EVALUATION OF THE LEAF ANATOMY OF FOUR (4) ECOTYPES OF VETIVER (*Chyrysopogon Zizanioides* (L.) Roberty *and C. Nemoralis* (L.) Roberty)

Evangelina Arcaná[1] y Oscar Rodríguez[2]. Universidad Central de Venezuela, Departamento de Agronomía, Facultad de Agronomía, Maracay, Venezuela.

[1]eva.arcana@gmail.com y [2]rodriguezo@agr.ucv.ve / osrp1958@gmail.com

Introduction

The Vetiver plant is a part of the Polaceae family and Panicoideae subfamily, and because of its characteristics of adaptability and resistance, it is used in soil and water conservation, protection and stabilization of infrastructures, the mitigation of natural disasters, rehabilitation and protection of the natural environment, among other uses (Rodriguez and Yepez, 2006). The objective of this investigation was to evaluate the leaf anatomy of 4 ecotypes of vetiver under 2 species: *Chrysopogon zizanioides* (L.) Roberty y *C. nemoralis* (L.) Roberty (formerly *Vetiveria Zizanioides/Nemoralis*); with the objective of understanding this genetic material and in order to make inferences on the most ideal uses for each of the ecotypes evaluated.

Materials and Methods

The vegetal material evaluated corresponds to 4 ecotypes (Table 1), in which one of them (Maracay) already counts more than 100 years of adaptation to the environmental conditions of our country (Venezuela), while the 3 remaining ecotypes were donated by Dr. Uthai Charanasri, of the Doi Tung Development Project and were brought to Venezuela by Dr. Oswaldo Luque, coordinator of the "Proyecto Vetiver de la Fundación Empresas Polar" in the year 2005 (Arcaná, 2009).

The samples for the anatomy study were taken from established plants in the experimental field of the Agronomy Faculty at the Central University of Venezuela. Leaves were collected from plants which had full sunlight and aged 6 months (from time of transplant). The material was fixed (preserved) in Formalin-acetic acid-alcohol (FAA) at 70% concentration, and afterwards transversal section cuts were made by hand using a blade and were rinsed for epidermal study. Samples were stained with toluidine blue at 0.5% and were mounted on semi-permanent slides for microscopic optic observation. For the anatomic description, the terminology proposed by Ellis (1976-1979) was used. Microphotographs were taken with a digital camera attached to the optical microscope.

Results and Discussion

<u>Similarities between Species</u>

Both species studied had leaves which were iso-facial and anfistomatic (meaning stomata is evenly distributed and on only one side of the leaf), with parasitic stomata, accompanied by triangular cells and bodies of halteriforme silica (Figure 1). In transverse section view, both species show a V-shape contour with symmetrical blades joined by a ridge which is made of just one central vascular bundle (Figures 2 and 3). In the same way, both species showed a radial clorenchyma associated with the vascular bundles of abundant adaxial chloroplasts and parenchyma; characteristics which coincide with that cited in the literature.

Anatomical Differences between the Eco-Types

Table 2 presents the morphometric anatomical variables of each of the vetiver ecotypes evaluated. Similarly, it is possible to differentiate based on some anatomic characteristics. For the ecotypes of *C. Nemoralis*, Roi Et is characterized by a pattern of regularly arranged conductive bundles and the presence of buliform cells at the level of the central ridge (Figure 8), while the ecotype Loei shows an irregular arrangement of the conductive bundles, the central ridge with microhairs towards the adaxial epidermis, and absence of buliform cells (Figure 9), along with prismatic crystals in the epidermal cells (Figure 10). For the ecotypes studied under *C. Zizaniodes*, the principal differences were found at the level of the central ridge/vessel, including the presence of buliform cells in the ecotype Maracay (similar to that of the ecotype Roi Et, shown in Figure 8) already observed in this specie by Metcalfe (1960), but these were absent in the ecotype Songkhla, which was characterized by the presence of translucent parenchyma of elongated cells (Figure 11).

Anatomical Differences between the Species

The two ecotypes evaluated of the *C. Nemoralis* species displayed an abundance of microhairs, aguijones (Figure 4) and macrohairs (Figure 5) in the adaxial epidermis, while the species *C. Zizanioides* displayed few microhairs only in the Maracay ecotype. In transverse section for *C. Nemoralis* the edges of the half-blade are wandering towards the adaxial area, with a large number of small air spaces (Figure 6), and the central ridge is rounded in shape (Figure 2), while the *C. Zizanioides* displayed straight edges on the adaxial face and wandering to the abaxial face; mesophyll with few air spaces of large size (Figure 7) and the central ridge more or less protruding towards the abaxial face (Figure 3).

Conclusions

The folic (leaf) anatomy facilitates differentiation between the vetiver ecotypes and possibly some of these characteristics could be associated with the adaptation of the same ecotypes to distinct environmental conditions; for example the presence of buliform cells, which have been associated with folding and unfolding of leaves as a mechanism to reduce transpiration, was

observed to be present in the ecotypes Roi Et and Maracay. Possibly for this reason these ecotypes would be able to respond better to conditions with higher water stress.