

## Plants can get 'cold feet' too

WASHINGTON — Chilly soil can reduce the level of zinc and other trace minerals in plants, so people get less in their diets, say scientists at the U.S. Department of Agriculture.

Crops dislike "cold feet," so even a slight drop in soil temperature slows down the uptake of minerals by roots, said David L. Grunes, soil scientist, and Ross M. Welch, plant physiologist, of USDA's Agricultural Research Service.

According to them, new laboratory studies show cold soils keep tap roots from penetrating deeply and putting out a thick network of branch or side roots in the lower depths to absorb minerals.

When soil temperatures hover around 50 degrees Fahrenheit, consumers may get less than expected amounts of minerals in foods.

This happens because a smaller root system cannot fully do the work of supplying mineral nutrients to the plant, according to Grunes and Welch, who are based at the research agency's U.S. Plant, Soil and Nutrition Laboratory, Ithaca, N.Y.

"We're doing root research because agriculture has a wealth of information about what happens within plant parts above ground, but relatively little is known about what goes on in the tangled world of roots. Yet, roots are the critical point in the plant's ability to ab-

sorb nutrients, water and essential ions," Grunes said.

So far, Grunes and his colleagues have studied mineral uptake by such grain crops as corn, barley and wheat, but future research will involve other crops.

As an example of what can happen, he pointed to North Dakota field studies several years ago of corn grown on soils low in zinc and phosphorus. Grunes found that the plants, grown on cold soil, had stunted roots and showed severe symptoms of deficiency in both zinc and phosphorus.

An agency research team in Ithaca also has shown in recent greenhouse work that barley plants have much less zinc in their tops when the root-zone tem-

perature is low. Ironically, when the root-zone temperature is low, more zinc is absorbed by the roots, but it stays in root cells.

When the root-zone temperature increases, greater amounts of zinc can travel into the top or edible parts of the barley plant, according to the findings of the team of Grunes, Welch, chemist Earle E. Cary, and soil scientists Wendell A. Norvell of the research agency and visiting soil scientist Samuel M. Schwartz of the Volcani Center, Bet-Dagan, Israel.

In its barley studies, the team also found that at a soil temperature of 68 degrees F., the plants produced many branched roots which fanned out and filled their six-inch deep, one-gallon

containers.

By contrast, at 50 degrees F., the barley plants put forth only a few long, thick roots with some hairlike rootlets. Branching was confined to the older parts of roots in the upper three inches of soil, Grunes said.

Knowledge of how and when zinc moves into the food chain is important because it is an essential element. Evidence points to borderline deficiencies in livestock and some human population groups.

Plants need only about 20 parts per million of zinc in their tissues, but animals and humans need more — about 30 parts per million — in their diets.

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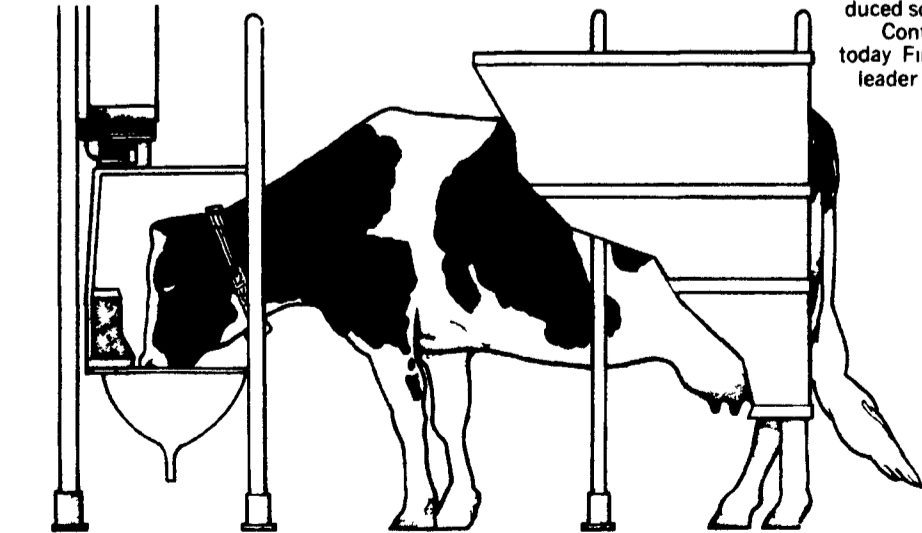
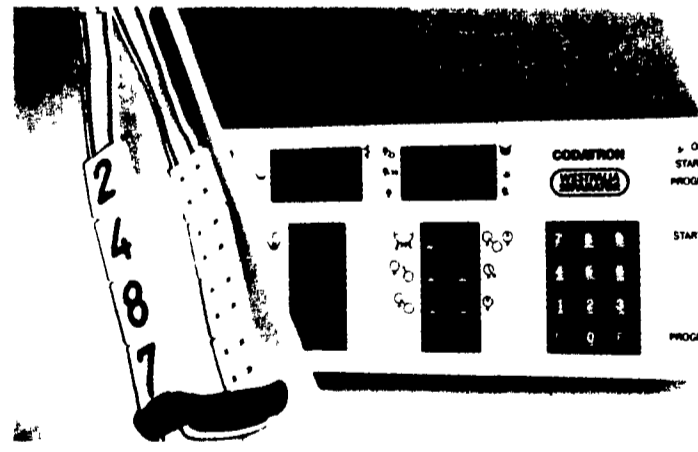
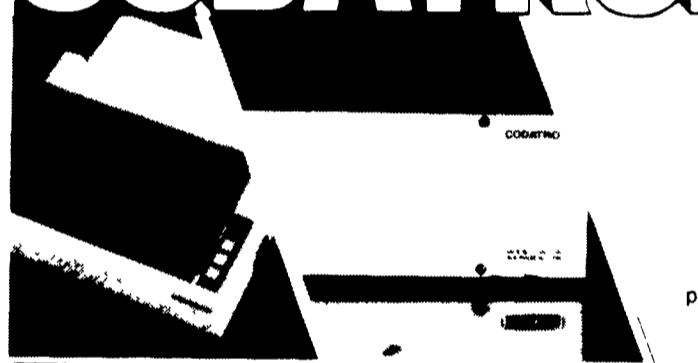
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