-bloom stage.

Ease of Establishment

Lacy phacelia seeds germinate readily in 15 to 30 days without treatment. Germination is inhibited by light and temperature, so plant seeds ¼-inch deep and plant when soil temperatures are below 68° F. Soil temperatures can vary greatly depending on location and should be considered when planning late spring or summer plantings.

Planting Rates (all recommended amounts based on pure-live-seed [PLS])

Direct Seeding. The full stand drill seeding rates listed in Table 1 are based on 12-inch wide, between-row spacing on a favorable (non-critical area) site, and should be used as approximate guidelines. With its potential for slow establishment and relatively shallow roots, a recommendation for lacy phacelia seeding in critical areas is not provided. Forbs are seldom seeded in pure stands except for production purposes. Seeding rates vary by percentage in the mix, row spacing, and planting method (drill versus broadcast). Seeding rates by planting method and site condition are shown in Table 2.

Table 1. Seeding specifications for conservation plantings of lacy phacelia.

Seeds/ Pound ^{1/}	Seeding Date	1 PLS Pound/Acre Rate ^{2/}	Full Stand Rate ^{3/}	
			PLS seeds/ft ²	lbs. PLS/ac
244,944	spring/early summer	5.6	20	3.5

^{1/} Number of pure live seeds (PLS) per pound.

^{2/} Number of PLS seeds per linear or square foot at 1 pound PLS/acre rate.

^{3/} Full stand drill seeding rate in PLS pounds per acre with 12-inch, between row spacing on a favorable site.

Table 2. Seeding rates for lacy phacelia as determined by planting method and site condition.

Non-Critical Drilled lb. PLS/ac	Non-Critical Broadcast ^{1/} lb. PLS/ac	Critical Area Drilled ^{1/} lb. PLS/ac	Critical Area Broadcast ^{2/} lb. PLS/ac
3.5	7	N/A	N/A

^{1/} Multiply the non-critical drill rate times 2.

^{2/} Multiply the non-critical drill rate times 4.

Seeding rates for annual phacelia in cover crop mixes depend on the desired percentage of annual phacelia in the stand. If there is an erosion concern, add a faster germinating species such as annual buckwheat *Fagopyrum esculentum* to the mix.

Stand Establishment

For best results, seed should be planted into a firm, weed-free seedbed in early spring after the soil has reached a temperature of 40° F, and the danger of a killing frost has passed. It is recommended to drill the seed to a ¼-inch depth to ensure a uniform seeding depth, although broadcast seeding followed by cultivation may also be successful. Seeding a forb component in alternate-row or cross-planting (forb in one direction and grass in the other) configurations may ensure better forb establishment. Adjust seeding rates accordingly for these types of plantings. Refer to Plant Materials Technical Note, MT-78 (Rev. 1), Calculating Seeding Rates when Using Alternate-Row and Cross-Seeded Planting Techniques.

Seed Production

Seed production specifications for lacy phacelia are shown in Table 3. Harvest by direct combine before more than 10% of the seed heads have turned brown and fluffy. Harvested material must be dried to prevent mold and decay. Seed production rates are highly variable and have been reported from 150 pounds in eastern Texas to 800 pounds in eastern Oregon. Table 3 lists seed production from the Mediterranean region of Turkey and eastern Oregon.

Table 3. Seed production approximations for lacy phacelia.

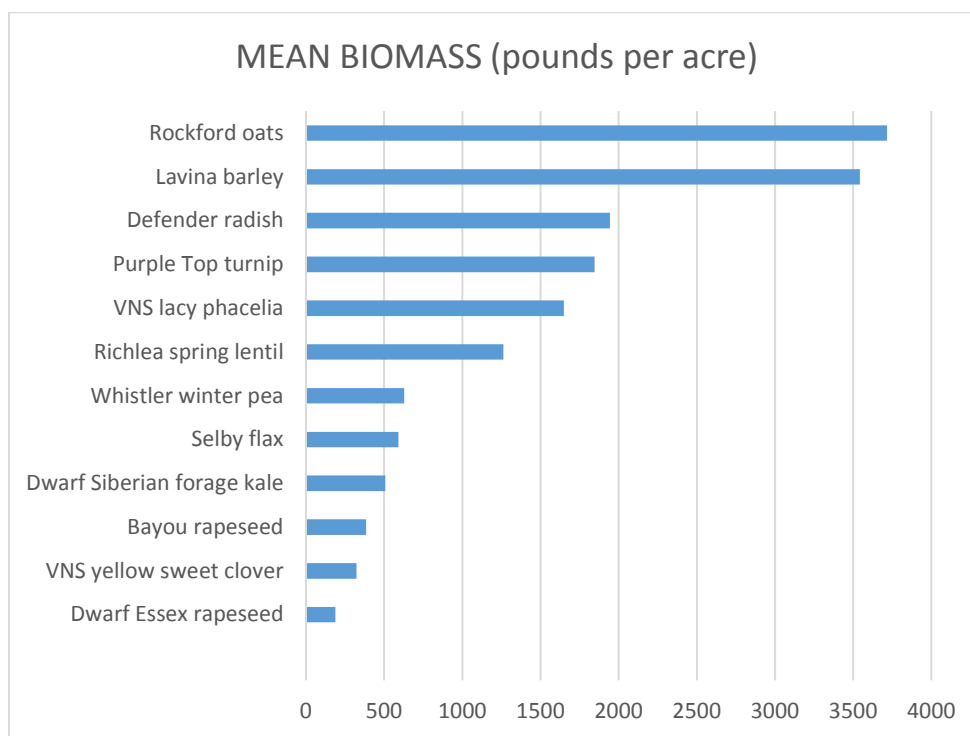
Row Spacing	Seeding Rate		Irrigated Seed Yield
<i>inches</i>	<i>PLS/ft²</i>	<i>Lbs. PLS/ac</i>	<i>bulk lbs./ac</i>
7	26	4.6	438

Biomass Production

Lacy phacelia produces relatively abundant biomass, especially in temperate climates. The biomass, however, breaks down quickly, and may not increase long-term soil organic matter. The decomposition of lacy phacelia residue can be slowed by growing this species in combination with a cereal grain or other durable residue species.

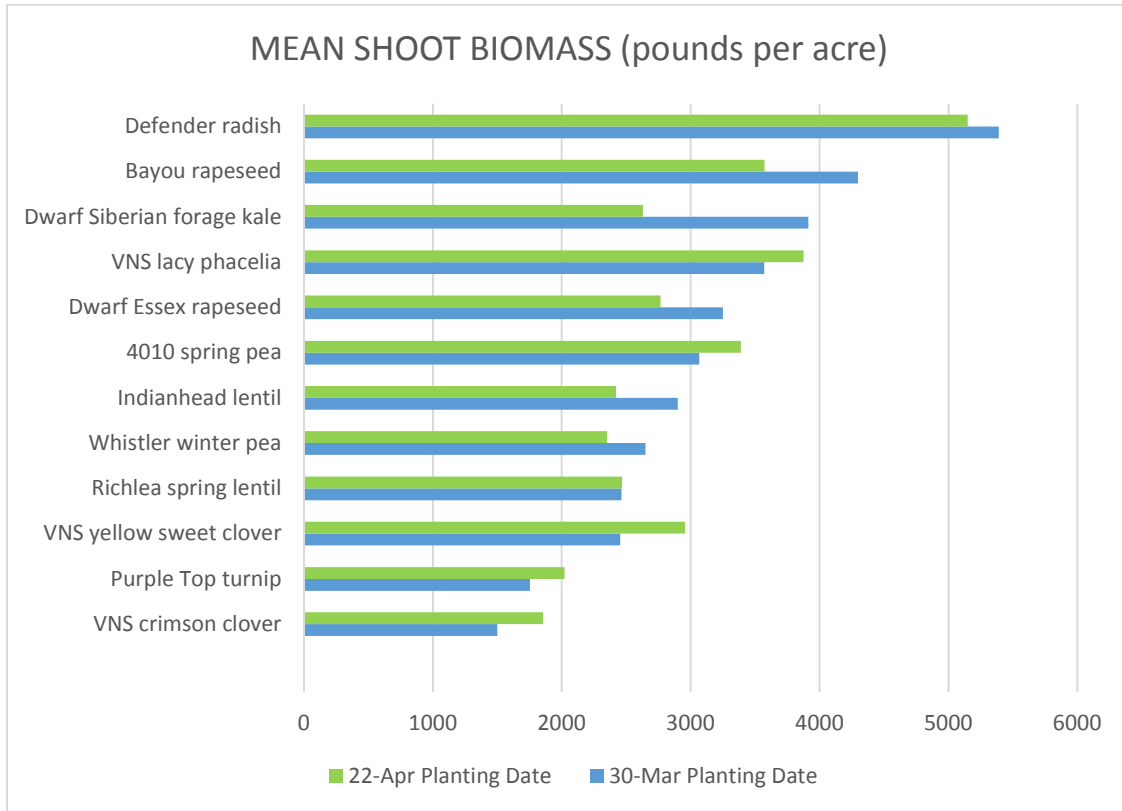
On January 30, 2015, a frost planting study at the Bridger Plant Materials Center (BPMC) that included VNS (variety not stated) lacy phacelia was seeded. Plots were sown as solid stands, on 14-inch between-row spacing, at a seeding rate of 35.5 seeds per linear foot, and maintained as a dryland planting. Shoot biomass of lacy phacelia ranged from 1,492 pounds per acre to 1,924 pounds per acre with a mean production of 1,650 pounds per acre (see Figure 1). This was greater than 7 of the 11 other tested species/varieties. Root biomass was not sampled.

Figure 1. Mean biomass weights, cover crop frost seeding study, Bridger, Montana. 2015.



A spring planting date study was installed at the BPMC (planting dates of March 30, 2015 and April 22, 2015), that included VNS (variety not stated) lacy phacelia. Plots were sown as solid stands, on 14-inch between-row spacing, at a seeding rate of 15.5 pure-live-seeds (PLS) per linear foot, and maintained as a dryland planting. Shoot biomass of VNS lacy phacelia when planted on March 30 ranged from 2,222 pounds per acre to 5,144 pounds per acre with a mean production of 3,570 pounds per acre (see Figure 2). This was greater than 8 of the other 11 tested species/varieties, and was only less than Dwarf Siberian forage kale (3,912), Bayou rapeseed (4,298), and Defender radish (5,391). Mean shoot biomass increased to 3,876 pounds per acre when sown on April 22, resulting in production greater than all other tests species/varieties except Defender radish (5,150).

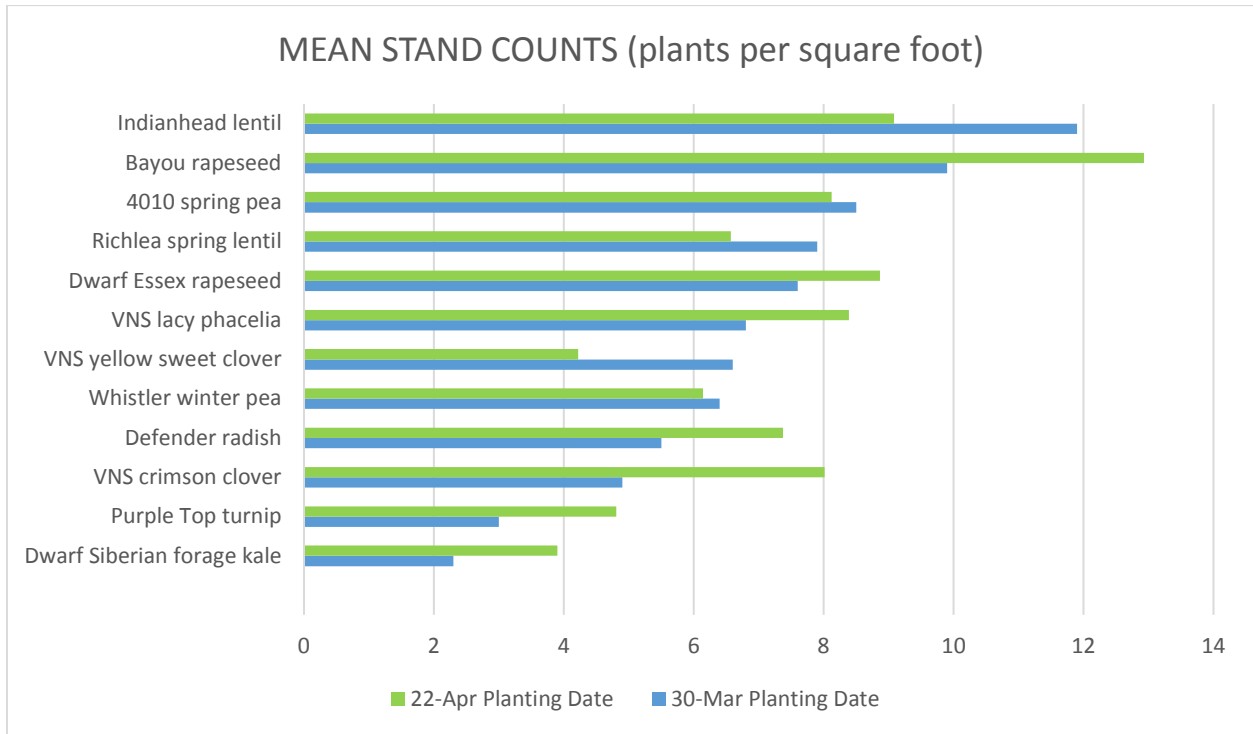
Figure 2. Mean shoot biomass weights, cover crop spring seeding study, Bridger, Montana, 2015.



VNS lacy phacelia established at a rate of 6.8 plants per square foot when planted on March 30, which was approximately a median value for tested species/varieties for that planting date (see Figure 3). Number of stems of lacy phacelia per square foot increased to 8.4 for the April 22 planting, which was greater than 8 of the 11 other test species/varieties.

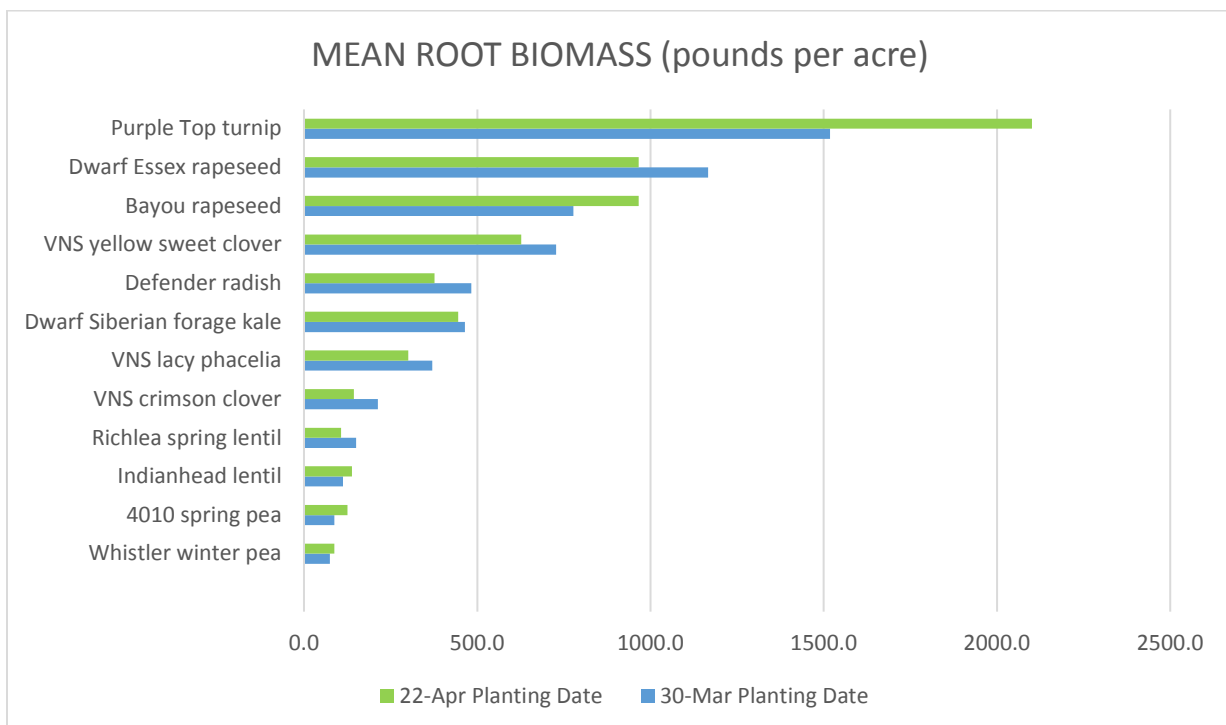
Soil temperatures at the time of planting for the three study plots are 27.6° F (January 30 frost seeding) with mean production of 1,650 pounds.; 44.5° F (March 30 spring seeding) with mean production of 3,570 pounds, and 45.1° F (April 22 spring seeding) with mean production of 3,876 pounds. Biomass production was significantly reduced when seeded at soil temperatures below 37° F.

Figure 3. Mean stand counts, cover crop spring seeding study, Bridger, Montana. 2015.



In non-replicated sampling of root biomass production in the March 30 planting, mean root biomass production of VNS lacy phacelia measured 370 pounds per acre, which was slightly below the median production for all test species/varieties (see Figure 4). For the April 22 planting, root biomass of VNS lacy phacelia decreased to 301.1 pounds per acre, which was again below the median production for all species/varieties tested.

Figure 4. Mean root biomass weights, cover crop spring seeding study, Bridger, Montana. 2015.



Limitations

Lacy phacelia is an excellent pollinator attractant, but when planted in large solid stands, may deter pollination of other target species. Lacy phacelia readily self-seeds, so termination before seed set will be needed to limit volunteer plants from establishing.

Releases

There are no varietal releases of lacy phacelia from the United States. There are several released varieties from Europe. Seed of VNS is available from commercial seed companies.

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