FOLLOWING THE BOTANICAL CHANGES IN SOME POPULATIONS OF *EQUISETUM ARVENSE* L. FROM BIHOR COUNTY

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Abstract

Equisetum arvense L. is a widely used species, the medicinal product, *Equiseti herba* (FR.X) as constituent of diuretic teas; it has antiseptic action of urinary system, haemostatic, healing and mineralizing.

In this work we are presenting the results of morphological and anatomical studies carried out in case of several *Equisetum arvense L.* populations.

There were studied the sterile stems of *Equisetum arvense L.*, collected from different regions of Oradea's area and Cefa's area, in September 2014. There have been made macroscopic and microscopic analysis of transversal sections, both in the main stem and its ramifications.

As a result of the study we have observed the presence of anatomical differences on the level of ramifications in the studied populations.

Keywords: Equisetum arvense L, sterile stems, anatomical study

INTRODUCTION

Horsentails (Equisetopsida) are old fern lineage with fossil ancestors dating back to the late Devonian. Out of over 10,000 living form species (monilophytes) the global recent occurance of horsentails is represented by only 15 species [4, 5, 16]. Within the genus Equisetum, two distinct groups are described: subgenus Equisetum (8 species) and subgenus Hippochaete (7 species) [10].

This differentiation is clearly supported both by morphology and molecular characters (chloroplast genes), only the taxonomic status of the most basal horsentail seems to be questionable [15]. *Equisetum arvense* L. is a perennial fern. In spring increase an unbranched, fertile stems with characteristic, brownish terminal cones, with conspicuous nodes (joints) that are easily separated. It has fluted, prominently ridged stems (3-5 mm) and whorled branches which are usually regularly and abundantly branched [1, 2, 4, 6].

The branches are ascending or suberect, simple and nearly smooth. The leaves consist of small teeth set in a whorl on a closely adnate nodal sheath and at maturity are free of chlorophyll [3, 8, 14]. However, the species are very variable and differences in the numbers of branch teeth, the nature of branching and the habit have been described [2, 7, 9]. E. arvense has extensive and deep-seated rhizomes that are dark brown to black, dull,

covered with hairs and occasionally bear tubers. The tubers are formed as shortened swollen internodes consisting of starch-filled cells traversed by a few vascular bundles. The rhizomes send out shoots each year [1, 2, 9].

The sterile stem is circular, with 6-18 ribs and as many of valecules. In the transversal section the epidermis is observed composed of thickened walled cells and strongly silicified.

The ground tissue is very thick compared with the central cylinder and covers a mechanical external area (silicified colenchima), more developed in the ribs and another internal parenchymal, rich lacunar.

In the ribs under the colenchimatic cords a tissue develops assimilated palissade, and in the valecules extensive aeriferous aeras, in the forms of some channels, gaps, circulars, all arranged orderly.

The central cylinder begins with a pericycle, the cells are small closely joined together.

In the fundamental parenchyma of the marrow there are numerous leading bundles, all arranged in a circle, the floem tissue being situated just below the pericycle and it is more developed than the xylem tissue (Figure 1).

In the xylem tissue the protoxilem and metaxilem elements can be differenced. In the right of protoxilem vessels there is an aeriferous gap. The centre stem is occupied by a large gap air marrow.

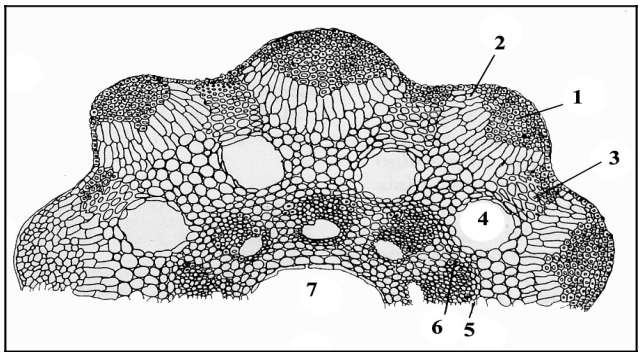

Figure 1. Cross section through the main stem [15]
1- silicified colenchima; 2- assimilated palissade parenchyma
3- silicified colenchima in valecules; 4- aeriferous aeras in groung tissue;
5,6- leading bundles; 7- main gap marrow

In literature it is described as a recognition character for *the Equisetum arvense L.* species, the ramification of the main stem, the ramifiations being tetramuchiated, with 4 edges [6, 18].

In the latest ramifications of the scape tetraangles appear in the transversal section (Figure 2). Deeply furrowed in a shape of a cross with equal arms.

Towards the main scape the following difference appear:

The bark is reduced to assimilated palissade parenchyma from the right of the rib, well represented, the silified colechim is reduced to some elements in the right of the ribs, the cortical gaps are missing, in the central cylinder there are 4 leading bundles, having the same structure as in the main stem, the main gap marrow is missing [13, 16, 17].

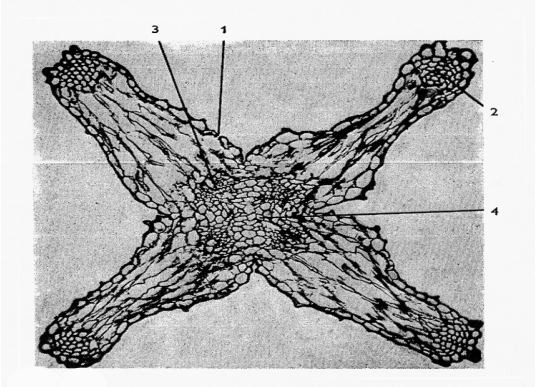

Figure 2. Cross section through the ramifications [15]
1- dermal tissue; 2- silicified colenchima; 3- leading bundles; 4- main gap marrow is missing

MATERIALS AND METHODS

We accomplished a study on some *Equisetum arvense* L. populations from Oradea and Cefa regions, Bihor county. We harvested sterile stems in September.

The cross-section was carried out through the main stem and ramifications which was observed with the mycroscope (X100, X200).

At the level of the main stem there were not highlighted significant differences between the specimens from the two populations studied and the described structures in literature.

Both the harvested specimens from Oradea and those harvested from the region of Cefa, I observed anatomic differences at the level of ramification of the main stem.

RESULTS

In case of transversal sections accomplished at the level of main stem (Figure 3). The number of ribs varies between 7-18 at those harvested

from Oradea region and between 6-18 at those harvested in the region of Cefa.

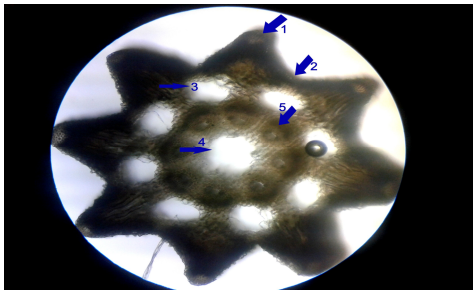

Figure 3. Cross section through the main stem from Oradea area
1- silicified colenchima;
2- silicified colenchima in valecules; 3- aeriferous aeras in groung tissue;
4- main gap marrow; 5,6- leading bundles;

In the case of transversal sections accomplished at the level of the latest ramifications of the harvested specimens there were observed 5, 6, 7, edges, hardly ever 4.

Through analysing 500 of ramifications at the level of harvested specimens from Oradea area, and from Cefa area , the following results have been obtained, shown in table nr. 1

Table nr.1. Results after analysing 500 of ramifications from Oradea area, and from Cefa area

Types of sidewide ramifications	Oradea area (number)	Oradea area percentage %	Cefa area (number)	Cefa area percentage %
Ramifications with 4 edges	93	18.6	76	15.2
Ramifications with 5 edges	236	47.2	256	51.2
Ramifications with 6 edges	152	30.4	118	23.6
Ramifications with 7 edges	19	3.8	50	10.0
TOTAL	500	100%	500	100%

In the structures of ramification with 4 edges there were observed the described structures in the specialty literature.

In the structures of ramification with 5 edges the following observation has been made (Figure 4):

- The bundles of mechanic fibers appear both at the level of the ribs and at the level of valecules, too.
- The assimilation tissue is one of palissadic type
- The cortical gaps are missing
- It shows 5 leading vessels
- The central pithy gap is missing

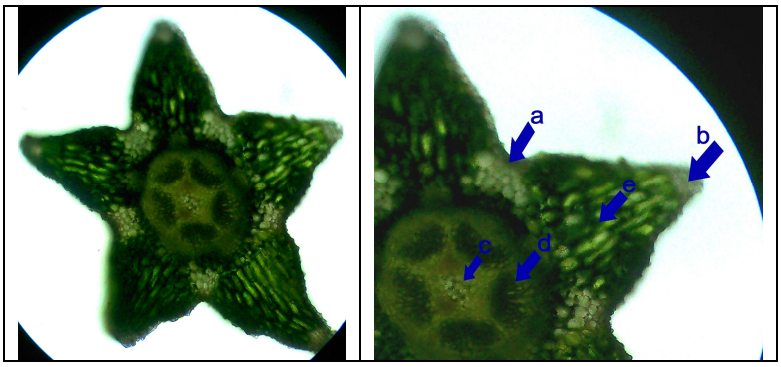

Figure 4. Cross section through the ramifications with 5 edges (from Cefa area) a- silicified colenchima ;b- silicified colenchima in valecules ;c- main gap marrow is missing; d- leading bundles; e- assimilated palissade parenchyma

In the structures of ramification with 6 edges the following observation has been made (Figure 5):

- The bundles of mechanic fibers appear both at the level of the ribs and at the level of valecules, too.
- The assimilation tissue is one of palissadic type
- In any of the cases cortical gaps can appear
- It shows 6 leading vessels

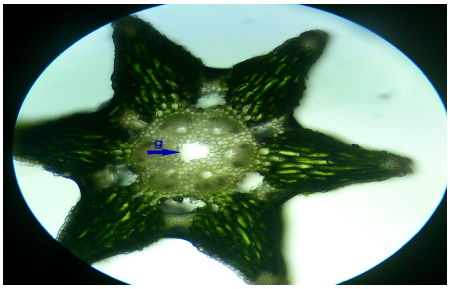

Figure 5. Cross section through the ramifications with 6 edges *(from Oradea area) g- main gap marrow*

In the structures of ramification with 7 edges the following observation has been made:

- The bundles of mechanic fibers appear both at the level of the ribs and at the level of valecules, too.
- The assimilation tissue is one of palissadic type
- In any of the cases cortical gaps can appear
- It shows 7 leading vessels
- It shows the central pithy gap

CONCLUSIONS

It is observed that in the studied populations, the sterile stem strain has a characteristic structure for the species but at the level of ramifications major differences appear, the most ramifications having 5, 6 edges instead of 4. Because of the numbers of the edges from the levels of ramification shows a character of identification of the species [11, 12, 13, 18], and considering the fact that the species can be confused with other species from the Equisetum genus, some of them being quite toxic, it has a great importance the knowledge of the arising variations in the species' anatomy for the right identification and the avoidance of confusions at harvesting.

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