

WHICH WAY DELUDED HUMANITY ?

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(Communicated by Dr. N. R. Dhar, F.N.I.)

Humanity stands at the cross-roads today in the most critical situation civilization has ever faced. If only a small proportion of the wasted millions poured into the insatiable maw of using atomic forces to produce atom bombs for wholesale destruction could be halted in its mad race to pile up more and better bombs we could make some real progress. As agriculturists it is our most urgent duty to see that these misapplied energies are turned into the proper channels. There is a crying need for more investigation in the field of human nutrition in its vital relation to the soil as a living organism. Stricken humanity needs immediate help in extricating itself from its present perilous position. Soil and food are inextricably bound together, and the rapid depletion of soils the world over, either by impoverishment or wrong methods of fertilization bids us pause to consider sanely where we stand. No progress can be made without the maintenance of a high standard of health freed from the lurking dangers of 'the hidden hunger' and the all too evident increasing malnutrition diseases which have multiplied with such astounding rapidity during the last few decades. Both are matters of profound importance which concern us both in the Orient and the Occident, the one with its famine stricken millions and the other with its millions starving on full stomachs.

The findings of recent researches on the intimate relation of health to the health of the soil have revealed that most of our ill-health stems back to the flagrant abuses of the soil which could be so easily overcome if we could be made to realize the vital importance of the correct methods of soil renewal. Repeatedly, our most progressive chemical laboratories have been furnishing us with the most convincing data which reduced to its lowest terms understandable to scholar and layman is: poor soil, poor food, poor health. It is this vicious circle we should break. It is with profound interest that I have read and digested as far as possible, with my limited experience, the helpful chemical research in agricultural fields done by your leader, Dr. N. R. Dhar, Head of the Chemistry Department of the University of Allahabad. The various reprints of the *Proceedings* of the National Institute of Sciences of India and his invaluable book on Biochemistry should be in the hands of every progressive agriculturist.

Of special interest to us in the semi-arid south-west is the Reclamation of 'Usar' (alkaline) Land by Treatment of Molasses and Press-mud. Of great interest throughout the country is the new light thrown on the direct nitrification of the soil.

Since the time of Baron von Liebig the Western World, Europe, and especially the United States, has been under the domination of the N P K group which is deeply entrenched in the mistaken belief of the efficacy of the Big Four chemicals, nitrogen, phosphorus, potassium and calcium. Already we are seeing the handwriting on the wall; and, if we continue in the error of our way, we are eventually going to reach the point in the near future when the abused soil will not produce enough to feed us. During World War II, having the supervision of many Victory Gardens, I had a chance to observe the devastating effects of over-doses of commercials applied by many zealous gardeners.

Having taught, lectured on, and practised organic methods all my life, I have read critically to find out what is being done in all parts of the world. Situated as I am in the semi-arid south-west, near Los Angeles, 34° 10' N. and 118° 30' W. I find Dr. Dhar's researches helpful. Here we have one of the five typical Mediterranean climates where there are short mild winters with a rainfall from 7 to 20 inches, and long, dry, rainless summers. Throughout the years, I have learned to adapt my agricultural practices to this particular climatic region. I do not adhere to any particular group, but take the best from all. In the first place, I use no commercial fertilizers, for, in the long run, they deplete the soil. For renewal, I compost, cover-crop and sheet-compost.

I have used several methods of composting, the Indore, the Bio-dynamic, Maye E. Bruce's Quick Method Composting and the four week method, advocated by R. Sanford Martin with his activator, Humisite. This product is very rich in humic acid and has a high bacterial count. This latter method, designed by its originator to meet our conditions here in the semi-arid south-west is the best and easiest method I have found, especially for the smaller home gardens. There is no heavy and laborious turning, no soil to add to furnish extra bacteria. No ashes or lime are added, for the pH here is already far too high. The material for composting is first dried and mixed. It is made up of the miscellaneous vegetable wastes which accumulate in the garden. A ventilated compost bin made of redwood is far better than a pile, for it keeps the heat in and furnishes sufficient aeration. Starting with a pile 12 inches high, which is packed in evenly and watered down thoroughly, you proceed to put on your light sprinkling of Humisite, continuing these two layers until you reach the top. The last layer at the height of six feet is sprinkled with Humisite, and the whole surface of the bin is covered with several thicknesses of newspaper. By the next morning the heat generated will be sufficient to kill any weed seeds and destroy any lurking plant diseases. You test the moisture by a curtain pole sharpened at one end, inserted diagonally. When pulled out, if dry and hot, more water should be added. After the heat has subsided you can add earthworms, but it is not absolutely necessary. You can apply the finished product without sieving, for it is quite fine and black, making an excellent mulch or the best sort of organic material to enrich your soil. In this semi-arid region where the blazing heat burns up the humus in the soil, it is necessary to have a quick and easy way to supply new humus. The Indore method of composting, which requires double turning, the Bio-dynamic, which is involved with rituals and special activators which are given out to the membership of the society or subscribers only, and Maye E. Bruce's Quick Method, which is adapted from the Bio-dynamic, all have their drawbacks here where we do things on a big scale.

Cover crops are planted, or should be, so as to keep all unused ground summer and winter from being wind and water eroded. *Melilotus indica*, yellow clover, is one of the cheapest and best winter cover crops. Sown in October and plowed in during the early spring, it furnishes some humus and considerable nitrogen from the air by the bacteria on the root nodules. Oats and purple vetch make another good winter crop; but the legume which has the largest amount of succulent herbage is the Windsor bean. The nodules are particularly large and numerous. In addition, you have the benefit of an edible crop. We have two very fine self-sown cover-crops, the bur-clover, *Medicago hispida*, naturalized from Europe, and a native dwarf lupine, *Lupinus micranthus*. They both come up naturally with the advent of the fall rains, and we have found that the land which has been naturally cover-cropped by them is much richer in nitrogen content.

Composting and cover-cropping consume so much time that renewal of the soil through the addition of organic material is not practical where we do agriculture on such a large scale as we do in California. Direct nitrification of the soil by a process similar to photosynthesis is the answer, and furnishes the techniques which are very simple as Dr. Dhar proves conclusively in his experiments at Allahabad.

I have always believed in the efficacy of sheet-composting and have tried it out in a number of projects. Several years ago, while I had charge of the Agriculture Department of the Gateway Estate at Ramona, San Diego County, I used this method very successfully. This estate of 168-A was situated in the foot-hills, an old-grazed cattle range badly eroded. Some gullies were three and four feet deep. Before I took charge the land had been plowed up and down, waste material had been burned, no cover-cropping had been done and the water supply was furnished by an antique system using hundreds of feet of hose with tall sprinklers running usually in the sun and wind. With my force of workmen I proceeded to remedy the results of these ruinous practices. First, with a disc-terracer, I had the land contoured. The irrigation system was next renovated, changing from $\frac{3}{4}$ inch pipes to 2 inch ones, with low tripod sprinklers delivering the water at night, 2A inches being put on at one time. We invested in a Ford-Ferguson tractor, a large power-run insilage cutter, and a spring-tooth plow. Thus, we were working with all power machinery. Cover-crops were planted at the proper time, *Melilotus indica*, yellow clover, and oats and *Vicia purpuria*, Purple Vetch were used exclusively on the different acreages. Windsor beans, on account of their rank foliage and large bacteria bearing nodules, were used in the vegetable plots to furnish food and extra material for composting. Composting by the Indore method (which the Directors of the estate requested) took time and much labour. I resolved on a short cut-sheet-composting programme and made a survey of available waste materials which I could get for nothing. I set my workers to collecting it. Turkey raising and dairying were the chief industries of the locality. The cow-manure was left to pile up and go to waste. With two large trucks we hauled load after load before it was leached by winter rains. The turkey raisers were glad to have their pens cleaned up and offered us some of their most valuable material which they called 'turkey poult'. This is made up of turkey manure, mixed with a ground milo maize and bran mash on which the young turkeys are fed. (Rich in carbohydrates enough to satisfy Dr. Dhar's requirements.) After we had stacked loads of these manures at regular intervals along our main garden plots, we next collected in all the waste vegetable material the neighbourhood offered. There had been an early fall rain, and one rancher offered us as many bales of spoiled hay as we wanted.

After the land had been contoured we spread the 'turkey poult' and dry vegetable waste and set the sprinklers for an all night run delivering 2A inches of water, the average fall rain amount. The usual fall rain came before we needed another irrigation. In the early springs-planting season, we plowed and worked in the sheet-composted material at the same time. We had test plots of *Melilotus indica* and the untreated plots planted for comparison. On these areas we planted summer squash, bush beans, carrots, beets, lettuce, chard, etc. From the sheet-composted area we harvested the most bountiful crop, the vegetables having the appearance of having had a strong commercial nitrogenous fertilizer applied. With sheet-composting every bit of the plant food goes directly into the soil and the action of the hot sun on the surface of the area composted precipitated nitrogen directly from the air. Of course, you must necessarily allow the interval of several months to elapse before you get the complete nitrification.

In all my work with soils I watch the pH very carefully, for this is a matter of great importance in the semi-arid south-west where the soil is nearly always too alkaline to produce the best results. We find from wide experience that the best results are obtained from soil which is neutral, or slightly above or below neutral, $6\frac{1}{2}$ to $7\frac{1}{2}$ pH. To acidify the soil, we find the volcanic soil sulphur which is mined some twenty-five miles south of the border at Calexico, Mexico, to be excellent. The appended analysis made by the Geo. W. Gooch Laboratories, Ltd., Analytical and Consulting Chemists of Los Angeles, is a revealing one.

Laboratory Report.

Sample sulphur				
Mark 70% soil sulphur				
Based on sample as submitted				
Moisture (100°C. to constant)	..	..	..	1.60%
Sulphur (by extraction)	..	..	..	73.40%
Ash	..	..	..	24.60%
Acidity (as sulphuric acid (H ₂ SO ₄))	..	..	..	0.01%
Arsenic (As)	..	..	..	Nil

The volcanic soil sulphur compounds create acidity so essential in our basic soils, make other plant foods more available, furnish an essential plant food element, condition the soils along with manures and phosphates, and lastly develop more vigorous and healthy plants.

Analysis of Ash.

Silica (SiO ₂)	..	..	..	..	65.80%
Iron oxide (Fe ₂ O ₃)	..	..	..	..	2.20%
Aluminium oxide (Al ₂ O ₃)	..	..	..	..	8.90%
Titanium oxide (TiO ₂)	..	..	..	..	0.45%
Calcium oxide (CaO)	..	..	..	..	6.60%
Magnesium oxide (MgO)	..	..	..	..	2.85%
Manganese oxide (MnO)	..	..	..	..	Trace
Total sodium oxide (Na ₂ O)	..	..	..	..	2.60%
Total potassium oxide (K ₂ O)	..	..	..	..	1.55%
Sulphur trioxide (SO ₃)	..	..	..	..	6.35%
Phosphoric anhydride (P ₂ O ₅)	..	..	..	..	0.10%

Spectrographic Qualitative Analysis : Estimated Quantity.

Silicon	..	..	..	..	..	10.0%
Calcium	..	..	..	..	..	10.0%
Aluminium	..	..	..	..	..	1.0% to 10.0%
Magnesium	..	..	..	..	..	1.0% to 10.0%
Iron	..	..	..	..	..	1.0% to 10.0%
Sodium	..	..	..	..	..	0.1% to 1.0%
Potassium	..	..	..	..	..	0.1% to 1.0%
Manganese	..	..	..	..	..	0.1%
Strontium	..	..	..	..	..	0.1%
Titanium	..	..	..	..	..	0.01% to 0.1%
Barium	..	..	..	..	..	0.01% to 0.1%
Chromium	..	..	..	..	..	0.01%
Copper	..	..	..	..	..	0.01%
Boron	..	..	..	..	..	0.001%
Silver	..	..	..	..	..	0.0001%
Arsenic	..	..	..	..	..	None

As a garden consultant, I advise my patrons to have a spectroscopic analysis made of their soils so that they are not working in the dark. They know the pH, the principal mineral constituents, the trace minerals and the percentages of coarse sand, fine sand, silt and clay. From these basic findings, we can build up almost any soil so that it produces superior vegetables and fruits. Organically raised food grown by gardeners who follow such a regime is not only good to look at but is body-building and comparatively disease resistant.