

Biodiversity of fruit species in the valley of Oued Righ: the case of the area of Touggourt (Algeria)

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Biodiversity of fruit species in the valley of Oued Righ: the case of the area of Touggourt (Algeria).

Abstract – Introduction. Algerian oases are characterized by a diversification of local fruit species and cultivars. However, this diversity is subject to erosion. To preserve the genetic heritage, we undertook the first work on the inventory of fruit species crops in the region of Touggourt in south-eastern Algeria. **Materials and methods.** Our working methods were based on surveys carried out on farms in the Oued Righ region according to a questionnaire that met our objectives. For this, we divided the study region into three zones and in each zone we selected ten farms for the inventory of fruit species cultivated. **Results and discussion.** The results of our investigations allowed us to identify thirteen species, including four species with a wide distribution (pomegranate tree, apricot tree, fig tree and vine). The local genetic diversity of these species is little known. The varieties or cultivars inventoried have local names given by the farmers in the region according to certain morphological characteristics of the fruit. We surveyed five cultivars for the fig tree, two cultivars for the pomegranate tree, two cultivars for the vine, and two apricot tree cultivars. The study of the biodiversity of fruit trees in the Oued Righ region showed high richness of the species and cultivars; some are local and others are endemic to the region. Better knowledge of genetic diversity will begin with tests of behavior and characterization of the different genotypes encountered to dispel the ambiguities and to highlight the actual composition of populations or varieties of different species.

Algeria / Sahara / oases / biodiversity / fruit crops / farm surveys / erosion

La biodiversité des espèces fruitières dans la vallée de Oued Righ : cas de la région de Touggourt (Algérie).

Résumé – Introduction. Les oasis algériennes se caractérisent par une diversification des espèces fruitières locales et de leurs cultivars. Cependant, cette diversité est sujette à l'érosion. Afin de préserver le patrimoine génétique, nous avons entrepris un premier travail d'inventaire des cultures fruitières dans la région de Touggourt au sud-est de l'Algérie. **Matériel et méthodes.** Nos méthodes de travail ont été basées sur des enquêtes menées dans les exploitations agricoles de la région d'Oued Righ à partir d'un questionnaire orienté vers nos objectifs. Pour cela, nous avons divisé la zone d'étude en trois zones et, dans chaque zone, nous avons sélectionné dix fermes qui ont donné lieu à un inventaire des espèces fruitières cultivées. **Résultats et discussion.** Les résultats de nos enquêtes nous ont permis d'identifier treize espèces, dont quatre avec une large distribution (grenadier, abricotier, figuier et vigne). La diversité génétique locale de ces espèces est peu connue. Les variétés ou cultivars inventoriés portent des noms locaux donnés par les agriculteurs de la région en fonction de certaines caractéristiques morphologiques du fruit. En ce sens, nous avons identifié cinq cultivars pour le figuier, deux cultivars pour le grenadier, deux cultivars pour la vigne, et deux cultivars d'abricotiers. L'étude de la biodiversité des arbres fruitiers dans le Righ Oued a montré une grande richesse des espèces fruitières et cultivars ; certaines sont locales et d'autres sont endémiques à la région. Une meilleure connaissance de la diversité génétique de ces espèces débutera par des tests de comportement et la caractérisation des différents génotypes rencontrés afin de lever les ambiguïtés et de mettre en évidence la composition réelle des populations ou des variétés des différentes espèces.

Algérie / Sahara / oasis / biodiversité / plante fruitière / enquête sur exploitations agricoles / érosion

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RESUMEN ESPAÑOL, p. 37

1. Introduction

Algeria is a large center of bio-diversity; its geographical position and the structure of its bioclimatic layers harbor a significant stock of genetic resources [1, 2].

The oases of the Algerian Sahara are characterized by a significant agro-biodiversity. The biggest diversity exists for the cultivated taxa, particularly for date palm, with more than 900 cultivars [3]. In addition, there are some varieties or populations of vegetable species, forage, fruit and condiments. Unfortunately, some formerly cultivated varieties or populations have been abandoned and replaced by foreign material with high genetic potential but that is very demanding and often inappropriate [4, 5]. The subsistence agriculture usually practiced in these areas is extensive; the inputs are low and the mechanization is limited [6].

No systematic study has been performed to further knowledge, improvement or conservation of these taxa. They are endangered by the mass introduction of industrial crops in the Sahara.

In the oases of the region of Oued Righ (Algeria), date palm cultivation is the principal form of agriculture, followed by the other fruit trees; they are marginal and practiced on a small scale and in an extensive way, with some trees of the different species intended only for family consumption.

In this region, the cultivated species are mostly adapted to the soil and climatic conditions and the type of planting is usually done between the palm trees, with an intensive drive whose primary purpose is marketing and improving incomes [7].

Farms in the region of Touggourt (Oued Righ, Algeria) are characterized by diversification of fruit species covering an area of 81.28 ha [8]. Local cultivars exist and are very ancient cultivation in southern Algeria, but they often remain unknown and prone to be forgotten.

For a better understanding of this plant heritage and for the purpose of safeguarding, characterizing and evaluating it, an inventory was necessary to give a status report on the matter and make it possible

to identify the steps to take in order to achieve this objective. Consequently, our study targeted such an inventory of fruit species grown in the palm gardens of the region of Touggourt.

2. Materials and methods

The region of Oued Righ is a valley situated in the North-East of the Algerian Sahara. It covers a South-North axis whose latitude is 32°54' to 39°9' North and longitude 05°50' to 05°75' East. Also, it is part of the lower Sahara which contains significant underground water, especially artesian water. The Saharan climate is characterized by cold winters and dry summers. The valley of Oued Righ is divided naturally into blocks called trios: Upper Oued Righ (Touggourt region), Middle Oued Righ (Djamaa region) and Lower Oued Righ (M'ghair region) [9]. Our study was conducted in the Upper Oued Righ (Touggourt).

The methodology adopted for our work was based on surveys and field investigations [10], and interviews with farmers of the region. The approach used was a systematic inventory of all fruit species and of the existing cultivars or populations. To do this, we divided the study area into zones; each zone was subdivided into locations and each location was divided into farms. The different locations of each zone were Nezla area, which includes the places Merdjaja, Messaoud, Loukda, Benzanoun and Chemerra; Tebesbest area, with the places Farjamoun, Sbakh, Lakrab, Chemerra and Ba'Amor; and Zaouia area, with the places Lahchichine, Lahdada, Rghioua, Boukabbout and Lamhareth.

According to the statistics of the agricultural services of the Ouargla wilaya (= administrative division of the region), the number of farms exceeds one thousand farms per municipality [8]. Faced with such a number, systematic sampling would be expensive in terms of time and resources. Consequently, the adoption of a judicious sampling was required. Thus, the selection of farms surveyed was based on various criteria, namely: – the state of maintenance operations, which should be achieved in average to good conditions,

Table I.

Significance of fruit species inventoried in thirty farms of three study zones (Nezla, Tebesbest and Zaouia) in the Upper Oued Righ (Touggourt region, Algeria). A total of 1139 trees was observed.

| Families | Scientific names | Common names | Number of trees inventoried per study zone | | | Total of trees per species | % of trees per species relative to total trees inventoried |
|------------|---------------------------|------------------|--------------------------------------------|-----------|--------|----------------------------|------------------------------------------------------------|
| | | | Nezla | Tebesbest | Zaouia | | |
| Lythraceae | <i>Punica granatum</i> | Pomegranate tree | 125 | 131 | 114 | 370 | 32.48 |
| Moraceae | <i>Ficus carica</i> | Fig tree | 64 | 51 | 57 | 172 | 15.10 |
| | <i>Morus</i> sp. | Mulberry tree | – | 1 | 1 | 2 | 0.17 |
| Oleaceae | <i>Olea europae</i> | Olive tree | 12 | 15 | 9 | 36 | 3.16 |
| Rosaceae | <i>Prunus armeniaca</i> | Apricot tree | 97 | 112 | 107 | 316 | 27.74 |
| | <i>Prunus domestica</i> | Plum tree | 13 | 37 | 15 | 65 | 5.70 |
| | <i>Malus domestica</i> | Apple tree | 12 | 22 | 17 | 51 | 4.47 |
| | <i>Cydonia oblonga</i> | Quince tree | 4 | 2 | – | 6 | 0.52 |
| | <i>Prunus persica</i> | Peach tree | 3 | 1 | 1 | 5 | 0.43 |
| | <i>Mespilus germanica</i> | Medlar tree | 1 | – | – | 1 | 0.08 |
| | <i>Pyrus communis</i> | Pear tree | 1 | – | 2 | 3 | 0.26 |
| Rutaceae | <i>Citrus sinensis</i> | Orange tree | – | 1 | 1 | 2 | 0.17 |
| Vitaceae | <i>Vitis vinifera</i> | Vine | 47 | 24 | 39 | 110 | 9.65 |

– the presence of a practical polyvalent and diversified agriculture,

– the presence of a farming expert.

In a pre-investigation, we noticed a similarity of agricultural practices on farms in the region; this observation allowed us to reduce the number of samples studied. Therefore, the number of farms to be considered was limited to ten farms per zone. In total, thirty farms were surveyed.

A descriptive sheet was prepared for studying each cultivar observed. The information related to location of the farm, common name of the cultivar, its origin, the meaning of its name, its significance in number, its repartition (abundant, frequent or rare), the age group of the farmers, the date of maturity of the fruit, the estimation of its production, diseases encountered, etc.

3. Results

The inventory achieved showed that the region of Touggourt is rich in fruit species (*table I*). Thirteen species were recorded, seven of them belonging to the Rosaceae

family (*Prunus armeniaca*, *P. domestica*, *P. persica*, *Malus domestica*, *Cydonia oblonga*, *Mespilus germanica* and *Pyrus communis*), two species belonging to the Moraceae family (*Ficus carica* and *Morus* sp.), and other species belonging to the Lythraceae family (*Punica granatum*), the Vitaceae family (*Vitis vinifera*), the Oleaceae family (*Olea europaea*) and the Rutaceae family (*Citrus sinensis*). The dominant species were *Punica granatum* (pomegranate) and *Prunus armeniaca* (apricot) with, respectively, 32.48% and 27.74% of all fruit species inventoried.

Of the thirteen species recorded (*table I*), three species are abundant and represent a wide spatial repartition: the pomegranate tree, with 32.48% of all the trees inventoried, the apricot tree, with 27.74% and finally, the fig tree, with 15.10%. Other species are less abundant; they were observed in several farms but with a low representation: the vine, with 9.65% of all the trees inventoried, the plum tree, with 5.70%, the apple tree, with 4.47%, and the olive tree, with 3.16%. The remaining species are rare, with a very low number of trees in a few farms, and they

never exceed a tree per species and exploitation. This is the case for the quince tree (0.52%), the peach tree (0.43%), the pear tree (0.26%), the orange tree (0.17%), the mulberry tree (0.17%), and finally, the medlar tree (0.08%).

The species recorded are composed of cultivars, usually from the types grown locally and often more or less empirically selected by farmers. However, these cultivars were not subject to any characterization study or identification. In general, the names given to these cultivars express one of their characteristics, such as the species origin or shape, color, date of maturity or taste of fruit. Thus, in our surveys, we identified the names of different local cultivars: two different cultivars for the pomegranate tree ('Hlou', which means sweet, and 'Hamad', which means sour taste); five cultivars for the fig tree ('Kharfi', which means maturation of fruit in autumn; 'Ngaoussi', from the village called Ngaous; 'Bou3ank', which means that the fruit has a long petiole; 'Tinedli', from the village called Tinedla; 'Bakor', which means early maturation cultivar); two cultivars for the vine ('Taibati', from the village called Taibat and 'Kalb Serdouk', which means that the fruit has the shape of a cock's heart); two cultivars for the apricot tree ('Beldi', which means that the tree comes from a local area and 'Louzi', with a nucleus which tastes of almond).

4. Discussion

Our results showed that the Upper Oued Righ was characterized by a rich biodiversity consisting of thirteen different fruit species other than date palm trees. However, this number remains low compared with other regions of Southern Algeria such as El Golea and Ghardaia, where some authors have identified other species such as almond and citrus [11, 12]. This relative weakness of the Upper Oued Righ region may be due to several reasons, including weather, water salinity and soil characteristics.

In the region of Oued Righ, Perennes identified only five species: apricot, pomegranate, fig, apple and peach [13]. According to Dubost, the true Saharan species are

those that adapt to climatic conditions, such as vine, apricot, fig and pomegranate [14]. Our results showed that these species are very significant, but other species neglected by farmers can be grown in the region such as plum, olive, peach and pear, that we mentioned. These fruit trees seem tolerant to the adverse conditions encountered in the region.

The genetic diversity of these species is little known. Cultivated species form a group of cultivars selected by farmers who have given them local names.

The study of biodiversity of fruit trees in the upper Oued Righ region shows a high richness of species and cultivars, some of which are local and some endemic to the region [2].

A future work could be considered in conjunction with farmers of the area to restart farming breeding techniques to save the diversity of these fruit species, to evaluate it and to improve the genetic materials.

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La biodiversidad de las especies frutales en el valle de Oued Righ: el caso de la región de Touggourt (Argelia).

Resumen – Introducción. Los oasis argelinos se caracterizan por una diversificación de las especies frutales locales y de sus cultivares. No obstante, esta diversidad está sujeta a la erosión. Con el fin de preservar el patrimonio genético, emprendimos un primer trabajo de inventario de los cultivos frutales en la región de Touggourt, en el suroeste de Argelia. **Material y métodos.** Nuestros métodos de trabajo se basaron en las encuestas realizadas en las explotaciones agrícolas de la región de Oued Righ, a partir de un cuestionario orientado hacia nuestros objetivos. Para ello, dividimos la zona de estudio en tres zonas y, en cada zona, seleccionamos diez granjas que dieron lugar a un inventario de las especies frutales cultivadas. **Resultados y discusión.** Los resultados de nuestras encuestas nos permitieron identificar trece especies, de las cuales cuatro con una amplia distribución (granado, albaricoquero, higuera y vid). La diversidad genética local de estas especies es poco conocida. Las variedades o cultivares inventariados llevan nombres locales atribuidos por los agricultores de la región, en función de algunas de las características morfológicas del fruto. En este sentido, identificamos cinco cultivares para la higuera, dos cultivares para el granado, dos cultivares para la vid y dos para el albaricoquero. El estudio de la biodiversidad de los árboles frutales en Righ Oued nos mostró una gran riqueza de especies frutales y cultivares; algunos son locales y otros son endémicos de la región. Se emprenderá un mayor conocimiento de la diversidad genética de estas especies con las pruebas de comportamiento y con la caracterización de los diferentes genotipos encontrados, de modo a resolver las ambigüedades y a poner de manifiesto la composición real de las poblaciones o de las variedades de las diferentes especies.

Argelia / Sahara / oasis / biodiversidad / frutales / encuestas sobre explotaciones / erosión