Early Use of Soaptree Yucca as Emergency Feed

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By 1900 most rangelands in the southwestern U.S. were stocked to a level where periodic droughts left livestock without sufficient feed. Droughts occurred at intervals of 3 to 10 years and lasted up to several years. Ranchers quickly looked for emergency feed. The lack of transportation limited availability of supplements such as fodder crops from irrigated lands. The only alternatives were native plants that might be more palatable if properly prepared. Many plant species were considered and used, but early in the century the most widely and frequently used emergency feed was soaptree yucca *(Yucca elata),* also called soapweed, palmilla, or ooce.

Soaptree yucca resembles a palm, growing to 30 feet in height and crowned with a dense tuft of swordlike leaves. This species is one of the more common and conspicuous plants of the desert Southwest and is the state flower of New Mexico. Beautiful clusters of waxy-white flowers adorn the plant in May and June. This impressive plant is often reproduced on canvas, sculpture, and film by artists and photographers.

Soaptree yucca occurs from western Texas, through southern New Mexico and southern Arizona, and south into northern Mexico. It is found on dry, sandy plains and mesas to clayey and gravely soils. Originally, its most common associate was black grama. Soaptree yucca persists in association with mesquite, snakeweed, and other plants of low palatability.

If within reach, the succulent flowers and flower stalks are eagerly sought by cattle. The growing tips in the center of the upper circle of leaves are also grazed to some extent while young and fleshy, especially during a

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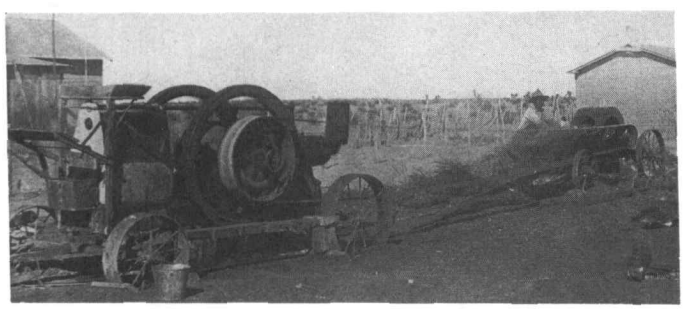
The leafy upper portion of the soapweed yucca plant was sometimes chopped to make ensilage. Stems or, more commonly, stems and leaves, were chopped and fed immediately from troughs or bunkers (photo by C.E. Fleming, 1916).

During the drought of 1915-1918, soaptree yucca was harvested by hand and hauled in wagons to feed cattle at watering places or in dry lot in southern New Mexico and Arizona (photo by C.L. Forsling, 1918).

On the Jornada Range Reserve, now the Agricultural Research Service's Jornada Experimental Range near Las Cruces, New Mexico, dead leaves were removed by burning the soaptree yucca stems prior to chopping and feeding (photo by C.L Forsling, 1918).



Specially designed choppers and cutters were manufacturecd for processing soaptree yucca. The one pictured here was belt-driven and powered by the gasoline engine shown at the left. The finished product appears to the right of the photograph (photo by C.L. Forsling, 1918).

dearth of other forage. The sharp points on the leaves discourage grazing, but hungry cattle learn to chew the leaves from the center or base, out toward the sharp end. In recent times, Nelson et al. (1970) observed cattle grazing soaptree yucca on the Jornada Experimental Range in southern New Mexico from November through February, when availability of more succulent forage was limited. Compared to other plants, soaptree yucca is harsh, tough forage.

Chopping Soaptree Yucca

Soaptree yucca was being fed to cattle in the Southwest soon after the turn of the century, but it was utilized most extensively as an emergency feed during a drought from 1915 through 1918. As early as 1910, E.J. Moyer of Willcox, Arizona, fed soaptree yucca to 40 cows for 3 months. J.H. Lowdon of Bowie, Arizona, began feeding the plants in 1913. He began by testing the method on 20 cows and was feeding soaptree yucca to 500 cows by 1918. According to Jim Jardine (1917), Chief of the Office of Grazing Studies in the Forest Service and later in charge of all experiment stations operated by the U.S. Department of Agriculture, C.T. "T-Hook" Turney of Mesilla Park introduced the practice to New Mexico in 1914. Mr. Turney was cooperating with the U.S. Department of Agriculture on the Jornada Range Reserve (now the Jornada Experimental Range) with more than 5,000 cattle. Turney began more extensive feeding trials using the plant tops in 1915.

Prior to 1917, soaptree yucca was harvested and chopped into small pieces with hand axes. One person was required for every 40 cows, and the work was tedious. Hand chopping often resulted in cows choking in attempts to swallow pieces that were too large. At least one cow on the Jornada Range Reserve died from starvation as a result of a large piece wedged in the esophagus. Bloat was an occasional problem.

Soaptree yucca was later processed with machines in combination with extensive labor. According to R.H. Williams (1918) with the University of Arizona, soaptree yucca was initially processed with tools and machines designed for other uses. Cook and Johnson of Willcox, Arizona, cut the stems into 12- to 14-inch lengths, split them, and fed the pieces through a 12-inch silage cutter. Powers and McCord of San Simon, Arizona, used a large knife attached to a lever to slice stalks. In May 1917, a man in Thatcher, Arizona, devised and built a yucca slicer, but further chopping with axes was often required. J.H. Ranch, north of Wilcox, arranged a vertical pumpjack with a stroke plunger to cut the stems into short pieces. It soon became apparent that using ordinary silage cutters and other ill-adapted equipment was unsatisfactory. Heavier machines were needed and sought from machine shops.

By 1918, several specially designed machines were made for reducing the soaptree yucca stems to fodder. A wood-pulping "hog" for cutting up wood for paper pulp was adapted with some success. The wood-pulping "hog" was modified by screwing a set of small teeth into a cylinder so that each tooth could strike at a different time. Output was about 1 ton per hour.

One machine, called the "Ideal", was manufactured by Peterson of Deming, New Mexico. Another machine, the "Crackerjack", was sold by the firm of Krakauer, Zark, and Moye of El Paso, Texas. An unnamed machine was manufactured by Davies in Deming. It had triangular knives like those on the cutter bar of a mowing machine but bolted to the face of a cylinder. The knives sliced the stems into pieces 1/2 to 3/4″ thick.

Successful machines were all modifications of a single

plan. A heavy cast cylinder revolved on a horizontal shaft and carried knives or cutting teeth that passed close to a chopping block to which the material was carried by some feeding mechanism or by gravity from an overhead hopper. A 12 to 14 hp gasoline engine was used to power the machines. These machines would chop from 1-1/2 to 2 tons per hour. With the largest machines, a crew of three persons could chop from 15 to 20 tons of soaptree yucca in a 10-hour day. One machine could provide enough food for 500 cows with only one-fifth the labor required for hand-chopping.

Early machines had wheels and moved from place to place. Near corrals, the engine which pumped water could be used to power the chopper. During the worst of the drought, cattle in very poor condition were fed at watering places because they were too weak to walk very far to water.

Harvesting Soaptree Yucca

As the plant grows, the lower leaves in the cluster die and hang close to the stem, where they remain. C.L. Forsling (1918), who was superintendent of the Jornada Experimental Reserve from 1917 to 1920, claimed that these dry leaves were low in nutritive value, low in palatability, and high in crude fiber content, making digestion difficult. The dead leaves were burned before plants were harvested on the Jornada Range Reserve. The succulent stem and green foliage were not harmed by burning. One person could burn the dead portions from 8 to 10 tons of soaptree yucca per day. A dead, dry trunk was used as a torch. This usually posed no wildfire hazard because there was not enough litter on the ground during droughts to spread the fire. When conditions were conducive to wildfires, plants were hauled to the chopping machine and arranged on the ground in rows, two plants wide with the butts together and the green tops to the outside. This arrangement prevented the fire from becoming hot enough to burn the green leaves or stems. Shrinkage was about 30% of the original weight, so the advantage to burning before transporting was obvious. Williams (1918) recommended against burning. Cows were less subject to bloat and scouring because the dry leaves furnished considerable bulk and dry matter. Dry leaves did not interfere with chopping if plants were placed in the hoppers head first.

Four persons with two wagons and eight mules could cut and haul 8 tons per day when the haul was not over 2.5 miles. One person acted as foreman to direct operations, select plants for cutting, and burn off dead leaves. Two persons with axes cut the plant at the ground and loaded them onto the wagons. The fourth person arranged them on the rack and drove the team. On the Jornada Range Reserve, 150 plants averaging 35 lbs each were removed from an acre, the equivalent of 4,250 lbs of fresh weight per acre.

Feeding Soaptree Yucca

Best results were obtained by feeding the soaptree yucca in troughs or racks. It was possible but wasteful to feed on hard ground. At most ranches, the plants were fed soon after chopping. On the Jornada Range Reserve, about 150 tons of chopped heads and leaves were put into a silo in December 1915. The silo was opened the following March and 10 tons were fed. Cows relished the ensilage but had difficulty eating the large chunks. The silo was opened again in January 1918, and 30 tons of the ensilage were fed. About 15 lbs of a mixture of soaptree yucca ensilage and cottonseed meal, in a ratio of 10 lbs to 1, were fed to each cow daily. The ensilage was well preserved, and the leaves had softened, but the fiber was still tough.

By 1918, prolonged drought had prevailed over much of the Southwest for several years, and feeding of soaptree yucca was widespread. On the Jornada Range Reserve, cows in poor condition were separated from the main herd and held in a feedlot. They were fed 25 lbs of chopped soaptree yucca and 3 lbs of cottonseed meal per day for 20 to 30 days. After an additional 35 to 40 days on a 15- to 20-lb ration, 85% of these cows were put back on the range and given 1.5 lbs of cottonseed cake daily. More than 1,000 cattle were placed on feedlots and fed during the first six months of 1918. A total of 306 tons of soaptree

Ensilage made from soaptree yucca is ready to be placed in a pit silo. Note the fibrous nature of the ensilage (photo by C.E. Fleming, 1916).

yucca were fed during this period. Loss due to starvation was approximately 1% of the herd. Nearby ranches without extensive feeding had losses of 10 to 20%. In time of drought, the measure of range management success was the percentage of livestock carried over the critical period without excessive cost and without the sacrifice of the breeding herd or a great reduction in the calf crop.

Almost all hungry cows would eat soaptree yucca stem pulp after a few hours and leaves during the first day. Williams (1918) recommended feeding only 5 to 10 lbs the first day to avoid bloat and scours. He recommended that the quantity then be increased by 1 to 3 lbs daily until the cows were given all they could eat in a half hour. If given all they wanted, cows could consume up to 50 lbs per day. Williams also reported that calves could be taken from

their dams when 3 weeks old and raised on yucca and cottonseed meal.

E.O. Wooton (1918), the first Officer-in-Charge of the Jornada Range Reserve (1912–1915), reported that alfalfa had 2.5 times as much total dry matter, over 5 times as much crude protein, more than 4 times as much ether extract (usually called fat), and twice as much nitrogen-free extract (usually representing carbohydrates) as an equal weight of soaptree yucca. Forsling (1918) reported that soaptree yucca had 3 times as much nitrogen- free extract as alfalfa. But these data are contradictory to other findings. Williams (1918) reported that soaptree yucca had 60% more ether extract and 50% more nitrogen free extracts than alfalfa. Of course, sample collection, analysis, and calculation methods varied. Apparently, soaptree yucca contained enough nutrition to improve cattle health during the drought. More recent analyses indicated that protein content of leaves was from 10 to 11% during winter, with 2.5% ether extract, 43.5% acid detergent fiber, and 10.6% acid detergent lignin (Nelson et al. 1970). In this study, the protein content was higher than and the fiber content was similar to that of most grasses sampled at the same time.

Conservative, Selective Use

Both Forsling (1918) in New Mexico and Williams (1918) in Arizona were concerned with over-utilization of these slow-growing plants. Forsling estimated that a soaptree yucca plant required 10 years to reach the size for profitable cutting. Williams estimated that a plant required 25 to 40 years to attain a weight of 50 lbs. Both recommended that the plant be used only for emergency needs. However, Wooton (1918) claimed that a new crop about as good as the original may be expected from cut-over land in 3 or 4 years. Half of the plants on the Jornada Range Reserve were under 36 inches, tall, and those were left for regeneration and for protection against wind erosion. Occasionally, plants tall enough for the seed stalks to be out of the reach of cattle were left to produce seed. Judging from the number of soaptree yucca plants in the southwestern U.S. today, it is obvious that they have been well preserved.

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With the exception of invitational papers, articles in the *Journal of Range Management* are published in the order of acceptance. Our goal is to publish an approved manuscript within 3 to 9 months from time of acceptance. *Rangelands* articles for an issue are selected to provide a variety of subject matter within a priority system based on time of acceptance. Exceptions are for material which has a "timeliness," such as articles on subject matter or locations related to the annual meetings. *Rangelands* also includes a variable amount of Society business, which makes it difficult to publish a uniform number of articles.

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