



Desert saltbush is one of many salt-tolerant shrubs and grasses that provide forage for livestock and wildlife in rangelands such as the Owens Valley. Many of these halophytes are being studied as sources of salt tolerance in other plants.

Halophytes as a rangeland resource

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More than 40 million of California's 100 million acres are rangelands. The forest, grassland, and rangeland environments comprise about two-thirds of the land area of the state, and more than 50 million acres are grazed. The desert saltbush, an abundant, shrubby inhabitant of some of California's driest, saltiest rangelands, is one of many salt-tolerant shrubs, trees, and grasses that have become increasingly valuable as resources for arid and saline lands. These salt-tolerant plants (halophytes) provide forage for livestock and wildlife in rangelands throughout the West. Furthermore, many have been shown to be adaptable to genetic manipulation by selection or breeding.

The introduction of genetic traits from hardy species into less hardy but more desirable species has been investigated in many halophytes. Workers at the University of California, Davis and Riverside, as well as at other universi-

ties throughout the western United States, have been able to improve palatability and forage yield in such natives as saltbush and sagebrush; several introduced range grasses (including bermudagrass and wheatgrass) have been used in gene-transfer experiments to improve salt tolerance in other lines or even other species; and several more conventional crops such as tomatoes, alfalfa, wheat, and sunflower have been crossed with their wild, salt-tolerant, and sometimes exotic relatives to produce lines of increased agronomic interest.

In studies done at Riverside several years ago, several saltbush (*Atriplex*) species were found to have a crude protein content in their foliage of up to 25 percent dry weight. When cultured as a

Foliage of some saltbush species contains up to 25 percent crude protein. One native California species produced 9 tons of forage per acre per year.



forage crop, one species native to California produced 18,000 pounds of forage per acre per year. Native species of saltbush are salt-, drought-, and heat-tolerant, insect-, disease-, and fire-resistant, easily cultivated, highly productive, nutritious, and palatable, and they make attractive ornamentals.

The recognition that some halophytes can be adapted to agriculture has led to experiments in marginal soils with special problems. For example, many salt-tolerant shrubs and grasses have been tested on mine spoils, oil-field locations, and other drastically disturbed sites. Success in the revegetation of such sites involves tolerance to heavy metals, salts, and drought, seedling survival under prolonged stress, capability of rapid growth under short-lived favorable conditions, rooting characteristics that ensure deep-zone exploitation of water and nutrients, and root systems and ground-covering capacity that help stabilize soils.

Many products useful to humans can be derived from halophytes. Plantings of jojoba (*Simmondsia chinensis*) have been made in several parts of the state. Jojoba is a salt-tolerant shrub that produces a high-quality wax used in cosmetics and industrial products. A number of halophytic grasses and composites produce edible seeds. Several species, most notably guayule (*Parthenium argentatum*), produce latex in usable quantities.

There are some drawbacks to their use. Some palatable shrubs can be toxic to livestock when consumed in excess. For example, saltbush and other shrubs may accumulate toxic concentrations of oxalates, and *Halogeton* is a well-known poisonous halophyte. Many have thorns or spines; others may not respond well to grazing pressure. Some shrubs used in roadside landscaping may attract too many wildland animals to roadways (although other halophytes, such as the ice plant, do not). The same features that make some plants desirable for reclamation purposes may make them troublesome as weeds under other circumstances. For example, salt cedar (*Tamarix*) is a deep-rooted shrub or tree that can rapidly invade streambanks and is quite inefficient in its use of water in such locations.

The potential benefits of halophytes are still being explored. They are among the important resources of rangelands, areas that not only provide grazing lands for livestock, habitat for wildlife, and watersheds, but also may be considered as repositories for still undefined genetic materials.

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