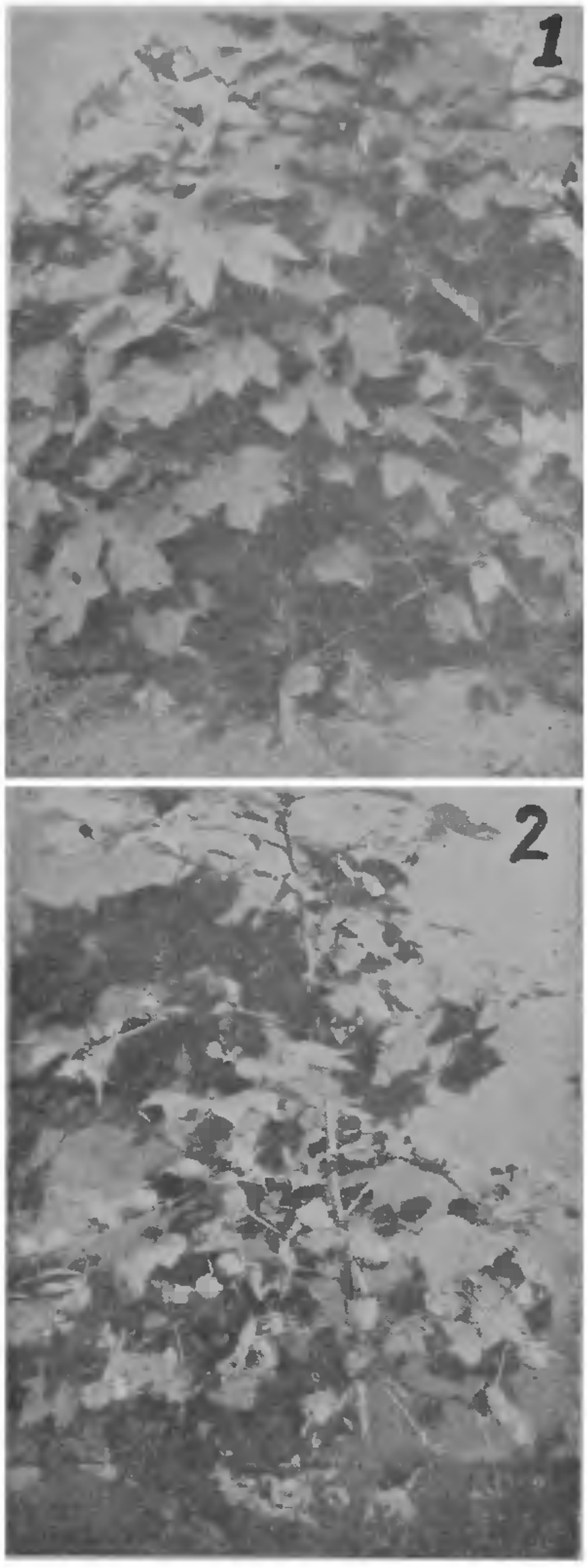
of 14, but in mutants it varied from 60 to 100 when recorded after 175 days of sowing. This,



FIGS. 1–2. Fig. 1. Control. Fig. 2. Photo-insensitive mutant. Both plants 90 days old.

in turn, increased the yield of seed cotton by 2 to 5 times. The other fibre qualities of length, strength and fineness were more or less similar to those of the controls. The ginning in one of the mutants (mutant 6) was increased to 37% as against 34% of control.

As regards efficiency of the radiation dose to induce photo-insensitive mutations 20 Kr of gamma-rays appeared most suitable. The higher doses induce more of seedling lethality and sterility; with lower doses, the frequency of mutants was considerably reduced.

Some of the mutants appear very promising and may be released for general cultivation in North Indian conditions in the near future.

Division of Genetics, R. N. RAUT.
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MORPHOGENETIC VARIATIONS IN THE GAMETOPHYTE OF A 3X RACE OF A FERN - *HYPODEMATIUM CRENATUM* (FORSK.) KUHN

THE two morphologically dissimilar generations in the fern life-cycle, *viz.*, sporophyte and the gametophyte begin their development from a single-celled zygote and a spore. The gametophyte is a much too simpler organization than the sporophyte and its adult form is modulated through three growth sequences, *viz.*, mono-, bi- and three-dimensional. Experimental studies have shown that the early developmental stages in culture are light-dependent photoreactions reflecting differential gene activity.[3] However, no direct studies dealing with the effects of chromosomal and cytoplasmic disturbances inherent in the spores, on the above-mentioned growth sequences, have been made.

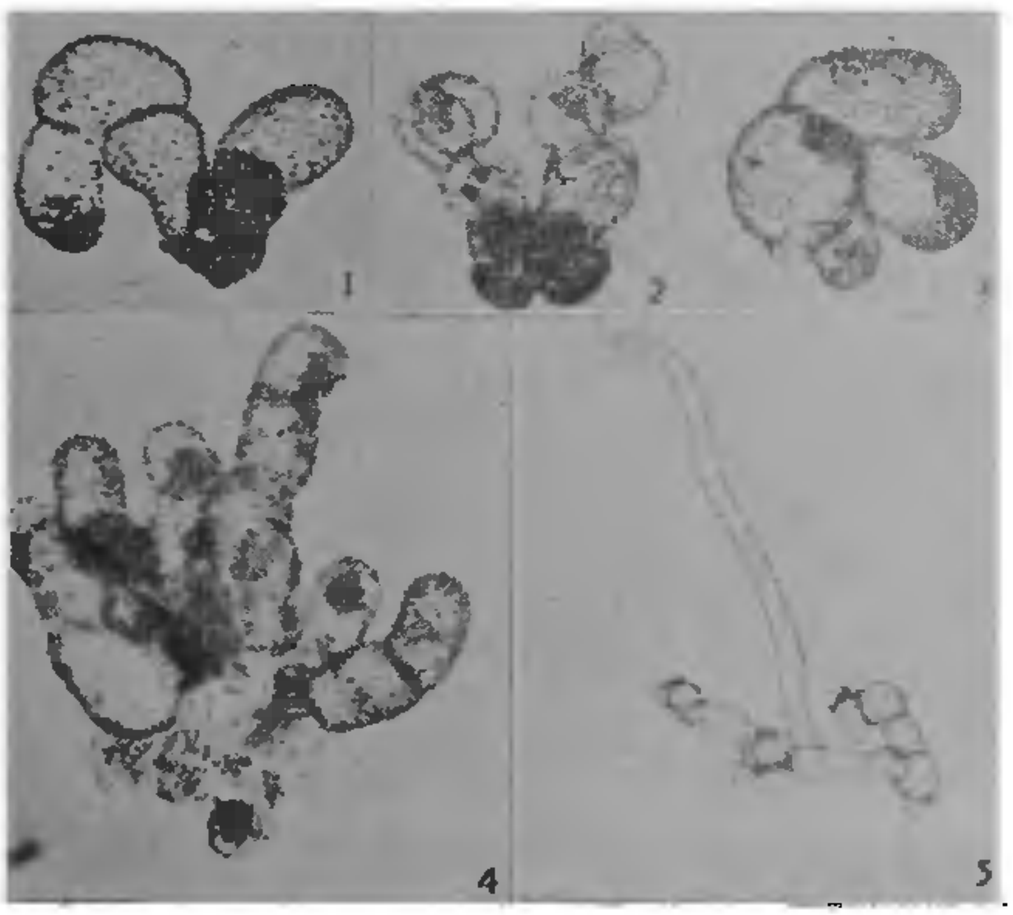
The Himalayan populations of this fern are comprised of 2X ($2n = 82$), 3X ($2n = 123$) and 4X ($2n = 164$) plants. The 2X and 4X produce 32 spores per sporangium in contrast to 64 in majority of the sexual ferns. These spores, on germination, passed through the above-mentioned growth sequences leading to normal cordate prothalli. In 3X plants, the meiotic aberrations resulted in highly unbalanced spores and germination trials in a sample gave upto 37% germination in contrast to 75–82% recorded for the X and 2X spores. These data of 3X are, however, expected to vary from sample to sample.

All the cultures were raised under uniform conditions of light and nutrition. The first

germ-cell in 3X failed to exhibit polarity gradient and, unlike the germ-cells in X and 2X spores, retained potentiality to undergo mitosis more than once, the plane of spindle being different at each division. In many cases, the rhizoidal differentiation was either inhibited or considerably delayed.

Based upon such variations as: (*a*) plane of division in the first germ-cell, (*b*) its number of mitotic divisions, and (*c*) subsequent fate of the filamentous protonemata, the growth patterns may be described under the following three broad categories:

(1) In contrast to the highly asymmetrical plane of division in X and 2X germ-cells, in 3X, it may be oblique or vertical. The two almost equal-sized cells grow into two separate filaments and the differentiation of the rhizoidal cell is bypassed. As shown in Fig. 1,



FIGS. 1–5. Fig. 1. Ten-day-old protonema showing two divisions of the germ cell, the rhizoidal differentiation is inhibited, × 100. Fig. 2. Sixteen-day-old protonema developed as that of Fig. 1 or from a binucleate, abnormal spore, × 100. Fig. 3. Three successive divisions of the germ cell after the differentiation of the first rhizoid, the plane of division is different each time, × 125. Fig 4. Ditto, Twenty-day-old, rosette shaped protonema, × 125. Fig. 5. Fifteen-day-old protonema showing highly differential, monoplanar growth, × 100.

the cell on the left forms a filament of three cells, each cell exhibiting highly differential growth. In some cases, regular alternation of spindle axis was observed at each mitosis (Fig. 2).

(2) The germ-cell may divide repeatedly in more than one plane, resulting in a rosette of filaments (Figs. 3, 4). A comparison of the protonema depicted in Fig. 5 with those in Figs. 3–4 show well-marked differences in cell and chloroplast size in different protonemata and also within the same protonema. The chromosomal analysis of the different types of protonemata demonstrated variable numbers from below the haploid level ($n = 41$) to well above the diploid level ($n = 82$). Thus, if the various patterns are evaluated in terms of the genotype, we can regard each viable spore as distinct.

(3) In one-month-old cultures, 32% protonemata did not grow beyond the filamentous stage and produced antheridia only. In other 35%, the filaments entered biplanar growth and formed cordate prothalli which bore archegonia. A detailed study on the sex organs and fertilization is in progress.

The results obtained simulate those produced by colchicine[2] and ionizing radiations[1] and to account for the disturbed growth sequences observed in the present material, the events at meiosis and the early developmental stages of the gametophyte may be envisaged as a continuum in the life-cycle.

Dept. of Botany,
Panjab University,
Chandigarh-14 (India),
March 17, 1971.

D. S. LOYAL.
PARMJIT PAIK.

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SOME CULTURAL OBSERVATIONS ON *SCHIZOMERIS LEIBLEINII* KUETZING

IN recent years, *Schizomeris leibleinii* Kuetz. has been studied in cultures by some workers. The studies show that the alga is highly variable in its morphological and cytological characters. Prasad and Srivastava (1963) have recorded the occurrence of zoospores as having 2–8 or more flagella and Patel (1967) has described a variable number of chromosomes as 15, 28 and 30, some cytological details and occurrence of thick-walled cysts. The species recently collected and cultured has yielded certain observations unrecorded so far.

The present form was growing attached to some decaying twigs of water plants in an open slow-flowing drain at Allahabad during November 1970. The alga readily produced zoospores when put in a liquid medium. It was reared in unialgal culture starting from such zoospores obtained from a single filament. It grows well in both liquid and solid