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EFFECT OF IONIZING RADIATION ON SEED GERMINATION OF *PASSIFLORA* SPECIES

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THE recent popularity of the genus *Passiflora*, because of its edible species, has attracted the attention not only of taxonomists but also of cytogeneticists. Of the 400 known species of *Passiflora*, about 50 to 60 bear edible fruits. Probably all these are indigenous to the American tropics. In most areas of the tropical and subtropical world where passion fruit is grown, the species *P. edulis* Sims. (purple passion fruit) predominates. Purple passion fruit, because of its high fruit quality is by far more popular in Australia, New Zealand, Brazil and S. Africa. In India it is known only in some parts. Besides the juice, purple passion fruit also contains vitamin A and niacin[1]. Commercial production of this fruit has limitations because of its susceptibility to common pests and diseases and intolerance to cold.

Seed germination percentage has been found to be very poor in *P. edulis* and to a certain extent in *P. foetida* Linn. Ionizing radiations could be of great importance as a means for removing the dormancy of the plant material, increasing the germination and germination energy of seeds, tubers and roots.

Seeds of *P. edulis* were obtained from Sims Park, Nilgiris and those of *P. foetida* were obtained from Agriculture and Fisheries Department, Kowloon, Hong Kong. Seeds of both the species were surface sterilized before they were dispatched to BARC, Trombay, for irradiation. The irradiation treatment consisted of 12 levels of gamma rays ranging from 1 kr to 30 kr with 150 seed sample used per dose. The entire experiment was repeated twice and the mean was tabulated and given in Table I.

TABLE I

Germination and survival percentage of P. edulis *and* P. foetida *seeds irradiated with gamma rays. Data taken after 30 days of survival*

Dose	*P. edulis*		*P. foetida*	
	Germination %	Survival %	Germination %	Survival %
Control	33·4	33·5	38·7	67·3
1 kr	87·6	90·4	80·5	94·6
1·5 kr	82·3	100·0	84·8	92·3
2 kr	88·7	92·4	81·4	93·4
2·5 kr	80·7	83·7	94·5	91·7
5 kr	74·6	76·8	89·7	84·7
7·5 kr	68·3	61·3	84·5	82·3
10 kr	59·7	45·7	79·8	68·4
12·5 kr	48·3	43·7	69·4	58·7
15 kr	41·5	40·2	59·8	51·3
20 kr	18·4	14·8	33·6	27·8
25 kr	06·7	04·5	27·6	18·5
30 kr	00·0	00·0	00·0	00·0

The irradiated seeds were sown within 24 hours, in pots together with the control seeds. Survival percentage for each dose was determined.

Table I indicates that the percentage of seed germination in both the species was found to have increased at lower doses over those of control but the survival percentage of seedlings increased considerably at lower doses ranging from 1 kr to

5 kr in *P. edulis* and from 1 kr to 10 kr in *P. foetida*. After 15 kr there was observed a sudden drop in the germination as well as in the survival percentage in both the species. More or less similar type of results were obtained in *Lupinus luteus, Papaver somniferum*[4]; *Datura stramonium*[5].

The seeds of both the species which were irradiated at lower doses were found to have germinated earlier than those of the control and of higher doses. The effect of ionizing radiation on the acceleration of seed germination was indicated very clearly. Between 1 kr to 2·5 kr, seeds germinated within 18 to 21 days while seeds of control *P. edulis* took 29 days for germination. While at 1 kr to 2 kr seeds of *P. foetida* germinated within 10 days but the germination was observed on 15th day in control seeds. Almost every investigator found that germination and germination energy of seeds increased after irradiation with small doses[6-7].

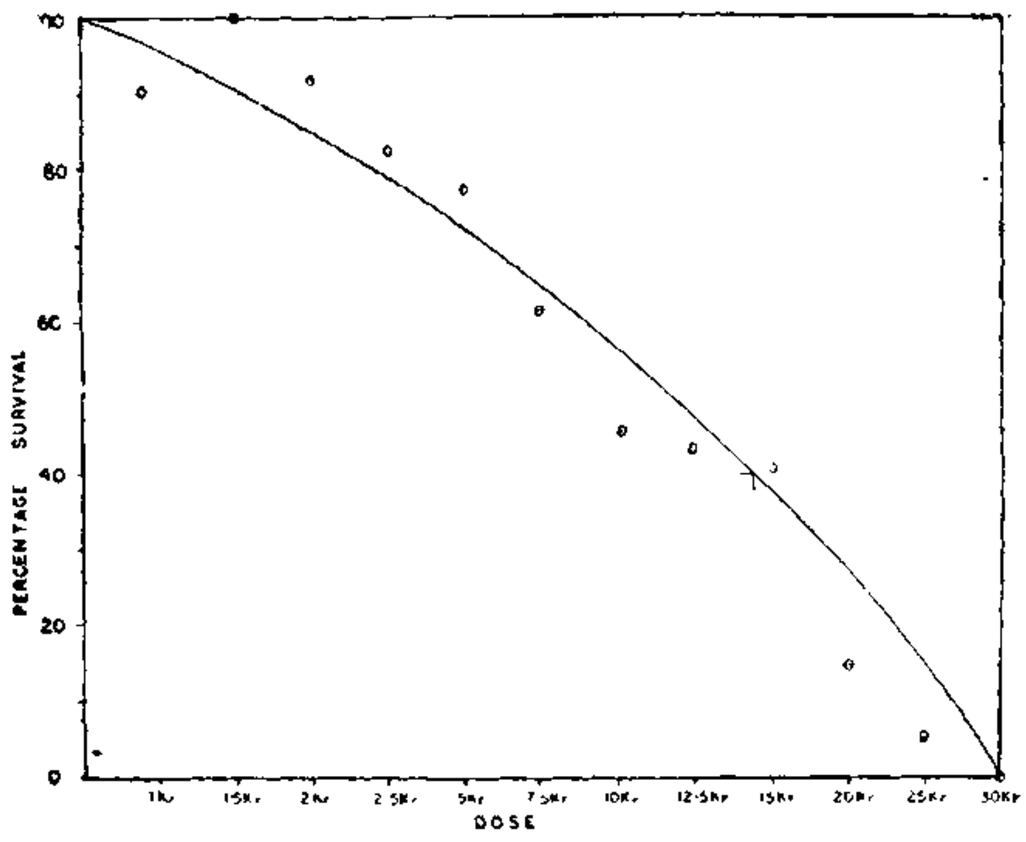

FIG. 1. Relation of survival in the seeds of *P. edulis* exposed to different doses of gamma rays.

In Sweden and in U.S.A. plant breeders who use radiation are employing the so-called "critical dose" in which about 40% of the plants survive. According to Dubinin[8] a critical dose of radiation is the one in which an appreciable depression is observed in the development of plants, but at which, an adequate number of plants remains capable of producing seeds. Also there is a relation between the radiosensitivity, number of chromosomes in cells and their size in different species of plants. Such a comparison was made by Sparrow[9]. It has been found that in general plants with a similar number of chromosomes have almost equal radiosensitivity. The radiosensitivity is being figured here in the term of critical dose. In the present investigation *P. edulis* which has $2n = 18$ and with large chromosomes (range $47{\cdot}9\,\mu - 13{\cdot}19\,\mu$), the critical dose is 14·5 kr (Fig. 1) while *P. foetida* with $2n = 22$ and with comparatively smaller chromosomes (range $28{\cdot}42\,\mu - 4{\cdot}9\,\mu$) has a critical dose as 18 kr (Fig. 2).

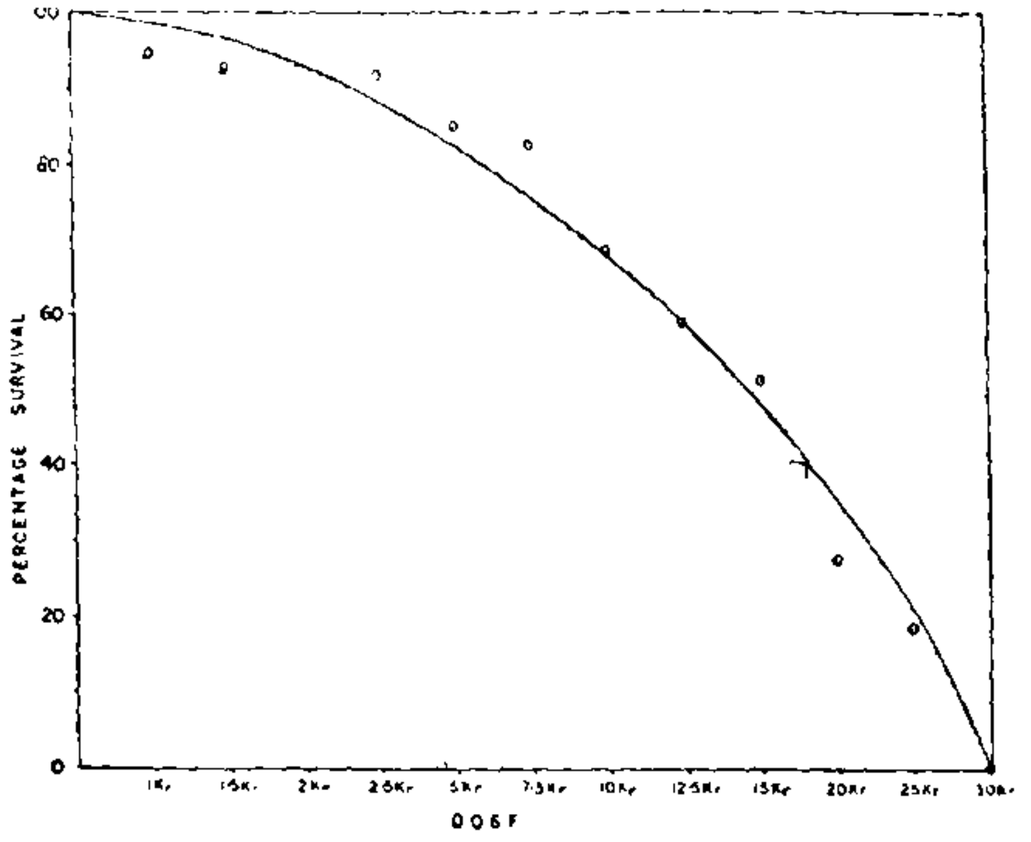

FIG. 2. Relation of survival in the seeds of *P. foetida* exposed to different doses of gamma rays.

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