

Recent Research in Science and Technology 2018, 10: 01-06
 doi: 10.25081/rrst.2018.10.3360
<http://updatepublishing.com/journal/index.php/rrst/>



ISSN: 2076-5061

REGULAR ARTICLE

COLLECTION AND ETHNOBOTANICAL INVESTIGATION OF LENTIL (*LENS CULINARIS* MEDIK) IN ALGERIA

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ABSTRACT

The present investigation was done to prepare an inventory of lentil crop in Algeria. Surveys and collection of lentil accessions were conducted in different agro-ecological zones of Algeria in 2011. From ten regions (Departments), fifteen villages were surveyed and 30 lentil accessions were collected. The present study was carried out to survey, identify and document the uses of lentil accessions collected. The information on ethnobotanical uses was collected through semi-structured questionnaires with local villagers, elders and those people having knowledge associated with the production and utilization of lentil (*Lens culinaris*). The study revealed that among the interviewed farmers, 64% were males while 36% were females. The commonest cropping system found was the cultivation of lentil alone (95.5% of producers) and associated with grass pea (2.5%). Regarding the plant part used, two main parts are used by the farmers interviewed: seeds and the aerial part after harvest as a straw to feed animals. Low yield (40% of responses), disease and insect attack (36%), and low rainfall (24%) were the main production constraints reported by the interviewees.

Keywords: Lentil accessions, Collection mission, Ethnobotanical uses, Farmers

INTRODUCTION

Lens culinaris Medikus is one among the historic crop cultivated since time immemorial [1]. It has been cultivated in the most difficult agricultural environments, being perhaps second only to barley in this sense [2]. The common English name of this species is Lentil because of its lens shaped seeds [3].

In Algeria, the cultivated lentil *Lens culinaris* subsp. *culinaris* was introduced in 1920, during the colonial period in the region called Serssou [4]. Significant variability has been built up since their introduction and acclimatization. However, genetic erosion linked to the loss of local crop varieties being replaced by high yielding improved cultivars is becoming a notable concern. Therefore, accessions collected and information gathered regarding the farmers traditional knowledge are the first steps to undertake before starting plant breeding work.

The objectives of this study were (1) Draw the geographical distribution map of lentil accessions in Algeria using DIVA-GIS software, to (2) gather information regarding knowledge related to the use, traditional cultural practices of lentil, (3) collect samples to establish a national germoplasm collection of lentil for ex situ conservation and further research and development studies.

MATERIALS AND METHODS

Sites characteristic

Collection trips were made throughout Algeria in 2011 at different agro-climatic zones which are characterized by variation in altitude, annual rainfall, temperature and vegetation covers. In order to suitably cover the study area, 15 surveyed rural area or villages were randomly selected throughout 10 Departments. The geographical details (latitude, longitude and altitude) of each locality were recorded using global positioning system (GPS). Information characterizing each location (name of sites, name of the village/district and name of department) is mentioned in Gaad *et al.* [5].

Ethnobotanical and agronomic data

Data were collected in 2011 during the harvest season of lentil (June and July). Forty-seven (47) farmers were interviewed. The farmers were initially selected through a random selection of households. During the survey, demographic, ethno-botanical and agronomic information was collected using a Semi-structured interviews based on questionnaire derived from Marchenay, [6]. The variables used in the interviews included: source of seeds (where they obtained their seed); taxonomic status of collected samples, plant part used; why this plant is still cultivated?

Received 07 December 2017; Accepted 11 February 2018

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The end destination for the product; for how long time was cultivated in the region? and main production constraints. In addition, the agro ecological conditions under which the lentil is grown (association of cultivars, soil types and application of pesticide). Moreover, basic demographic information was collected from each farm household interviewed (age and sex).

Accessions collected

Germplasm materials (seeds/pods) were collected with the agreement and help of farmers. In total, 30 accessions were sampled from 15 collecting sites. The detailed list of the collected material is reported in Gaad *et al.* [7].

Statistical methods

To know the spatial distribution of accessions DIVA-GIS version 7.5.0 was used. Survey data were analyzed by using descriptive statistics to score scale responses, frequency distributions and mean comparisons. Statistical analyses were performed using the Minitab Statistical Software (Copyright 2018 Minitab Inc.).

RESULTS

Mapping geographic distribution of accessions

DIVA-GIS program allow us to visualize the spatial distribution of the 30 lentil accessions collected. Each point represents on the fig. 1, the location where the accessions were collected or sampled.

Survey results

The ethnobotanical and agronomic characteristics of this 30 accessions collected were documented. A total of 47 farmers were individually interviewed. Demographic information is summarized in table 1.

Among the interviewed farmers, 30 (64 %) were males while 17 (36 %) were females. 20.3% of the farmers were less than 45 y old, half (53.3%) were between 45 and 65 y old and 26.0% were more than 65 y old. Only in the region of Setif and Djanet the age group exceed 65 old years. However, at Kabyle region (T-Ouzou and Bouira) and Media lentil is cultivated by young farmers less than 45 y old (61.11%).

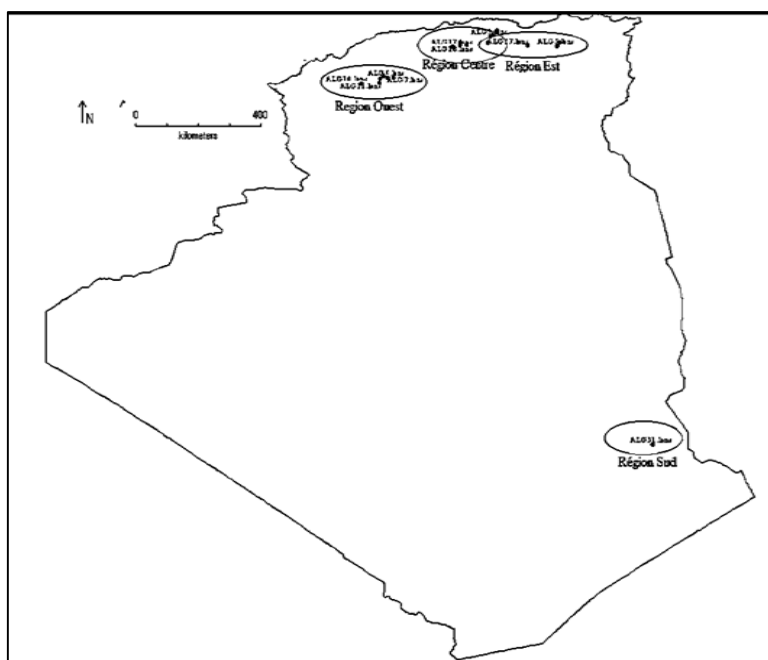


Fig. 1: Mapping of *Lens culinaris* germplasm collections using DIVA-GIS program

Table 1: Demographics characteristics of farmers interviewed. Gender and age presented in percentages

Regions	Gender		Age		
	Male	Female	<45	45-65	>65
Ain Timouchnet	100	00	00	100	00
Bouira	45	55	66.67	25	8.33
Constantine	100	00	00	100	00
Djanet	00	100	00	00	100
Medea	80	20	66.67	14.29	19.05
Mila	100	00	00	100	00
Setif	100	00	00	00	100
Sidi Bel-Abbass	100	00	20	60	20
Tiaret	16.9	83.04	00	83.33	16.67
Tizi Ouzou	50	50	50	50	00
Mean	69.19	30.08	20.33	53.26	26.04

According to farmers interviewed, collecting source is dominated by: institutional distribution or local extension services of research and development offices (64.33%) followed by seed saved or self-keeping (20.66%) then market (15%).

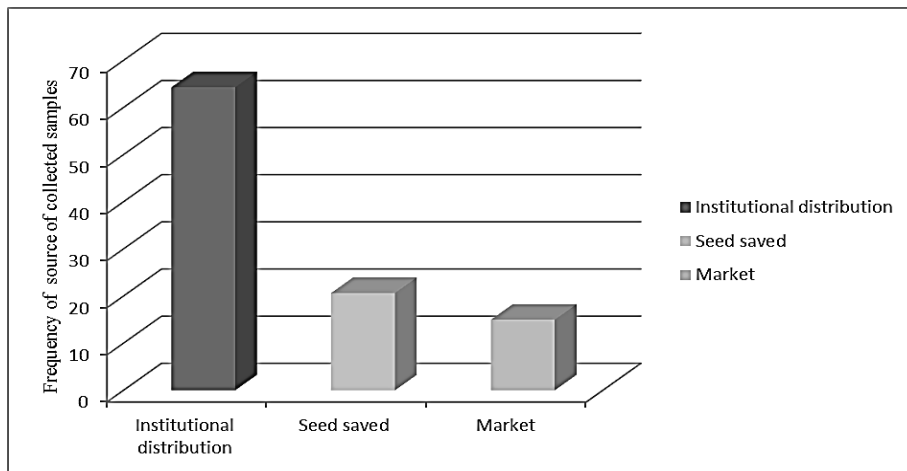


Fig. 2: Frequency of variable: source of collected samples

Detailed information regarding the taxonomic status of collected samples revealed that reveal that 55% are cultivated varieties, 42% populations or old traditional cultivars and 3% self-propagated seed from advanced modern cultivars.

The soil texture according to farmers revealed that lentil cultivated area are dominated by Sandy loam soil (77.5%). Followed by Clay-muddy soil at 20% and Clay-

calcareous at 2.5%. These results reveal great differences in the distribution of lentil accessions depending on soil texture.

According to the producers interviewed around the 10 departments, cultivated lentil is sown in the majority of case alone (97.5%), expect in Constantine district where is associated with grass pea (2.5%).

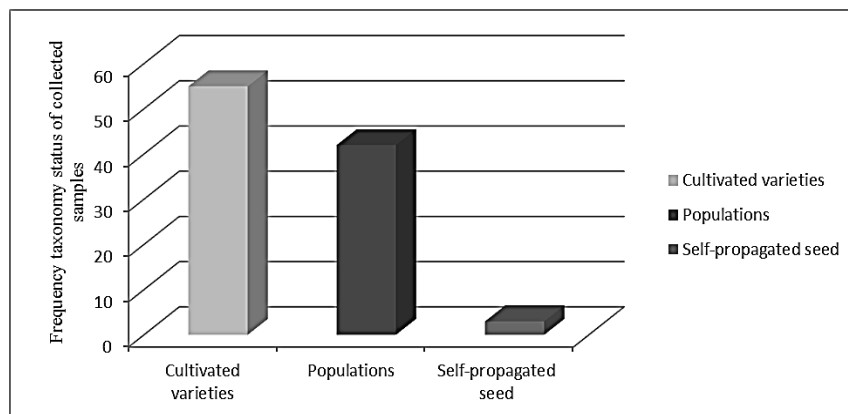


Fig. 3: Frequency of variable: taxonomy status of collected samples

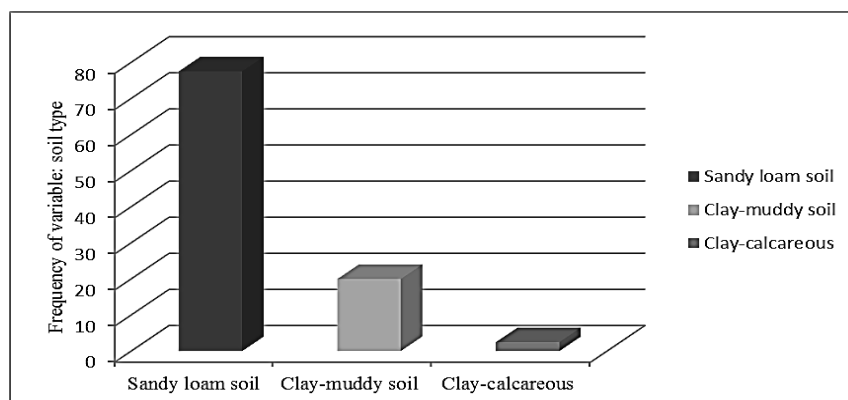


Fig. 4: Frequency of variable: soil type

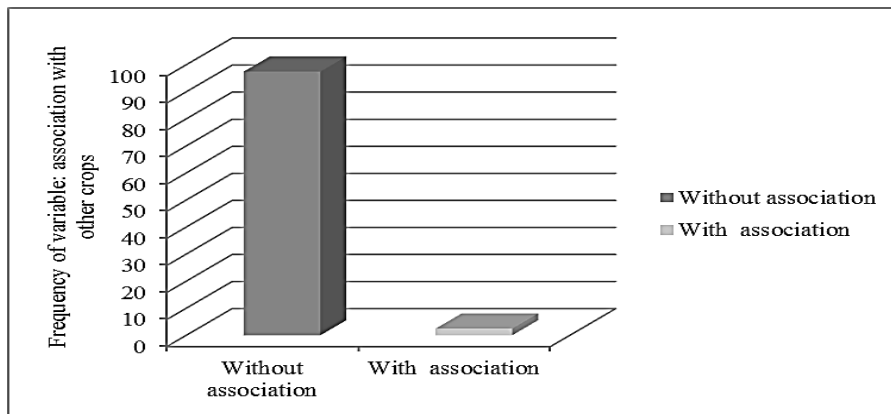


Fig. 5: Frequency of variable: association with other crops

The majority of farmers (97.5%) revealed that lentil is still cultivated because of its high nutritive value especially protein content. While, only 2.5% of farmers consider a lentil as a cultural heritage.

The majority of farmers (77.5%) reported that lentil was cultivated since colonized period. However, 20% of farmers reported that they had cultivated lentil for less than five years and 2.5% were unsure when cultivation began on their farms.

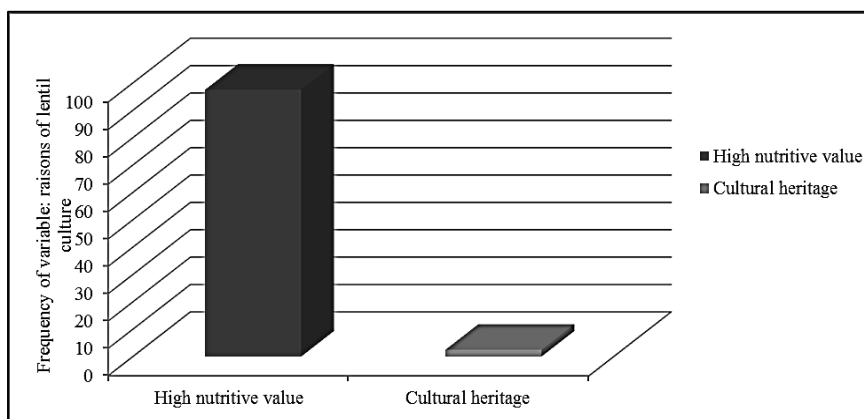


Fig. 6: Frequency of variable: raisons of lentil cultivation

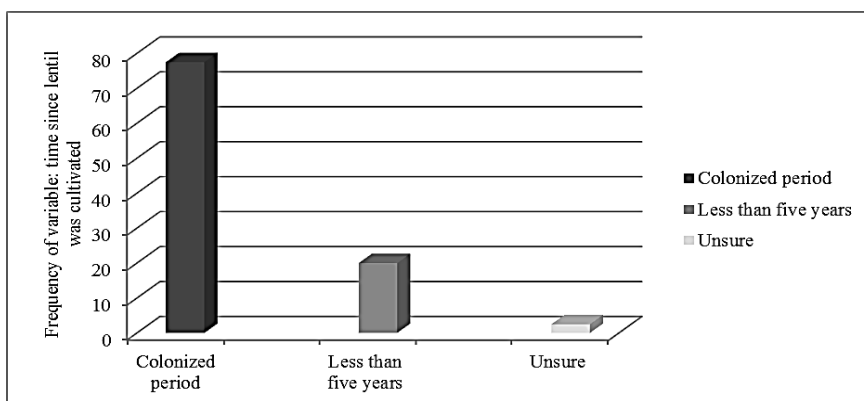


Fig. 7: Frequency of variable: time since lentil was cultivated

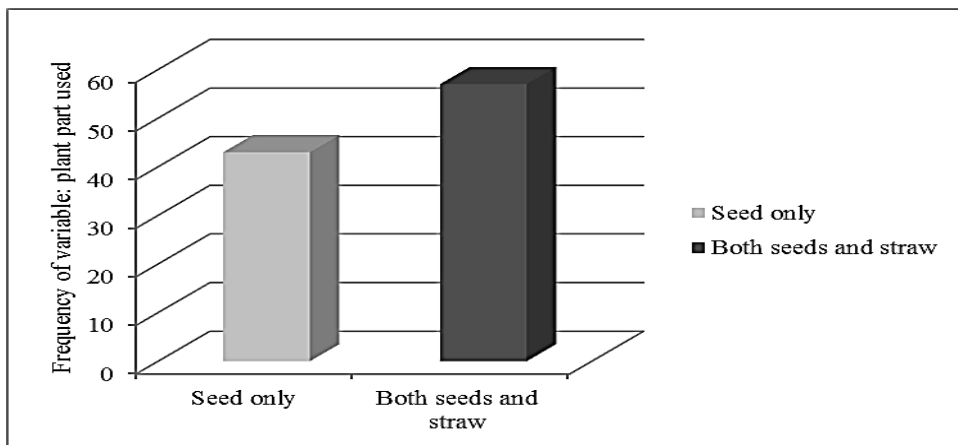


Fig. 8: Frequency of variable: plant part used

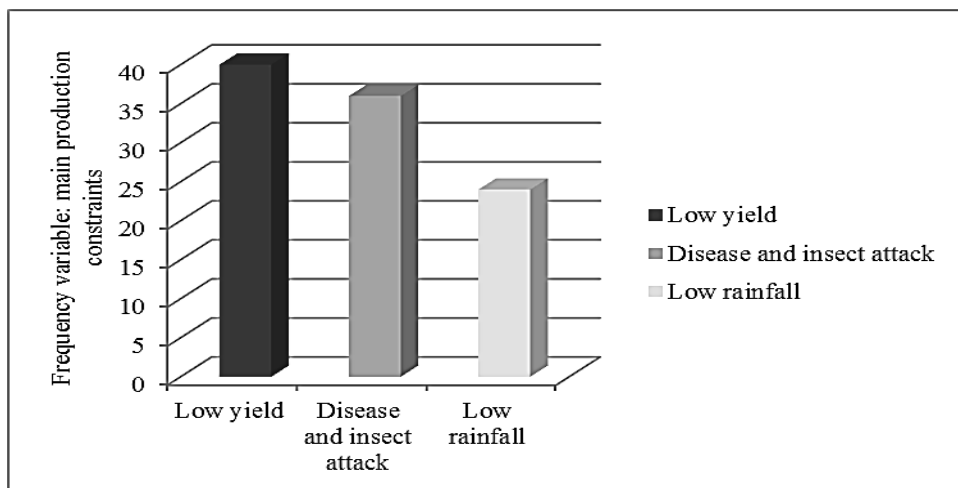


Fig. 9: Frequency of variable: main production constraints

Regarding the plant part used, two main parts are used by the farmers interviewed: seeds and the aerial part after harvest as a straw to feed animals. In fact, 57% of those interviewed use both seeds and straw and 43% harvest for seed only. Three main production constraints were reported by the producers, the first related to the low yield (40% of responses), then disease and insect attack (36%), and finally low rainfall (24%).

DISCUSSION

The collecting missions during 2011 allow us to collect 30 accessions of lentil; among them 11 were local populations or landraces. This shows that despite the intensive modern agricultural practices and the use of modern varieties and hybrids, there is still a tradition of cropping lentil among the small farmers. According to Chouaki *et al.* [8], there are two types of cultivated lentil in Algeria; autochthon and European. The first one was cultivated since the ancestral time and is a mixture of diverse forms, predominantly small seeds (rarely big seeds), with brown testa and red

cotyledons, and preferred by Algerian people. However, the threat of losing local germplasm is present and has been irreversible in many areas. Analysis of the questionnaire given to interviewed farmers showed that the majority of farmers were male and suggests that the women were rarely involved in the cultivation of lentil. Women are generally involved in post-harvest operations. In contrast, Ghalmi [9] in the same context found that women are more active than men in the traditional culture of *Vigna unguiculata* (L.) in Algeria.

The age of the majority of farmers was between 45 and 65 y and only a few elders continue to cultivate lentil, also, younger generations seem to be reluctant to this culture. This stressed that cultural information possessed by the older generation of farmers is disappearing along with an important form of heritage. The farmers of the surveyed area cultivate lentil on a small scale generally for their own use and only a few of them sell their products. This indicates that the consumer prefers to use lentil imported from other countries, which may jeopardize the

conservation of local genotypes/varieties. In the regions studied lentil is commonly consumed in soups with meat called lentil tagine and mixed with other vegetable like potato, tomato and onions. Lentil crop residues rich in protein are used to feed animals. According to Erskine [10]. The straw is the product of a traditional threshing process, and it includes pod walls, leaflets and branches. Saved seed from the previous harvest are the principal source of lentil for planting. Some farmers participate in government programs and used certified seed and a few buy seed from local market.

The loss of genetic resources of local varieties was noticed when farmers mentioned that they had sown lentil seeds in the past that currently are no longer available. According to interviewers, low rainfall, pests and diseases and low yield were the main constraints that limit the culture of lentil in the area studied. As a result, farmers turn to a more productive and economic crop like wheat. In contrast, Erskine and Goodrich [11] reported that hand harvesting is a limiting factor in lentil production in MENA region.

CONCLUSION

The information provided by farmers indicates that there are still local lentil populations with great variability found in their fields. However, this genetic resource is in danger of extinction due to many factors such as the use of modern cultivars and abandonment of the activities on part of the farmers. Therefore, measures will be taken to collect and conserve this germplasm. The experience of this mission encouraged further collecting work in remote areas where erosion reached a very advanced stage and where in many places indigenous landraces completely disappeared.

ACKNOWLEDGEMENTS

The kind and helpful support of the administration s of the area visited as well as the traditional hospitality of the farmers and other person in the mountain villages is greatly appreciated.

AUTHORS' CONTRIBUTIONS

Authors contributed equally to the overall study and manuscript preparation and approved the final version of the manuscript for publication.

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