

The analysis of correlation coefficient reveals a negative correlation ( $r = -0.556$ ) between the diploid chromosome number and the amount of 4C nuclear DNA. It therefore appears that at least in the four species of *Ocimum* studied, the variation in the amount of DNA is not necessarily correlated with the change in chromosome number. The significant differences in the amount of DNA ( $P < 0.01$ ) may suggest that there has been widespread changes in nuclear DNA content with the evolutionary divergence of the different species of *Ocimum*. It is not likely that a major portion of the DNA present in the different species is repetitive in nature. It is to be ascertained to what extent this variation in the amount of nuclear DNA can be attributed to the repetitive sequences.

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### SUPEROXIDE DISMUTASE: AN INDICATOR OF SO<sub>2</sub>-TOLERANCE IN PLANTS

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SULPHUR DIOXIDE, a major gaseous air pollutant, can induce foliar injury and cause reduction in growth and yield in many plant species. Laboratory studies have revealed variation in SO<sub>2</sub> sensitivity among

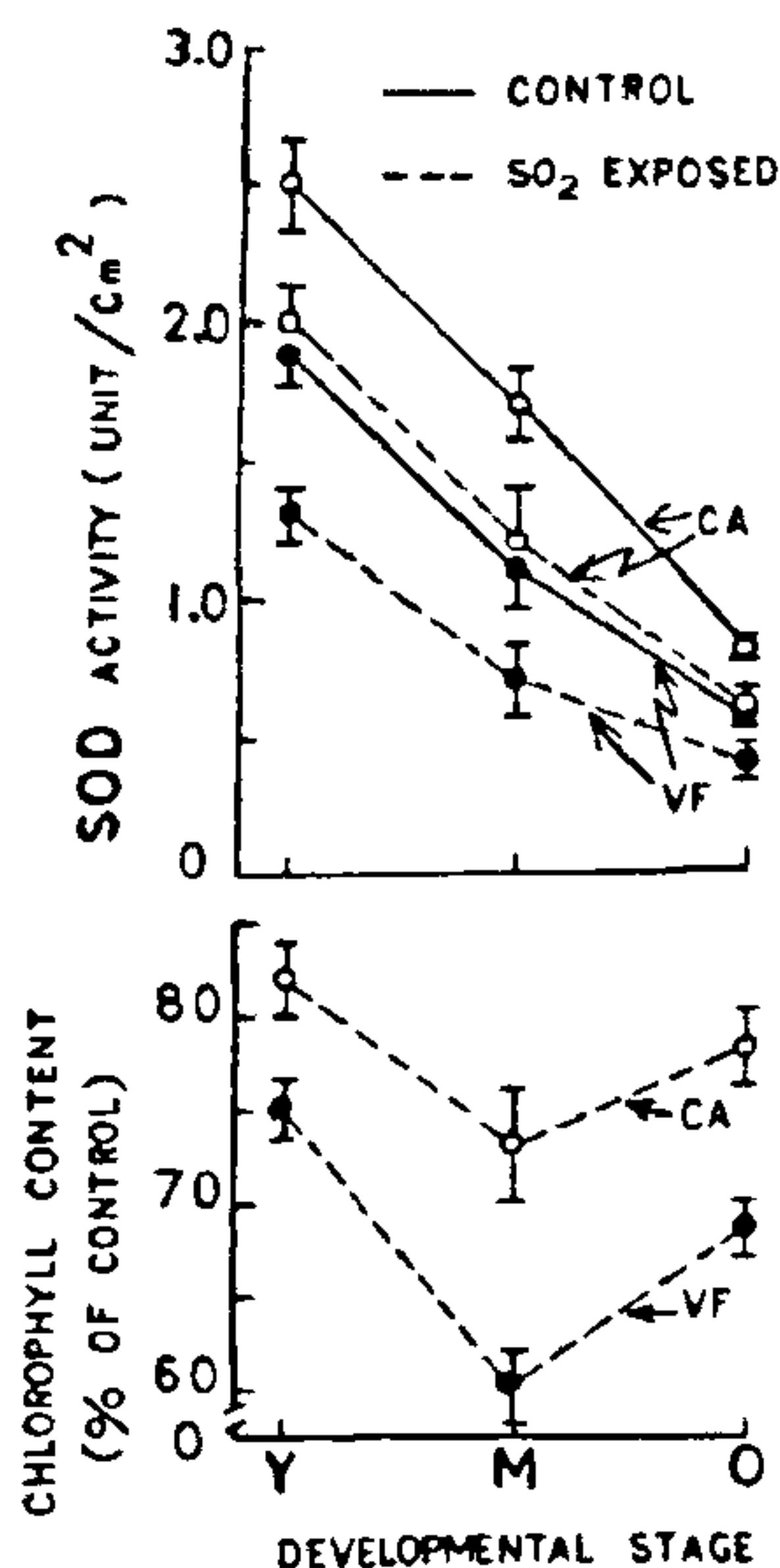
plants. These can be attributed to differences in SO<sub>2</sub> uptake rates, biochemical properties and genetic expression<sup>1,2</sup>. SO<sub>2</sub>-toxicity involves the formation of either sulphite or free radicals during photo-oxidation of sulphite to sulphate<sup>3</sup>. Evidence regarding free radicals toxicity is based on the reports that SO<sub>2</sub> injury increases in plants treated with diethyl-dithiocarbamate, an inhibitor of superoxide dismutase (SOD), which decomposes free radicals and that the use of chemicals that scavenge free radicals reduce SO<sub>2</sub> or bisulphite-induced chlorophyll destruction and leaf injury<sup>3-5</sup>. In the present study, the differential sensitivity of two crop plants to SO<sub>2</sub> based on changes in their SOD activity and chlorophyll content was assessed.

Gram (*Cicer arietinum* L cv T-3) and broad bean (*Vicia faba* L cv Local) plants were grown in pots (2 plants/pot) under greenhouse conditions for 40 days at day and night temperatures of  $25 \pm 0.5$  and  $20 \pm 0.5^\circ\text{C}$ , respectively and relative humidity of  $70 \pm 5\%$ . After 40 days, 10 plants of each species were transferred to environmentally controlled fumigation chambers and exposed under illuminated conditions to  $0.5 \pm 0.01$  ppm SO<sub>2</sub> for 2 hr<sup>6</sup>. During fumigation SO<sub>2</sub> concentration within the chamber was measured continuously with a CEA SO<sub>2</sub> analyzer. Control plants were placed in identical chambers flushed with filtered air system.

Leaf samples of three age groups i.e. young, mature and old, were collected 24 hr after fumigation from control and SO<sub>2</sub>-exposed plants for the determination of chlorophyll content<sup>6</sup> and SOD activity<sup>7</sup>. Five replicates were taken for each analysis. The total chlorophyll content of SO<sub>2</sub>-exposed plants was expressed as percentage of the control. SOD activity was assayed by the method of McCord and Fridovich<sup>7</sup>, which is based on SOD inhibition of superoxide-mediated ferricytochrome reduction. One unit of SOD activity was defined as that which inhibited 50% of the reaction rate per cm<sup>2</sup> leaf area.

The present findings showed that young leaves of the gram had higher SOD activity than those of broad bean. With increasing age, leaves of both these plants exhibited simultaneous decrease in SOD activity and chlorophyll content. However, with respect to control such decreases in SO<sub>2</sub>-exposed plants were significantly ( $P < 0.01$ ) higher.

Recent reports have indicated that accumulation of superoxide radicals (O<sub>2</sub><sup>-</sup>) in the chloroplasts of illuminated SO<sub>2</sub>-exposed plants causes destruction of chlorophyll pigments<sup>3</sup>. The present results show that leaves gradually lose SOD, a scavenger of O<sub>2</sub><sup>-</sup>,



**Figure 1.** Effects of SO<sub>2</sub> on SOD activity and chlorophyll contents of *Cicer arietinum* (CA) and *Vicia faba* (VF) leaves at different stages of development (Y = young, M = mature, O = old). Values are mean of 5 separate observations. Bars represent  $\pm$ SD.

with ageing as well as due to SO<sub>2</sub>-treatment. The impact of such changes was much pronounced in broad bean in which the O<sub>2</sub><sup>-</sup> induced destruction of chlorophyll pigments were higher than that in gram plants, suggesting higher SO<sub>2</sub> tolerance of gram plants in comparison to broad bean (figure 1).

Thus, the present study provides a biochemical basis for differential SO<sub>2</sub> sensitivity of leaves of different ages, which reveal that susceptibility of plants to SO<sub>2</sub> depends greatly upon their O<sub>2</sub><sup>-</sup> scavenging capacity and that plants with higher SOD activity vis-a-vis less inactivation of their SOD are tolerant.

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#### COLCHICINE-INDUCED TETRAPLOIDS IN CARDAMOM (*ELETTARIA CARDAMOMUM* MATON)

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*ELETTARIA CARDAMOMUM* Maton, a monotypic member of the family Zingiberaceae, forms the chief source of the well-known spice, small cardamom. Literature survey shows that only diploid chromosome numbers have so far been reported in this species<sup>1-3</sup>. Successful induction of tetraploid plants is reported in this note.

Germinating seeds were treated with 0.5% aqueous colchicine solution for 90 min. The seedlings raised from the treated seeds along with their controls were initially grown in polyethylene bags and transplanted to the field when they were ten-month-old. Cytological studies confirmed the tetraploid nature of the treated seedlings with  $2n = 4x = 96$  chromosome and the control diploids  $2n = 2x = 48$  chromosomes (figures 1 and 2).

The induced tetraploids resembled their diploid progenitors in gross morphology. However, marked difference could be observed in the leaf anatomical characters. Colchitetraploids had thicker leaves (221.25  $\mu$ m) than diploid controls (185.19  $\mu$ m). A study of stomatal index showed that the induced tetraploids had fewer stomata per unit area and