# SISTER CHROMATID EXCHANGE AND PREMATURE CENTROMERE MOVEMENT AS A CAUSE OF ANAPHASE II BRIDGES IN *Agave angustifolia:* A HYPOTESIS

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## Introduction

*Agave angustifolia* belongs to the subgenus *Agavea* group *Rigidae*, and is used for Mezcal production in México. The chromosome behavior in the meiosis of *Agave* species has been previously reported (1, 2, 3). Frequently, in diverse plant species, the formation of dicentric bridges and acentric fragments in Anaphase I is reported as a result of inversion heterozygosity. In *A. tequilana*, the analysis of Pollen Mother Cells in anaphase I (A-I) has shown cells with normal and irregular A-I with side arm bridges (SAB), cells with one bridge and one fragment, anaphases with one or two lagging chromosomes and acentric fragments. Also, in anaphase II (A-II) some cells showed bridges, all of them leading to the production of shrunken or empty pollen grains (3). The aim of this work was to study and understand the chromosomal mechanisms leading to aberrant meiotic division in *Agave angustifolia*.

## Methods

The plant material used in this study consisted of immature anthers from the inflorescence of a plant which was an offshoot taken from a mother plant originally collected in the year 2006, in the vicinity of Sayula, Jalisco, México. Fresh anthers from young buds were selected and squashed in 1% aceto-orceine. The best cells for chromosome analysis were photographed using an Olimpus BH2 microscope coupled with a digital Sony camera.

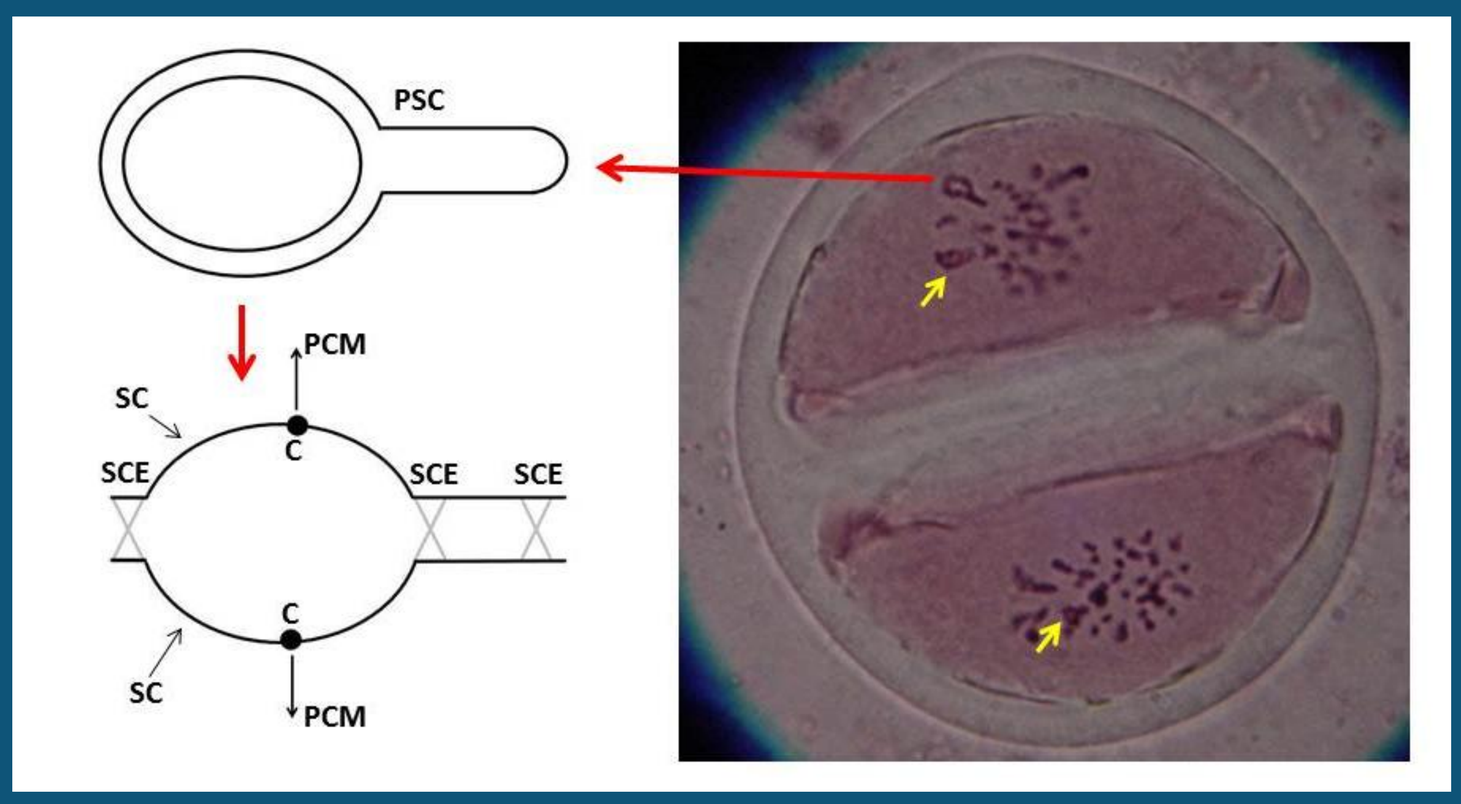


Figure 1. Pan-shaped chromosomes in Metaphase II of *Agave angustifolia*. SC=sister chromatid. SCE=sister chromatid exchange. C=centromere. PCM=premature centromere movement. Yellow arrows=pan-shaped chromosomes.

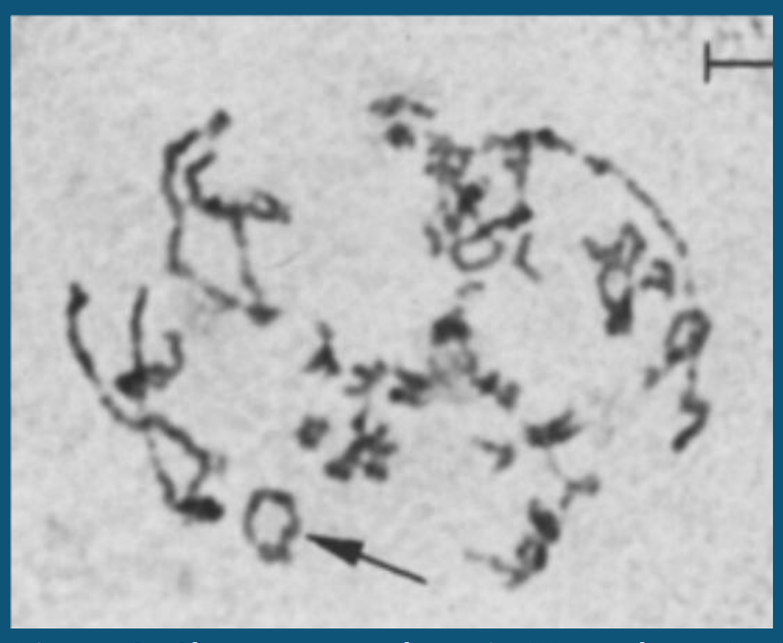

Figure 2. Chromosome loop in Metaphase II of *Agave stricta* (from Brandham, 1969)

## Results

In this study several aberrant meiotic divisions could be observed in the male gametogenesis. Some of the most frequent aberrations were bridges formed in anaphase I mainly due to heterozygous inversions and probably to sister chromatid exchanges. A striking finding was a couple of pan-shaped chromosomes in each cell of a diad in Metaphase II entering Anaphase II (Fig.1), which are highly similar to those previously reported for *Agave stricta* (1), a species that belongs to the subgenus *Littaea* group *Striatae* (Fig.2). The putative sister chromatid exchange and the premature movement of centromeres in metaphase II where several proteins are involved, will be presented and discussed.

## Conclusions and discussion

A hypothesis rises from the described observations: pan-shaped chromosomes are formed by sister chromatid exchanges and a premature centromere movement in metaphase II which are meiotic aberrations that exist in these phylogenetic distant species since ancient times in their evolution.

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