

Cattle feeding trials with

Acorns and Oak Leaves

indicate need for supplementing dry range forage

The incidence of deformed calves—acorn calves—has decreased with the widening use of supplemental range feeding and improved breeding herd management. Some stockmen operating in oak areas in California have long considered that consumption of acorns by pregnant range cattle contributed to the birth of deformed calves, to loss of weight, abortions, and even death. Other stockmen have claimed acorns were not harmful but were good cattle feed.

To determine the effects of ingestion of acorns and oak leaves on cattle a series of studies was conducted at the San Joaquin Experimental Range. Acorns of the blue oak—*Quercus douglasii*—were used because they ripen earlier and are available over a longer period than the acorns of the interior live oak—*Q. wislizenii*. The interior live oak is common in the Sierra foothills and many stockmen consider the live oak acorns to be more deleterious than those of the blue oak. A short feeding trial was made with acorns of the water oak—*Q. lobata*—known also as the valley oak because it has followed many of the larger streams up into the foothills. The water or valley oak acorns usually are not considered injurious to cattle.

The acorns and leaves for the trials were hand-harvested and fed so the daily consumption could be recorded. Except

for the initial test, ripe acorns were harvested from the ground and stored until fed. The leaves were harvested daily

Feeding Acorns

In the first trial of the series the cows were group fed all the acorns they would eat daily. In addition the animals had free access to natural annual-type range forage. At the start, the forage was completely dry and the acorns had not commenced to fall freely from the trees. Feeding was started at that time because some of the cows were seen browsing acorns from the trees. Acorns from most blue oaks seemed quite palatable to the animals but apparently the nuts from some trees were not, so the acorns were fed as a blend from several trees. The cows were removed from the study as they calved.

From August 5 to October 1, when the range forage was completely dry, the animals had an average daily acorn consumption of 7.8 pounds and suffered an average weight loss of 147 pounds. During the same period the experimental station's unsupplemented breeding herd had an average weight loss of only 24 pounds while the supplemented breeding herd—given a one-pound of cottonseed cake per head daily—made an average

10-pound weight gain. However, the two herds had limited access to acorns.

Substantial rains and warm weather in October resulted in rapid initiation of a new forage crop. Average daily acorn consumption by the test animals increased to 10.2 pounds for the month and the average weight loss was only 3.0 pounds. In November, when increasing amounts of green forage became available and only two cows remained in the test, average daily acorn consumption increased to 17.5 pounds and the cows made an average 58-pound gain.

In the final 33 days of the test the one remaining cow averaged a daily acorn consumption of 18.6 pounds and a total weight gain of 40 pounds. Thus on dry forage heavy weight losses occurred with acorn consumption, but when some green forage was available there were weight gains.

During the final 33-day period the test cow ate 37.8 pounds of acorns one day and, in the following seven days, there were two days when daily consumption was over 31 pounds. There was no evidence of illness at any time. Throughout the acorn feeding period the droppings had a sour smell and contained fragments of acorn shell and kernel.

One cow, in the 175th day of gestation at the start of the study, dropped a scant 31-pound bull calf that was classi-



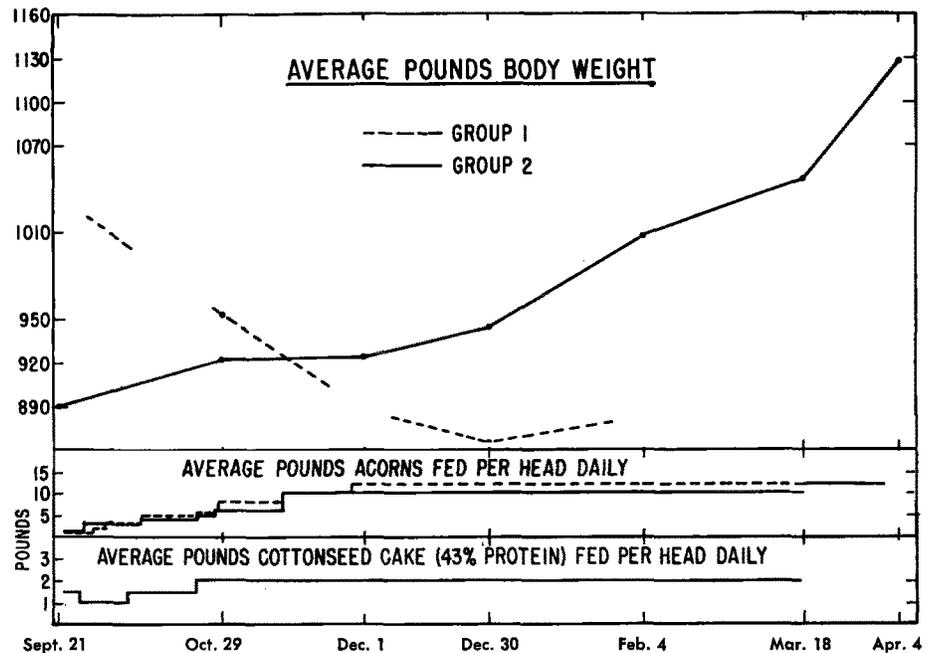
Left—Acorn calf and normal calf of the same age. Right—An acorn calf nursing its mother while a normal calf stands nearby.

fied as an acorn calf. The calf was short-legged and small boned, with slightly enlarged leg joints; a crooked spine, with a small hump behind the shoulders, caused it to walk with a sidling gait. The calf was not thrifty and at about 2½ years of age weighed only about 400 pounds. Shortly afterward it went into a decline and died.

A later feeding test was conducted to see whether ill effects of acorn consumption with dry forage could be offset by the daily feeding of a protein supplement. Seven cows were divided into two groups for the study. Three cows in Group 1 received a maximum of 12 pounds of acorns per head daily. The four cows in Group 2 received a maximum of 10 pounds of acorns and two pounds of 43% cottonseed cake per head daily. Each group was in a separate pasture and feeding started on September 23. Difficulty was encountered in getting the animals to eat their daily allotment of acorns and it was not until November that full consumption was achieved. Difficulty was encountered also in Group 2 when two of the cows developed a definite preference for acorns over the cottonseed cake. It became necessary to feed the cottonseed cake first and then return later in the day to feed the acorns.

Rains late in November were sufficient to start new forage but growth was slow and the forage did not become sufficiently abundant to maintain cattle weights without supplements until mid-February. The feeding of acorns was continued in both groups until April 2.

The cows in Group 1—without the protein supplement—lost an average of



The feeding of a protein supplement to range cows subsisting on dry range forage and blue oak acorns (Group 2) resulted in moderate weight gains, whereas, other cows (Group 1) on similar feed but not receiving the supplement suffered heavy weight losses.

1.74 pounds per head daily between September 21 and December 30. The Group 2 animals—receiving cottonseed cake—made an average gain of 0.54 pound per head daily, during the same period. Thus the cottonseed cake was an effective supplement in preventing the marked weight losses occurring from acorn consumption on dry forage. While both groups made weight gains in the latter portion of the trial, as green forage became increasingly available, the average daily gain of Group 1 was only 0.67

pound per head as compared to 1.41 pounds per cow in Group 2.

Neither group produced an acorn calf. However, one cow in Group 1 aborted in her sixth month of gestation but it is questionable whether the acorns were responsible. In addition, one cow in each group failed to calve and the remainder produced normal calves.

A small supply of valley oak acorns made it possible to conduct a 30-day feeding test with two cows. Each animal

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Cattle Feeding Experiments with Acorns and Oak Leaves

Trial	Age years	Starting weight lbs.	Feeding period	Acorns or leaves fed	Average daily consumption lbs.	Roughage	Starting stage of pregnancy. Days	Calving	
1	4	1257	Aug. 10–Nov. 9	Acorns	9.0	Natural range	192	Normal	
	4	1214	Aug. 10–Dec. 6	"	11.2		175	Deformed	
	4	1142	Aug. 10–Feb. 12	"	12.3		103	Normal	
2	10	983	Sept. 23–Apr. 2	Acorns	9.94	Natural range	...	None	
	(1)	3	" " " "	"			20	Aborted	
	3	957	" " " "	"			33	Normal	
	(2)	3	842	" " " "			"	...	None
	3	792	" " " "	"			2	Normal	
	3	930	" " " "	"			33	Normal	
3	997	" " " "	"	8.65	and supplement	24	Normal		
3	4	1165	Oct. 14–Dec. 14	Leaves	1.36	Natural range	67	Normal	
	4	1045	" " " "	"	1.19		61	Normal	
	3.6	1010	" " " "	"	1.36		59	Normal	
4	5	1173	Nov. 20–Dec. 19	Acorns*	9.0	Dry grass and straw	75	Normal	
	4	1114	" " " "	"	9.0		120	Normal	
5	2	644	Nov. 1–Dec. 8	Acorns	5.14	Oat hay and straw	28	Normal	
	2	649	" " " "	"	5.92		...	None	
6	2.5	815	May 2–May 24	Leaves	11.25	Some oat hay	10	Normal	
	2.5	803	" " " "	"	"		...	None	

* Water, or Valley, oak.

Nutritional needs of Fruit Trees

indicated by leaf analysis

Deficiencies and excesses of essential elements occur in various California orchards. A major research project is aimed at detecting those faults and restoring the fruit trees to healthy and profitable condition.

Soil analysis has been used for detecting deficiencies, but too many variable factors prevent accurate diagnosis by this method. Knowledge obtained in the

laboratory can not always be applied to the complex tree-root-soil relationship in the orchard. Soil analysis for the so-called trace elements—zinc, iron, manganese, and boron—has generally proved unsatisfactory. These elements are deficient in important amounts in California orchards, and methods other than soil analysis must be used to detect such deficiency.

Leaf analysis has proved to be an accurate approach to the study of nutritional deficiencies in fruit trees, and has solved several nutritional problems on widespread acreage throughout the state. Certain soil and root conditions can not be measured accurately by chemical examination of the soil. For example, a dense, heavy soil, although well supplied with nutrients, frequently limits root extension and sufficient nutrient absorption for normal growth. These and other conditions which produce a poor root environment are not easily measured individually, but their over-all effect is frequently reflected through the leaves.

The outlook for continued progress in detecting nutritional deficiencies through leaf analysis appears promising.

Omund Lilleland is Pomologist, University of California, Davis.

K. Uriu is Assistant Pomologist, University of California, Davis.

ACORN

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was confined in a separate pen and fed nine pounds of acorns daily with harvested dry range grasses mixed with some barley straw. The acorns seemed to be palatable and were eaten readily. At the close of the test one animal had lost 17 pounds and the other had gained 20 pounds. Both cows subsequently dropped normal calves.

In the fourth feeding test, blue oak acorns were fed to two-year old heifers for 37 days to see if they would consume sufficient quantities to cause digestive difficulties. The heifers were pastured on poor range until November 1 when they were placed in separate pens. Each animal was given a daily roughage ration of about 1.3 pounds each, of oat hay, barley straw and cottonseed hulls. The amount of roughage fed was kept low as an inducement to greater acorn consumption. A supply of acorns—changed daily—was kept before the heifers at all times.

One heifer had an average daily acorn consumption of 5.14 pounds that reached a maximum of 13.5 pounds the fourth day. After the fourth day's maximum she vomited some intact or coarsely cracked acorns with previously eaten roughage. She displayed no other ill effects except a mild diarrhea the 23rd day of the test.

The second heifer had an average daily consumption of 5.92 pounds of acorns with a maximum of 21.5 pounds,

also on the fourth day. The fifth day she showed little interest in her feed and ate only about a pound of acorns. The sixth day she was slightly ill, gaunted and still not interested in eating but in a few days she returned to normal.

Blue Oak Leaves

A 62-day test was designed to study the effects of feeding mature blue oak leaves—no acorns—to pregnant cows subsisting on dry range forage. Each animal was about 60 days pregnant at the start of the feeding trial. The animals were confined to individual stalls a few hours each day and each one given 2½ pounds of blue oak leaves. When not in their stalls the cattle had access to natural dry range forage.

Shortly after the start of the test there was a rain that was sufficient to leach the forage of some of its palatability and nutritive value but not enough to start a new forage crop. Half way through the test heavy rains started good germination and the new forage was well established when the trial was stopped.

For the test, fully mature leaves were harvested daily and only from trees with the greener leaves. The leaves were quite leathery and seemed to be of low palatability. The cattle would not eat the leaves from some trees so the daily feedings were mixtures from several trees, but even then the average daily consumption per head seldom reached two pounds. The use of feed flavors did not increase consumption.

There was no indication of illness during the test period. However, there was a marked average weight loss of 2.0 pounds per head daily. Such weight loss was excessive for dry cows under the existing forage conditions but all the cows subsequently dropped normal calves.

In a late spring trial two heifers were fed blue oak leaves for a 23-day period to learn whether a staggering condition—sometimes known as the jimmies—would result. In the late spring of certain years staggering cattle are troublesome when they are being driven some distance from one pasture to another.

The two test heifers were confined together in one lot and received no feed other than the blue oak leaves, except a little oat hay in mid-trial. At the start of the test the leaves from the initial bud opening had reached full size and stem growth was active. This new growth was collected daily and fed in amounts greater than consumed. The leaves seemed to be palatable and were eaten readily. Average daily consumption was 11.5 pounds with a maximum of 20 pounds. No ill effects were noted during the feeding period and none developed at the end of the trial when the animals were driven some distance on a warm afternoon. The cause of the staggering condition remains unknown.

Kenneth A. Waggon is Specialist in Animal Husbandry, University of California, Davis.

The above progress report is based on Research Project No. H-1005.