CHEMICAL COMPOSITION, CORN SILAGE LOSS STUDY—GLENN COUNTY 1967

Location of samples		Chemical composition of ensiled samples—average of four replications						
Level	distance from floor	Crude fiber	Dry matter	Crude protein	Estimated TDN*	Ash	NFE	Fat
	inches	%	%	%	%	%	%	%
13	128	31.6	11.32	12.9	65.8	10.6	43.2	1.7
12	114	34.8	15.84	7.7	68.9	6.7	49.4	1.5
11	101	34.0	18.09	6.4	69.9	6.5	51.2	2.0
10	89	33.3	18.62	6.5	69.8	6.1	52.2	1.8
9	77	28.4	23.7	6.8	70.0	6.4	56.3	1.7
8	67	27.7	24.08	7.3	69.9	6.8	56.8	1.8
7	60	28.3	22.82	7.0	69.9	7.2	55.7	1.8
6	55	28.2	22.95	7.3	69.6	7.4	54.5	2.5
5	46	27.2	24.58	7.1	69.8	6.9	56.6	2.2
4	36	27.1	24.13	7.0	69.9	7.0	57.2	1.8
3	26	27.3	24.08	7.2	69.8	7.2	56.3	1.7
2	13	27.3	23.48	7.9	70.7	7.9	55.3	1.6
1	0	29.3	21.12	7.5	69.6	8.9	53.0	1.3
Average of 52 samples before ensiling		28.4	25.6	7.2	69.7	7.1	55.47	1.8

* TDN estimated using Pennsylvania State University Forage Testing Laboratory formula for corn silage.
Est TDN = 77.07 − (0.75 CP + 0.07 CF)

reduce dry matter losses. For example, a settle-packed tower silo had a much higher dry matter loss than a continuously packed and immediately covered bunker silo. More samples were used in the 1967 study, and the earlier trends were more clearly defined.

The complete proximate analyses of the 52 samples stored at 13 levels in an uncovered bunker silo in 1967 are presented in the table. The table also gives the average chemical composition of the 52 samples not ensiled. The increased water content in the top 4 ft of stored silage was undoubtedly caused by the 10.24 inches of rain which fell during the 130-day storage period, as was the moisture increase in the lower 2 ft of the stored silage. An apparent increase in percentage of crude protein, ash and crude fiber content in the upper few feet of the silage mass apparently resulted from the more rapid leaching of the more soluble nutrients by the rain. Judging from the reduction in the upper layers and the gain in the middle layers of the nitrogen-free extract (NFE), which represents the more soluble parts of the silage, nutrients must be leached from the upper to the middle and lower layers of the silage mass, depending upon each component's solubility. Although run-off was not measured, it is conceivable that some of the more soluble nutrients were leached through the silage mass and lost as part of the silage run-off, as the decrease in dry matter in silage near the floor of the silo seems to suggest.

The most severe losses appear to have occurred as a result of combustion of dry matter in the silage mass, particularly in the upper one-half of the silage. Average losses increase from a low of approximately 15½ per cent in the middle layers to a high of 55.6 per cent in the top layer (graph 2). This severe loss in the upper foot was no doubt due to both the leaching effect of rain and the exposure to air which allows combustion of dry matter into carbon dioxide, nitrogen and other gasses (which are then lost in the air). That the increase in crude protein in the upper two feet is misleading is evident in calculations of the actual amount of crude protein lost (graph 3) on the basis of a comparison of the original and final weights of the silage samples. This loss very closely parallels the loss in dry matter content—except that here the greatest loss occurred 3 and 4 ft from the surface. An average of approximately 15 per cent of crude protein was lost in the bottom 7 feet of the silo —a figure considered excessive by many research workers.

The loss in other chemical constituents beside TDN does not appear excessive until combined with the actual loss in weight of the silage represented in the sample bags. The reduction in per cent NFE (graph 4) in the upper layers indicates a substantial loss of sugars and starches when the dry matter loss is taken into consideration. The changes in ash or mineral content of the various layers reflect the downward movement of these constituents, particularly the increase in ash content of the top layer.

The loss in weight throughout the entire profile of the silage mass averaged 18.8 per cent of the dry weight of the material placed in the silo. Dry weight losses of the original corn silage averaged 38.7 per cent in the upper 4 ft and 55.6 per cent in the upper foot. Losses of this magnitude indicate a need for an adequate cover to protect the silage from air and rain.

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Effects of growth reg of citrus

SUCCESSFUL HARVESTING with mechanical shakers requires a tree with an open-spreading branch structure. A vase-like arrangement of three primary scaffold branches arising from the main trunk at a height of from 24 to 30 inches is ideal. The low, open-centered, spreading canopy thus formed allows fruit to fall to a catching frame with less chance of striking interfering branches.

The natural shape of a citrus tree is nearly spherical. However, when planted in an orchard, citrus trees become somewhat columnar because of crowding. Many of the main shoots of young trees grow upright until they bend from their own weight. Buds along the top of the bending limbs sprout to form new upward growing shoots. The bending branch droops further to form the tree's skirt. The uprights eventually bend and the process is repeated. Thus the tree increases in size and the center becomes filled with haphazardly arranged closely spaced branches. Therefore, the open-scaffold structure needed for shake harvesting must usually be achieved by pruning, which is time-consuming, expensive, and which also delays bearing and decreases yield.

Previous tests

Previous tests with the growth regulator, TIBA (Triiodobenzoic acid) when sprayed on shoots three to five inches in length of vigorously growing, red Delicious apple trees, has been shown to cause the shoots to bend outward and to change the upright growth habit of the tree to one with a more spreading branch structure. Opening the tree in this manner allows a greater choice of scaffold branches for the permanent framework of the tree. Also the increased crotch angle produces a stronger union between the branch and the wood from which it arises.

To determine the reaction of citrus branching to TIBA, four varieties of citrus were treated with concentrations ranging from 25 to 2,000 ppm. Year-old seedlings grown in gallon cans were

TIBA

ulator on open branching for mechanical shaking

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topped to cause sprouting of buds around the trunk which could be used to form the scaffold framework. The varieties of citrus included: Koethen sweet orange, Cleopatra mandarin, Troyer citrange, and Rubidoux trifoliate orange. Length of new shoot growth varied from 2 to 9 inches at the time of spraying.

Nine single tree replications were used for each treatment. The foliage of each tree was sprayed to runoff with TIBA at concentrations of 25, 50, 100, and 200 ppm with 0.02 per cent X-77 added as a surfactant. After five months, the plants were again headed to remove all leaves and laterals and the test was repeated using the same concentrations.

The test was repeated a third time using a tenfold increase in the concentration of TIBA. A fourth test was carried out using a series of three applications at three-week intervals using the higher concentrations of 250, 500, 1,000 and 2,000 ppm plus 0.02 per cent X-77 added as a surfactant (see photo).

Trees were observed regularly and measurements of branch angle in relation to the main trunk were made five months after treatment. There were no significant differences between treated and untreated trees for any variety at any of the lower concentrations. Negative results occurred when the test was repeated.

Concentration increased

TIBA concentration which was increased tenfold in the third test produced leaf curl and slight shoot tip malformation on all varieties at 2,000 ppm. This was soon outgrown and the plants returned to normal.

In the series treatment, applications of TIBA at concentrations of 500 ppm caused outward bending of branches. There was slight leaf curl and twisting of the growing shoot tips. Slight overall growth reduction occurred. At concentrations of 1,000 and 2,000 ppm there was increased leaf curl and shoot malformation along with marked reduction in growth. While leaf and shoot malformation increased with higher concentrations of TIBA, there was little increase in outward bending or drooping of branches.

Four varieties

The four varieties of citrus tested did not react as readily to foliage sprays of TIBA as reported for apples. This may in part be due to the waxy cuticle of the citrus leaf, which retards penetration. However, repeat sprays at increased concentrations caused an outward bending of growing shoots, and slight reduction in total growth.

The outward bending of branches to form an open scaffold branch structure would be of value for mechanical harvesting.

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Rubidoux trifoliate orange sprayed three times at three-week intervals with TIBA at rates indicated below plants.