Induced polyploidy in black pepper (*Piper nigrum* L.)

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ABSTRACT

Induced polyploidy in a hybrid cultivar of black pepper Panniyur-I is reported. Open-pollinated seeds were used for polyploidy induction. One tetraploid of Panniyur-I with 104 chromosomes in somatic cells was recovered from plants raised from seeds treated with 0.05% colchicine. The plant was vigorous and possessed all the polyploid syndromes.

Key words : polyploidy, *Piper nigrum*, colchicine.

Piper nigrum L. (Piperaceae) is the source of black pepper of commerce. Somatic chromosome number in most of the cultivated and many of the wild varieties of *P. nigrum* is reported as 2n=52 (Mathew 1958; Martin & Gregory 1962; Mathew 1973; Samuel & Bavappa 1981; Jose & Sharma 1984; Okada 1986; Samuel & Morawetz 1989). Natural polyploids with 2n=104 were reported in some wild varieties (Mathew 1958, 1973; Jose & Sharma 1984) and 2n=78 in a cultivar (Nair, Sasikumar & Ravindran 1993) of *P. nigrum*. But no literature is available so far on induced polyploidy in black pepper. The present study reports the induction of polyploidy in black pepper by treating seeds with colchicine.

Fully ripened seeds of hybrid black pepper cultivar Panniyur-I were harvested and the outer skin was removed. The seeds were then washed in distilled water and two lots of 60 seeds each were treated with 0.05% and 0.1% colchincine in distilled water for 4 h from 10 am to 1 pm by soaking the seeds in it. Subsequently, the treated seeds were washed in distilled water and kept in moist filter paper in a petridish. The seeds were sown after 20 h. Fifty untreated seeds formed the control. After germination, the seedlings were allowed to grow in pots for 6 months and then transferred to multiplication nursery. In the nursery some of the treated plants showed variation in growth and morphological characters such as stunting, thick leaves, change in leaf shape and stem thickness. These plants were cytologically analysed along with controls.

For cytological analysis, actively growing root tips were collected at 11 am and treated with a saturated solution of alpha-bromonaphthalene at 5°C for 4 h and fixed in a 3:1:1 mixture of ethyl alcohol, glacial acetic acid and chloro-

form. Staining was done with 2% lactopropionic-orcein. Only intact mitotic metaphase plates with reasonably good spread were counted for chromosome number. To determine stomatal frequency, uniform sized leaf discs of both Panniyur-I and induced polyploid were cut and epidermal layers separated by boiling in conc. HNO_3. Three leaf discs in each case were counted for number of stomata and number of stomata per unit area was also calculated.

On chromosome analysis, it was found that plant No. C.5 which was derived from a seed treated with 0.05% colchicine had a chromosome number of 104 in its somatic cells (Fig. 1 d). Out of 78 mitotic metaphase plates of plant No. C.5 from 10 slides counted, all had 104 chromosomes. The plant was characterised by thick, typically cordate leaves, thick stem, purple shoot tip and stipules and vigourous growth in nursery. The number of stomata per mm^2 was 95 in the case of Panniyur-I and 55 in induced polyploid. On visual comparison it was found that the stomata in induced polyploid was larger than in Panniyur-I. The plant was strikingly

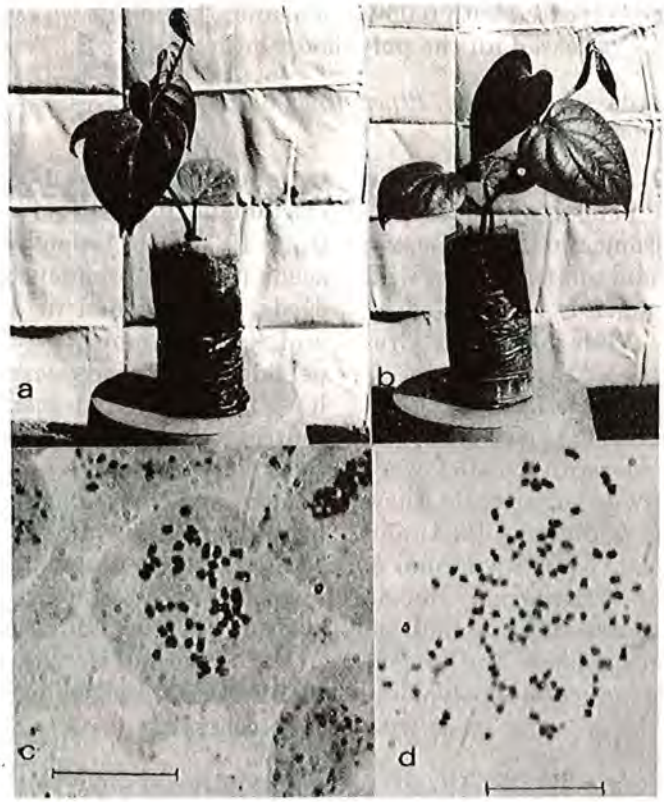

Fig. 1. Normal and induced polyploid in black pepper (var. Panniyur-I)

a. A normal plant of Panniyur-I b. Induced polyploid from colchicine treated seed c. A mitotic metaphase cell of Panniyur-I showing 2n=52 d. A mitotic metaphase cell of induced polyploid showing 2n=104 (Bar represents 10 μm)

different in shoot tip colour from Panniyur-I, which has greenish white shoot tip. Since shoot tip colour of all other plants including controls were greenish white it is possible that the colchiploid mentioned may have been derived from an out-crossed seed. Production of greenish white shoot tipped progenies alone by Panniyur-I has already been reported by Ibrahim, Pillai & Sasikumaran (1985). According to Ravindran, Sasikumar & Babu(1982) pigmentation in black pepper is controlled by two complementary genes A_1 and A_2 and Panniyur-I has a genotype of $A_1a_1a_2a_2$ which will produce only greenish white progenies on selfing.

The present report on induced polyploidy in black pepper is the first of its kind, and gives us hope for production of aneuploids in black pepper. The possibility of an induced polyploid to emerge itself as a high yielding variety cannot also be ruled out.

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