

***SALVIA COLUMBARIAE* BENTH. VAR.
*COLUMBARIAE***

COMMON NAME: CHIA

FAMILY: LAMIACEAE

GROWTH FORM: ANNUAL HERB



PLANTING

Ideally, seeds of this species would be planted during October, before the winter monsoonal period of November through March. However, we have planted the species as late as December. Seeds were hand-sown onto mounded planting beds, and a thin layer of soil was then raked over them. The seeds germinate readily without any form of pre-treatment.

PHENOLOGY

When growing in the San Joaquin Valley, *S. columbariae* germinates as early as mid-January, and will begin flowering in mid-March. May through early June is the peak time for seed collection, but seeds have been collected during July in some years. Seed is retained well on plants as they senesce, and a small amount of seed would likely still be available for collection several months after senescence. However, a decrease in seed viability may occur over time.

SEED HARVESTING

We typically wait for all the seeds on a given plant to mature and then collect the entire plant. However, seed collection on more than one date may still be necessary, to collect

both early and late maturing plants. With this approach, it is possible that a small fraction of the early-maturing seed will have become dispersed before plants are collected.

Plants are ready for collection when the inflorescences are dry and brown in color, with no green color remaining. It is ideal to minimize the amount of soil that is collected along with the plants; soil particles that are of a similar size and weight as the seeds can be very difficult to remove during seed processing. We would transport the harvested plant material to a warehouse and spread it out on tarpaulins to air dry, before seed processing.

SEED PROCESSING METHODS

Using a hammer mill, raw plant material is reduced into a coarse but uniform mixture of seeds and associated chaff (e.g., pieces of stems, leaves, floral structures). Seeds can then be separated from chaff using either a Clipper Office Tester or Clipper Eclipse (both made by the A.T. Ferrell Company). An air separator (Seed Tech Systems, LLC.) can be used to remove additional lightweight chaff. For relatively small seed lots or in the absence of the equipment mentioned, plant material can be broken up by rubbing it over a screen or sieve. Wire mesh sieves with various screen sizes can then be used to separate seeds from chaff.

Seeds per gram = 784¹

CULTIVATION OVERVIEW

S. columbariae was sown in the nursery for three consecutive years, and has reliably produced seed each year. Due to its aromatic nature, this species is not susceptible to browsing by herbivores.

S. columbariae performed well at the nursery; it germinated readily, grew vigorously, and reliably produced seed. However, weed control was an important factor in our success with cultivating *S. columbariae*. The dominant weed species at the nursery germinate so densely and grow so aggressively that in the absence of weed control, they would have significantly hindered the growth of the planted natives. The use of irrigation in response to seasonally low rainfall was also a contributing factor in our success with cultivating *S. columbariae*.

The Rancho Santa Ana Botanic Garden has reported success with cultivating *S. columbariae* (Everett, 1957): they were able to harvest over 8 pounds of seed from just 27 ounces of seed sown in field rows of sandy river bottom silt. They also reported that a seed lot that had been stored in a garage in the desert for 11 years and 10 months had a high germination rate when sown.

ETHNOBOTANICAL USE

S. columbariae was a valuable plant to many Native American tribes of California, and has a variety of ethnobotanical uses (for more information, refer to the NRCS Plant Guide listed below).

¹ This figure (n = 5; standard deviation = 15) is derived from a seed lot that was harvested from the native plant nursery in 2008.

REFERENCES

Everett, P.C. 1957. A summary of the culture of California plants at the Rancho Santa Ana Botanic Garden 1927-1950. Claremont, CA: Rancho Santa Ana Botanic Garden. 263 p.

ADDITIONAL INFORMATION ABOUT SALVIA COLUMBARIAE:

Internet Resources

Species profile from the Ladybird Johnson Wildflower Center at the University of Texas:
http://www.wildflower.org/plants/result.php?id_plant=SACO6

Plants for a Future Database:
<http://www.pfaf.org/database/plants.php?Salvia+columbariae>

Seed photos from the Rancho Santa Ana Botanic Garden:
<http://www.hazmac.biz/020904b/020904bSalviaColumbariae.html>

Data on seed abortion from the Rancho Santa Ana Botanic Garden (p.3):
http://rsabg.org/horticulture/Seed%20Program/Seed%20Collecting%20Guidelines_MDW3.pdf

Plant Guide from the Natural Resources Conservation Service (NRCS):
http://www.plants.usda.gov/plantguide/pdf/cs_saco6.pdf

Seed Processing Protocol from the Native Plant Network:
http://nativeplants.for.uidaho.edu/network/view.asp?protocol_id=3333

Literature

Capon, B. and W. Van Asdall. 1967. Heat pre-treatment as a means of increasing germination of desert annual seeds. *Ecology* 48: 305-306.

Capon, B. and P.E. Brecht. 1970. Variations in seed morphology and germination among populations of *Salvia columbariae* Benth. in southern California. *Aliso* 7: 207-216.

Capon, B., G.L. Maxwell, and P.H. Smith. 1978. Germination responses of temperature pretreatment of seeds from ten populations of *Salvia columbariae* in the San Gabriel Mountains and Mojave Desert, California. *Aliso* 9: 365-373.

Fuller, P.J. and M.E. Hay. 1983. Is glue production by seeds of *Salvia columbariae* a deterrent to desert granivores? *Ecology* 64: 960-963.

Keeley, J.E. and C. J. Fotheringham. 1998. Smoke-induced seed germination in California chaparral. *Ecology* 79: 2320-2336.

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PHOTOS



S. columbariae seedling at the native plant nursery during February 2006.





S. columbariae seeds. Scale shown is millimeters.



S. columbariae seed. Scale shown is millimeters.

