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The Importance of Vegetables Crops in the Oases of Gabes

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Abstract: The prospecting and evaluation of the plant biodiversity on the coastal oasis of Gabes were conducted through an investigation covering 13 oases to determine the species richness, composition based on indexes of diversity of Shannon (H ') and equitability. The inventory of species present in the oasis of Gabes has proved that the carrot, turnip, onion are the most cultivated species. The other species occupy small areas. Some local cultivars of onion, carrot and turnip have been distinguished.

Keywords: Biodiversity, Oases, Vegetable crops

1. Introduction

The oases of south-east of Tunisia extend along the coasts of gulf of Gabes which give them a maritime climate. Several studies have targeted to study cropping systems practiced in this oasis divided into three distinct stages of cultures: Palm trees, which form the upper floor and symbolise the oasis landscape, a panorama of fruit trees forming the intermediate floor (pomegranate, olives, several varieties of grapes, fig, apricot, plum, apple, pear, citrus) and other herbaceous crops that occupy the lower ground floor formed by various vegetable crops, fodder and industrial ones (henna and tobacco). In spite of their importance, the vegetables species cropped in the underlying floor were very partially studied. The aim of this study is to estimate the biodiversity of vegetables species grown in these oases.

2. Materials and Methods

The inventory of species was done through a questionnaire which takes into account the objectives of the study, namely the characterization of farms, the inventory of species distribution and the abundance of species and cultivated varieties. The survey was prepared in collaboration with leaders members in local NGOs and the official services of agricultural promotion. The study area had covered 5 oases: Gabes city, Gabes south, Gabes West, Gannouch and Metouia. The sampling size for each one is proportional to its size with a total number of farmers counting 366.

2.1. Evaluation of species diversity

To appreciate the diversity of species in each oasis, the number of different species cropped was counted. For that several indexes and parameters were used to assess the biodiversity within each ecosystem. The level of species diversity is quantified by specific richness (S), Shannon diversity and equitability index.

2.1.1. The species richness (S)

This variable is essential to quantify the biological diversity of an ecosystem: It consist on counting different species found in the exploitations visited and conducted on permanent grassland (Nicklès, 1839 cited by Pervanchonm, 2004). According to Blondel (1995), this method gives a rapid view to express the biodiversity.

2.1.2. Index of species diversity

The index of Shannon-Weaver (Shannon and Weaver, 1949) takes into account the number of species present and their relative abundance and allows us to obtain additional information. The diversity index Shannon H '(Shannon, 1948) is used in ecology as a measure of species diversity (Margalef, 1958 cited by Frontier, 1983). It allows us to quantify the diversity by combining two components: the number of species and their distribution on land. It is calculated by this formula

$H' = -\sum_{i=1}^{S} p_i (\log_2 p_i)$, With:

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p_i = (area of exploitation / total area studied)

: S the total number of species present;

H ' is equal to 0 where the population is formed by one specie only and $\log_2 S$ if all species are present with an equivalent abundance (This index is usually ranged between 4.5 and 5 for the most diversified plant population).

2.1.3. Index of equitability (R)

The equitability index is also used to appreciate the level of fair distribution of the diversity (Ricotta and Avena, 2003). This index can measure the fair distribution of species compared to a theoretical equal distribution for all species (Barbault, 1992). It is given by the following formula:

R= H′ / H max

With: H max = $\log_2 S$.

R = 0 (one species dominates) or 1 (all species have the same abundance).

3. Results and Discussion

3.1. Estimating the diversity of the 3rd floor of the cropping system

The importance of various speculations in the oases studied and their distribution are illustrated by the **Figure 1**. It shows that the palm cultivation remains especially in the oasis of Gabes city with an area covering nearly 51%, the tree cultivation is mainly practiced in Gabes south covering 29 % of the area and vegetable crops are especially developed in the oasis of Ghannouch where they occupied 53 % of the area.

3.2. The species richness

Our survey revealed the existence of many species in the oases visited. Indeed, species richness S at this stage culture is 21.

3.3. Specific composition

The exploration has shown that each oasis is specialized at the production of certain species (**Table 1**). This table shows that there is a great diversification of vegetable crops in the oasis of Ghannouch. To a lesser degree, vegetable crops are important in the oasis of Gabes city. The oasis of Metouia is specialized at the cultivation of coret (*Corchorus olitorius*), Gabes north east is specialized at leek (*Allium Porrum*) and Gabes south in forage crops especially (*Medicago sativa*).

3.4. Index diversity of Shannon

The richness and the specific composition of flora are not enough to measure the diversity of species and to estimate the degree of diversification. The Shannon index is 0.84. This value is closer to 0 than $\log_2 s$ (4.39) which reflected a very significant loss of biodiversity in the ecosystem. The index Shannon diversity was also calculated within each oasis. The results are presented in **Table 2**. The oasis of Metouia is the poorest in terms of biodiversity (H '= 0.017). Even if the Ghannouch oasis's index is relatively high, its value did not indicate really a great biodiversity.

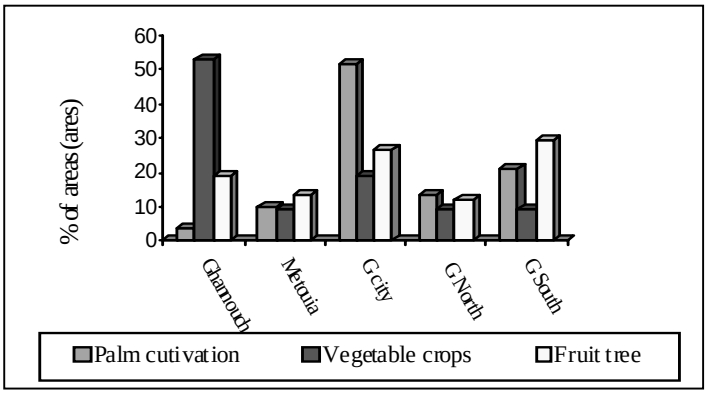

Fig. 1. Distribution of different areas of speculation in the oasis studied.

Table 1. The most practiced species for each oasis.

G.city	G.north	G.south	Ghannouch	Metouia
- Parsley, - Blett, - Fennel, - Spinach, - Coriander	- Leek	- Alfalfa, - Oats - Henna, -Tobacco.	- Onions - Carrot, - Turnip, - Garlic, - Squash, - Cucumber, - Cabbage, - Chilli, - Tomato, - Lettuce - Watermelon, - Melon, - Beet - Celery	- Coret

Table 2. Index of diversity of Shannon for each oasis.

oasis	G.city	G.north	G.south	Ghannouch	Metouia
H'	0.052	0.0342	0.0774	0.2111	0.017

Table 3. Index of equitability for each oasis.

oasis	G.city	G.north	G.south	Ghannouch	Metouia
R	0.0118	0.0078	0.0176	0.048	0.0039

3.5. Index of equitability

The equitability of vegetables in the 5 oases studied is 0.19, this value closer to 0 than 1, indicates a deterioration of the biodiversity of the lower floor. The index of equitability calculated for each oasis is illustrated in **Table 3**. All values are also closer to 0 than 1. Metouia has a very low index (0.0039), reflecting the scarcity of biodiversity in this oasis, while Ghannouch shows a highest index of equitability highest.

4. Conclusions

Nowadays life transformation in the oases of the Southeast of Tunisia had led to an increase in the abundance of agricultural activity at the expense of industrialization and the development of other attractive economic sectors. This work was carried out to study the biodiversity of vegetable crops in the oasis of Gabes. The different indexes studied (species richness Shannon and equitability) had reflected a loss of diversity of vegetable crops in the oasis of Gabes. The richness of flora biodiversity in the oasis of Ghannouch can be explained by water availability. The plots are irrigated in an interval of 10 to 15 days (water tower) which is the shortest tour through contribution to others oasis which promotes the practice of vegetable crops. The poorest oasis in terms of plant diversity is the oasis of Metouia. Indeed this oasis suffers most from the problem of hydromorphy, neglection and immigration. The hydromorphy causes soil salinity, the degradation of soil quality and their inability to crops production.

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