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Research Article

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Search for medicinal plants with pharmaceutical use by integration of the physical and biotic informations in a geographic information system: The interface steppe region - Saharan region (Algeria)

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ABSTRACT

Algeria is a large, rich country in flora and fauna. The objective of this study was the integration of biological and physical data in a GIS for research of medicinal plants. The use of GIS has allowed us to create several maps of the interphase region steppe-region Saharan Africa, and discover that Stipa tenacissima was the most dominant species. The plant could be a promising source of bioactive compounds and drugs.

Key words: *Stipa tenacissima*, GIS, Algeria, Medicinal plants.

INTRODUCTION

Algeria is a big northern African country, more than five times the size of California [1]. Its rich flora may be a promising source of new drugs. Knowledge of plant biodiversity in arid regions may contribute to understanding and controlling the human impact on the environment. Steppe ecosystems specifically, interface region steppe- African Sahara with mainly pastoral vocation, are a promising source of medicinal plants and thus new drugs [2-6]. Unfortunately, these ecosystems are exposed to high degradation resulting in reduction of the biological potential and disruption of ecological and socio-economic equilibrium.

GIS or geographic information systems combine different methods and computer technology that can mobilize, capture digitally, store, manage, view, analyze, represent objects or collections of objects, with the particularity to take into account their spatial characteristics as well as descriptive attributes attached thereto. Indeed GIS designation covers a wide variety of software implementation built to different choices to features and broad performance [7].

Our researches aim to understand the functioning of these ecosystems and the establishment of a system for acquiring information that could lead to clarify the relationship between plant biodiversity and other environmental factors [8].

The main objective of this study is integration of multi-source data (satellite imagery, field observations, or other available data generated thematic ...) of a rich region of medicinal plants and biopharmaceuticals in a geographic information system (GIS).

EXPERIMENTAL SECTION

For our study, we chose the steppe pre-Saharan interface region in western Algeria. This territory represents a biologically and ecologically particular entity. Our study area is divided into six stations, established and chosen in two transects North-South and East-West. Sites were located by Global Positioning System (GPS) and a Staff Map Scale 1 / 50,000 or 1/25, 000 of the study area was used. Data processing was performed by the Software Map Info Professional (8-5 Original Version) [9].

Functional analysis involved accessing data (requests) and representations (maps, cartographic edition) and the use of a library of map symbols specific to the study area. We then looked for GIS solution, it consists of critical examination of various possible technical scenarios for the application and, secondly, the choice of good prototype for the application with, in particular, the choice of program (s) as MapInfo.

Finally we proceeded to data modelling to translate the real world with all its complexity in data structures by checking the documents to be scanned (graphics plans); fixing of scanning parameters such as resolution; choosing the recording format; timing scanned image; indexing and fitting scanned boards; vectorization, either manual or automatic. Furthermore, we've carried out the collection of data necessary for the achievement of expected results as previously described [10].

RESULTS AND DISCUSSION

Geographical situation of the study area is shown on maps at different scales (fig 1).

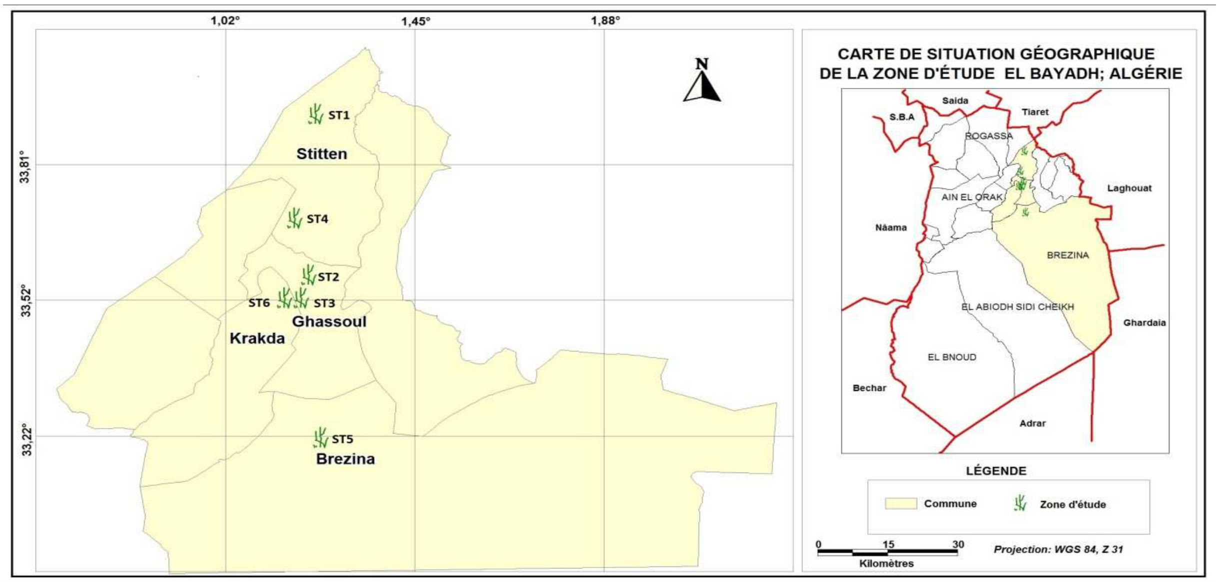

Figure 01. Goegraphical localization of the study aeria

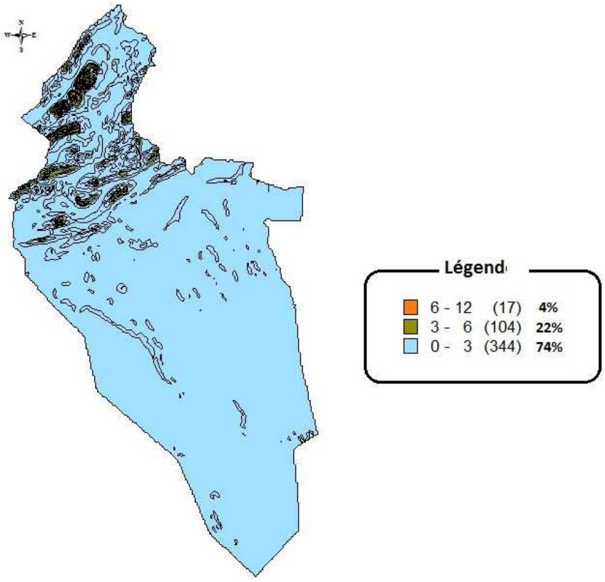

Figure 02. Slopes map of the study aeria

With the GIS processes we obtained in a short time an image containing the value of all the slopes (Fig.02). The slope informs us, plus the profile, the greater or lesser ability to runoff the land. The slope class 0-3% characterizes all funds valleys, plains and plateaus. This class demonstrates the stability of the ground with a low risk of erosion. The slope class 3-6% characterizes the plateau land or low hills foothills. The slopes of 6-12% class most often characterized foothills areas that are an extension of mountains of the study area. These are usually courses and forest land courses (light scrub). Erosion risks are present with onset of signs caused by overland flow [11].

The study area is characterized by high altitudes (1100 m on average), the highest reaches 1200 m and lower range between 1000 and 1100 m. These findings show that the irregularities are unimportant (Fig 03). This space is characterized by arid climate, low rainfall, irregularity and the harmful effects of sirocco. Substrate is relatively encrusted with limestone dominance generating only low horizons. The latter are severely affected by wind erosion. Relief of the study area is quite diverse since it differs from the plains, plateaus and mountainous area. Thus, physio-geographic regions are characterized [12].

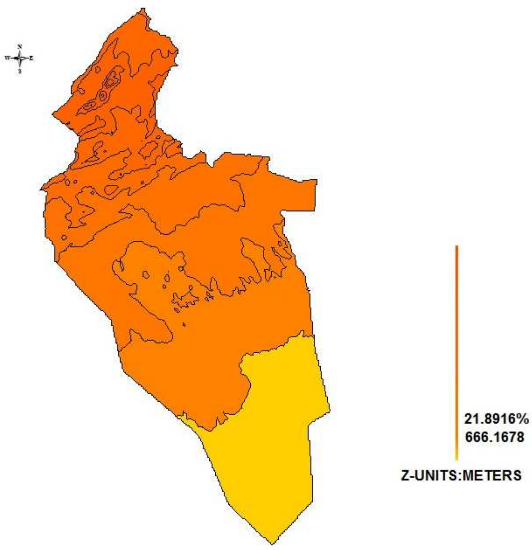

Figure 03. Contour map of the study area

The effect of exposure is particularly important and is reflected in the difference between the north side and south side of the mountains, or between the two sides of a valley when the latter has a generally east –west direction. The presence of a cliff facing south protects lands in his foot against the north winds, concentrates the light and determines a significantly warmer local climate than the rest of the study area [10].

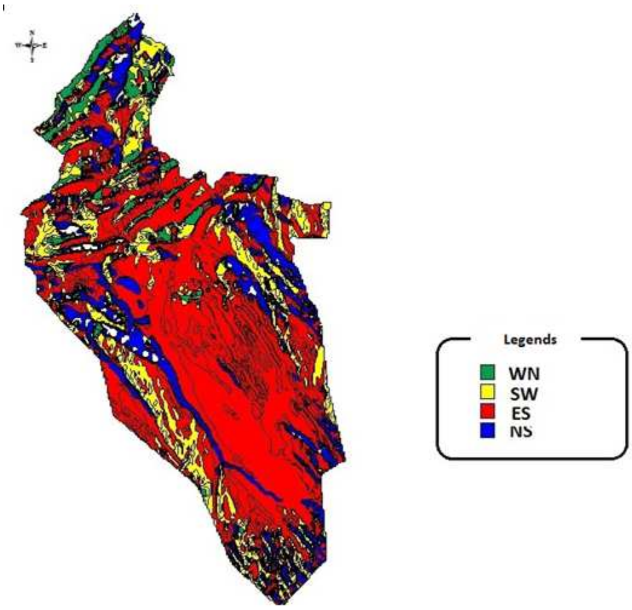

Figure 04. Exposure map of the study area

We noticed the predominance of clear and dense scrub trees, consisting of Aleppo pine forests. It is appropriate to note the dominance of hardy species characteristics of the semi-arid bioclimatic stage. Interestingly, we found that Alfa, *Stipa tenacissima*, is the most dominant species in these forest areas (Fig 05). It has been reported that the plant possess an anti-crystallisation Calcium Oxalate Urolithiasis activity [13]. *Stipa tenacissima* is a rich source of lignins with promising potentials. Indeed, lignins of *Stipa tenacissima* have shown a high antioxidant capacity over a range of concentrations that are not harmful to normal human cells [14]. Promising anticancer properties of Soda lignin, dioxane lignin and milled lignin from the plant have been demonstrated [15].

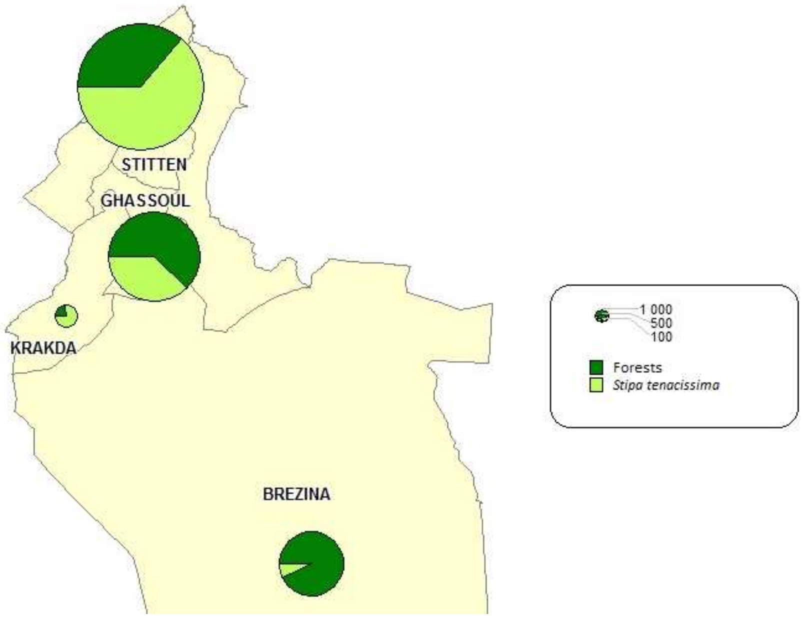

Figure 05. Distribution of forests and *Stipa tenacissima* in the study area

CONCLUSION

At the end of our work, we were able to create maps using a GIS and effectively inexhaustible source of information in a reasonable time, this allows us to offer a development model for the rational use of space (soil and vegetation). The most important finding of the present study was the importance of *Stipa tenacissima* in the study area, as a source of bioactive compounds and pharmaceutical substances to valorize.

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