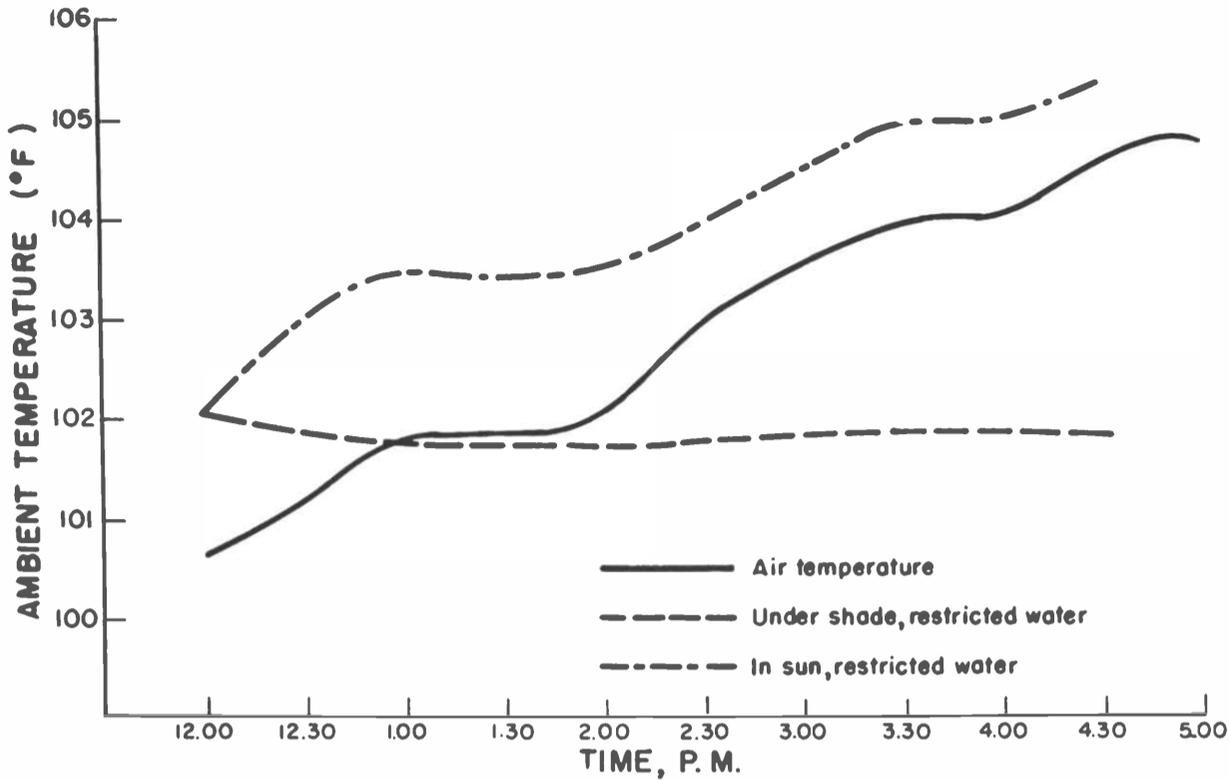


# SUN, WATER AND CATTLE IN ARIZONA



Carl Roubicek

The body temperature of an animal must remain relatively constant within a wide range of environmental conditions. Such body functions as digestion, circulation, respiration, muscle tension, and other processes not so obvious all produce body heat.

During cold weather the animal uses these sources of heat to keep warm. However, when environmental temperature exceeds body temperature, this body heat must be dissipated as soon as it is produced or the body temperature starts to rise. An increase in body temperature of only 6° or 7° F. may be fatal, and the efficiency of the body machine deteriorates rapidly even with slight increases in body temperature.

## Heavy Heat Load

Solar radiation can also be an important source of heat to an animal. On a clear, bright June day in Arizona, radiant heat from the sun can be equal to 10,000 calories per square foot per hour. If you have ever had the experience of picking up a monkey wrench that had been lying in the sun for an hour or two, you already know how much heat this is. In cold weather this solar heat can help to maintain the animal's body temperature, but during the summer

it just increases the heat load of an already heavily burdened animal.

Evaporation by means of sweating is the major source of heat transfer. The loss of heat by evaporation depends on the fact that a certain amount of heat is required to change water to water vapor at the same

NOTE, IN GRAPH at left, that as the air temperature rises on a hot summer day, animals in the shade, but with restricted water, held their body temperature constant. Animals in the sun, however (also with water restricted) suffered as their body temperature climbed even beyond the temperature of the surrounding atmosphere.

temperature. The water loss by evaporation does increase the animal's water requirement. This had been recognized as early as 1557 when Tusser in his "A Hundreth Good Pointes of Husbandrie" stated:

"In summer-time daily, in winter in frost,  
If cattle lack drink, they be utterly lost."

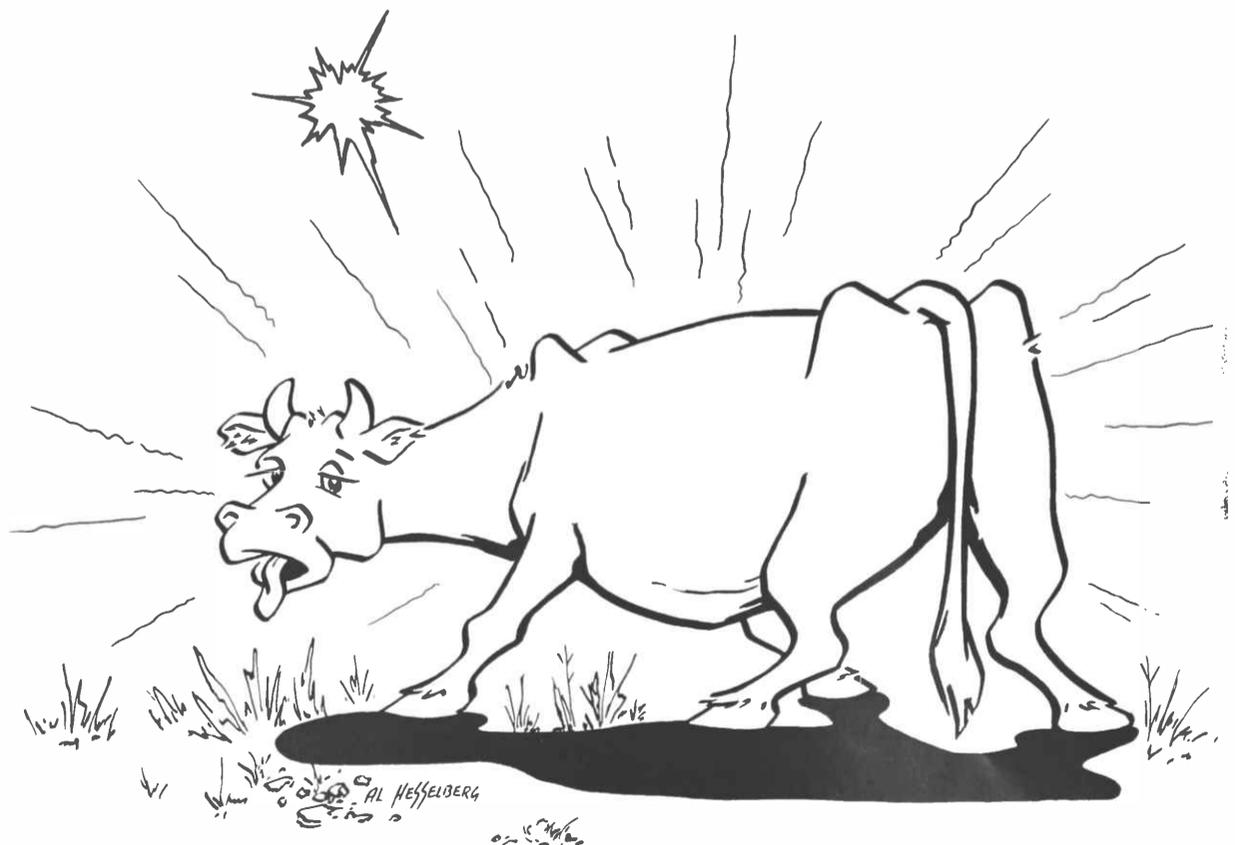
Studies were made to determine the effects of water restriction and direct solar radiation on the body temperature of 9 to 12 months old Hereford calves. The trials were conducted during June of 1963 and 1964 at The University of Arizona farm, Tucson.

## Compare Shade, Sun

The effect of direct solar radiation was determined by comparing animals in the sun to others kept under an aluminum shade. Various periods of water restriction were used for both groups, ranging from *ad libitum* water to as much as 30 hours restriction. Body temperature was recorded at half-hour intervals during the test periods.

A typical example can be used to illustrate the general effect of direct solar radiation and water restriction

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Dr. Roubicek is professor of Animal Science.

# Even With Chemicals, Farming Takes Brains

James R. Carter

Although we may not recognize it, new developments in agriculture have come thick and fast during the past 20 years, especially so far as agricultural chemicals are concerned. Today we have somewhere in the vicinity of 600, maybe 620 different pesticides and chemicals. Perhaps 75 to 100 of these now are in use in the United States to control weeds, with perhaps 25 currently being used here in Arizona for that purpose.

These herbicides or weedicides are most important, particularly in a rainy year such as this year has been. All you have to do is drive down any road to get an indication of the way weeds can grow here when conditions favor their growth.

## Control With Caution

Control of these unwanted plants can be most difficult, and sometimes

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This is a condensation of the talk given by Mr. Carter at the Cotton Field Day at the U of A Cotton Research Center on Oct. 21, 1964. Much of what Jim Carter said that day is applicable to crops other than cotton, making publication of this talk useful to all of our readers. The speaker-author was a County Extension Agent in Maricopa County for 14 years, presently is Research Coordinator of the Arizona Cotton Growers Association.

the control measures themselves lead to problems that will be felt for years after. For example, working a field with mechanical cultivation equipment can lead to a compaction problem, especially if the soil is a little on the wet side as it often was this past season. The use of chemicals to control weeds may have no adverse effect on this year's cotton crop, but some of these materials can carry over to the next season, or perhaps for several years, and create a serious problem on other crops.

In other words, any agricultural chemical or, for that matter, any piece of equipment must be used with a good bit of intelligence. Otherwise a mistake could be made that might hurt future production and future cost of production for a long time.

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on the body temperature of the calves:

Water restriction was started at 8 a.m. for animals under the aluminum shade and those in the direct sun. Body temperatures for both groups rose from 101° to 102° F. by noon. During the afternoon the air temperature increased from 100.5° at noon to 104.5° at 5 p.m.

## Exceeded Air Temperature

The animals under shade, although without water, were able to maintain a body temperature of 102° F. during the afternoon. However, those ani-

imals exposed to direct sunlight, without water, very quickly showed considerable rise in body temperature. Their body temperature continued to increase during the day and by 4:30 p.m. reached 105.5° F. The accompanying graph illustrates the contrast between the animals in the shade and those in the direct sunlight. The body temperature of the animals in the sun actually exceeded the air temperature.

This increased body temperature is detrimental to the animals' normal body functions. For feedlot steers, this increased body temperature would be accompanied by a marked decrease in appetite and feedlot gain. The time required for complete recovery of water balance, appetite and

## Control Is Last Resort

At the same time, it pays to bear in mind the fact that mechanical or chemical control is the last resort, not the first step in dealing with weeds. First and foremost, you should grow good cotton plants in an environment that will favor their development rather than the development of a weed population. Irrigation, fertilization, planting pattern, cropping sequence or rotation and even the variety you choose to plant will affect weed population. This is because one of the best ways to discourage most weeds is to shade them out with strong, vigorous cotton plants.

If the variety you choose is slow to close across the row and shade the ground in your situation, you invite a weed problem. The same is true if you settle for a skippy stand or drown out the cotton plants in a field as a result of poor tail water control. The former is very evident in many alfalfa fields, and the latter quite often helps to explain why a weed problem develops in the lower end of some cotton fields.

In other words, weed control is not something all by itself. It is tied in with everything else you do in the course of the growing season and even before.

I mention this because it is important, because weed control is the theme of this field day, and because it will give you some idea of what our research workers must take into consideration when working on the problem of weed control.

## No "Little Research"

Quite often, we hear people suggest that perhaps a "little research" should be done on this or that prob-

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other body functions will depend on the duration and severity of the imposed stress. About 48 hours would be required for an animal subjected to the stress shown in our graph. Thus, the entire period of stress plus the time required for recovery would represent a basic loss in feedlot performance.

## Even Few Hours Can Hurt

These results do emphasize the importance of applying the basic management procedures of adequate shade and water for our domestic animals. Without adequate shade, even a few hours without water during a hot summer day will cause a deterioration in animal function and performance.