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Saxena M.C. (ed.), Cubero J.I. (ed.), Wery J. (ed.).
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Zaragoza : CIHEAM

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 9

1990

pages 141-143

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=91605022>

To cite this article / Pour citer cet article

Iliadis C. **Chickpea production in Greece**. In : Saxena M.C. (ed.), Cubero J.I. (ed.), Wery J. (ed.). *Present status and future prospects of chickpea crop production and improvement in the Mediterranean countries*. Zaragoza : CIHEAM, 1990. p. 141-143 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 9)



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Chickpea production in Greece

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SUMMARY - Chickpea is the most important pulse crop in Greece after common beans. It is a spring crop, sown early in March and harvested in the middle of July, covering non-irrigated areas, mainly in rotation with wheat. The yearly planted area is 6000-8000 ha with a production of 7000-10000 t which meets the local demand in the country. The average seed yield is low (1120 kg/ha) due to the following limiting factors: (a) moisture stress in spring sown crops; (b) weed competition; and (c) *Ascochyta* blight. Research at the Institute of Fodder Crops and Pastures is addressing to these problems and trying to develop genotypes and technology for winter sowing. It is expected that the chickpea cultivated area will either be maintained or will increase in the future, because there is an increasing interest in chickpea as animal feed.

RESUME - "La production du pois chiche en Grèce". Le pois chiche est la deuxième légumineuse alimentaire en Grèce, après le haricot. C'est une culture de printemps semée au début Mars et récoltée à la mi-Juillet, dans des zones non irriguées, principalement en rotation avec le blé. La superficie cultivée est de 6000 à 8000 ha représentant une production de 7000 à 10000 T qui couvre les besoins du pays. Le rendement moyen est faible (1120 kg/ha) à cause des facteurs limitants suivants: (a) déficit hydrique sur les cultures de printemps; (b) compétition par les adventices; et (c) anthracnose. La recherche à l'Institut des Plantes Alimentaires et des Fourrages est focalisée sur ces problèmes en essayant de développer des variétés et des techniques culturales pour le pois chiche d'hiver. Dans le futur la superficie cultivée en pois chiche devrait se maintenir ou même augmenter, du fait de l'intérêt croissant porté au pois chiche protéagineux.

Introduction

Chickpea is a traditional crop which has been cultivated in Greece since ancient times. It is the second most important pulse crop after the beans, grown all over the country in small areas, but more extensively in the central and northeast regions. It is a spring crop sown early in March and harvested in the middle of July, covering non-irrigated fields, mainly in rotation with wheat.

As chickpea is grown under rainfed conditions, the yearly planted area and production are largely dependant on weather conditions. The annual planted area is about 6000-8000 ha which constitutes 15% of the total area under pulses. The annual chickpea production is about 7000-10000 t, which is sufficient to meet local demand in the country. The average seed yield of 1120 kg/ha is considered low. Climatic and biotic stress factors are largely responsible for this situation.

Only kabuli types are grown with large seed size and white or light yellow seedcoats which satisfy consumer demand. The crop is cultivated exclusively for human consumption. Dry seeds are mainly consumed as soup,

and a smaller amount are roasted and sold in the market as a snack 'stragalia'.

Cultural practices

Although chickpea is planted in spring, land preparation starts early in winter. Farmers make a deep plowing to break large clods thereby leaving a rough surface. During winter months these large clods break into small pieces. The land is cultivated again, immediately before planting, to control weeds that emerge during winter and to achieve a fine compact seedbed.

The optimum sowing time is between February 15 to March 15 and sowing is completely mechanized. Wheat sowing machines are used for sowing the seeds in rows 25-30 cm apart, at a depth of 5 cm. The best seed rate is 180 kg/ha for large seeded varieties and 160 kg/ha for medium size. The crop is raised on the residual moisture.

Many experiments conducted in the past showed that in soils having low available phosphorus application of

60 kg P_2O_5 /ha gave satisfactory results. Neither potassium nor nitrogen fertilizer was needed.

Presowing or preemergence herbicides such as trifluralin and pendimethalin are used for weed control, but postemergence herbicides are necessary for satisfactory weed control. During growing season many pests and fungal diseases attack chickpea. Among them ascochyta blight, wilt-root rots diseases and leafminer (*Liriomyza cicerina*) are most important.

The crop is harvested when all the plants have dried completely and their leaves have fallen. Combine harvesters suitable for wheat are also used for harvesting the crop.

Major limiting factors in chickpea production

The current average seed yield of 1120 kg/ha is considered very low. There are several reasons responsible for this situation. The most important are discussed below:

Moisture regime

The climatic conditions prevalent during the chickpea growing season in Greece are shown in Fig. 1. The temperature and rainfall curves show the typical Mediterranean climate. During winter months there is a lot of rain while the temperature remains low. Going to summer months the rainfall decreases while temperature increases rapidly and during June, July and August the climate is characterized by extremely low rainfall, high temperature and dry soil moisture regime. Furthermore, from the end of

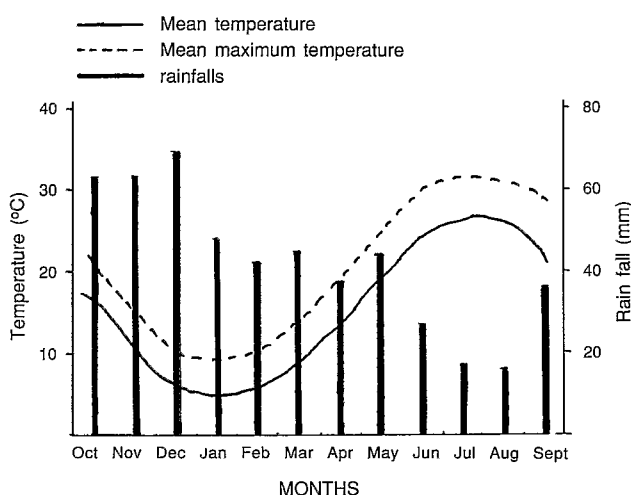


Fig. 1. Average climatic conditions over 30 years in Larissa, Greece.

May usually southwest hot winds blow which dry the plants quickly.

Chickpea sown early in March are usually subjected to moisture stress particularly during flowering and pod filling stages, at the middle of May and during June. This situation reduces yields, especially in the case of late spring sowing. A good solution to this situation is through the adjustment of sowing time. In winter sowing the growing season will increase, while flowering and pod filling stages will come earlier at the end of April and during whole May under favorable moisture conditions. Our preliminary results indicated that seed yields in winter sowing increased from 60% to 130% over those obtained from spring sowing. These results show that we can increase seed yields in chickpeas only by changing the sowing time.

In order to achieve a successful winter sowing program we must address ourselves to the following problems.

a) *Ascochyta* blight: This disease becomes more serious in winter sowing than in spring. So the varieties which are going to be used must be resistant to this disease.

b) Low temperature: Varieties-tolerant to low temperatures are needed. They should be able to tolerate as low a temperature as $-10^{\circ}C$.

c) Wilt-root rot diseases: These diseases also affect winter sowing. Among them *Sclerotinia* which appears during February and March is more dangerous. Varieties are needed that resist this disease.

d) Weeds: Postemergence herbicides are necessary for effective weed control.

e) *Orobanche crenata*: This parasitic weed is not a problem at this moment in spring sowing, but it may become a serious problem in winter sowing. So effective herbicides are needed to control this weed.

Weeds

Weeds constitute a serious problem even in the traditional spring sown crop and decrease seed yields. Although the harmful effects of weeds are fully realized by farmers the huge cost of hand weeding prevents them from undertaking this operation.

Effective herbicides have solved weed problem in many crops, but in the case of chickpea the situation is not satisfactory. Big chemical companies have given little attention to this crop until now for two reasons. Firstly, in the developed countries small areas are cultivated with chickpeas and consequently there is little economical interest. Secondly, in the developing countries where this crop is mainly cultivated, the existence of very cheap hand labour in the past discouraged appropriate efforts.

Until now only presowing or preemergence herbicides are available in the market such as trifluralin and pendimethalin with satisfactory weed control, but complementary hand weeding is also necessary for complete weed control. Postemergence herbicides will solve the problem.

Ascochyta rabiei

Chickpea can be infected during growing season by many pests and fungal diseases. The most important disease in Greece is *Ascochyta* blight caused by *Ascochyta rabiei*. Blight is present in all chickpea areas and almost all chickpea varieties and populations grown in the country are susceptible. Yield losses due to blight infection are very high but fluctuate according to climatic conditions prevalent each year. High relative humidity in spring and much rainfall during April and May favor the occurrence and spread of the disease.

Foliar sprays with fungicides and seed treatment do not give satisfactory results. Only resistant varieties will solve the problem and efforts in this direction are underway.

Current research programs

The projects which are carried out at the Institute of Fodder Crops and Pastures in Larissa are relative to the above mentioned major limiting factors and are following:

a) Breeding for varieties resistant to *Ascochyta* blight is going in two directions: (1) Large seeded varieties for human consumption and (2) Medium-small seeded varieties as animal feed. From this project the first set of resistant varieties (medium/small seeded) have already been developed but their resistance must be confirmed to different races of *Ascochyta* fungus present in the country.

b) A large number of varieties have been evaluated for their resistance to cold as well as *Ascochyta* blight

and root-rot and some of them were found resistant and suitable for winter sowing.

c) Improved methods of weed control in spring and winter sowing are being investigated.

d) A project on cooking quality is investigating factors which influence cooking time in chickpeas and how these can be controlled.

Perspectives

During the last 25 years the food habit of the people has changed due to an improvement in income. They use now in their food more animal proteins. That was one of the reasons why chickpea area decreased from 22000 ha in the past to 8000 ha now. It is expected, however, that this area will be maintained and there may even be a little increase as the realization of a need to replace wheat monoculture increases.

On the other side, livestock production is deficient and many efforts are underway to overcome this problem. Livestock production is constrained because of lack of feed, specially protein rich seeds. Each year a large amount of soyabean is, therefore, imported to cover livestock demands. Chickpea seeds rich in proteins and carbohydrates undoubtedly, may play an important role in animal feed. So, studies need to be encouraged on nutritional value of the chickpea for certain kinds of animals. Also, increase of seed yield is necessary so as to make chickpea more competitive crop for such a use.

This use of chickpea will give new opportunities to increase chickpea cultivation. Currently in the country there are 1,718,000 ha under rainfed arable crops and only 100,000 ha of these are sown with leguminous crops. Appropriate rotational systems with increasing area of leguminous crops must be followed in the future in order to avoid the consequences of monoculture and maintain soil fertility. Expansion of area under chickpea will help this a great deal.