

Wild Safflower in California

improvement of cultivated safflower through plant-breeding program to obtain desirable characteristics of wild species

P. F. Knowles and Amram Ashri

Cultivated safflower — *Carthamus tinctorius* L.—was established in California as a commercial crop in 1950 and by 1956, approximately 84,000 acres were in production. Most of the acreage was in the Sacramento Valley but it is likely that the total acreage will increase because there is a good market for safflower oil.

Most field crops—such as oats, barley, beets—have several related wild species, some of them weedy. The same thing is true of safflower, and two of the wild species are found in California. Both of the wild species have been called distaff thistle.

There are approximately 25 wild species of safflower, all of them native to Asia, Europe, North Africa and the coun-

tries drained by the Nile. Many of them are quite different from the cultivated species. Some are perennials, and some have blue to purple flowers. With one exception all are very spiny, and many are weeds.

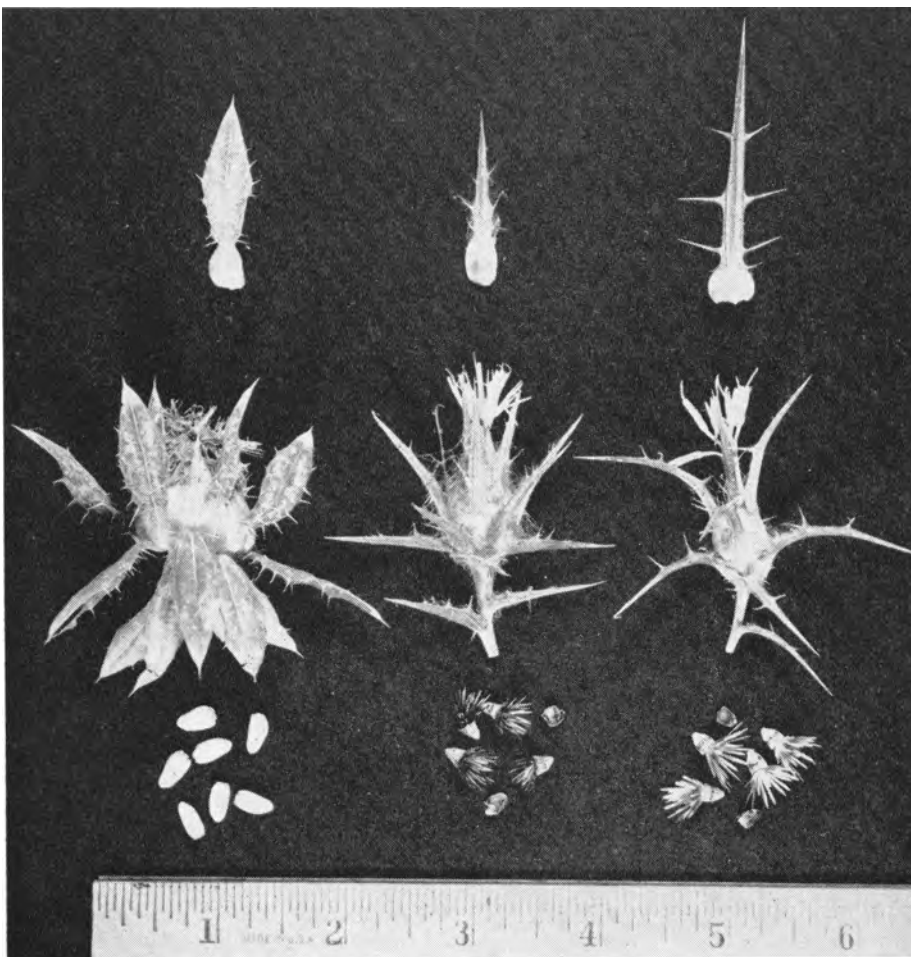
One of the wild species—*Carthamus lanatus* L.—has been found in California in areas near the ocean, though it is not known whether or not it prefers the cooler temperatures prevailing there. The plants are 1'-4' tall and are a dull gray green. There are short hairs on the stem, and long hairs on the bracts and leaves with a weblike appearance. The flowers are lemon-yellow. The heads are up to 1" wide, and about 1.75" long. The outer involucre bracts surrounding the head are about the same length as the head,

are weakly spined, and do not flare outward.

This species—*C. lanatus*—is distributed widely in the Old World. Early reports indicate that it was first established in California between 1884 and 1891, in South San Francisco. It has been collected in San Luis Obispo County on the north side of Toro Creek Road, 3.2 miles from Highway 1 and also seven miles southeast of Arroyo Grande. In Santa Clara County it was found at the west end of California Street in Palo Alto. In Marin County it was growing in the Chileno Valley 10.5 miles from Petaluma and in Sonoma County, 15.2 miles west of Skaggs Springs on the road to Stewart's Point.

The second wild species—*Carthamus baeticus* (Boiss & Reut.) Nym.—appears to prefer the drier, inland areas of the state. Like *C. lanatus*, the plants of *C. baeticus* are 1'-4' tall. The stems are smooth, however, and the weblike hairs on bracts and leaves are much reduced. The flowers are pale yellow. The heads are about 0.75" wide and 1.75" long. The outer involucre bracts are about twice as long as the head and flare outwards. They are narrow and have a few very prominent spines at right angles to the midvein.

Top to bottom—bracts, heads, and seed. Left to right—Cultivated safflower—*C. tinctorius*; *C. lanatus* and *C. baeticus*.



Cultivated and Wild Safflower

	Oil content %	Iodine value*
Cultivated safflower	30-36	140-145
<i>Carthamus lanatus</i>	16-20	138-144
<i>Carthamus baeticus</i>	16-21	137

* Measure of the drying properties of the oil.

C. baeticus is native to Portugal, Spain and adjacent areas of North Africa. It was first discovered in California in 1927 near Sonora. However, it was established in Australia at an early date, and may have been introduced from there.

C. baeticus has been collected in Orange County at the north end of Ocean-side Avenue in Olive, and east of the reservoir above Tonner Canyon; in Los Angeles County in the Francisquito Canyon; in Tuolumne County at the east edge of Jamestown, south of Juniper Mine; and along Highways 49 and 120 west and east of Jacksonville. In San Joaquin County it has been found east of Stockton on Highway 4 in two loca-

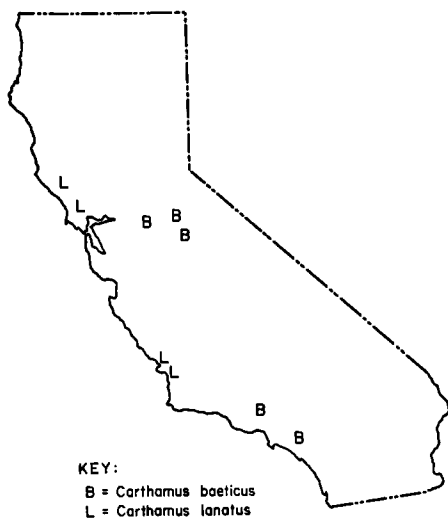
tions, one 0.2 mile west, and the other 1.3 miles east, of the Jack Tone Road.

Livestock will not eat well developed plants of the wild species, nor enter dense stands to graze other vegetation. Both species have weedy characteristics and have spread widely in some locations. They appear to be weeds of the roadside and of range areas, and have not become established in cultivated fields. In Australia, where these wild species were naturalized over 75 years ago, they are considered noxious weeds.

Cultivated safflower has not shown any weedy characteristics. It has not been able to maintain itself at the margins of fields nor on roadsides in competition with other species.

The wild species—and the cultivated safflower also—are susceptible to 2,4-D compounds when young and succulent. Applications at the rates used for weeds in small grain should effect control. Like most weeds, some of the seeds of the wild species will remain dormant for one or more years. Therefore, control measures must extend over more than one year.

Locations where wild safflower has been collected in California.



The seeds of the wild species contain much less oil than cultivated safflower. The Iodine Value—a measure of the drying properties of the oil—appears to be slightly lower in *C. baeticus* than in *C. lanatus* or the cultivated species.

The two wild species are not closely related to cultivated safflower. Cultivated safflower has 12 pairs of chromosomes, *C. lanatus* has 22 pairs, and *C. baeticus* has 32 pairs. Hybrids from *C. lanatus* crossed with cultivated safflower have been sterile. Crosses of cultivated safflower with *C. baeticus* have not been achieved.

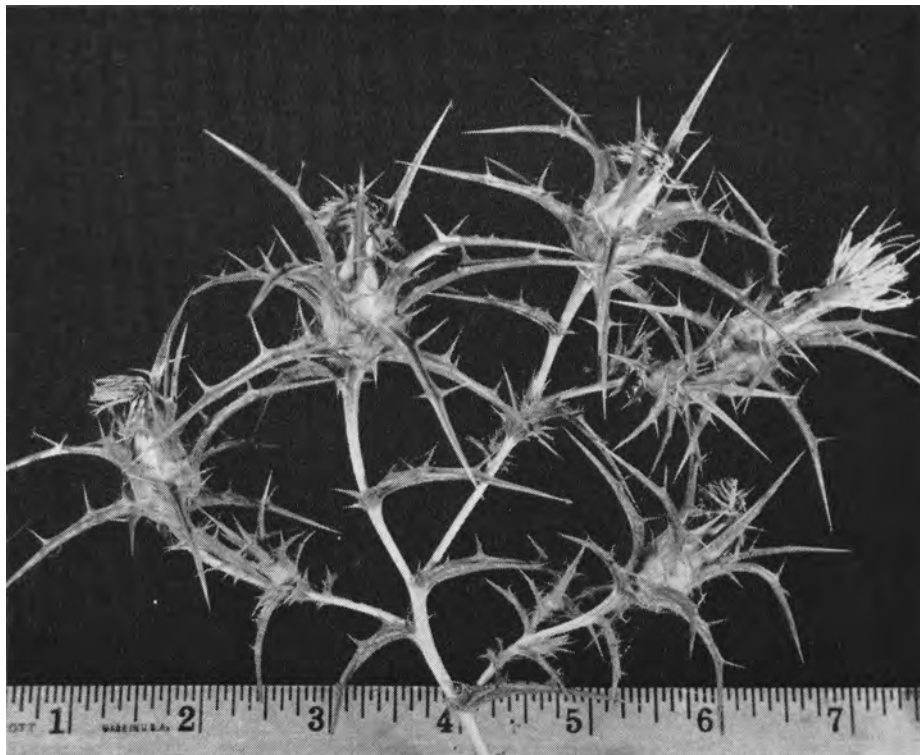
Studies are underway to explore the possibility of using other wild species to improve cultivated safflower. It may be

possible to obtain from the wild species such characteristics as disease resistance, drought resistance, and greater cold tolerance. As an example, both *C. lanatus* and *C. baeticus* are highly resistant to rust. Search for additional stands of wild safflower in California is continuing.

P. F. Knowles is Associate Professor of Agronomy, University of California, Davis.

Amram Ashri was Research Assistant in Agronomy, University of California, Davis, at the time the above reported studies were conducted.

The above progress report is based on Research Project No. 1041.



A portion of a branch of *Carthamus baeticus*,
and—below—
a portion of a branch of *Carthamus lanatus*.

