

THE INFLUENCE OF TREATMENT WITH THEOPHYLLINE ON MITOTIC DIVISIONS AND ON GROWTH OF PLANTLES AT *CAPSICUM ANNUUM L.*

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Abstract: This paper presents the theophylline effects on mitotic division of roots at *Capsicum annuum L.*, and the growth of plantlets after the treatment. The treatment has induced the decrease of the mitotic index, until total inhibitions at maximum variant of treatment (0,25% theophylline), and numerous aberrations types in anaphases and telophases.

About the growth of plantlets, the treatment has stimulated their growth, mostly on their roots.

INTRODUCTION

The theophylline (1,3 dimethyl xanthine), is a purinic derivative, which in specialized literature is described as a substance which blocks the cytokinesis, and in certain concentrations causing the appearance of binucleated cells (Acatrinei 2002). This substance stimulates the appearance of binucleated cells as 13 times more, beside control variant, and the incomplete appearance and baggy of separatory walls between two cells is as 17 times more, beside control variant (Acatrinei Gh., 1998).

MATERIALS AND METHODS

The biological material was represented by seeds of *Capsicum annuum L.*, *Export* variety and *Capsicum annuum L.*, *Cosmin* variety.

The seeds were put to germinate in lab conditions in theophylline solutions, with different concentrations (0,05%, 0,1% and 0,25%) and a control variant, in distilled water.

After the germination (four-six days), the roots were fixed in Bataglia fixing solution for 24 hours, after that the roots were immersed in grain alcohol 70%.

For cytogenetics investigations, the treated and non treated (control) roots, were hydrolysed with HCl 1N five minutes, and HCl 50% eight minutes and coloured with the basic colouring Carr.

The radicular meristem was displayed using squash technique and were counted the cells from 10 microscopical fields for each slide. The cells with the division aberrations were counted on the entire slide.

For the study of plantlets growth, after the germination, the seeds were washed with distilled water and were put to germinate in distilled water, follow-up.

After fifteen days, the roots and the length of plantlets were measured.

RESULTS AND DISCUSSIONS

The analysis of the mitotic index:

For each pepper variety, the theophylline has determined the decrease of mitotic index until total inhibition at 0,25% theophylline at a raised percentage of binucleated cells in interphases. The percentage of binucleated cell is more raised at *Cosmin* variety.

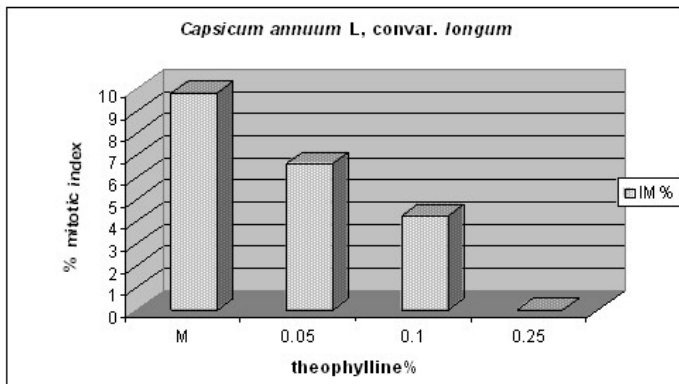


Fig.1 Mitotic index, after the treatment with theophylline at *Cosmin* variety

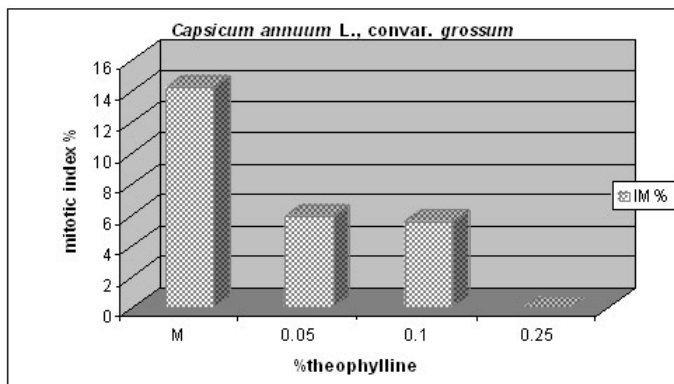


Fig.2 Mitotic index, after the treatment with theophylline at *Export* variety

The dynamics of division cells:

For each variety, the higher percentage was represented by the prophases cells and folowed by the telophases cells, anphases and a little percentage of metaphases cells.

At 0,25% theophylline were finded only the interphases cells.

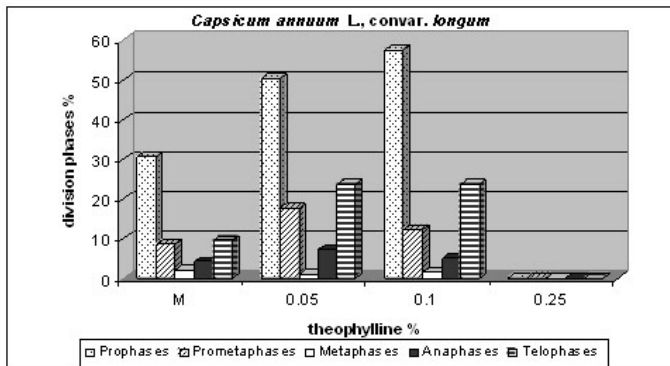


Fig.3 Mitotic division phases, at *Cosmin* variety

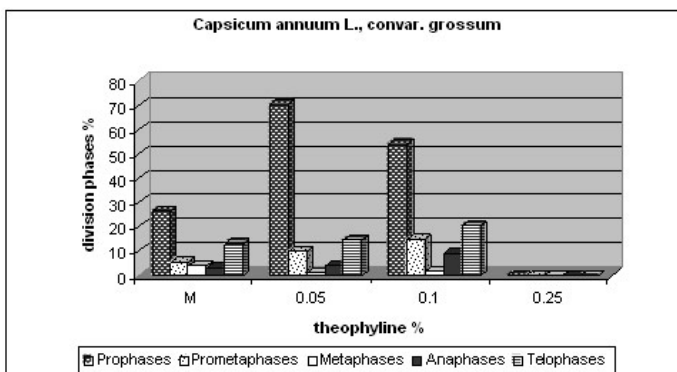


Fig.4 Mitotic division phases, at *Export* variety

The proportions of the types of divisions aberrations:

The treatment has determined more of aberrations types as the ana-telophases with multiple bridges, ana-telophases with single bridge, ana-telophases with double bridge and expelled chromosomes. The higher percentage was represented by the cells with multiple bridges at each variety.

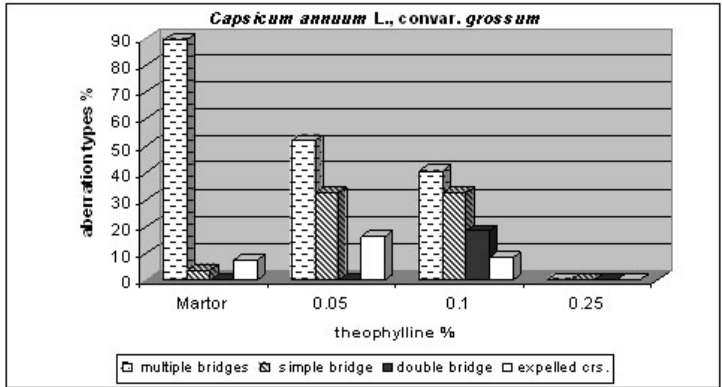


Fig.5 Proportion of division aberration types at *Export* variety

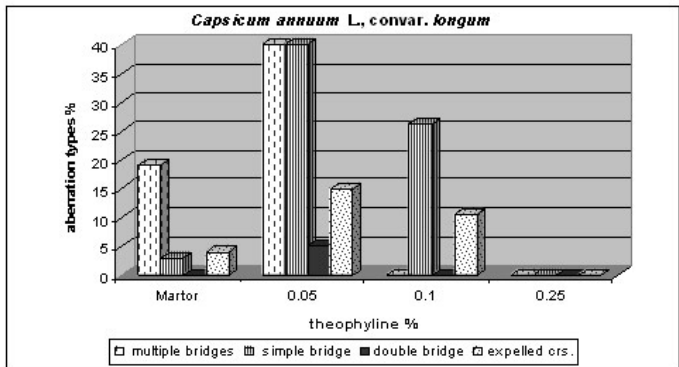


Fig.6 Proportion of division aberration types at *Cosmin* variety

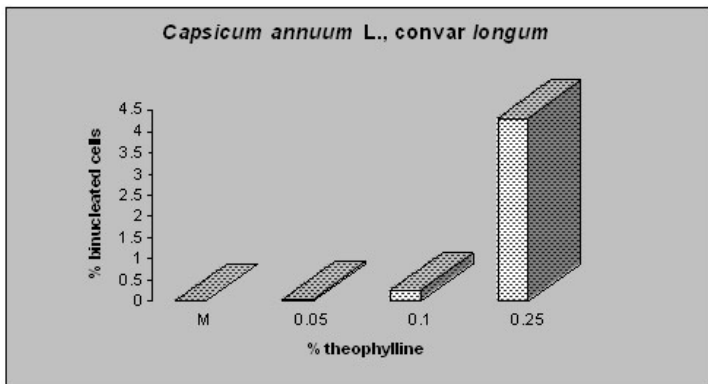


Fig.7 Proportion of binucleated cells in interphase at *Cosmin* variety

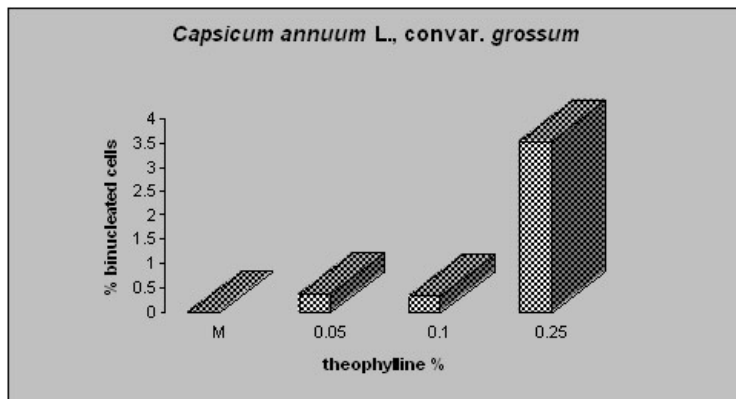


Fig.8 Proportion of binucleated cells in interphase at *Export* variety

The growth of plantlets:

In this experiment has been observed the growth of plantlets after the germination in the theophylline solutions. The seeds were washed because in an anterior experiment, the seeds what germinate in theophylline solutions several days, stoped germinating.

The treatment had a stronger effects on roots, determineting their growth. The higer lengt was observed at 0,25% theophylline.

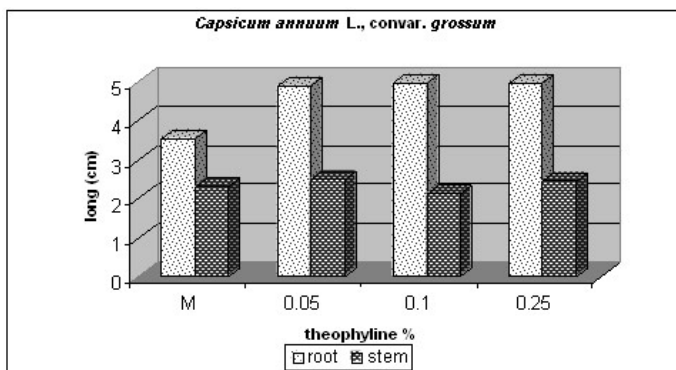


Fig.9 Lengt of root and stem at *Export* variety after the treatment

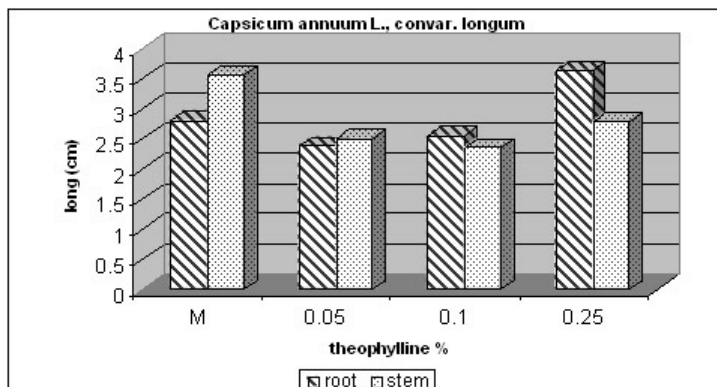


Fig.10 Lengh of root and stem at *Cosmin* variety after the treatment

CONCLUSIONS

The treatment determinate the decrease of the mitotic index, and the maxim concentration of substance used, detereminate the blocking of the division and the appearance of binucleated cells.

About the growt of plantlets, the treatment had an stimulating effect, mostly at maxim variant 0,25% theophylline. The effect was more strong as the roots, determinating theirs growth.

REFERENCES

1. Acatrinei Gh., Ligia Acatrinei, 1998, *Diviziunea celulelor la plante sub influența substanțelor biologice active*, Ed. Cermi Iași;
2. Băra I. Ion, Mirela M. Câmpeanu, 2003, *Genetica*, Ed. Corson, Iași;
3. Diaconu P., 1971, *Ereditatea și factorii mutageni*, Ed. Ceres, București

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