Comparative Sensitivity to Radiation of Seeds from a Wild Plant grown on Uraniferous and Non-Uraniferous Soils

THE long-term effects of low-level chronic irradiation on living organisms have attracted increasing interest in connexion with the observed contamination from man-made radioactive sources over large areas of the Earth's surface. No experimental evidence exists that definite biological changes are induced in a large population under very low continuous exposure.

The assessment of sensitivity during the process of germination may provide a satisfactory approach, as seeds are available from plants of the same species that have—or have not—grown for ages in a radioactive environment, thus being continuously irradiated. We used seeds of *Andropogon filifolius* (Nees) Steud, a perennial grass[1], collected by one of us on neighbouring uraniferous (Kasompi) and non-uraniferous, but otherwise similarly mineralized, soils (Dikuluwe) in Katanga (Belgian Congo). The dose received by the sexual or somatic cells of these plants is impossible to calculate, mainly because the radioactivity of the superficial layers of the soil is extremely variable—from 10 to 50 times background.

Table 1

Dose (*r*)	Germination (per cent)	
	Uraniferous soil	Non-uraniferous soil
0	30·0	18·0
1,000	26·7	18·0
1,770	24·0	22·0
3,160	30·7	22·0
5,620	28·0	24·0
10,000	24·6	11·5
17,700	24·7	14·0
31,600	21·9	13·3
56,200	19·3	11·1
100,000	19·9	17·3

Groups of seeds (150) soaked for 12 hr. from both soils were irradiated simultaneously on moist filter paper at different doses with a Siemens 'Stabilivolt' (200 kV.; 20 m.amp.; no filter; source-target distance: 30 cm.; rate, 700 r./min.). All seeds were grown in a greenhouse on moist filter paper. Three criteria were investigated: germination, and maximal lengths of stalks and roots[2] at the time of death of the plantlets. The percentage of 'normal' germination and length of stalk and roots were estimated from un-irradiated control groups (± 1·800 seeds). The results are shown in Table 1 and Fig. 1.

Seeds originating from uraniferous soil exhibit a higher percentage of germination, and plantlets develop stalks and roots of greater average length. Germination is not significantly inhibited by radiation in the range used. At any dose-level, the average length of roots and stalk is greater in plants from uraniferous soil. The potency of radiation in inhibiting growth of roots and stalks may be expressed as the percentage of shortening of initial length per roentgen. It decreased exponentially with dose and reached a plateau at the 20,000 *r*. dose-level; no significant difference was evident between either series (Fig. 2). However, the observed differences between percentages of germination and lengths of organs of plants from uraniferous soils and those from non-uraniferous soils lead to the conclusion that the two populations are different. The chronically irradiated population possesses higher vitality. Whether selection or adaptation or both are responsible is an open matter. In any event, enhancement of biological potentialities rather than degeneration has apparently resulted from long-continued low-level irradiation of *Andropogon filifolius*. This experiment is now being repeated with another species of *Andropogon*.

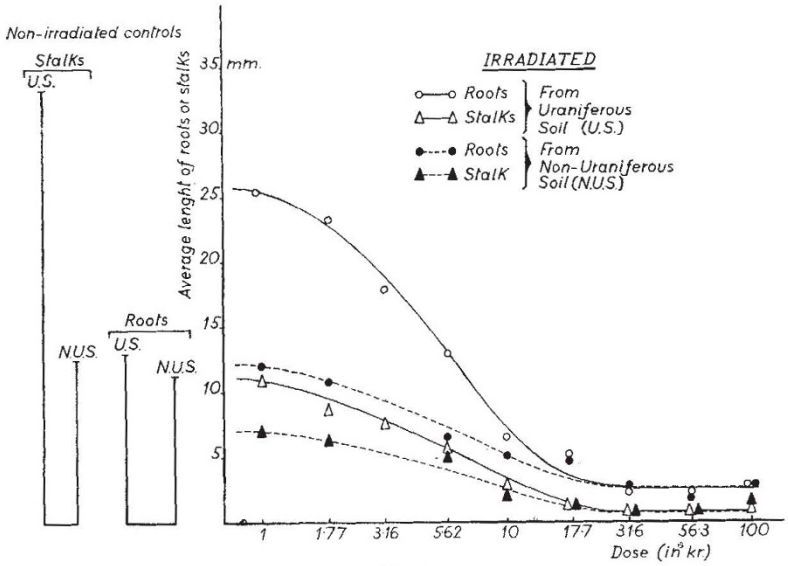

Fig. 1

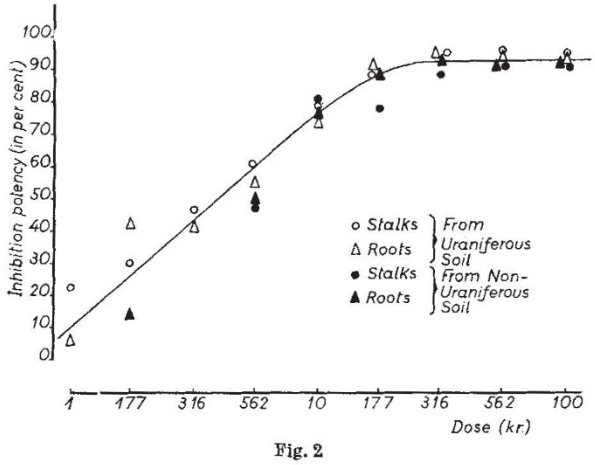

Fig. 2

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[1] Duvigneaud, P., *Bull. Soc. Roy. Bot. Belg.*, **90**, 127 (1958).
[2] Koernicke, M., *Ber. deut. Bot. Ges.*, **22**, 148 (1904).