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21 November 1956

Fallout and the Strontium-90 Hazard

In a recent paper (*1*) Andrews discussed the hazard from Sr^{90} where the total fission products from a nominal atomic bomb have fallen on one small area. His calculation relating to food assumes uniform dispersal of the Sr^{90} over an area of 2 square miles, and his calculation dealing with water is based on complete mixing in Lake Mead (volume, 600×10^9 cubic feet). He estimates that, to accumulate the maximum permissible body burden of Sr^{90}, a man would have to consume the fission products deposited on 4 square feet of food, or drink 50,000 cubic feet of the Lake Mead water. The latter figure has recently been cited by another author (*2*).

Andrews' conclusion that there is a negligible Sr^{90} hazard might be correct, but both of the calculations on which it is based are in error by two orders of magnitude. The maximum permissible body burden quoted from Handbook 52 (*3*) should be 1.0 microcurie (0.005 microgram) of Sr^{90}, not 1.0 microgram as he states. Andrews' estimates are therefore low by a factor of 200, and the corrected figures for human consumption are 3 square inches of food and 250 cubic feet of water.

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Root-Nodule Bacteria of Prosopis stephaniana

The most dominant of the leguminous plants that grow wild in Iraq is *shok* or *kharnub, Prosopis stephaniana* (Willd.) Spreng. This plant is found in desert, in open fields, along irrigation ditches, on river banks, in orchards, and in the foothills of the Iraqi mountains. It is a perennial plant with long roots. Some of the roots grow deeper than 2 m, and they branch in all directions. Some of the branches are more than 5 m long. The top shoot sheds its leaves in December, and new leaves and branches are formed in May; the plant blooms in late June and the fruits are green in color in late July, turning reddish-brown in late August.

Prosopis stephaniana seems to be a very ancient native of Mesopotamia. The old records of the Sumerians (3600–3000 B.C.) mentioned this plant and called it *eri-til-la,* meaning "the plant of the city of life." The Akkadians (3000–2300 B.C.) called it *kharubu,* which is very similar to the Arabic name *kharub* or *kharnub* (*1*). It is likely that the plant was in Mesopotamia earlier than is indicated by the written records so far discovered.

Winsherst (*2*) mentioned *Prosopis* and considered it to be an indicator of a good soil. He suggested the presence of nodulous bacteria, but he was unable to find nodules on the roots. I was able to grow *Prosopis* from seeds (*3*), and seedlings grown under greenhouse conditions had nodules when they were examined 3 months after planting. Microscopic examination of the nodules showed the presence of *Rhizobium* bacteria. A search was made to find young roots which might have nodules in the field. One-year old roots were found to have nodules which are reddish in color. Old roots were also found to have nodules, but they were not as conspicuous as those on the young roots. The bacterium found was motile and rod-shaped.

Rhizobium species from *Prosopis* are not mentioned in Bergey's *Manual* (*4*), and this could be a new species that has not been described before; its host is *Prosopis stephaniana.* There is another leguminous plant that is usually associated with *Prosopis*—camel thorn, *Alhagi maurorum* Medic., but the bacteria isolated from the nodules of *Alhagi* are different from those isolated from *Prosopis.* Further study is needed for the determination of these *Rhizobium* species.

Preliminary tests showed that *Prosopis* nodules contain large amounts of nitrates (*5*), the presence of which is attributed to fixation of the atmospheric nitrogen by bacteria. Large amounts of nitrates are being added every year to the soils of the Tigris and Euphrates valley through direct derivation from nodules and from the leaves that are shed every winter. The addition of nitrates to the soil increases the fertility of the land. The land of Mesopotamia, which has been under cultivation for more than 5000 years, is still fertile because of the constant supply of nitrogen provided by *Prosopis* plants. Winsherst in 1920 even suggested that *Prosopis* should be cultivated in lands where it does not grow in order to increase the fertility of the soil.

The Iraqi farmers have always used the fallow system. They do not use chemical fertilizers or the crop-rotation system to enrich their lands. In the fallow system, they cultivate half their land for 1 year and the other half the second year. *Prosopis* grows on the fallow land and adds to the fertility of the soil.

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References and Notes

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14 September 1956

Ultrasonic and Electron Microscope Study of Onion Epidermal Wall

The wall structure of the cortical cells of the root of the onion, *Allium cepa,* as observed under light and electron microscopes, has recently been described in detail (*1*). In this report, certain results of similar studies on the epidermis of the onion leaf are summarized. The structure of the onion leaf has been described by numerous anatomists, including Hayward (*2*). The gray "bloom" conspicuous on the older green blades consists of ubiquitous, minute wax rodlets about 2 to 4 μ in length, the majority 1 to 2 μ in diameter, and a minority, random in distribution, about twice this thickness. The underlying cuticle stains clearly with Sudan III.

The entire cell wall, as indicated by standard microchemical tests, consists in the main of cellulose and pectic substances. The latter are particularly abundant in a thin layer immediately beneath the cuticle. As is usual in the epidermis, the external wall of the cell is 2 or 3 times as thick as the inner tangential and the anticlinal walls. Within the living protoplasts, refringent, minute droplets of fat stainable with Sudan black (*3*) are seen to be most numerous next to the outer wall—that is, comparatively near the cuticle.