INFLUENCE OF ROUTINE MANAGEMENT PRACTICES AT BURNS AND UNION, OREGON, ON SELENIUM, COPPER, ZINC AND COBALT STATUS OF CATTLE

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The purpose of this study was to evaluate the influence of the routine management procedures on the copper, zinc, selenium, and cobalt status of cattle at Union and Burns, Oregon. There are several differences in the routine feeding procedures for cattle at the Burns and Union areas. In Union, the winter feed is generally higher quality, since a mixture of alfalfa and grass is usually fed, whereas in Burns only grass hay is generally fed. Because of higher elevation ranges the grasses become green earlier in the spring and stay green longer into the summer at Union than at Burns.

Feeder animals (400 to 600 pounds) were used starting in the fall because this is usually the type of animal that ranchers use to feed through the winter. A total of 22 steers each at the Burns and at the Union, Oregon, Experiment Stations were used. One-half of the animals at each location received iodized salt and the other half trace mineralized salt, which contained copper, zinc, cobalt, along with other minerals. Steers at Union also received selenium mixed with the trace mineralized salt. Blood and liver biopsies were taken at the end of the summer grazing period (around September), at the end of the fall feeding period (in November), at the end of the winter feeding period (around April), at the end of the spring grazing period (about July), and again at the end of the summer grazing period (September again). Whole blood was centrifuged to obtain the plasma, and copper and zinc content determined on it. The liver biopsied samples were digested with acids, and selenium, copper, zinc, and cobalt determined. The plasma, copper, and zinc content; and copper, zinc, and cobalt in liver were determined by atomic absorption. The plasma and liver selenium levels were determined by a fluorometric procedure.

RESULTS

Except for May through July, the copper plasma levels were higher in cattle at Burns than in those at Union (Figure 1, bottom). The plasma copper levels in the animals at Burns were below what is considered deficient levels in the samples taken in May and remained at this low level in the samples taken in July. The copper levels returned to the initial levels by September again. The plasma samples from cattle at Union followed the same general pattern except that the samples taken in November contained deficient levels of copper. Feeding trace mineralized salt to cattle at both Burns and Union resulted in higher plasma levels than those given plain iodized salt.

There was a gradual decline in the hepatic copper levels until July in the cattle at Burns (Figure 1, top). The copper levels in the subsequent fall samples were slightly higher than the end of summer samples. In contrast, the hepatic copper content was below the critical levels in the first two samples taken, increased above the deficient levels at the end of the winter period, and dropped below or near the deficient levels afterwards in the cattle at Union. Again, the trace mineralized salt resulted in higher hepatic copper levels than plain iodized salt, except for the November samples. It is not known why the November samples were not different.

Except for the fall samples, the plasma zinc levels were at or about the deficient levels at all times in the cattle at Burns (Figure 2, bottom). In contrast, the only time the plasma zinc levels were below the deficient levels in the cattle at Union was at the end of the winter feeding period.

A general decline in the hepatic zinc levels occurred until the end of the winter feeding period in cattle at both Burns and Union (Figure 2, top). Afterwards, the zinc levels either remained fairly constant or increased. Interestingly, giving trace mineralized salt did not consistently result in greater zinc levels in either the plasma or liver.

The plasma selenium levels were deficient in cattle at Union given plain iodized salt (Figure 3, bottom). Addition of selenium to the trace mineralized salt resulted in levels above deficient at all times. In contrast, there were no differences in the plasma selenium levels in cattle at Burns which received no selenium in the mineral mix.

The same patterns to plasma for hepatic selenium were evident (Figure 3, top). The hepatic selenium levels in the animals at Union not given dietary selenium remained near the deficient level at all times except for the initial samples. The addition of selenium to the mineral mix maintained the hepatic levels well above the deficient levels. Similar to the blood, there were no differences in the hepatic selenium levels in the cattle at Burns regardless of the presence of selenium in the salt mix. One reason for this may be because the hay fed the animals at Burns during the winter was shown by analysis to contain from 0.35 to 0.45 ppm selenium.

The only time the hepatic cobalt levels were near the deficient levels was in the cattle not given trace mineralized salt at Burns after the winter feeding period (Figure 4). The hepatic cobalt generally declined until at the end of the winter feeding period and increased to above the initial levels at the end of the study in the cattle at Burns. Interestingly, the hepatic cobalt levels in cattle given trace mineralized salt was higher only in the fall, winter, and spring liver samples. In contrast, the magnitude of differences in hepatic cobalt levels was not very great in cattle at Union with or without trace mineralized salt.

DISCUSSION

Of the four minerals studied, copper and selenium appear to be the ones most likely to be deficient. In spite of the seemingly more favorable nutritional conditions there appears to be a greater problem in cattle at Union than at Burns. The copper levels in cattle at Union were always down or near the deficient levels. It would have been expected that addition of copper or selenium to the diet would have resulted in increased growth, but this was not observed. This could mean that animals may be more subject to the effects of stress.

The values taken for deficient levels were obtained from two reference sources (1,2). It is quite possible that these values do not apply under all management programs, and other factors must be taken into consideration. Even though a critical level of plasma zinc has been assigned, this value for hepatic zinc levels is debatable (2). One source indicated that zinc deficient calves had about 100 ppm zinc in their livers (3). Based on this criteria, the cattle at both Union and Burns are deficient in this element except for the initial samples. Obviously more work is needed.

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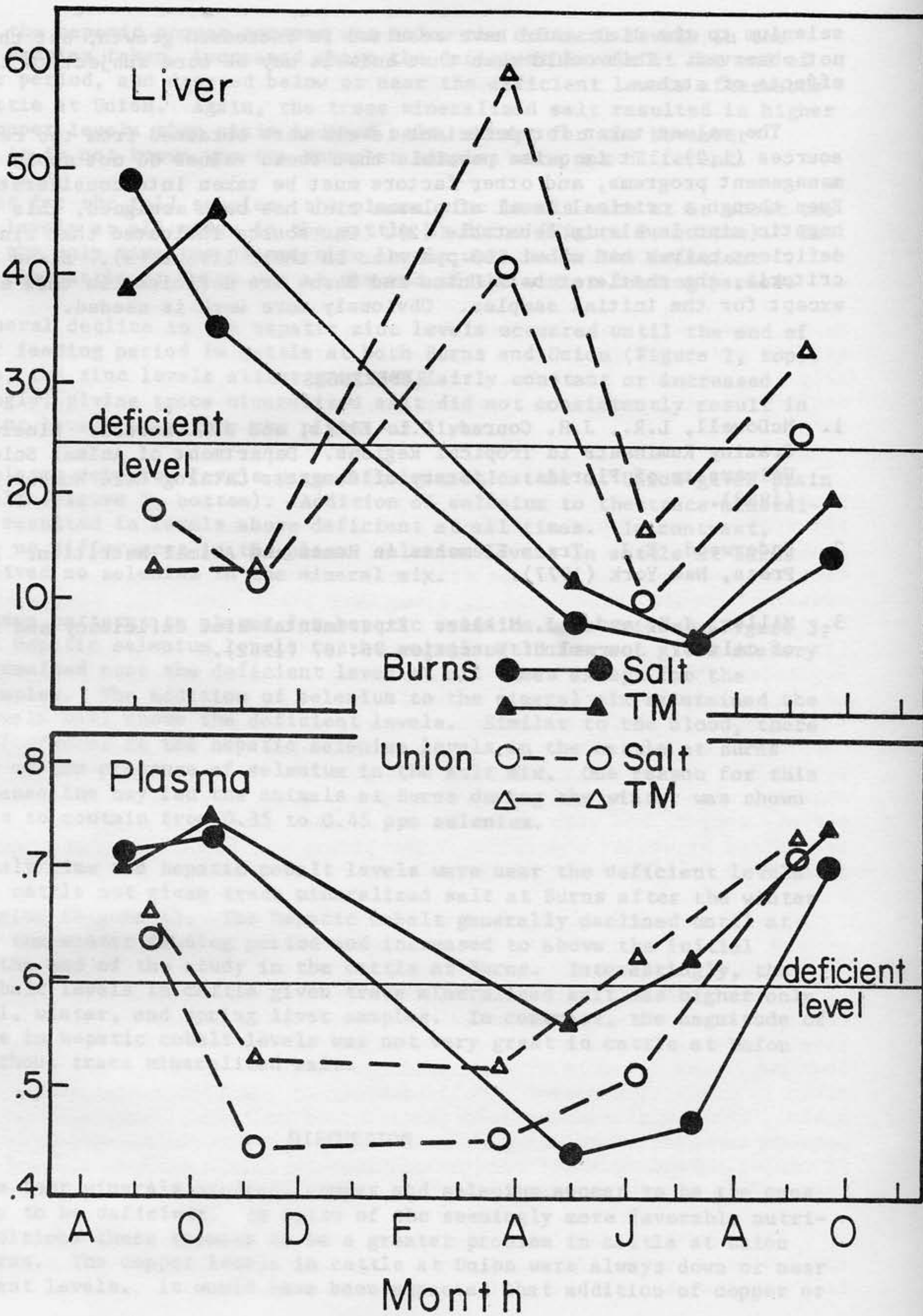

Figure 1. Hepatic and plasma copper levels in steers at Burns and Union.

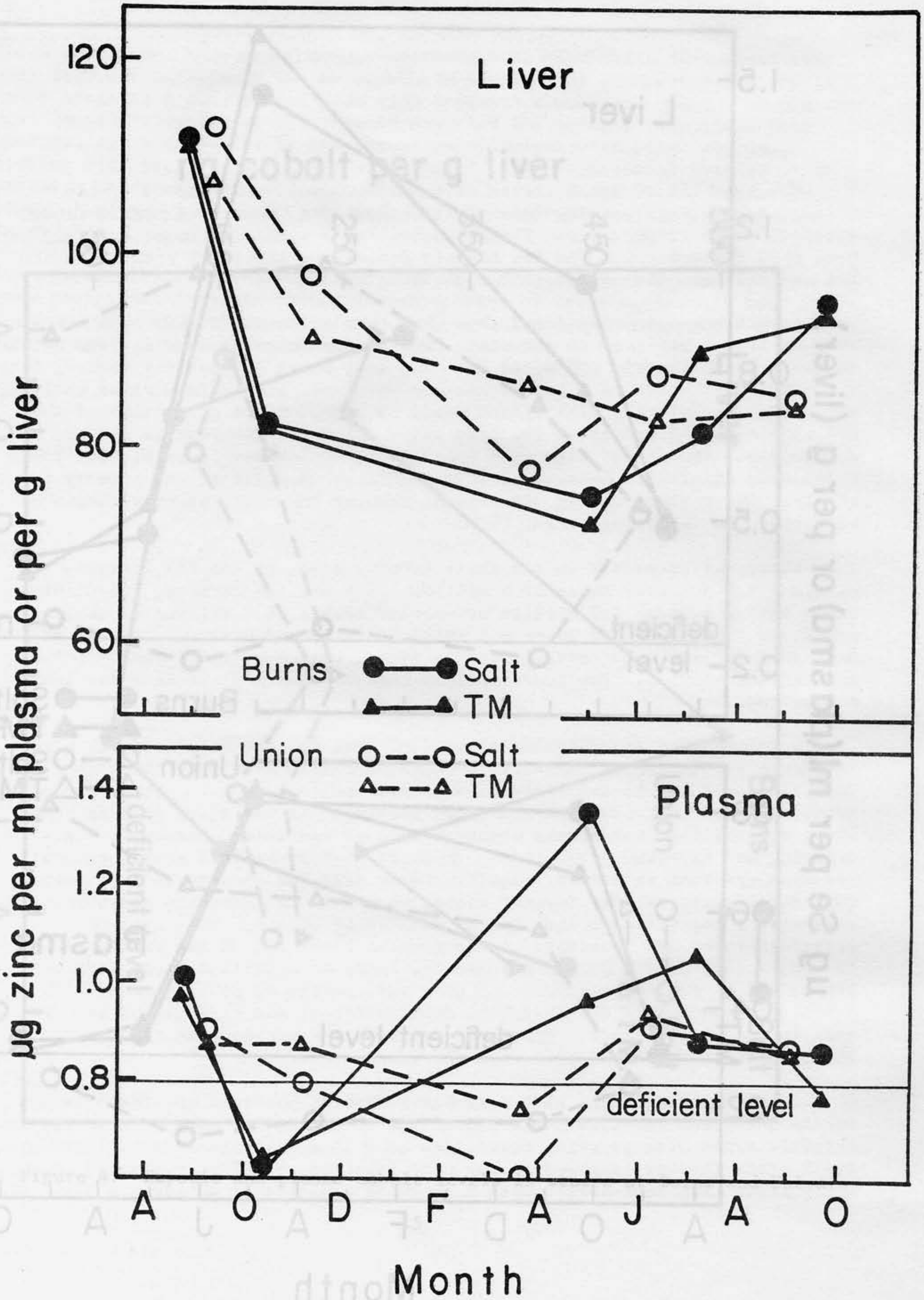

Figure 2. Hepatic and plasma zinc levels in steers at Burns and Union.

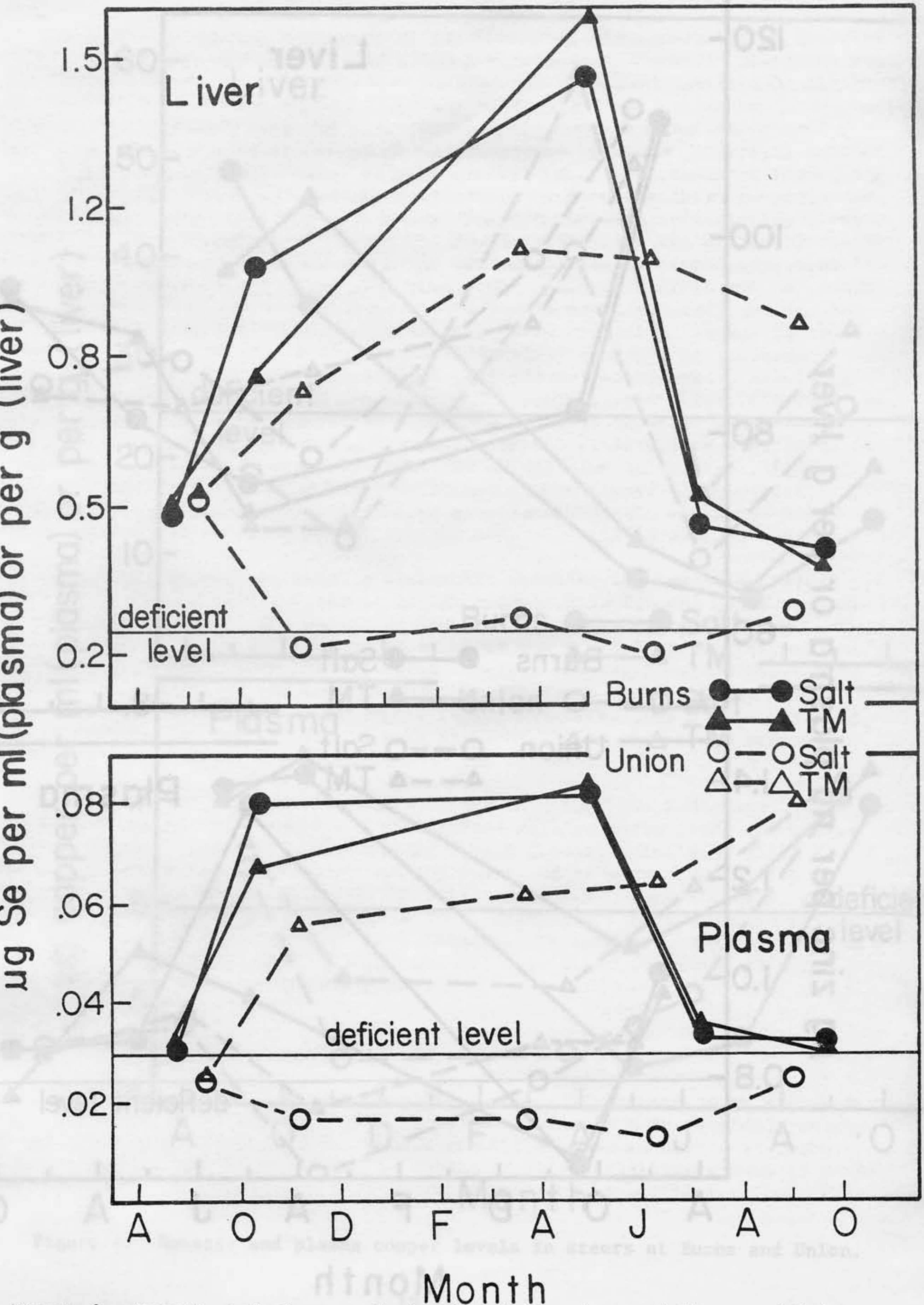

Figure 3. Hepatic and plasma selenium levels in steers at Burns and Union.

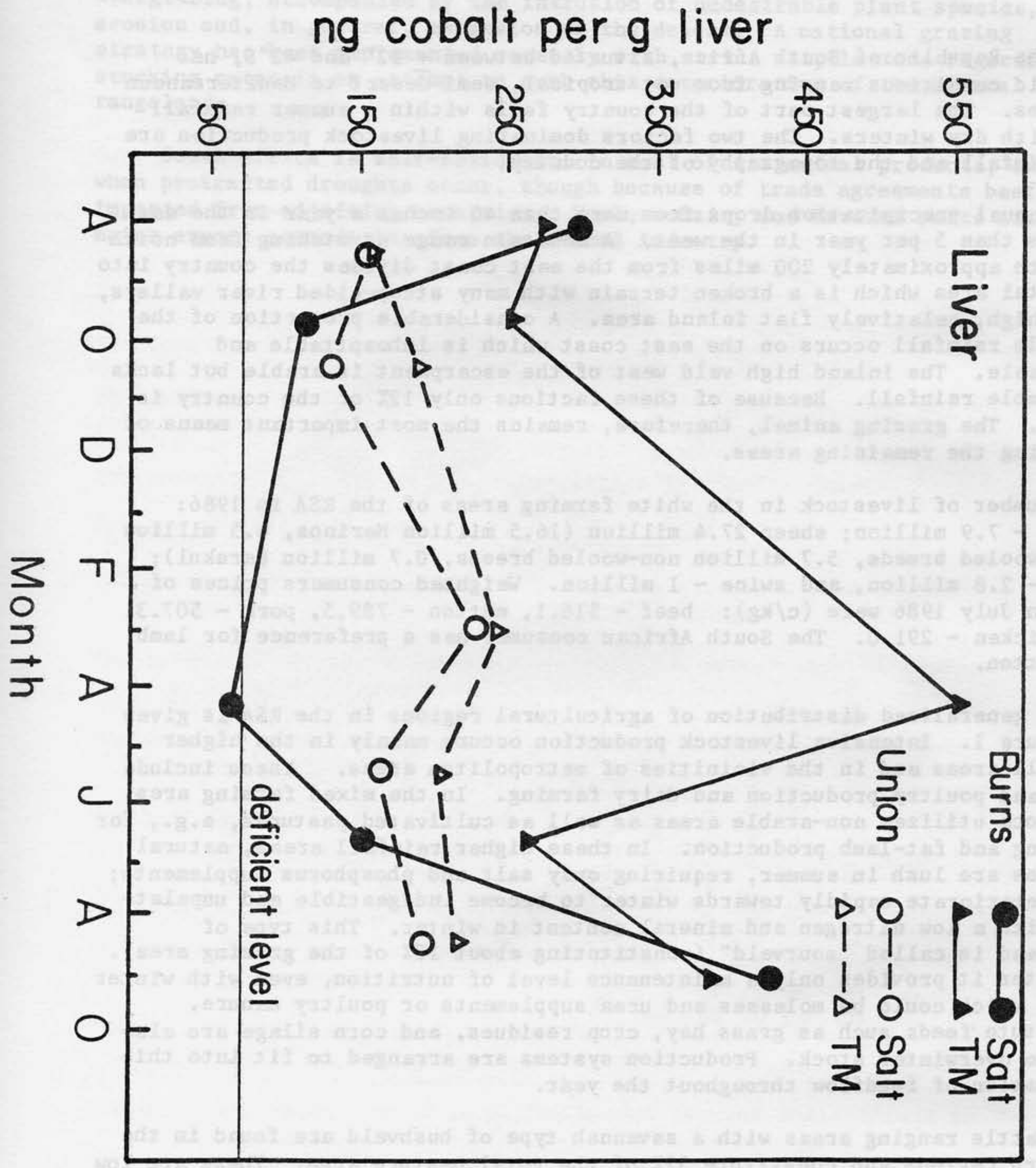

Figure 4. Hepatic and plasma cobalt levels in steers at Burns and Union.