Albania is one of the Balkan countries with high level of diversity for many cultivated and wild species including fruit tree crops. Fruit trees are economically, socially and culturally important crops grown over a wide range of ecological habitats in the country, in the range of 10,190 million trees, MAFCP (2010).

Introduction

Ecogeographic studies provide critical information about the diversity present in specific geographic areas, Maxted et al. (1995). Geographic information systems (GIS) were useful tools for ecogeographic analysis, Guarino et al. (2002).

Application of GIS tools to improve genetic representativeness (GR) of gene-bank collections, to detect areas of higher diversity (alpha diversity), to understand differences in the diversity between areas (beta diversity), to identify prioritized collecting sites and gaps in current conservation and the development of a more systematic conservation strategy and a good database for the PGR, were the purposes of this study.

Material and Methods

Description of the study area: The analysis of geographic distribution and fruit tree species diversity was conducted in all principal growing zones of fruit trees crops in Albania. The geographic areas where the geo-referenced observations were carried out include 11 counties of Albania: Berat (BR), Diber (DI), Durres (DR), Elbasan (EL), Fier (FR), Gjirokaster (GJ), Korce (KO), Kukes (KU), Shkodrer (SH), Tirana (TR) and Vlora (VL).

Analysis of species occurrence data in combination with climatic data was realized using higher resolution grid square cells 5 x 5 km (2.5 minutes), Hijmans, et al. (2005). In this study free GIS World Environment data was used, Hijmans, et al. (2005). Geographic data: Each individual plant/species (or the group of individuals) represents a georeferenced observation, which supposes presence of a fruit tree individual known as presence point. All georeferenced observations, chosen to carry out spatial analysis, were entered into the GIS analysis, as presence points, Hijmans et al. (2001). Several diversity indexes and richness estimators have been used to assess species diversity. Species richness (S), as simplest account of the number of different species in a given area and the species evenness as the relative abundance of individuals among the species, and diversity indexes as Shannon’s diversity index (H), Brillouin index (B), Simpson diversity index (1-D), Margalef’s index (Dmax), evenness estimators (B, abundance and evenness) as Chao-1 and 2; Jaccard-1 and 2, abundance coverage estimation (ACE) were calculated using DIVA-GIS tools. Distinction of the minimum number of areas (grid cells) necessary to conserve a given number of species varieties or alleles of the gene pool under study, Hijmans et al. (2001), was realized using reserve selection modeling, Rebelo et al. (1992). Cluster analysis method was used to measure (Bray-Curtis) similarity, McAleece et al. (1997), between species presence/absence in different observed areas.

Results and Discussion

The measurement of diversity and distribution of fruit tree species was realized in several ways. Firstly, the number of observations was tabulated per species and per counties. Secondly, the area of occupancy, as the total area occupied by a specific taxon, was selected as an indicator of abundance or rarity of a particular species. For this purpose geo-referenced data points (presence points) were checked for inconsistencies. Data points with incorrect coordinates on the administrative unit (country) were assigned coordinates where possible while duplicate or doubtful data were removed, Scheldeman et al. (2010). Data points without coordinates were removed. Study results show the presence of higher variability between observed geographic areas related to distribution, number and kind of fruit tree species. Species richness and diversity indexes proved the presence of this important variability (Table1, Fig. 1).

Diversity indices results (Table 2): Margalef index values (M=2.70) show presence of higher species diversity in the areas of EL, BR, DI, FR and TR counties. At the KO and VL counties (M=0.50) there were also areas (grid cells) of high diversity level. Shannon index values (H=2.20) show the presence of higher diversity in areas of EL, TR and DI counties. Simpson index of diversity (1-D=0.50) show presence of higher diversity in counties of BR, DI, FR and VL counties. Brillouin index values (B=2.00) clearly shows that high species diversity occurs in EL and TR counties. Richness estimators (E): Species richness (S), Spatial analysis detects areas of different high diversity (alpha diversity) levels.

Analysis clearly shows that high species richness occurs in observed areas (grid cells) of EL, TR, DI and KO counties. In these areas the highest number of species was observed (respectively 16, 13 and 11 species). At the second range the areas (grid cells) with highest number of species richness (S ≥ 10 species) were BR, FR, SH and VL counties. Less species richness occurs in KU and DR counties (respectively 3 and 7 species).

Reserve selection method ranked the minimum grid cells that should be given priority for conservation. Mapping gave the first priority to the grid cells with the highest alpha diversity (EL, TR and BR areas).

Cluster analysis identified the similarity between collecting (grid cells): FR and VL, also KO and SH, and DI and KO, etc (Dendrogram fig. 3).

Conclusions:

GIS analysis show the presence of variability between geographic areas related to number and kind of fruit tree species collected.

Diversity indices and richness estimator’s values show that Albania is a very rich country in tree species diversity. Modeled richness maps identified EL, TR BR counties as the areas with the highest potential fruit trees species diversity and with the most potential priority areas for in situ conservation. Confrontation of grid cells gave the subsequent priority to the additional areas (BR, DI and TR), where the highest number of new species was found: in BR 3 new species, in TR 4 other new species, and in DI one new species (Fig. 2 a, b, c).

Albania continues to be a very rich country in fruit trees species diversity.