

THE STATUS OF CHICKPEA PRODUCTION AND RESEARCH IN MOROCCO

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IMPORTANCE AND DISTRIBUTION

The food legume growing area of Morocco is about 520,00 hectares. The main pulse species are broad beans (*Vicia faba*), peas (*Pisum sativum*), chickpea (*Cicer aritinum*), lentils (*Lens esculenta*), dry beans (*Phaseolus vulgaris*), groundnut (*Araachis hypogaea*) and vigna (*Vigna sinensis*).

The chickpea with 85,000 ha is grown in the northern provinces around Meknes and the Sidi Kacem region (Fig. 1) with high rainfall during the spring season. More to the south, chickpea is cultivated in deep soil depressions.

The bioclimate of these zones varies from semi-arid with temperate winter to subhumid with more than 60 days of rainfall per year totalling 400-600 mm (Ionesco 1965). These zones correspond with the latest colonized areas which are characterized by large farms where mechanization is relatively advanced, but also where population pressure is the highest because of the labor demand of this crop.

Chickpea is cultivated as a spring crop in Morocco. In general, sowing is carried out from January to April. Seeding is often done by hand, as well as mechanically. Harvest is between June and August.

It is appropriate to mention the role of spring chickpea in the farming system : in effect this crop allows farmers to cultivate land during the spring season when the rainfall during the winter is either excessive or very late ; cereals suffer from this situation. This is especially true in heavy soil where chickpea is considered as a replacement crop. It is a delicate crop because of its susceptibility to waterlogging or water stress, particularly in these soils.

Chickpea contributes to soil nitrogen reserves and can yield satisfactorily without expensive nitrogen fertilizer inputs. However, it may also draw out the soil moisture and therefore it is a less appreciated legume crop in rotation systems.

PRODUCTION AND USES

Kabuli type with salmon white testa color and large or medium seeds is cultivated in Morocco. The price depends essentially on the seed size. Chickpea is a remunerative crop ; its local market value and yield approaches that of cereals and the export of about 40-50% of the total production brings important foreign exchange income to Morocco.

Human consumption is relatively low ; it increases during Ramadan. According to the 1971-72 survey the local consumption of dry pulses would be 5 kg/person per year (Bonnenfant 1975). Experiments conducted with the cooperation of UNICEF on children's food, based on cereals and chickpea flour, have given promising results.

The average annual production in about 64,000 tonnes with important fluctuations between years (Table 1).

Yield does not seem to have increased significantly in the last decade. Compared with other legumes, yield is relatively low. Climatic and parasitic conditions and lack of certified seeds are largely responsible for this situation. Recently, a program of seed production of promising cultivars has been initiated by the Multiplication and Control of Seed and Plants Service (SCMSP).

Seed commercialization is normally insured by SONACOS, the National Society of Seed Commercialization. However, there may be problems associated with increasing prices demanded for improved seeds. It is appropriate to mention the strenuous efforts of the government for seed price subsidies.

Table 1
Area, yield, production and export of chickpea, Morocco
Pests and Diseases

	1973	1974	1975	1976	1977	1978	1979	1980	Mean
Area (1.000 ha)	84.1	158.1	98.5	99.6	42.4	67.9	62.3	65.5	84.8
Yield (q/ha)	9.4	10.3	6.1	5.1	2.6	5.4	10.3	6.8	7.0
Prod. (1.000 q)	788.6	1637.	608.3	510.5	109.7	366.7	641.7	445.6	638.6
Export (1.000 q)	375.4	346.1	348.6	179.7	55.9	276.7			263.8

Sources : DAE - ONICL.

q = 100 kg.

Chickpea is liable to attack by several pests and fungal diseases. The most important disease in Morocco is blight caused by *Aschochyta rabiei*. Blight is present in all chickpea areas. In 1971 the estimated loss was about 730.000 q, equivalent to more than US \$ 10 million and the national average

730.000 q, equivalent to more than US \$ 10 million and the national average yield was only 0.2q/ha (Janati and Schluter 1977 ; Boorsma 1978).

Foliar sprays with dithiocarbamates (maneb, zineb and mancozeb) at the rate of 800 g a.i./ha and seed treatment at the rate of 800 g a.i./q gave satisfactory results (Janati and Schuller 1977).

Other diseases recorded in Morocco are *Fusarium spp.* and *Verticillium sp.*, *Corticium solani*, *Uromyces ciceri-arietinum*, *Didymella rabiei* and *Mycosphaerella tassiana* (Rieuf 1971).

The common pests are *Liriomyza cicerina* R. and *Heliothis armigera* H. Other pests recorded but of unknown economic importance are *Bruchus pisurum* L, *Agrotis ypsilon* R, *Macrosiphum pisij*, *Spodoptera exigua* and *Ilena cana* (Fichier entomologie).

One virus, mainly, pea leaf roll virus, has been identified.

Chickpea Research

Germplasm Collection

A research breeding program commenced in 1934 with emphasis on assembling a germplasm collection through (a) introduction, (b) selection within the local population, and (c) mutation. The biometrical and phenological characters of Morocco germplasm are shown in Table 2.

Selection among and within the germplasm collection provided the first promising kabuli type cultivars. Actually, lines Pch 46, Pch 30, Pch 37 and Pch 34 are multiplied by SCMSP.

The present collection is being classified for all readily distinguishable characteristics. Details of the first preliminary screening for blight resistance is shown in Table 3.

INTERNATIONAL COOPERATION

The FAO International Program of Horizontal Resistance to crop pests and diseases in Morocco concerning chickpea commenced in 1976. The main objectives of this program are the development of adequate screening methods for disease resistance and the establishment of breeding strategy on horizontal resistance to ascochyta blight (Boorsma 1978).

Since 1978 a wide program of cooperation has been developed with ICARDA, especially in regard to the improvement of germplasm disease resistance for. further crosses, screening early segregating populations of relevant crosses and the development of winter chickpea cultivars.

Table 2***Characteristics of chickpea lines in Moroccan germplasm.***

Characters	No of samples	Mean	SD
Leaf Characters			
Leaflet characters	211	13.4	0.9
Leaf length (mm)	153	65.4	6.0
Leaflet length (mm)	73	16.0	2.9
Leaflet width (mm)	75	8.0	1.9
Phenological characters			
Days to emergence	1025	12.7	
Days to tillering	1297	16.8	1.4
Days to flowering	1222	64.4	4.1
Flowering period (days)	658	32.4	4.0
Days to maturation	1310	123.0	4.3
Yield components			
Plant height (cm)	728	50.6	6.5
Pods no./plant	563	65.1	19.6
Total branches (Pr + Sd)	735	8.6	1.6
1000-seed weight (g)	1124	38.0	12.0
Yield (q/ha)	903	16.27	3.98
Nutritional characters			
Protein (%DM)	396	22.04	1.24
Calcium (%DM)	50	0.174	0.027

Pr = primary; Sd = secondary ; DM = dry matter ; SD = standard deviation.

Table 3***Preliminary screening for ascochyta blight resistance of 169 chickpea lines.***

Seed types	Blight Score					Total lines	Promising lines
	1	2	3	4	5		
Kabuli	0	0	11	43	54	108	Pch 129, 120, 90, 45
Desi	2	1	8	13	8	35	Pch 217, 15, 1282, 1380
Intermediate	1	3	6	10	9	29	Pch 128, 70, 100, 134

• 1 = resistant, 5 = susceptible.

OBJECTIVES OF CURRENT RESEARCH

The specific objectives of the Moroccan breeding program are (1) the improvement of kabuli, large-seeded, high-yielding, early-maturing, spring cultivars, (2) the development of disease resistance (especially blight wilt), (3) development of winter-adapted cultivar and the study of agronomic aspects, (4) biometrical studies and cultivar selection for mechanical harvesting, and (5) the improvement and diversification of chickpea uses.

Winter Chickpea

The yield in Moroccan rainfed conditions depends largely on the amount of rainfall, particularly between February and May (Table 4). However, yield also depends on blight incidence, e.g. in 1970-71 the national average yield was 0.2 q/ha (Janati and Schluter 1977).

Winter chickpea seems to be a solution to both problems because it increases the yield potential and it may avoid ascochyta blight attack because only resistant cultivars are being introduced for winter sowing.

Table 4

Chickpea yield, precipitation during February-May and annual rainfall, during the last 7 years in the Fes region, which represents 25-30% of total chickpea area in Morocco.

	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78
Yield (q/ha)	8.4	8.6	7	4.9	1.9	3.5
Feb-May precipitation (mm)	269	336	322	251	139	290
Annual precipitation (mm)	666	553	418	379	620	540

Source : Statistiques agricoles du Maroc (DAE).

The primary yield trials on winter chickpea cultivars have been encouraging (Table 5). Winter chickpea offers a great possibility for improving productivity, but from a farming system point of view more work needs to be done. A number of questions have to be analyzed in detail, namely :

1. The role of chickpea in the farming system, taking into account the importance of spring chickpea as a replacement crop, and also the need for intensification of land use in favorable areas. However, the development of an early-maturing winter chickpea is more profitable and offers the possibility of cultivating summer crops. Winter chickpea could be more interesting in arid zones and offers the possibility of extending the cultivation area.

Table 5

Results of a trial on winter chickpea cultivars at Douyet - Fes (lat. 34° North, long 5°). 1979-80.

Cultivars	Origin	Blight incidence	Yield (q/ha)
ILC 249	USA	2.3	39.68
ILC 282	Turkey	2.0	39.54
Pch 128	Morocco	2.7	35.31
ILC 3279	USSR	1.0	34.31
Pch 129	Morocco	3.0	32.75
ILC 215	USA	1.7	31.08
ILC 202	USSR	1.0	30.35
ILC 195	USSR	2.0	30.12
ILC 190	USSR	3.0	30.00
Pch 42	Morocco	3.5	29.79
Pch 34	Morocco	3.2	22.29
Pch 25	Morocco	4.0	5.07
Pch 20	Morocco	5.0	4.97
Pch 75	Morocco	5.0	0.88
Diff. of Dunett (0.01)			8.17

* 1-5 scale : 1 = resistant, 5 = susceptible.

2. The economic and social role within this system should be considered for both spring and winter chickpea, as well as their impacts on rotation systems.
3. As a consequence of chickpea introduction into the winter crop system, land use, agricultural practices and production factor uses will be strongly influenced by this crop.
4. Agronomic impacts should be studied, particularly the impact of winter chickpea on soil-moisture level, nitrogen fixation and the risks of waterlogging in clay soils where chickpea is normally cultivated as a spring crop.
5. From the disease point of view, other parasites might gain importance.

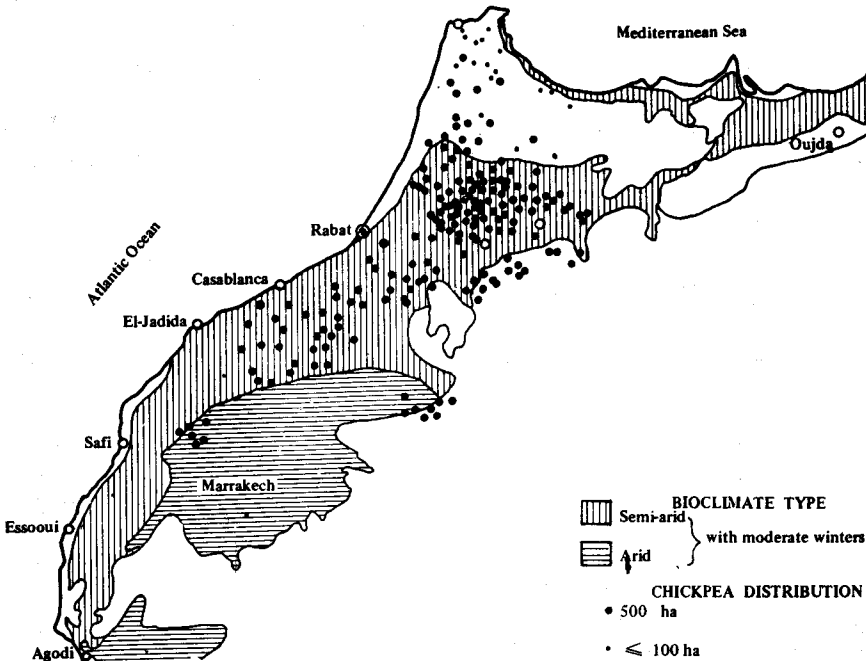


Figure 1
Geographical distribution of chickpea cultivation in northern Morocco in relation to the climatological conditions.

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