

Artichoke thistle in California *

Craig D. Thomsen and G. Douglas Barbe
California Department of Food and Agriculture

INTRODUCTION

Artichoke thistle Cynara cardunculus L., is a robust, rigidly spined perennial belonging to the sunflower family (Asteraceae). It is a member of the thistle tribe (Cynareae), a group that comprises some of California's most prominent alien rangeland weeds, including such weeds as Italian thistles, bull thistle, starthistles, knapweeds and Scotch thistle.

Artichoke thistle is native to the Mediterranean region but occurs as an aggressive and troublesome weed in grazing lands of Australia and New Zealand, countries of South America, and localized areas on annual ranges in California. Observing this plant in the Argentine pampas during the voyage of the beagle, Darwin wrote that "very many, probably several hundred square miles are covered by one mass of these prickly plants and are impenetrable by man or beast. Over the undulating plains where these great beds occur, nothing else can now live...I doubt whether any case is on record of an invasion on so grand a scale of one plant over the aborigines."

DISTRIBUTION

In California, artichoke thistle thrives best on annual ranges with a coastal influence and appears to be favored in soils having a high clay content. It is primarily a weed of uncultivated lands and has been most troublesome in areas with an extended history of heavy cattle grazing. Over the years, artichoke thistle has appeared in at least 31 counties. Contra Costa, Solano, and Orange counties have the greatest amount of infested land with over 95 percent of all artichoke thistle in the state. Santa Barbara has some locally dense stands, as does Camp Pendleton in San Diego County.

In these and other counties persistent control efforts by county agricultural commissioners has substantially reduced its presence and potential for spread, but it continues to be a problem plant in some areas, particularly Contra Costa and Orange County where much effort is still directed toward suppressing large populations or eradicating incipient infestations. Perhaps most notable are the extensive and exceedingly dense stands near San Juan Capistrano, where artichoke thistle sometimes dominates many acres of prime grazing lands. Some portions of land are so heavily infested that cattle grazing is no longer possible. One ranch in the area has made major efforts to reduce this weed in what is probably the largest private undertaking in California for controlling a noxious weed. During the spring when artichoke thistle is actively growing, up to 60 employees work nine-hour days, six days a week in control activities. Cowhands on horseback and in pickup trucks use sprayers, and also hand-chop thistles and place granular 2,4-D on the crown of the plant.

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ESTABLISHMENT IN CALIFORNIA

The initial establishment of artichoke thistle in some parts of California can be attributed to the introduction and cultivation of its close relatives, globe artichoke Cynara scolymus L. and cardoon C. cardunculus. In referring to the extensive spread of artichoke thistle on the South American pampas, Charles Darwin wrote that no cultivated plant has run so wild on so enormous a scale as the cardoon. Numerous early California plant observers mentioned either the cultivated artichoke or cardoon as escaping from cultivation and occurring as a localized weed.

In 1933, Walter Ball described a very large and spreading infestation of artichoke thistle that had become established over 70,000 acres on the hillsides of Solano, Contra Costa and Napa counties. He suggested that it was first introduced to the Benicia area of Solano County circa 1880 and was probably brought by immigrants from southern Europe as cardoon or artichoke for their vegetable gardens. It escaped and slowly spread over the hill pastures and fields near Benicia and to the adjacent counties, prompting agricultural authorities to declare the tri-county infestation a special weed problem in the state. Many of the early artichoke thistle infestations in the state probably originated in this fashion, being first planted for food at missions and ranchos and by other early settlers, and then later escaping as the more aggressive and stoutly spiny forms that were well adapted as rangeland weeds. William Brewer, Asa Gray, and Sereno Watson did botanical surveys in California from 1860 to 1964 and reported globe artichoke Cynara scolymus as occasionally spontaneous and had probably escaped from cultivation. Similar reports by S. B. Parish in 1897, Leroy Abrams in 1911, and Philip Munz in 1935 mentioned the cultivated artichoke as a weedy escape.

TAXONOMY AND CULTIVATED CLOSE RELATIVES

Botanists have been aware for some time that cardoon and globe artichokes are domesticated forms selected from their wild and weedy progenitors during centuries of cultivation. The weakly spined or spineless cardoon must have been domesticated from the wild thistle very early in southeastern Europe; it was cultivated by the ancient Greeks and Romans. Globe artichoke was apparently selected out of cardoon varieties in medieval monastery gardens and is not found wild anywhere in the world.

While taxonomists have conventionally placed the cultivated and wild forms of Cynara into two species, C. scolymus for globe artichoke, and C. cardunculus for cardoon and artichoke thistle, some taxonomists feel that they are one species, C. cardunculus. Recent studies by European researchers D. Zohary and J. Basnizsky support the idea that cardoon and globe artichoke are the same species but suggest that the Syrian artichoke C. syriaca Boiss., also contributed to the genetic makeup of the cultivated artichoke. Hybridization studies with C. scolymus, C. cardunculus, and C. syriaca, demonstrate that both wild species are interfertile with the cultivated artichoke. The different forms are thus not distinct species but rather a variable complex derived from wild populations.

When vegetatively propagated by division of their perennial crowns, cultivated varieties of cardoon and globe artichoke maintain their desirable edible properties, but when grown from seed, they are quite variable and rarely of horticultural value. Some plants grown from seed revert back to the wild form, developing inch-long spines and stoutly pointed bracts, and as such are considered artichoke thistles. During our field studies, we found populations of cardoon persisting from cultivation with much seedling variation, ranging from the typical spineless cardoon through a host of intermediate forms to outright artichoke thistles.

The three forms of Cynara may be separated as follows:

Bracts of flower head notched at the tip, a rudimentary spine in the notch
stems and foliage without spines.....C. scolymus "globe artichoke"

Bracts of flower head tapering to a stout point; stems and foliage armed with
stout spines, or spines absent

Stems and foliage with small, weak spines, or none; spines at
base of flower head absent....C. cardunculus "cardoon"

Stems and foliage and base of flower head armed with stout inch-
long spines.....C. cardunculus "artichoke thistle"

CHARACTERISTICS

Artichoke thistle has particular attributes that make it a successful weed
on rangelands. Among these are:

- 1) Evolved in a Mediterranean climate, in areas with a history
of livestock grazing
- 2) Heavily spined throughout
- 3) Very large seeds
- 4) Basal rosette
- 5) Rapid growth with a robust habit
- 6) Perennial life cycle with a large, swollen root system
- 7) Long growing season

Important to the status of artichoke thistle as a range weed in California
is its evolution in a climate that approximates parts of California where
artichoke thistle flourishes. The heavy grazing pressure by livestock in areas
where this weed evolved undoubtedly resulted in the selection of hardy and
aggressive spiny forms that are well-suited to the over-grazed ranges so
typical of where artichoke thistle thrives here. Zohary has hypothesized that
many of the spiny and unpalatable weeds of the Old World evolved in areas where
severe overgrazing was commonplace.

Spininess is a means by which plants protect themselves from grazing
animals. This protective feature appears repeatedly in the plant life of weedy
rangeland communities and plants with such protection are often at an advantage
under heavy continuous grazing pressures. Many of the states' noxious range
weeds are equipped with spines, barbs, thorns, etc., the principle reason why
they are considered undesirable. Artichoke thistle is well-endowed with
inch-long spines throughout the plant and has phyllaries with tips that
terminate into a sharp point.

Other characteristics also help insure its success. Artichoke thistle
has unusually large seeds, a property that can give a competitive edge to
developing seedlings. Large seeds have ample food reserves enabling seedlings
to quickly establish a root system and a critical plant size necessary for
capturing resources more readily than neighboring plants. Artichoke thistle's
perennial habit makes it an effective competitor against annual plants. The
root system stores enormous quantities of available food reserves, which allows
for a rapid development of basal leaves with the onset of autumn rains. This
rapid deployment of a leaf canopy which frequently reaches diameters of five
feet results in the shading and suppression of neighboring annual grasses and
other vegetation. Under high densities, layers of dried, decaying leaves form
a thick mulch-like thatch that effectively prevents annual grasses from
establishing the following year.

Artichoke thistle has a long germination period and with adequate moisture
can sprout throughout most of the year. It continues to be active after most
annuals have completed their life cycles. The deep, tuberous root system

provides artichoke thistle with the means to extract water at greater depths after shallower soil horizons have been depleted and consequently enables it to continue growth after rains have long subsided. Thus, artichoke thistles are frequently active in late spring and summer when competition from other plants are at a minimum.

ECOLOGY

Artichoke thistle represents one of the many immigrant plants that have successfully invaded California rangelands. Many reasons have been given for the enormous success of Old World weedy plants which in many areas have resulted in the replacement of the native plant cover by an alien weedy flora.

One underlying driving force that contributes to the local success of a noxious weed such as artichoke thistle is the manner in which rangelands are grazed and managed. As selective grazers, animals first consume the most palatable forage and avoid the less desirable plants. Under continuous grazing, undesirable weedy plants -- those that are avoided by livestock because of poisonous compounds, bitter flavor, lignified foliage, spines, thorns, etc. -- often increase where overgrazing has removed plant cover and competition. Undesirable weedy species possessing such characteristics are favored and will increase as more desirable species are grazed out. Over time, undesirable range weeds, some of them being noxious will inevitably increase, often to the extent that they may eventually occur as the dominant vegetation. This process of change has taken place in many areas of the state where heavy continuous livestock grazing has occurred and continues today.

Immigrant annual plants, most notably the grasses, are well known for having entirely replaced the original plant cover that once characterized much of California's herbaceous rangeland vegetation. Less appreciated are various noxious weeds that have gradually encroached or in some areas have become so abundant that control programs have been implemented to reduce their influence. Among these are:

Carduus pycnocephalus
C. tenuiflorus
Carthamus baeticus
C. lanatus
Centaurea calcitrapa
C. solstitialis
C. virgata var. squarrosa
Cirsium arvense
Cynara cardunculus
Onopordum acanthium
Salvia aethiopis
Scolymus hispanicus
Senecio jacobaea

Large infestations of noxious range weeds indicate range environments that are badly degraded. Landscape changes that typically accompany the changes in botanical composition include reduced productivity, increased soil compaction and erosion, deterioration of drainages and riparian environments, and a decrease in wildlife species, changes that suggest desertification. The proliferation of noxious weeds such as artichoke thistle, then, often represent rangeland problems that go much deeper than unwanted infestations of weeds. As one South African botanist in assessing rangelands of that country put it, "in many cases, noxious weeds should be regarded as symptoms of a deeper seated malaise: many unpalatable species which are currently regarded as weeds increase only as a result of mismanagement and might better be regarded as indicators of this, or as 'caretaker species' which provide at least some cover and protection to the soil until man mends his ways."

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