



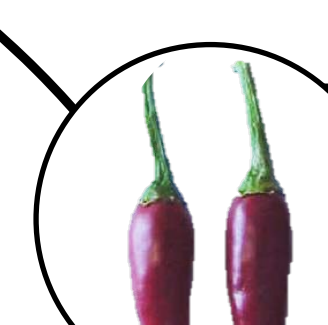
Anatomical changes in *Capsicum annuum* leaves due to potentially toxic metals

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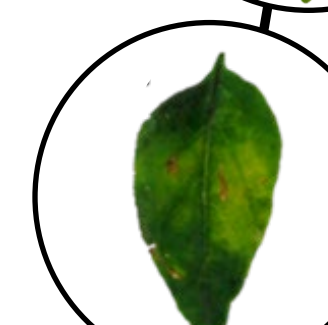
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Introduction

Chili pepper (*Capsicum annuum*) - accession UENF 1381

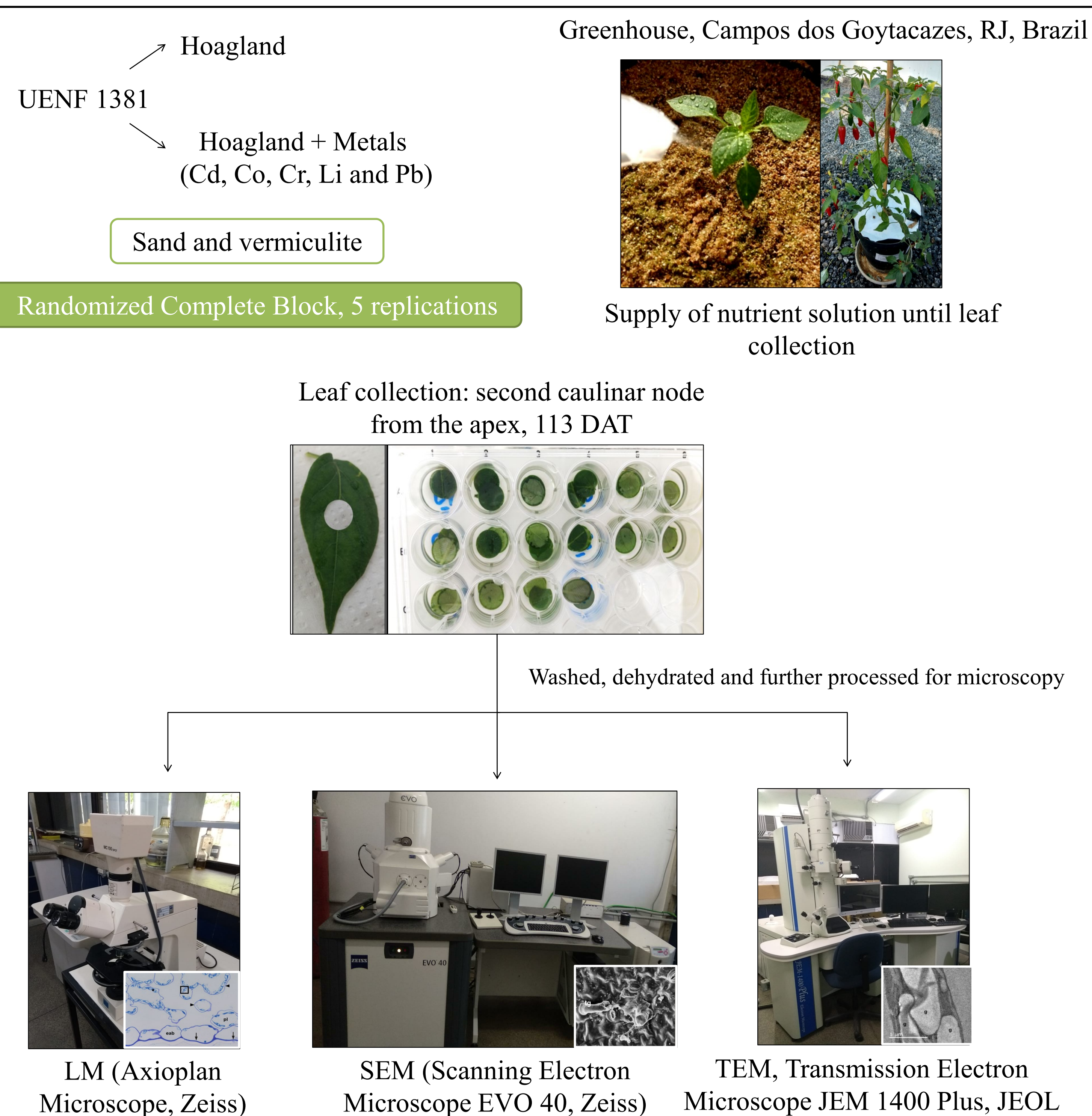
Model plant - Resistance to various diseases (*Xanthomonas euvesicatoria*, *X. gardneri* and *Colletotrichum gloeosporioides*)



Differences in leaf mineral composition of essential nutrients in plants treated or not with potentially toxic metals

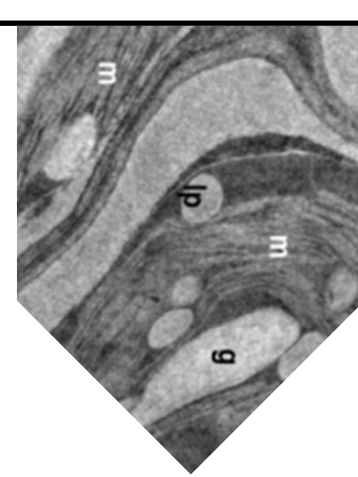
- ✓ This work aimed the characterization of anatomical structures of *Capsicum* leaves and possible correlations with potentially toxic metal present or not in Hoagland nutrient solutions.

Material and Methods



Results

- ✓ Anatomical and ultrastructural differences were observed in the adaxial and abaxial surfaces of UENF 1381 leaves treated with potentially toxic metals (Fig.1 and Table 1).



TEM analysis showed significant differences in the chloroplast ultrastructure. In leaves treated with potentially toxic metals, less starch granules, lipid droplets and cytoplasmic retraction were observed (Fig. 1, J and L).

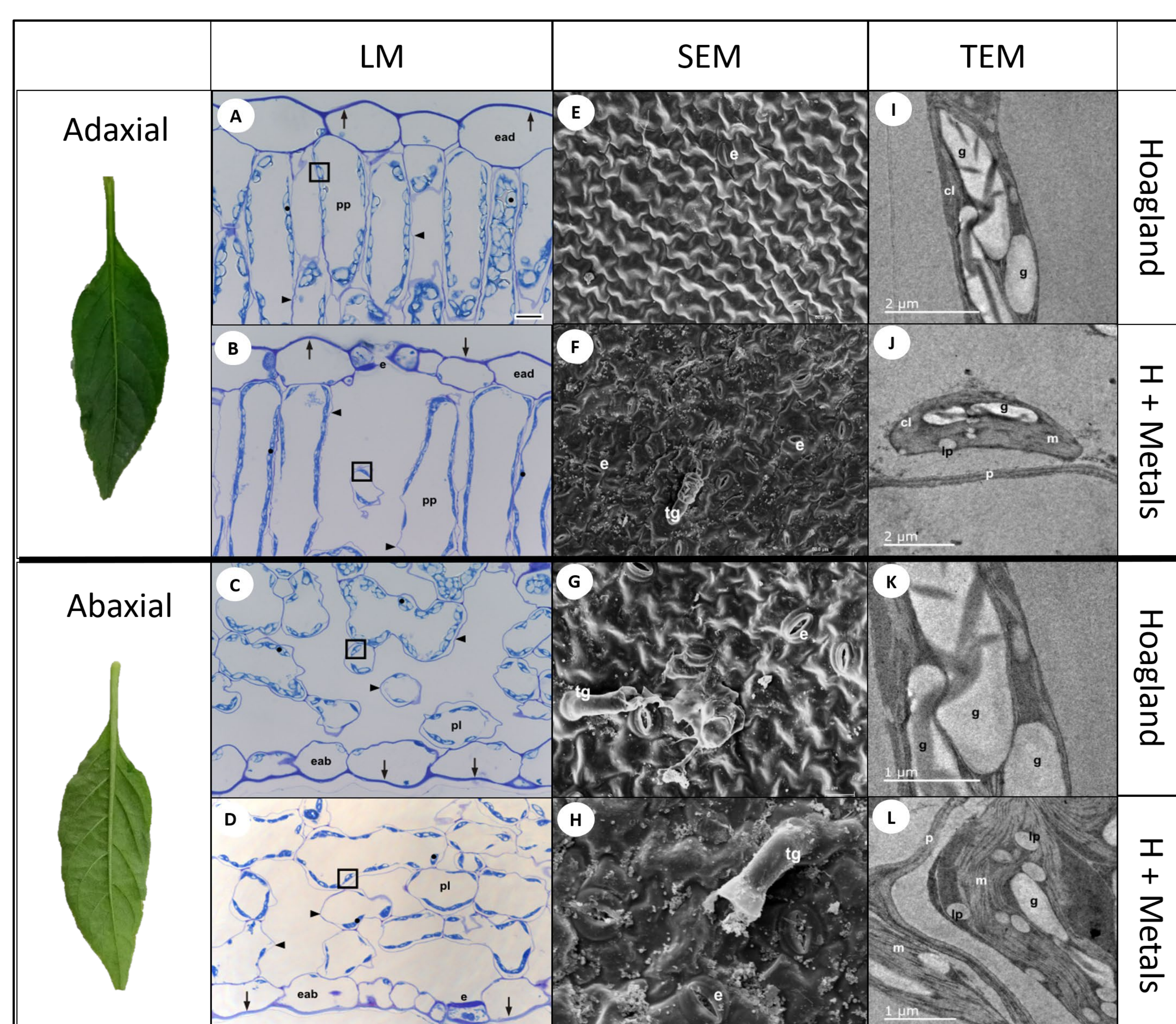


Figure 1. Leaf surface of *C. annuum* – UENF 1381. **LM** of adaxial (A and B) and abaxial (C and D), bars: 10 μm . **SEM** of adaxial (E and F) and abaxial (G and H) surfaces, bars: EG = 50 μm , FH = 20 μm . **TEM** are I, J, K and L. ● – indicative of primary starch; ▲ - cytoplasmic membrane; ↓ - cuticle; cl – chloroplast; e - stomata; eab - abaxial epidermis; ead - adaxial epidermis; g - starch granule; lp - lipid droplets; m - thylakoid membranes; p - cell wall; pl - lacunar parenchyma; pp - palisade parenchyma; and tg – glandular trichome.

Table 1. Morphological and structural responses in *C. annuum* leaves treated or not with potentially toxic metals.

| | Hoagland | Hoagland + Metals |
|------------------------|-----------------------|----------------------|
| Thickness of cuticle | > | < |
| Size of chloroplasts | > | < |
| Granules of starch | > | < |
| Frequency of stomata | < | > ad. surface |
| Glandular trichomes | = | = |
| Surface ornamentation | < | > |
| Cytoplasmic retraction | > *ad. surface | < |

Conclusions

Capsicum leaves treated with potentially toxic metals clearly showed anatomical and ultrastructural differences. These changes may be associated with:

- ✓ reduction in energy sources (smaller chloroplasts with less starch) and weakening of physical barriers in *Capsicum* leaves.
- ✓ effects in defense mechanisms of resistance of the studied genotype (UENF 1381)

Further studies of the presence of potentially toxic metals and relations with structural and biochemical defense mechanisms are in progress.

Acknowledgments