rise to a level which, maintained over a period of time, might give cause for concern, it would be desirable to restrict dairy cows to an all-grass diet. On current evidence this situation is unlikely to occur if the present level of atomic weapon testing is maintained, but in the future it might prove desirable to take this measure to reduce the strontium-90 level in milk, particularly that consumed by children. Such measures might first become necessary in regions of high rainfall, or where other local factors predispose a higher than average radiostrontium content of milk. Milk radiostrontium contents as high as 32 S.U. have been reported[5].

Where land that is relatively heavily contaminated with strontium-90 must be actively farmed, then bare fallow should be sown with an appropriate grass, no clover being included in the mixture. Established pastures should be heavily fertilized with nitrogen to encourage the growth of grass at the expense of clover.

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Plants and Fall-out

It has been suggested that the gist of certain unpublished observations on the condition of certain plants in the area of the Marshall Islands affected by fall-out from the 1954 Bikini hydrogen bomb test should be made public in order to stimulate further investigation on the subject of cumulative effects of low-level radioactivity in plants. These observations have hitherto remained unpublished because of their preliminary and inconclusive nature.

In earlier fall-out surveys of 1954 and 1955, made by non-botanical observers, in the atolls of Rongelap, Ailinginae, Rongerik and Utirik no visible effects on plants were observed, although accumulation of radioactive materials in plant tissues was demonstrated. In the 1956 re-survey, under the auspices of the U.S. Naval Radiological Defense Laboratory, only casual observations were made on the condition of the plants, attention being concentrated on collection of material for analysis. Eight coral islet stations were examined which had been affected by different intensities of fall-out.

Later study of notes made on the vegetation on these islets showed abnormal or pathological conditions in certain plant species, increasing from islet to islet in the same order as the increase in fall-out intensity. Since the observations were not made systematically, nor with the possibility of visible pathological effects in mind, only the roughest of correlations is possible. Even so, the differences were striking enough to merit further attention.

On Gegen Islet, Rongelap Atoll, the station with the greatest fall-out exposure, of a total flora of 15 species, 13 showed conspicuous pathological or abnormal symptoms, ranging from plants dead or almost so to chlorosis, dead terminal twigs and mistletoe-like abnormal growths.

On Kabelle Islet, Rongelap Atoll, next most heavily exposed, 3 species showed some damage.

On all other stations at most one or two species showed effects, but on Eniwetak Islet, Rongerik Atoll, though only two species were involved, the symptoms, defoliation and die-back of twigs, were so conspicuous as to alter the appearance of the vegetation, causing a general grey colour in place of the normal green.

On Likiep Islet, Likiep Atoll, which had scarcely any measurable fall-out, no abnormal appearances of any sort were noticed.

The plants most widely affected were: *Suriana maritima* L., which was completely dead on Kabelle Islet and partially dead on other islets where it was observed; *Cordia subcordata* Lam., which on Gegen Islet was dead or almost so, and on Eniwetak Islet, where it is the most important tree in the vegetation, had the tips of almost all its twigs dead for 10–15 cm.; and *Pisonia grandis* R. Br., which was more or less leafless on the more affected islets and bore, on Gegen Islet, curious mistletoe- or witches-broom-like leafy branches of a dark green colour which have not been noted elsewhere on this species. The defoliation of the last species is not necessarily abnormal, as it happens during severe drought periods. Its association with the stations where fall-out was relatively heavy and without other evidence of drought makes it of interest.

In all, 43 species are known from Rongelap, Rongerik and Ailinginae, the three atolls heavily affected by fall-out. Only about half these plants grow on the four islets where the heaviest fall-out was recorded. Of these, 16 species were noted to show some abnormality. Two species of universal occurrence and great abundance, *Scaevola sericea* Vahl and *Tournefortia argentea* L. f., showed no abnormal appearance whatever.

It will be noted that the total flora of these islands is very small and made up of strand species, tolerant of high salt concentration and exposure to drying winds.

I am very familiar with the flora and vegetation of coral atolls, generally, and with the Marshall Islands, especially, so that the observations are of more significance than if I had less background.

It is not suggested that these observations are positive indication of cumulative effect of fall-out. There may be other unsuspected causes. However, the correlation between intensity of observed symptoms and intensity of recorded fall-out is at least suggestive, and would seem to justify further investigation. The extreme diversity in the reactions of different species growing under the same conditions to whatever caused these effects is of great interest. It suggests the advisability of using a wide variety of plants in any set of experiments designed to investigate the effects of radioactivity, as well as those of other environmental factors. It becomes harder and harder to generalize on the influence of any factor on plants.

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