



Study on the cytotoxic and genotoxic capacity of decoctions of *Minthostachys verticillata* from Córdoba, Argentina.

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INTRODUCTION

The popular use of medicinal plants is an ancient practice, and even widespread used all over the world. Among the bioactivities of interest are the evaluation studies on the cyto-genotoxic potential of such plants (Rani *et al.*, 2005). *Minthostachys verticillata* (Griseb) Epling. ('peperina') is an example of a commonly used plant in the popular medicine of Córdoba, Argentina. Infusions are indicated for treatment of indigestions, vomits, stomach pains, owing to the digestive, carminative and antispasmodic properties (Cantero and Núñez, 2000). Fractions of peperina extracts have been proved in a number of *in vitro* assays, and their immunomodulator, antimicrobial and antiviral action has been demonstrated (Zanon *et al.*, 1999; Escobar *et al.*, 2004).

The aim of this study was to determine the effect of decoctions of this plant species on chromosomes and cell cycle by the *Allium cepa* L. test.

METHODOLOGY

Peperina decoctions (D) were prepared with plant material collected in the province of Córdoba, Argentina, during April and October, 2005. For the evaluation of the cyto-genotoxic capacity, the *Allium cepa* L. test was developed according to Fiskesjö (1985). Leaf decoctions used in the concentration range: 12.8 to 3.2 mg/ml in April, and 16.6 to 5.33 mg/ml in October, were *in vivo* evaluated on meristematic cells of onion root tips. For each treatment a series of five bulbs was

set up, including the control subjected to mineral water. Onions were allowed to produce roots in water at room temperature for 48 h, then treated with decoctions for 48 h.

Three roots per bulb were extracted for evaluation of microscopic alterations, and further exposed to the same solutions for 3 days for macroscopic damage observation. At the end of the assay (5 days of exposure) alterations in length, colour occurrence and abnormalities of roots were recorded. For microscopic exam roots were fixed, stained with lactopropionic orcein and a microscopical slide was prepared. A thousand cells were analysed per bulb for all treatments and control. Mitotic Index (MI), Phase Indexes (PI), Total Aberrations Indexes (TAI) and Phase Aberrations Index (PAI) were determined.

All data were statistically evaluated by the Prism 3.0 software.

RESULTS AND DISCUSSION

The two fractions of *Minthostachys verticillata* decoction induced macroscopic root modifications. Shortening of the root length without tissue necrosis was demonstrated. Also there was absence of statistically significant differences within treatments, but yes against control (Fig. 1). Neither induced the development of radicular hooks, valid indicator of toxicity, since the appearance frequency of this anomaly (1.21%) was very below with regard to normal mean.

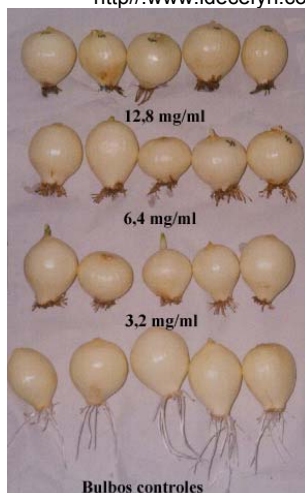
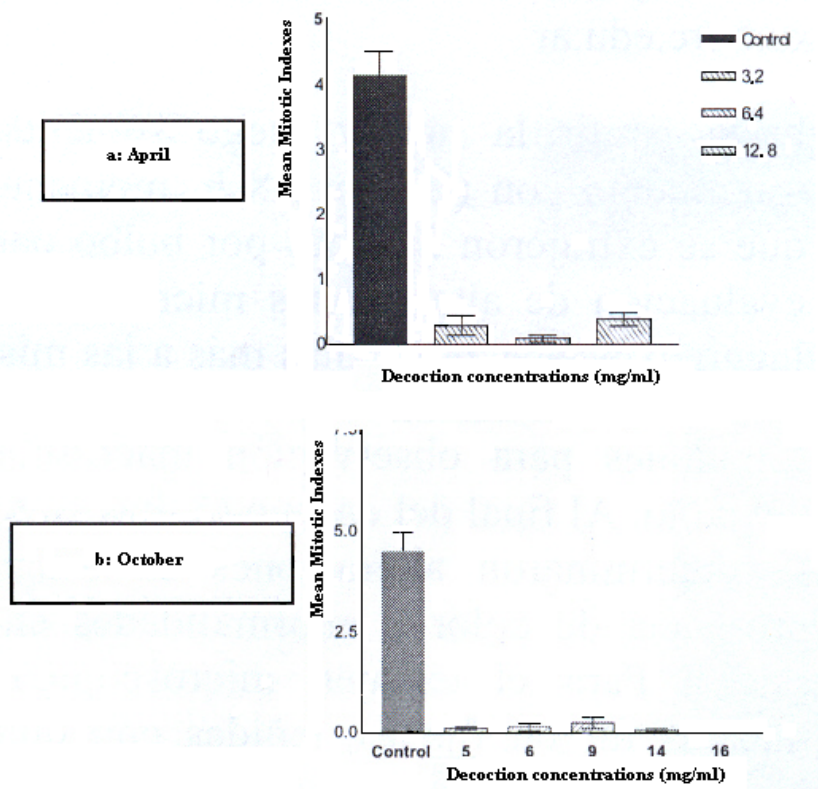


Figure 1. Macroscopic aspects of *Allium cepa* L. bulbs treated with decreasing decoction concentrations of *Minthostachys verticillata* collected in April vs onion bulbs treated with mineral water (control).

There was a MI decrease in treatments with both decoctions regarding the control ($p < 0.0001$) (Graph. 1a and b). Also interface cell division arrest was demonstrated by PI, thus justifying the

MI decrease. Data were consistent with bulb root length shortening of the bulbs subjected to treatments with plant fractions.



Graph 1. Mitotic Indexes of *Allium cepa* L. roots treated with different decoction concentrations of

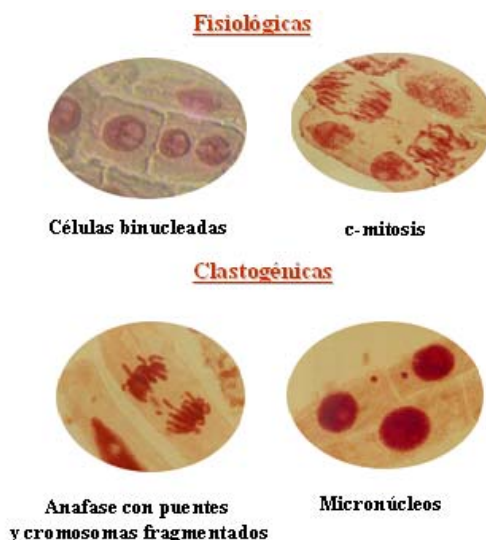


Figure 2. Microscopic alterations of *Allium cepa* L. meristematic root cells due to *Minthostachys verticillata* decoction used at different concentrations.

CONCLUSIONS

Both root length and MI decrease in treatments revealed the toxic character of *Minthostachys verticillata* decoctions, although the non-genotoxic character of these fractions was demonstrated by the low frequency of chromosomal damage compared with control.

These studies have allowed to characterize for the first time the behaviour of peperina decoction at a cytogenotoxic level.

Results highlight the ethnobotanic potential of this aromatic species, further supported by previous reports on its antimicrobial and immunomodulator capacity.

Note: This study was presented at the 'I Reunión de Biotecnología aplicada a plantas medicinales y aromáticas' (First Biotechnology Meeting on Medicinal and Aromatic Plants), Córdoba, Argentina, 2006.

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