INTERNAL RIB NECROSIS AND MATURITY OF LETTUCE AS AFFECTED BY VARIETY, DATE OF PLANTING, AND IRRIGATION TREATMENT, USDA SOUTHWESTERN IRRIGATION FIELD STATION, BRAWLEY—1969-70

| Variety | Irrigation treatment | Date of Planting | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Sept 24 | | Oct 8 | | Oct 22 | | Nov 5 | |
| | | % Cut | % IRN | % Cut | % IRN | % Cut | % IRN | % Cut | % IRN |
| Climax | Normal | 51.3 | 0 | 73.3 | 0 | 64.4 | 85.4 | 60.2 | 34.6 |
| | Wet | 62.7 | 0 | 71.6 | 0 | 50.9 | 59.7 | 62.7 | 38.5 |
| Forty-Niner | Normal | 83.5 | 0 | 73.4 | 0 | 76.3 | 0 | 92.8 | 0 |
| | Wet | 89.8 | 0 | 78.9 | 0 | 76.8 | 0 | 90.6 | 0 |
| Golden State D | Normal | 80.2 | 0 | 78.3 | 0 | 80.8 | 0 | 85.1 | 0 |
| | Wet | 75.3 | 0 | 70.6 | 0 | 80.3 | 0 | 96.1 | 0 |
| Vanguard | Normal | 27.3 | 0 | 55.3 | 0 | 65.8 | 0 | 83.5 | 0 |
| | Wet | 34.6 | 0 | 56.6 | 0 | 67.8 | 0 | 65.9 | 0 |

with "russet spotting." "Rusty rib" was a serious problem in lettuce shipments from the Imperial Valley in 1970, and the disorder was apparently confined to Climax. Thus, Climax appears to be susceptible to two different types of tissue breakdown—one which develops in the field during maturity (internal rib necrosis), and one which develops after harvest under conditions of cold storage ("rusty rib"). These two types of symptoms may be different manifestations of the same general physiological disorder.

Analysis of the data from field plots at Brawley failed to show any effect of irrigation treatment on internal rib necrosis. Even though the plants harvested from the October 22 planting seemed to develop more internal rib necrosis under the "dry" treatment, the difference between the treatments was not great enough to be statistically significant. The results indicate that the suspicion that wet soil near maturity causes an increased incidence of internal rib necrosis is unfounded.

### Weather records

An examination of the records of weather prevailing during the Brawley trial provides some insight into the effects of environmental conditions on disease development. Periods of cold weather preceded the harvests of both the October 8 and October 22 plantings by two weeks, yet the plants from the October 8 planting failed to develop internal rib necrosis. Cold weather in itself, therefore, does not appear to be the cause. Rainfall preceded the harvests of the last two plantings, but, even though both plantings showed considerable internal rib necrosis, the most abundant development of the disorder was in the October 22 planting. This harvest was preceded by both cold weather and rainfall. A combination of low temperature and rainfall was thought by several observers to be the major predisposing factor for the prevalence of the disorder in the winter of 1969, and it may explain why Climax, maturing before and after these periods during both 1969 and 1970, was largely free of internal rib necrosis.

Based upon the present knowledge of internal rib necrosis, the only solution lies in planting varieties resistant to the disorder. Climax is closely related to Golden State D, Francisco, and Vanguard through the USDA breeding line parent. From the results of the present experiment, at least two of these varieties (Golden State D and Vanguard) are known to be resistant to internal rib necrosis. Breeding lines related to Climax through the parent had been observed to be segregating for susceptibility to rib necrosis in 1959 and 1960 tests at Salinas. It appears possible, therefore, that resistance also exists within present stocks of Climax. Field selection of symptomless heads might lead to establishing lines with resistance to internal rib necrosis. This process of selection will require a minimum of three years; but should be pursued because Climax has some good horticultural characters and is well-adapted to midwinter production in the desert valleys of California. In the meantime, other varieties will need to be evaluated for the purpose of finding a suitable substitute for Climax, if necessary.

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# *Feedlot performance . . .* STEERS vs.

GOOD TO CHOICE HEIFERS are discounted from one to three dollars per hundredweight on most U. S. markets. This is true for live weight as well as for wholesale carcasses. On the other hand, Good to Choice ewe lambs and gilts bring the same price as wether lambs and fat barrows of equal grade, for both live animals and for carcasses.

This penalty against heifer beef has been with the industry for a long time. In the early days, most of the "she stuff" on the market came from old cows far advanced in pregnancy—or over-finished, wasty animals. Historically then, there is some justification for the price differential. However, some countries—England, for example—prefer heifer beef to steer beef. They maintain that the female meat is of finer grain, more palatable and more tender than steer beef. Even in this country, most of the heifer beef sold today over the block brings the same price as steer beef of the same grade and quality.

In the fall of 1968, two ranchers, Jim Sinton of Shandon and Bert Crane of Merced, cooperated on a test to study the performance of heifers and steers. Birthdates on the calves from both herds were secured. They were weighed and one-half of each sex class implanted with stilbestrol—15 mg for the heifers and 30 mg for the steers, at approximately six weeks of age. The calves received no extra feed—just their mothers' milk and what forage they consumed. They were weaned at approximately eight months of age and weaning weights were recorded. These data show that steers on both ranches outperformed heifers in average daily gain (ADG) as well as weight per day of age (WDA). For example, Sinton steers had an ADG of 1.57 lbs and a WDA of 1.79 lbs while the heifers gained 1.41 lbs and 1.64 lbs, respectively. The Crane steers had an ADG of 1.82 and a WDA of 2.09, while the heifers recorded 1.72 and 1.98. All of these data are significant in favor of the steers. In this study the Sinton control steers had an ADG of 1.53 and WDA of 1.74. Treated steers had an ADG of 1.61 and their WDA was 1.84 (significant in favor of the treated animals).

Sinton control heifers gained an average daily weight of 1.33 and WDA of 1.57 while the treated heifers gained 1.52 and 1.73, respectively. Untreated Crane

# HEIFERS

heifers' preweaning performance in ADG was 1.76 while WDA was 2.02. Implanted heifers' ADG was 1.68 and WDA was 1.95. These heifer data are significant in favor of the treated animals.

Crane steer controls gained an average of 1.83 and had a WDA of 2.13. The treated steers gained 1.81 and 2.05. These differences are not significant and are contrary to some other tests, including the results at the Sinton ranch. One reason for variable results when stilbestrol is implanted into nursing calves may be the time elapsed between treatment and final weighing since most of the stilbestrol would be absorbed during the first 100 days.

In July 1969 these calves were brought to Davis and after a warm-up period of approximately 14 days, they were placed on full feed, receiving a ration of about 85 per cent concentrates. At that time part of the Crane calves were implanted for the first time with 36 mg of stilbestrol; another group that had been implanted as calves were re-implanted with the same amount. This then resulted in four groups: yearling implant, no implant, calf implant and double implant. Because there were fewer animals, all of the Sinton cattle were implanted at the start of the finishing period with 36 mg stilbestrol.

In the Crane cattle, the overall steer performance on rate of gain was 2.36; heifers gained 2.18. The quality grade and the yield of trimmed cuts were the same for both sexes when killed at the same degree of fatness. The heifers averaged 32 days younger than the steers and their carcasses were 90 lbs lighter.

A similar comparison (see table 1 of steers and heifers from the Sinton ranch shows identical results. The steers gained faster in the feedlot with a larger WDA and had heavier carcasses. There were no statistically significant differences in carcass quality as measured by grade, fat content, marbling score or per cent of trimmed cuts. However, the steers from both ranches had about 0.1 inch more fat thickness over the rib than the heifers.

The overall performance indicates that steers and heifers handled in an identical manner from birth and slaughtered at the same fat content will produce carcasses of equal grade and quality. The heifer carcasses will be 90 to 100 lbs lighter and in this experiment the heifers were one month younger. Feed efficiency was the same for both sexes.

The influence of the hormone stilbestrol on the steer—heifer comparison is shown in table 2. The single implant at the feedlot maintained the daily gain advantage of steers over heifers, but there were no significant growth differences between sexes at either ranch when the calves were implanted at six weeks and then re-implanted at the feedlot. There were significant differences in carcass weight due to sex, but carcass grade, fat content and cutability were not different. This data shows a slight trend toward a lowered performance of the double-implanted steers as compared with steers given a single implant in the feedlot; but the reverse trend is apparent for the heifers. Definite conclusions will have to await further investigation.

However a final comparison of steers with heifers from the Crane ranch can be made with regard to the single implant, as a calf, vs no implant. (See table 3). Growth rates and carcass weights of the steers were higher than of the heifers in each comparison. The difference in carcass grade in favor of the steers approached significance. The steers were significantly fatter than the heifers in this comparison, and produced a lower yield of trimmed cut. The major conclusion from this comparison is that single stilbestrol implants to suckling steer and heifer calves had little influence on subsequent feedlot performance. These data also indicate that those steers not receiving a stilbestrol implant at the feedlot could have been slaughtered somewhat earlier, and would have still produced a Choice carcass.

In calculating the economics of this study, heifers were inventoried in at 31¢ and steers at 34¢. The selling price was figured at 28¢ for steers and 27¢ for heifers. The cost of feed was estimated at 3¢ per pound. Based on these assumptions, Sinton steers returned 17¢ per head above feed cost while heifers returned $3.10. On this basis Crane steers lost $4.35 per head while heifers showed a loss of $2.65. Steers in this study ate an average of 15.5 lbs of feed and heifers 13.6 lbs.

These data indicate that when heifers can be purchased at 3¢ per pound less than steers, have a selling value of 1¢ less per pound, and have a fattening period of 30.7 days shorter than steers, they prove to be just as efficient as the male animals. When the same buying and selling price is used, heifers failed to compete economically with steers. When the same buying and selling price (34¢ and 28¢) was used, Sinton steers returned 17¢ per head while the heifers lost $3.82 per head. Crane steers showed a loss of $5.45 and heifers, $10.71, respectively.

TABLE 1. FEEDLOT PERFORMANCE OF CRANE AND SINTON STEERS AND HEIFERS

| | CRANE | | SINTON | |
|---|---|---|---|---|
| | M | F | M | F |
| Daily gain (lb) | 2.36* | 2.18 | 2.27* | 2.06 |
| Feed intake (lb)† | 16.0 | 14.7 | 15.0 | 13.1 |
| Feed/lb of gain† | 6.7 | 6.7 | 6.6 | 6.4 |
| Carcass wt (lb) | 623.0* | 530.0 | 552.0* | 453.0 |
| Carcass grade | 7.9 | 7.8 | 8.3 | 7.6 |
| Fat (%) | 33.6 | 33.5 | 32.7 | 32.3 |
| Trimmed cuts (%) | 49.9 | 50.5 | 50.0 | 50.5 |
| WDA‡ (lb) | 2.08* | 1.92 | 1.92* | 1.72 |
| Age at slaughter (days) | 472.0 | 440.0 | 461.0 | 430.0 |

*Significant ($P > .05$).
†Feed related factor could not be tested for differences because of group feeding.
‡WDA = weight per day of age.

TABLE 2. FEEDLOT PERFORMANCE OF CRANE AND SINTON STEERS AND HEIFERS RECEIVING SINGLE OR DOUBLE IMPLANTS

| | CRANE | | | | SINTON | | | |
|---|---|---|---|---|---|---|---|---|
| | Single implant | | Double implant | | Single implant | | Double implant | |
| | M | F | M | F | M | F | M | F |
| Daily gain (lb) | 2.48* | 2.19 | 2.23 | 2.27 | 2.30* | 1.85 | 2.23 | 2.30 |
| Feed intake (lb)† | 16.4 | 14.2 | 15.3 | 15.3 | 14.8 | 12.6 | 15.1 | 13.7 |
| Feed/lb of gain† | 6.6 | 6.5 | 7.0 | 6.8 | 6.4 | 6.8 | 6.8 | 6.0 |
| Carcass wt (lb) | 636.0* | 538.0 | 607.0* | 541.0 | 545.0* | 427.0 | 557.0* | 482.0 |
| Carcass grade | 7.7 | 8.3 | 7.5 | 7.4 | 8.6 | 8.1 | 8.0 | 7.1 |
| Fat (%) | 32.6 | 34.8 | 31.5 | 32.4 | 32.9 | 32.7 | 32.5 | 31.7 |
| Trimmed cuts (%) | 50.1 | 50.4 | 51.1 | 50.5 | 49.7 | 50.3 | 50.3 | 50.7 |
| WDA (lb)‡ | 2.13* | 1.91 | 2.00 | 1.97 | 1.92* | 1.61 | 1.92 | 1.84 |

*Significant ($P > .05$).
†Feed related factor could not be tested for differences because of group feeding.
‡ WDA = weight per day of age.

TABLE 3. FEEDLOT PERFORMANCE OF CRANE STEERS AND HEIFERS AFTER RECEIVING A SINGLE IMPLANT AS A CALF

| | Control | | Implant | |
|---|---|---|---|---|
| | M | F | M | F |
| Daily gain (lb) | 2.35* | 2.18 | 2.36* | 1.96 |
| Feed intake (lb)† | 16.3 | 14.5 | 15.9 | 15.0 |
| Feed/lb of gain† | 6.9 | 6.6 | 6.7 | 7.6 |
| Carcass wt (lb) | 633.0* | 501.0 | 619.0* | 514.0 |
| Carcass grade | 8.3 | 7.9 | 8.4 | 7.6 |
| Fat (%) | 37.5* | 31.7 | 35.7* | 32.5 |
| Trimmed cuts (%) | 47.9* | 50.5 | 49.2* | 50.6 |
| WDA (lb)‡ | 2.15* | 1.86 | 2.05* | 1.88 |

*Significant ($P > .05$).
†Feed related factor could not be tested for differences because of group feeding.
‡WDA = weight per day of age.

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