FLUORITE MINERALISATION IN THE MANDI GRANITE, HIMACHAL PRADESH, INDIA

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THE present note reports the occurrences of fluorite mineralisation in the Mandi Granite, along the Beas river section between Mandi and Pandoh, particularly at the 9th km stone to Pandoh from Mandi. The fluorite is recognised by its hardness and characteristic purple colour.

The fluorite mineralisation occurs as patches in the colourless-to-white and smoky quartz veins of varying sizes, and as scattered disseminated grains in the sub-solvus Mandi Granite—far away from the quartz veins but parallel to main foliation (NW-SE/55°-SW) in contact with plagioclase feldspars. Veins of quartz containing fluorite vary in thickness from 0.5 to 10 cm with patches of fluorite having a size of 5×3 cm (maximum) to individual grains of 2 mm diameter. The disseminated fluorite grains of purple colour in the deformed and foliated Mandi Granite range in size between specks to 5×3 mm.

The fluorite mineralisation is structurally and chemically controlled as suggested by its parallel orientation with the country rock and association with Ca-rich plagioclase.

It is suggested that the Dhaula Dhar Granitoids, of which the Mandi Granite constitutes an extension, should be explored in detail for fluorite and also for uranium mineralisation with which this mineral is commonly associated.

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REGENERATION OF PLANTS FROM POLLEN—EMBROYS OF *ARACHIS*, *BRASSICA* AND *TRITICUM* SPS. CRYOPRESERVED FOR ONE YEAR

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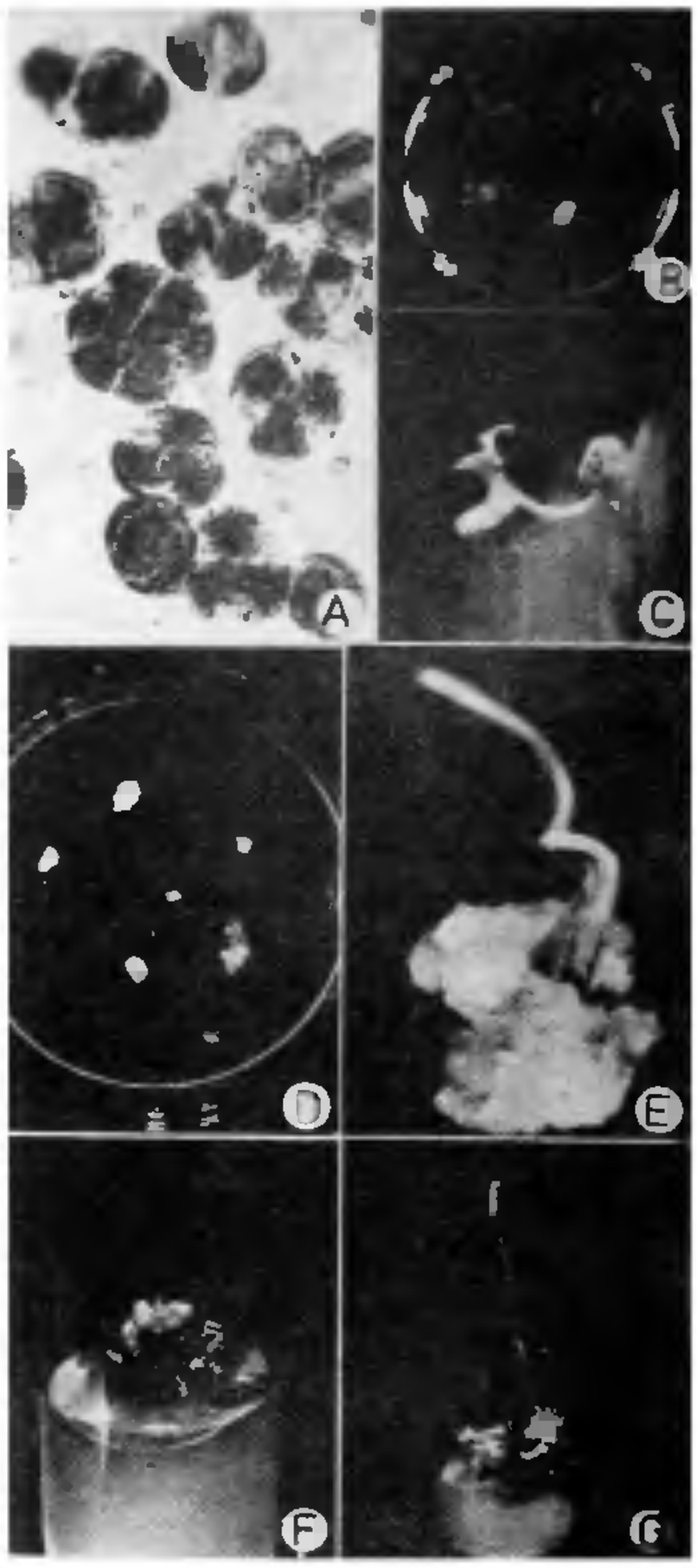
THE haploid cell cultures are known to be genetically unstable, and have a tendency to revert to their diploid form. In view of their importance in genetics and mutation studies, it is highly desirable to develop methods for their maintenance. In this respect freeze-preservation of cultures is a novel approach[1]. In the present communication the results on the survival of haploid tissues of some important crop species, *i.e.*



Figures A-G. Survival of pollen-embryos and segments of the androgenic anthers of *Arachis*, *Brassica* and *Triticum* frozen to − 196° C. **A.** Pollen-embryos of *Brassica campestris* isolated from 5-week-old cultured anthers, and used for freezing. **B.** A suspension of retrieved pollen-embryos grown in drop cultures. **C.** A plantlet of *Brassica campestris* obtained from cultures freeze-preserved for one year. **D.** Callus masses obtained from frozen segments of the androgenic anthers of *Triticum aestivum*, cv. Kalyansona. **E.** Same, showing the differentiation of a shoot. **F, G.** Anther-derived callus of *Arachis villosa* 7 (F) and 10 (G) weeks after reculture; note the regeneration of a shoot in G.

TABLE 1

Survival of pollen-embryos and segments of the androgenic anthers of Arachis, Brassica and Triticum cryopreserved for one year.

Plant species	No. of pollen embryos frozen	No. of pollen embryos survived	% survival	No. of anther segments frozen	No. of anther segments resumed growth	% survival
Arachis hypogaea cv. M 13	73	21	29	107	15	14
A. villosa	121	46	38	120	37	31
Brassica campestris cv. TL 15	94	29	31	111	12	11
B. napus cv. Tower	81	35	44	114	21	19
Triticum aestivum cv. Kalyansona	112	21	19	155	8	5

peanut, wheat and mustard frozen and stored at − 196° C for one year are summarized.

The excised anthers of *Arachis hypogaea* cv. M 13, *A. villosa*, *Brassica campestris* cv. TL 50, *B. napus* cv. Tower, and *Triticum aestivum* cv. Kalyansona were cultured on their respective media[2-4] for 4–6 weeks. Thereafter, they were removed, cut into 2–4 equal segments, and used for freezing studies. The segments from 50 anthers were either wrapped in an aluminium foil[5], or were put in 1 ml of the cryoprotective solution (5% each of dimethyl sulfoxide, sucrose and glycerol). From some segments a suspension of pollen-embryos was prepared[6]. The materials were frozen by two methods, (i) subjected to the vapours of liquid nitrogen and immersed gradually, (ii) immediate immersion in liquid nitrogen and were stored for one year. The materials were thawed at 35–40° C, washed and cultured[6].

The survival was judged by (i) increase in size of the embryos, (ii) callusing, (iii) greening, and (iv) formation of roots and shoots.

The cryoability of the anthers from various crops was highly genotypically oriented (table 1). The suspension of pollen-embryos (figure A) obtained from the 5-weeks-old anther cultures of *Brassica campestris* and *B. napus* and grown in drop cultures (figure B) showed a survival of 31 and 44% respectively (table 1). The pollen-embryos underwent a lag phase and did not show any visible sign of growth for the first 4 weeks in cultures, however, thereafter they started to elongate. The embryos resumbed growth, and either directly developed into plantlets, or were accompanied by callus formation (figure C).

The viability of the anther segments and the pollen-embryos was 31–38% and 19–44% in *A. villosa* and *B. napus* respectively. Wheat showed the poorest response, as only 5% of the anther segments resumed growth. The retrieved cultures underwent a lag period of 4–6 weeks, however after that the anther segments underwent proliferation (figures D, F) and the callus occasionally differentiated malformed shoots and plants (figures C, E, G).

The survival of the anther segments was observed in both the methods employed for freezing. However, the anther segments wrapped in the aluminium foil (dry method) yielded better results as compared to the ones frozen in the ampoules. In the later case anthers had a tendency to become spongy.

To conclude, the survival of pollen-embryos, and the regeneration of plants from cultures freeze-preserved for one year suggest the application of cryogenic methods for the conservation of haploid cultures, and for the establishment of germplasm banks of rare, endangered and elite genetic stocks of crops[7].

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A HIGH FREQUENCY OF NULLISOMICS IN THE WILD POPULATION OF *COIX GIGANTEA* (POACEAE)

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OCCURRENCE of nullisomics in a natural population is comparatively rare. This is mainly because any chromosomal deviation from the typical is often likely to be eliminated, the variants being usually incompetent. Individuals, in which a complete bivalent is lost from their chromosomal constitution ($2n$-2), are reported to be comparatively weak with low rate of survival. Nullisomics have, however, been produced under controlled conditions, through appropriate breeding of aneuploids or selfing monosomics, and they survive and thrive well when raised with care. Generally, nullisomics appear more among higher polyploids, as in wheat and oat[1], since in them, the loss of a bivalent can easily be withstood, and also more than compensated by the excess genomes in balance.

Coix gigantea Koen. ex Roxb., one of the oriental genera of the tribe Maydeae of Poaceae, grows wild in the western ghats of India. A population, collected from Purandar (Maharashtra State) and later maintained at the Botanical Garden of this University, was individually screened for chromosome number. Male racemes were fixed in acetic-alcohol (1:3) and the young anthers were squashed in acetocarmine (1%). Slides with desired stages in meiosis were made permanent using liquid carbon dioxide[2], and they were deposited with the Cytogenetics Unit of the Botany Department.

In nature, *Coix gigantea* is known to occur in two cytological forms, $2n=20$ and $2n=40$. Single plant cytology in a total of 105 plants[3-6], selected at random from wild population of *C. gigantea*, showed the various chromosomal variants as presented in the Table-1.

Nullisomics appearing in such a high frequency (about 65%) among natural population seems to be a highly significant feature when compared to the earlier reports on their origin and occurrence in several other taxa[1]. While the diploids revealed 10 regular bivalents (figure-1), the nullisomics showed clear nine bivalents (figure 2) that went through meiosis normally producing deficient but functional male gametes (n-1, *i.e.* $n=9$). Loss of a bivalent did not seem to have seriously affected the chromosomal behaviour in nullisomics. The sub-haploid gametes managed to survive and participate in the reproductive process producing more nullisomics in the population. The nullisomic plants were quite normal and healthy and some were even stouter and taller than diploids. Morphologically, there was hardly any obvious difference between nullisomics and the disomics. In the various aneuploid obtained, detailed observations on morphological marker(s) and the behaviour of the chromosomes are in progress and will be published subsequently.

In the tribe Maydeae, it appears from the literature[3-5] that there are two basic chromosome numbers, $x=5$ and $x=9$. All the genera of Maydeae have chromosome numbers in multiples of five. *Tripsacum* is the only exception to this and has nine as its basic chromosome number. Within the genus *Coix*, there is a species—*C. aquatica*— having $2n=10$ chromosomes, *i.e.* $x=n=5$. Considering, therefore, five as the basic chromosome number for the genus *Coix*, the present species, *C. gigantea* with $2n=20$ happens to be numerically at a tetraploid level. Appearance and survival of nullisomics in such a high frequency easily tolerating the loss of a bivalent and

TABLE 1

Frequency of various chromosomal variants in C. gigantea in the wild population

Total No. of plants	Nullisomic $2n=18$ $2n=2$	Monosomic $2n=19$ $2n=1$	Disomic $2n=20$ $2n$	Trisomic $2n=21$ $2n+1$	Tetrasomic $2n=22$ $2n+2$	Pentasomic $2n=23$ $2n+3$	Hexasomic $2n=24$ $2n+4$
105	68	13	9	12	1	1	1