C-Band Distribution, DNA Content and Base Composition in *Adoxa moschatellina* (*Adoxaceae*), a Plant With Cold-Sensitive Chromosome Segments*

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**Abstract:** The chromosomes of *Adoxa moschatellina* (*2n = 36, paleo-4x*) contain mostly terminal, occasionally intercalary, negatively heteropycnotic cold-induced regions which correspond to all major C-bands including the satellites, as revealed by sequential analysis. Positively C-stained are also centromeres, the dotlike arms of the 7 telocentric chromosome pairs, and some very narrow intercalary bands; their cold-sensitivity is hardly traceable. There exists a fraction of condensed interphase chromatin, at least after chilling, which is virtually not C-banded (possibly condensed euchromatin).

The DNA amount is 14.3 pg (1 C). The heterochromatin content is 13.0%. The thermal melting profile (Tm corresponding to 38.6% GC) does not reveal a particular AT- or GC-rich fraction. Significantly, the heterochromatin respond to the Hy-banding procedure is neutral.

The distribution of cold-sensitive regions in plants was analysed with the "arm-frame method": Intercalary positions, clearly, are not especially favoured regions. The obvious deficiency at centromeric positions may depend on the action of natural selection against mechanically labile centromeric regions.

First experimental evidence for the causal action of low temperature (around 0 °C) in the expression of the so-called "special segments" was presented by Geitler (1940) in the dicotyledonous species *Adoxa moschatellina* (*Adoxaceae*). He demonstrated that terminal, narrowed chromosome segments of low staining capacity can be reversibly...

* Dedicated to Univ.-Prof. Dr. Lothar Geitler on the occasion of his 80th birthday.
induced in mitosis by cold even within 6 hours, but are not visible at room temperature. At the same time Darlington & La Cour (1940) were able to show, in addition to their earlier observations on the differential reaction of chromosome ends in Paris polyphylla (Darlington & La Cour 1938), that in species of Trillium and Paris (incl. Kinagusa) temperatures around 0 °C were sufficient to produce "starved" segments at positions which were constant for a given individual. These authors left no doubt that "special segments" and interphase chromatocentres represent the same, heterochromatic chromosome parts. Since then there was a constant belief that "cold-starvation", i.e. segmental reduction of the chromosome diameter and stainability in metaphase following a cold treatment, was generally indicative of heterochromatin. Now that we dispose of the very sensitive banding methods for the detection of constitutive heterochromatin it becomes evident that this is not true in every case. While the postulated relation was verified in Trillium and Fritillaria (e.g. Schweizer 1973 b, Utsumi & Takehisa 1974), and Scilla siberica (compare Baumann 1971, Schweizer 1973 b, Greilhuber & Speta 1978), in Vicia faba only a minority of 2 "starving" segments was revealed to be heterochromatic according to C-banding, while others were clearly euchromatic. Further C-band positive regions respond to cold by overcontraction, as do also some euchromatic zones (Schweizer 1973 a, b, Greilhuber 1975). These complicated relationships between heterochromatin and cold-sensitive regions made it desirable to investigate C-bands and cold-induced regions in Adoxa moschatellina. Further interest concerned the eventual presence of DNA components of deviant base composition (satellite DNA), possibly situated in heterochromatin or "special segments", and the genomic DNA content of this species as an important nucleotypic parameter.

**Materials and Methods**

**Provenances of Plants.** Adoxa moschatellina L. was collected at various localities during spring and cultivated in the Botanical Garden of the University of Vienna either under open air or in a greenhouse. The following provenances have been used either for Giemsa analysis, DNA content determination, or thermal denaturation profiles:

1. Germany, Bavaria: Oberstdorf (Allgäu), along the river Stillach, 790 m alt., IV. 1976, W. Güttermann.
3. Lower Austria: Hardegg, along the river Thaya, 290 m alt., 11. IV. 1976, J. Greilhuber.
4. Austria, Carinthia: Himmelberg (NE of lake Ossiacher See), 700 m alt., IV. 1975, Gerlinde Fischer.

Herbarium specimens are preserved in the herbarium of the Institute of Botany of the University of Vienna (WU).