

other leaf tissues was observed in transverse and paradermal sections (Figs. 2 and 3). Majority of the sclereids are sub-epidermal in position situated either between the upper epidermis and the palisade layer or the lower epidermis and the spongy mesophyll. The long axes of such sclereids are distributed parallel to the surface of the leaf. Some of the others are obliquely oriented through the mesophyll tissue, occasionally connecting the sclereids next to the upper and lower epidermis (Fig. 2). The individual sclereids are 'T', 'y' or 'L'-shaped in outline, with a thick cell wall surrounding a central lumen and on an average they are 1128μ long. Occurrence of foliar sclereids is reported in fourteen other genera of this family and *A. sessilifolia* may be included among those that have sclereids with non-stratified walls.²

Taxotrophis ilicifolius Vidal is a small tree with oblong coriaceous leaves commonly found in the coastal regions. The leaf clearings show somewhat sparsely distributed thin-walled filiform sclereids arranged in a criss-cross manner (Fig. 4). They are mainly sub-epidermal in position (Fig. 5) and the individual sclereid cell has a homogeneous wall, with prominent central lumen. Most of them are elongated (average length = 653μ) and the tips are forked to form equal or unequal branched. Mid-branching of these cells is also not uncommon displaying 't' or 'L'-shaped outline. Sclerenchymatous idioblasts in the mesophyll tissue are reported only in case of three other genera of Moraceae, but further details about their morphology and relationship with other leaf tissues are not known.²

Timonius wallichianus is a medium-sized tree very common in the secondary and primary forests of Singapore, with characteristic lanceolate silky leaves. The prominent lateral veins are somewhat parallelly arranged extending from the mid-vein to the leaf margin. The leaf clearings and paradermal sections reveal that the elongated (average length = 662μ) filiform sclereids occur either singly or in groups of 3-4 and are parallelly distributed in between

the veins (Figs. 6 and 8). Though the sclereids in this species strongly resemble the xylem fibres that accompany the tracheids, they differ and could be distinguished from them by their thicker cell walls and terminal or mid-branching. The branched sclereids are 'y', 't' or 'r'-shaped in outline. In addition, there is a second type of sclereids in the leaves of this species, which is shorter (average length = 242μ), non-branching, with a thick-pitted cell wall that surrounds a prominent central lumen. These occur as isolated structures, and occasionally in groups of two or three. As regards their positional relationship, both the types of sclereids are distributed in the spongy mesophyll tissue. The upper epidermis is covered with a thick cuticle and the cells of the lower give rise to a number of unicellular trichomes (Fig. 7).

In all the three species above described, the elongated sclereids have a smooth, non-lamelated cell wall devoid of any spicules. Only in the shorter sclereids of *Timonius* pits were discernible, and they were rarely seen on the walls of elongated sclereids in other forms. The morphology and distribution of such polymorphic filiform sclereids are reported earlier in Melastomaceae,^{5,6} Oleaceae,⁷ Loranthaceae,³ Annonaceae and Myristicaceae.⁸ To establish their exact relationship with the veinlets, further ontogenetic studies are necessary, and these are in progress. Other tropical genera of these families also need to be investigated to obtain more details about the occurrence and distribution of foliar sclereids in them and the information thus obtained may be further helpful in understanding their taxonomic relationships.

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THE SENSITIVITY OF LOW AND HIGH ALTITUDE BARLEY TO GAMMA-RAYS

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THE factors that govern the radiosensitivity are inherent to different species of plants and other organisms. Some cellular constituents like chromosome number, nuclear volume, DNA content, chromosome structure and organisation

have a direct relationship with the radiosensitivity of the plants.^{1,2} But this sensitivity can be modified artificially by manipulating conditions before, during or after the process of irradiation. In the present note the differential

sensitivity of two types of barley is reported. One type represents a local one, which is under cultivation in North Indian plains while the second has been collected from Ladakh locally called Grim and grows at an altitude of 9-12,000 ft.

The seeds were exposed to 0, 10, 20, 30, 40 and 50 k.rads of gamma-rays. Following radiation seeds were germinated on moist filter-paper. Radiosensitivity has been measured by assaying the seedling growth and cellular abnormality. The height of the shoot portion was measured on 14th day. For cytological studies root-tips were fixed after 24 hours of germination in 1 : 3 acetic alcohol. Cells showing any type of chromosome aberration were scored as abnormal. The data of the seedling height are presented in Table I. Germination

TABLE I
Seedling height given as a percentage of control in grim and barley

Treatment	Seedling height % of control	
	Grim	Barley
Control	100	100
10 k. rad	96.1 ± 2.8	95.2 ± 1.14
20 "	58.5 ± 2.0	70.1 ± 1.37
30 "	48.4 ± 1.8	63.4 ± 1.20
40 "	41.4 ± 1.5	49.0 ± 1.05
50 "	32.0 ± 1.5	45.7 ± 0.61

in both sets started at about the same time, i.e., after 24 hours of putting them for germination. It is seen that there is a sharp reduction in seedling height in grim as compared to local barley. A 50% reduction in grim is effected by a treatment with 30 k.rads while the similar effect in local barley is given by 40 k.rad treatment. In other words there is a difference of 10 k.rad in the sensitivity of two types when seedling height reduction is taken as an index. Seedling height reduction has already been taken as a positive proof of radiation damage by many workers.³⁻⁶ The data regarding cellular abnormalities are presented in Table II

TABLE II
Comparative frequency of cells with aberrations after a treatment with gamma-rays

Treatment	% cells with aberrations in		
	Cells scored	Grim	Barley
Control	100
20 k.rad	215	19.4	12
30 "	254	33.4	22.5
40 "	197	58.4	62.4
50 "	134	69.7	65.6

where it is clear that percentage of abnormal cells for a particular dose of gamma-rays is generally higher in grim as compared to the local barley, thus supporting the data of seedling height reduction and indicating that grim is comparatively more radiosensitive than barley. Both the types, i.e., barley and grim belong to *Hordeum vulgare* with $2n = 14$. Their Karyotype is identical. The seeds were dried and stored under identical conditions and irradiation was carried out at the same dose rate and intensity, thereby eliminating all possible environmental factors that could have influenced the sensitivity of any one set of seeds.

It is well known that high altitudes differ from the plains in several ways. For instance with the increasing altitude there is a gradual decrease in temperature, pressure, oxygen tension and humidity while on the other hand there is progressive increase in the intensity and nature of ultra-violet, visible, cosmic and other radiations.⁷ In other words high altitudes receive more radiations in a certain period of time as against lower plains. According to general rules of radiobiology and natural selection it is expected that plants growing at higher altitudes should have gained some resistance to radiations. Implicitly grim that has been under cultivation at Ladakh for a very long time should have been more resistant than barley of plains. But the data presented in this do not support this contention. However, several physiological changes have already been reported to be associated with high altitudes.⁷ It is therefore presumed that some soil climatic or environmental factors have so modified the physiology of this plant that it has been rendered more sensitive to radiations.

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