Straw:

low-cost feed but not least cost

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Whenever grain and hay prices are high, there is renewed interest in feeding cereal straws to growing cattle as a possible method of cutting costs. Feeding trials were conducted using cereal straws in rations formulated by a computer least-cost ration program. The growing phase compared barley straw with wheat straw with a further comparison of cottonseed meal (CSM) and urea as the nitrogen source. A standard ration was fed during the fattening phase.

Many published chemical evaluations indicate barley straw should be superior to wheat straw in feeding value. However, for the computer formulation in the growing trial, the two straws were specified to be of equal value.

Published values were used for the nutrient composition of ingredients considered in the rations, and prices assumed were those reported in July 1975 (Federal-State Market News Service, Feed Market News—weekly edition). A cost of $27.80 per ton for milled straw versus $77.80 per ton for milled alfalfa was used in formulating the growing rations. Even with these differences in price, straw was not included in the initial ration. It was necessary to force the computer to formulate the ration to contain at least 50 percent straw.

Other nutrient specifications and restrictions were also placed on the rations. Values of 35 megacalories net energy for gain (NE_g) per hundredweight, 12 percent crude protein, 10 percent crude fiber, 0.30 percent calcium, 0.25 percent phosphorus, and 0.5 percent salt were forced into the rations. A maximum of 5 percent animal fat and 8 percent cane molasses was allowed in the ration. CSM or urea was allowed in the ration depending on the nitrogen source to be compared.

Table 1 presents the final least-cost ration formulated. Chemical analysis showed the barley straw had a 3.2 and 40.7 percent crude protein and crude fiber content, respectively, and wheat straw had 4.4 and 36.6 percent, respectively. The crude fiber content of the rations, however, as fed, was 27.7 percent for that containing barley straw and 28.8 percent for that with wheat straw. The protein content of the rations was established at 12 percent.

After the spring grass season, yearling Hereford and Hereford x Angus steers were brought to Davis from the University's Sierra Range Field Station and randomly assigned to the four treatments with eight head per treatment individually identified but group fed.

Table 2 shows results of the 116-day growing trial. Significant differences were found in average daily gain, whether on a shrunk or empty-body basis. This directly reflected the feed intake in the various treatments. Both groups of steers receiving CSM as their nitrogen source consumed more feed and, as a result, gained more than those fed urea. This difference may have been due to the high level of urea in the urea-straw ration, because a decrease in feed intake is known to occur when the level exceeds 1.5 percent. Cost per pound of gain was lower for the rations containing urea.

TABLE 1. LEAST-COST GROWING RATIONS AS FED

	Straw* plus			
	Cottonseed meal		Urea	
Ingredient	Percent	Cost/cwt	Percent	Cost/cwt
Barley straw	50.0	$0.70	50.0	$0.70
Beet pulp, molasses, dry	22.62	1.17	26.50	1.37
Cottonseed meal, 41% solvent extracted	16.62	0.99	—	—
Dicalcium phosphate	—	—	0.23	0.03
Fat, animal	2.26	0.29	2.02	0.26
Molasses, sugar cane	8.00	0.37	8.00	0.37
Salt	0.50	0.02	0.50	0.02
Urea, 45% nitrogen	—	—	1.85	0.18
Wheat, mill run	—	—	10.89	0.66
Total	100.00	3.54	100.00	3.59

* Wheat straw was substituted for barley straw in a second replicate.

TABLE 2. RESULTS OF 116-DAY GROWING TRIAL

	Barley straw*		Wheat straw*	
Item	Cottonseed meal	Urea	Cottonseed meal	Urea
Number of steers	8	8	8	8
Initial weight, lb	570	570	582	570
Final weight, lb	735	713	793	720
Avg daily gain, lb	1.42 ab	1.24 b	1.82 a	1.30 b
Avg daily feed consumption, lb, as fed	20.38 ab	15.87 b	22.05 a	14.74 b
Avg daily feed consumption, lb, dry basis	18.4	14.3	20.0	13.3
Feed/lb gain, lb, dry basis	13.0	11.5	10.9	10.3
Metabolizable energy intake, total kilocalories	329 ab	257 b	349 a	242 b
Megacalories energy/lb of gain	13.0	12.1	12.1	16.1
Feed cost/lb gain	0.459	0.412	0.380	0.365

* Treatment means on the same line having different letters differ significantly ($P < .01$).

The steers receiving wheat straw outgained the steers receiving barley straw when the same nitrogen source was compared. Although barley straw is generally considered of higher feed value than wheat straw, it actually tested lower in these trials. In other trials, a lowering of intake has been observed with rations high in barley straw, and there are indications that an inhibitor (not yet identified) may be present.

The various treatments resulted in no differences in dressing percent, composition of the gain, or energy retention, even when corrected for metabolic body size.

The use of the least-cost ration program to formulate the experimental growing diets gave some interesting results. As mentioned earlier, the straws were not a cheap source of nutrients (especially energy), and a lower-cost mix could be obtained without their inclusion. Forcing straw into the least-cost solution increased the price of the ration approximately 5 cents per hundredweight. Another aspect was that the prediction of daily gain using net energy for maintenance (NE_m) and NE_g was not accurate, as measured by ratio of observed to expected average daily gain, especially when high or very low levels of straw were included.

Calculations of the net energy values of the straws (as fed) during this growing phase were: net energy for maintenance—for barley straw 47, for wheat straw 50; net energy for gain—for barley straw 0, and for wheat straw 9, with a standard error of the estimate of 6 percent.

Following the growing phase, half of the animals (16) were slaughtered and the remainder, four head from each of the four growing rations, were fed a fattening ration. There were no significant differences in any of the criteria measured, such as daily gain, feed intake, energy retention, and carcass parameters. Therefore, regardless of previous treatment, i.e., wheat versus barley straw, or CSM versus urea, no carryover effects were evident during the fattening phase. All cattle at the end of the 112-day finishing period graded low choice or better with a yield grade of 2.9. These cattle went to market under the present beef grading system.

Conclusions

■ Cereal straw can be fed as a major portion of a growing ration with little if any energy available for production (NE_g).

■ Better growth can be obtained when cottonseed meal rather than urea is used as a nitrogen source to supplement straw.

■ A least-cost program will result in a least-cost ration for a given set of specifications and feed prices. However, the least-cost ration does not ensure least-cost gain.

■ More work is necessary on feeding cereal straws, especially on factors affecting intake and net energy values.

■ No carryover effects due to feeding straws were evident during a fattening phase.

■ Although straws may be low cost, the inclusion of them in a ration for production may not be least cost.

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Chemical defoliation of fruit trees

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Trees in most mature peach, nectarine, and plum orchards in the southern San Joaquin Valley cease growth by early to mid-October. Because the foliage often persists on the trees for another three to five weeks and interferes with the pruner's vision, it is impractical to start annual pruning immediately. Thus, any means of stimulating defoliation in mid-October that would allow an earlier start on pruning could become an important factor for progressive farm labor managers. Under normal conditions, many farm laborers are idle from mid-October through mid-November, because harvest of most other crops is nearly completed. The availability of defoliated trees by mid-October would provide work when the unemployment rate is high and would extend the period over which dormant pruning could be accomplished.

Chemical defoliation tests were conducted in 1972, 1973, and 1974 in Tulare and Fresno counties. Defoliants that looked promising in fruit-tree nursery-stock defoliation tests and those used commercially on cotton, alfalfa seed, and sorghum were selected.

In late October of 1972, ethephon, biuret, zinc sulfate, paraquat, sodium chlorate, Folex, and zinc sulfate plus oil were applied as dilute sprays on plum and nectarine trees. Within one week, plum trees sprayed with ethephon, biuret, and sodium chlorate were almost completely defoliated. Nectarine trees were not defoliated as readily, but the same three materials caused greater response than the other compounds tested.

All treatments were evaluated in the following spring for their residual effect on fruiting wood, flower buds, and shoot development. Blooming of flower buds was delayed two to three days by the biuret treatments and three to five days by the ethephon treatments. There were no adverse effects on crop set. Results of trials in 1973 and 1974 to delay flower opening, and thus provide better bloom overlap between early blooming Red Beaut plums and later blooming pollinators, were inconclusive. However, indications were that a short delay in Red Beaut blooming period did not influence the amount of fruit set. Sodium chlorate treatments resulted in excessive killing of flower buds.

In 1973, D-WK (DuPont-WK surfactant, active ingredient dodecyl ether of polyethylene glycol) was added to the test chemicals; other compounds found to be less promising in the 1972 trials were eliminated from further testing. D-WK and ethephon were used alone, and D-WK was also combined individually with ethephon, zinc sulfate, and sodium chlorate.

After eight days, both plum and nectarine trees were extensively defoliated; the more effective treatments were D-WK, alone and in combination with zinc sulfate. Flower bud evaluations the following spring showed no difference in bloom density or crop set between trees receiving these treatments and control trees. Trees treated with ethephon were again delayed in bloom, and those treated with sodium chlorate sustained flower bud injury.

In 1974, treatments on nectarine and peach trees included D-WK at ½ and 1 percent by volume, zinc sulfate at 10 pounds per 100 gallons of water, and zinc sulfate at 5 pounds per 100 gallons of water plus D-WK at ¼ percent. A fifth treatment of ethylene glycol from commercial antifreeze was also included. Five days after spray application, all treatments were rated before and after passes were made through the test blocks with a commercial dilute sprayer using only the air fan. D-WK at 1 percent, zinc sulfate at 10 pounds, and zinc sulfate at 5 pounds plus D-WK at ¼ percent induced good defoliation (see table). No adverse effects attributable to treatments were noted the following season.

During the three years of tests, it became apparent that all defoliants had less effect when applied later than mid-October. This is probably a result of lower activity and uptake by the leaves and trees. A good example is Armking nectarine, which grows later into the season than Independence; the former was more easily defoliated than the latter (see table).

Although D-WK was effective in these tests, the chemical is not registered for use as a defoliant on fruit trees. Zinc sulfate, often used in fall nutrient sprays, provides defoliation but has sometimes caused gumming of lower fruit wood on peaches and nectarines.

DEFOLIATION OF TWO NECTARINE VARIETIES FROM CHEMICAL SPRAYS*

	Percent defoliation			
	Armking		Independence	
Treatment	Before blow	After blow	Before blow	After blow
D-WK, 1%	96†	100	27	90
D-WK, ½%	53	98	12	57
Zinc sulfate, 10 lb/ 100 gal water	82	99	27	65
Zinc sulfate, 5 lb/100 gal water, + D-WK, ¼%	80	99	12	60
Ethylene glycol, 1%	5	20	1	8
Check	0	5	0	5

* Applied October 17, 1974; rated October 22, 1974, before and after passes through test blocks with commercial sprayer using air fan only.

† Average of three replications.

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