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THE ARTIFICIAL RADIOACTIVITY IN RAIN-BORNE DUST AND IN RAIN WATER OBSERVED IN CALCUTTA DURING 1962

The resumption of nuclear weapons testing from February 1960 led to elaborate measurements of radioactive fallout all over the world. In our laboratory, systematic record of the intensity of radioactive fallout has been maintained since early 1961.

Routine collection of air-borne, rain-borne and ground-deposited fallout samples has been made and the intensity of the radio-elements measured in terms of their β and γ activities. The present report deals with the measurement of β-activity of artificially radioactive elements carried down by rains at Calcutta during the year 1962.

The rain water was collected in a large enamel tray (64 cm × 50 cm × 5 cm). A known volume of the rain water, usually one litre, was filtered through an 'ashless' filter paper. The filtrate was evaporated to a very small volume and subsequently dried carefully by an infra-red lamp. The filter paper containing the insoluble residue was next dried and burnt to ashes. Both of these samples, containing water-soluble and insoluble radioactive materials were then tested separately for their β – activities, using a mica end-window (3 mgm/cm²) G–M counter mounted within a lead castle.

The slight day-to-day variation in the sensitivity of the G–M tube was calibrated carefully, using a Ra (D+E) standard of known strength. The error in the counting rate was always kept below 2 per cent. The measurement of activity of each sample was recorded after correcting for the background activity on the date of measurement, and also for the geometry and the efficiency of the G–M counter.

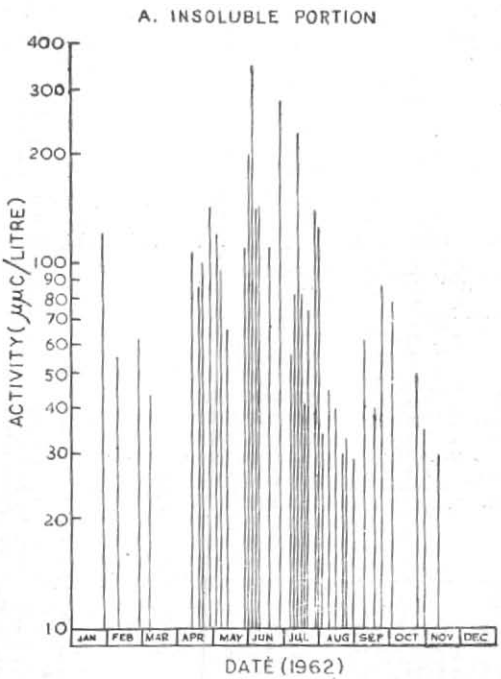

Fig. 1(a). β-activity of the ignited residue in rain water.

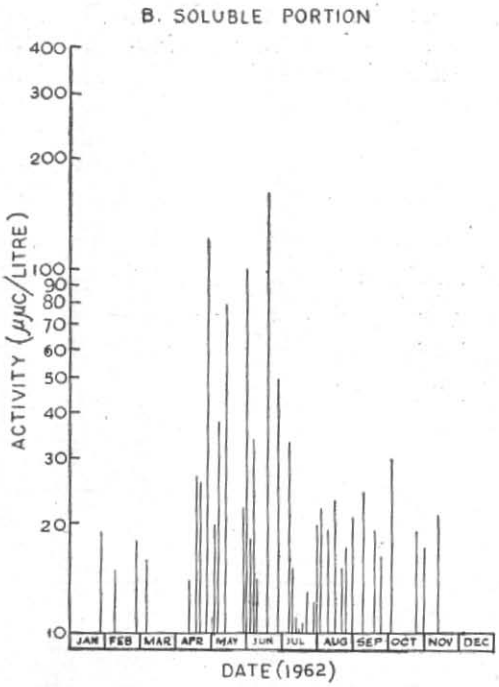

Fig. 1 (b). β-activity of the evaporated filtrate containing water soluble salts in rain water

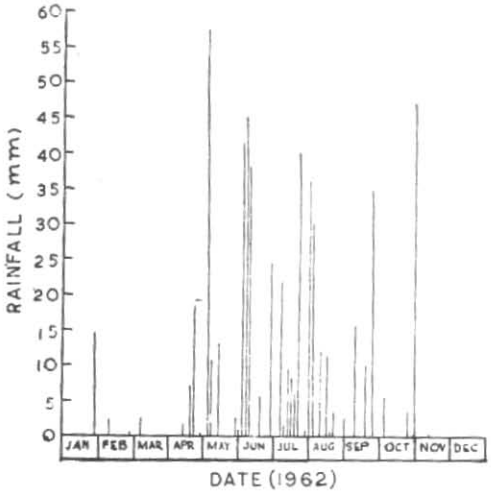

Fig. 2. Amount of daily rainfall against date of precipitation

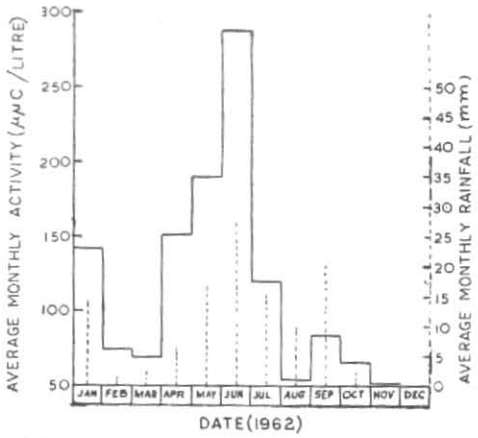

Fig. 3. Average total monthly β-activity of rain-borne radio-elements and average total monthly rainfall during 1962

Fig. 1 (a) shows the β-activity of the ignited residue in micro-micro-curies per litre of collected rain water, while Fig. 1 (b) indicates similar activity of the evaporated filtrate containing water soluble salts. It may be noted that, in general, the insoluble residue carries higher specific activity than its soluble counterpart, although it is evident that the distribution of activity between two portions is somewhat arbitrary, depending mostly upon environmental conditions.

Fig. 2 shows the amount of daily rainfall in mm during 1962, against the date of precipitation.

Fig. 3 shows the average total monthly activity of the rain-borne radio-elements and also the average total monthly rainfall in 1962. The total maximum activity is of the order of 0·5 milli-micro-curie per litre of rain water. This is quite small in comparison with the activity of 160 milli-micro-curie per litre of rain water as recorded in Japan (Miyake 1954) in 1954. The highest total activity was attained in June 1962 which corroborates the findings of Dutta *et al.* (1962). It may be seen that although higher deposition seems to be associated with high rainfall, there is no proportionality between the two. Vohra *et al.* (1960) have also reached similar conclusions, in connection with their measurements in the ground deposition of fission products from nuclear test explosions at various stations located in India.

SUSHIL Kr. DAS
S. D. CHATTERJEE

Jadavpur University,
Calcutta
September 30, 1963

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