

HEALTHY SOILS MEAN HEALTHY HUMANS



BY PROFESSOR W. A. ALBRECHT, Ph.D., *Emeritus Professor of Soils,
University of Missouri, U.S.A.*

*“When the manger is empty, the horses
bite each other”*

THE intense public concern focused on the dangers from poisonous — even carcinogenic — chemicals sprayed on the landscape, makes appropriate the home-spun remark by George Washington Carver who said, “When the manger is empty, the horses bite each other.”

For us to see the analogy between his last five words and the chemical warfare on pests and diseases, calls

for no unusual stretch of the imagination, which pictures man as the top stratum in the biotic pyramid “biting” all the other strata beneath — but supporting him.

It may, however, be going beyond the elastic limit of your imagination to see another analogy between Carver’s first five words, and the declining or exploited fertility of the living soil now failing to serve, via

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nutrition, as the foundation stratum for all others, viz. microbes, plants, animals and man.

That this changing lower stratum should cause the "biting" of each other by the upper ones may not be so self-evident.

But that pyramidal construction of the many life forms, from the soil upward, represents the evolutionary succession which arrived at man as the apex; all via their individual healthy survival.

The latter was possible only by fitness of each in the climatic soil setting growing suitable nourishment. Only by that combination could all of them have been available to feed man on his very late arrival.

Accordingly, the healthy human survival calls for consideration of that struggle also from the soil upwards, through nutrition for self-protection against so-called 'diseases'.

That call seems more logical than one for more powerful drugs, of which each is catalogued against a specific ailment for its cure, through man's ministrations from his uppermost stratum downwards.

In support of the importance of the soil as nutrition for healthy self-protection and prevention of diseases and pests, observations and research studies at the Missouri Agricultural Experiment Station in the U.S.A. deserve citation here in connection with plants, the only producers of food through their collection and storage of the sun's energy.

Those bits of knowledge are particularly appropriate as ecological approaches in the broader scope of the interrelations and interdepend-

encies of man and other forms of life. We need, especially, to see the interdependence between ourselves and the more lowly ones, including the living soil and its microbes by which, in the ultimate analysis, we must be fed.

As far back as the 1920's, there came suggestions from Missouri's agricultural research that plant diseases may be caused by deficiencies of some of the inorganic elements required from the soil as nourishment.

Those suggestions turned up in connection with the early application of the technique in which purified acid, colloidal clay, with calcium adsorbed in it, was used as increasing amounts in quartz sand to study the growths and their bacterial nodulation of soybean plants.

This method served as the tool to control, in refined detail, the plant's diet of fertility elements offered, and to measure the resulting chemical contents of healthy plants proving themselves users of atmospheric nitrogen and producers of satisfactory yields of forage.

This discovery of a case of plant "disease" caused by deficient nutrition was an accident when the plants were suddenly — and some very severely — attacked by a fungus. The symptoms suggested a "damping-off" disease.

That accident, in the plans of the research programme, brought to mind a scientist's statement, namely: "Many discoveries are accidents for the minds prepared to recognise them."

Consequently, those irregularities prompted more careful examina-

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tions, which revealed that the differences in percentages of healthy and diseased plants were a clear-cut case of the numbers invaded by the fungus as a reciprocal of:

(a) the increasing amounts of exchangeable calcium offered as nutrition; (b) the better plant growth shown by more height and heavier weights; (c) the greater uptake of calcium; (d) the more and larger nodules on the roots; and (e) more nitrogen fixed from the atmosphere through synthesis of more protein and thereby the autoimmunity through physiological defences, often viewed as antibodies and other such mechanisms.

Since each of those several factors could suggest by its increase that it was the cause of the highly correlated decrease in the numbers of sick plants, there is much danger of erroneously concluding that such causal connection holds true.

But correlations are perfect when both phenomena have a common cause, as was true here. The larger plants, the less of disease, and the more self-protection resulted because of the several increased effects via nutrition which was improved through the increases of calcium available in the soil.

Other research on the variable composition of plants, grown by similar techniques of feeding them, showed that by narrowing the ratio of calcium to potassium, offered by the clay of the soil, one could grow large yields of legume-plant bulk carrying increased carbohydrates but reduced concentrations of amino acids or proteins, and reduced nitrogen fixation from the atmosphere.

By using a wider ratio of calcium to potassium going to the plant roots from the clay, the plant's yield as bulk was decreased, but the amino acid contents in protein and the fixation of atmospheric nitrogen were both increased.

Accordingly, in some of our crop production which disregards balanced soil fertility, we can see plants being literally "fattened" under their protein-deficiency, but their larger carbohydrate output, with a "sickening" effect on the plants—much in the same manner as humans develop obesity—and our fattening of livestock, brings on increased susceptibility to diseases.

In the self-protection by plants, the significant factors suggest themselves as causes according as they favour nutrition, including more complete protein synthesis.

That nature projects self-protection (against insects) into the next generation, according as the soil grows it, was also demonstrated by some research studies by the Missouri Agricultural Experiment Station.

One readily accepts the theory that any seed, as a dormancy or with life processes at a very low rate, must preserve those processes in their health between their very high rates of the crop making the seed and of the succeeding generation started by the planting of it.

If such were not true the species extinction would result.*

*"Thus, dormancy is not characterised by the absence of the important parts of the protein-synthesising apparatus." Henry R. Henry, Jr., Roger Storck. *Science* 142:1675. Abstract. Dec. 27, 1963.

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For demonstration of the theory as fact, ears of hybrid maize, grown on soil given nitrogen fertiliser only and on soil given both nitrogen and phosphorus, were wrapped and bound as pairs within cellophane sheets with the ends of the ears exposed to permit entrance of insects, common to stored grain.

The grain grown from soil given nitrogen only was taken by the lesser grain borer first. The inside of almost every grain per ear was bored out to leave the shell and the waste meal resulting.

In contrast, there were but a few borer holes in the grain grown on soil given both nitrogen and phosphorus. That damage was only at points of close contact of the two different grains.

The damage had occurred during about two and a half years of storage. During the early part of that time, the absence of insects prompted neglect of observation, hence the date of the first attack is unknown.

After the two and a half years, some open-pollinated corn, grown on soil fertilised with barnyard manure, was added to the pairs, with their active insect fauna, and the storage period extended for about six months.

During that period there were some few additional insect attacks on the second hybrid but the open-pollinated grain, grown by the soil treatment of barnyard manure only, had but one hole suggesting borer damage.

Such observations of nature in action on stored grains, raise the

question whether we exhibit much wisdom in our designing of chemical poisons to fight the disease and pests, when by evolution nature grew the species of our diseased and insect-ridden crops which were not so attacked and destroyed.

That fact was shown by their healthy presence when we came along so late for domestication of them. Plants had their self-protection grown in them. They passed that attribute to their seeds in storage and even, apparently, on to the next generation to continue the ingrown capacity its predecessors demonstrated.

That farm animals (and wildlife) grow better health or more autoimmunity on better soils has been a continuing farmer demonstration, more particularly by a herd of 200 beef cattle, by the Poirot Farms of Golden City, Missouri.

During the past forty years their exhausted soil of the eastern edge of the prairie has been under restoration by a farmer and conservationist, who has been honoured as a master in each of those categories.

As a naturalist, he is a keen observer who has followed nature's laws in building up the fertility of much of the soil of 1,800 acres by using the choices of wildlife and of his livestock as guides for proper additions of calcium, magnesium, phosphorus, copper, cobalt and even iodine, some of the latter three coming to the soil via their presence in the salt.

"Science does not yet know all the biological values Mother Nature produces in the soil," says Mr. E. M.

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Poirot,* senior partner. "Animals just below man in the pyramid of life strata, are a part of the natural balances. Their choices and response are, therefore, valuable guides.

"Observations of them are our best helps until the chemical laboratory can point out the 'why' of the effects of the soil restoration on animal health.

"Before I applied any phosphate, now nearly forty years ago," he says, "my cattle were so hungry they chewed bones whenever they found one, and in the absence of them they would chew oakwood brought in from elsewhere . . . At any place where phosphate had been applied, cows would crop the plants, literally, down into the soil.

"Where lime and phosphate had been applied on part of the field, the cattle would mark the place to the line by avoiding the grass growing four inches from the drill-line of the applied treatment.

"The animals seemed to want more of the elements applied. When those were offered, either in the soil or in feed boxes in their pasture, diseases all but disappeared, their weights and general conditions improved, and they began to bear normal calf crops.

"My cattle are now living in good health, without need of any veterinary services for infectious diseases during the last eighteen years.

"They are reproducing normally and giving a calf-crop to nearly 100 per cent, without winter shelter and

without grains, silage, legume hay or other feeds, save a special protein mixture during the winter at one pound per head daily, along with the Bluestem hay left in the field at the spot where each bale was dropped while baling.

"Through restoring the soil, over 200 head are now enjoying margins of food, self-protection and reproduction on the same land area, which less than four decades ago could not supply an adequate ration for eight head of their ancestors."

From the preceding examples of natural self-preservation and careful observations of the autoimmunities of the lower forms of life below man, we cannot escape the deduction that each living unit, from the simple cell to the most complex organism, survives, to a large degree, according as it develops its own self-protection.

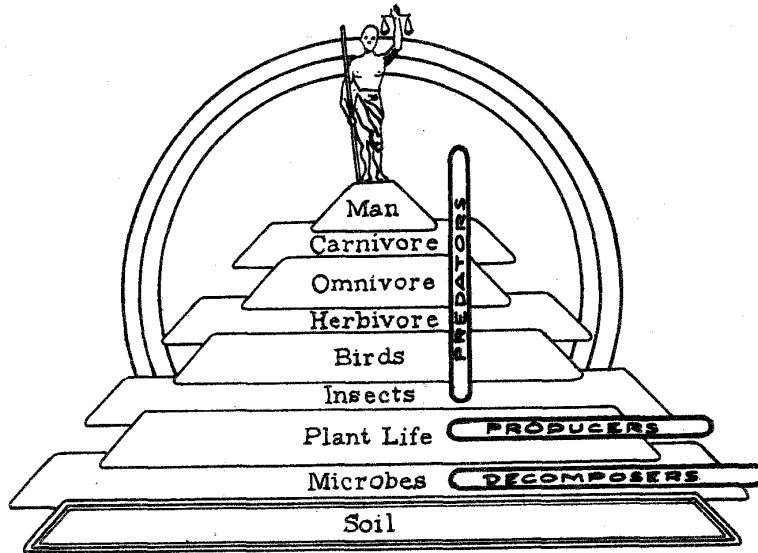
Better health of plants and animals are readily demonstrated as results from the more fertile soils.

Each body establishes many immunities which are not yet catalogued. Nor have we comprehended and explained many well enough to make them successfully manageable as uniformity throughout the crowd.

No epidemic is 100 per cent disastrous. There are always those who survive on their own. Nor is health in any group 100 per cent perfect.

But there is much to be gained in the latter by the individual's own effort of learning about his own nutrition, with buoyant health as a studied objective by concern with the natural qualities and nutritional values grown into, and preserved within, the foods we eat.

*E. M. Poirot. "The Margins of Life." Manuscript in preparation for publication. Copy read by courtesy of the author, January 9-12, 1964.



The Biotic Pyramid

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