Impact of Fertilisation on Yield and Quality Parameters in Chickpea (*Cicer Arietunum L.*)

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Abstract

The research presented in this paper aimed at the study of three native chickpea cultivars, as follows: the chickpea cultivars Burnas, Rodin, and Cicero 1. We set our experiments on a cambic, moist phreatic (poorly gleyed), poorly decarbonated chernozem on loessoid-dusty, clayish-loamy deposits of the experimental field of the Didactic Experimental Station of the Banat University of Agricultural Science and Veterinary Medicine in Timişoara (Timiş County, Romania). Among the experimental chickpea cultivars, the chickpea cultivar Burnas is to be noted for its mean yield in all three fertilisation rates: 2,994 kg/ha. The chickpea cultivar Rodin comes second, the difference between the two being very significant. Establishing fertilisation rates for the chickpea cultivars mentioned above is extremely important since biological materials were developed in different soil and climate conditions from the research area and from the area in which they are to be cultivated. The lowest yield was in the chickpea cultivar Cicero 1, the mean for the three fertilisation rates being 1,945 kg/ha. As for the fertilisation rates, the fertilisation variants $N_{50}P_{60}K_{60}$ and $N_{100}P_{60}K_{60}$ resulted in a very significant increase.

Keywords: chickpea cultivars, fertilisation rates.

1. Introduction

Chick pea beans are very important both green and particularly at maturity due to their high protein content. Chickpea flour is widely used: it is also used in bread-making (10-15%) mixed with wheat flour making bread more nutritious and tastier [1-3].

Being very drought-resistant, chickpea yields well in droughty areas due to its good resistance to both hydric and thermal stress; given the aridisation of the climate in the area, we should pay particular attention to this crop [4-6].

A plant of the large Family Leguminosae, chickpea is known to improve soil, leaving in the soil very accessible biologically fixed nitrogen for the crop rotation plants, particularly for straw cereals. This allows environmental pollution with nitrates and hydrocarbon consumption for the manufacturing of chemical fertilisers [3, 5, 6].

In human medicine, chickpea is recommended and sued in the treatment of the urinary tract (acting as a diuretic and eliminating uric acid), of chlorides, of congestive liver, of digestive failure, of asthenia, of intestinal parasites, and as antiseptic [4, 7].

The goal of the research was to emphasise the impact of fertilisation on yield and quality parameters in three Romanian chickpea cultivars – Burnas, Rodin and Cicero 1 – with a view to expand it into cultivation and to produce economically efficient yields.

In the present study, we supply data concerning the behaviour of the chickpea cultivars Burnas, Rodin and Cicero 1 depending on fertilisation rates with impact on plant size, on the number of ramifications/plant, on the number of pods/plant, on the number of beans/plant, and on the bean yield.

Research aim at improving the cultivation technology of chickpea with a view to expand its cultivation in the area of the Didactic Experimental Station of the Banat University of

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Agricultural Science and Veterinary Medicine in Timişoara (Timiş County, Romania), located in the Banat-Crişana Plain, subunit Câmpia Timişului interfluve Bega-Berecsău.
In the research area mentioned above, chickpea enjoys favourable soil and climate conditions so that the studied cultivars could display their productive ability.

2. Materials and methods

The experiments were bifactorial, set after the subdivided plot method with three replications, in which factor A was the chickpea cultivar with three graduations – a_1 – the chickpea cultivar **Burnas**, a_2 – the chickpea cultivar **Rodin**, a_3 – the chickpea cultivar **Cicero 1** – and factor B was the fertilisation rate with three graduations – b_1 – $\mathbf{N_0P_{60}K_{60}}$, b_2 – $\mathbf{N_{50}P_{60}K_{60}}$, and b_3 – $\mathbf{N_{100}P_{60}K_{60}}$.
The pre-emergent crop was winter wheat. The cultivation technology we used was the cultivation technology specific to this crop.
We need to mention that plant density in all three graduations of the factor B was 60 germinating beans/m^2.
Sowing was done during the favourable period, i.e. when temperature stabilised at 4°C, which corresponded, calendaristically, to the end of the month of March.
During vegetation, we made biometric measurements concerning the following: plant size, number of ramifications/plant, number of pods /plant, and number of beans/pod.
Yield results were calculated at 13% moisture, according to the setting method of the experiments in the field, and biometric measurement results were interpreted through the analysis of the statistic set of variations.

3. Results and discussion

Table 1 presents yield results in chickpea depending on chickpea cultivars and fertilisation rate.
Yield results ranged, in the research field, within 1,402 kg/ha in the chickpea cultivar Cicero 1 in the variant fertilised with $\mathbf{N_0P_{60}K_{60}}$ and 3,664 kg/ha in the chickpea cultivar Burnas in the variant fertilised with $\mathbf{N_{100}P_{60}K_{60}}$.
On the average for the three fertilization rates, the yield was 19% higher in the chickpea cultivar Burnas (2,994 kg/ha) compared to the chickpea cultivar Rodin (2,406 kg/ha). The chickpea cultivar Cicero 1, less adapted to the area, yielded 13% less than the chickpea cultivar Burnas, i.e. 1,945 kg/ha.
Figure 1 shows the evolution of the volume of 1,000 beans: the highest value was in the chickpea cultivar Burnas, in the variant fertilized with $\mathbf{N_{100}P_{60}K_{60}}$.

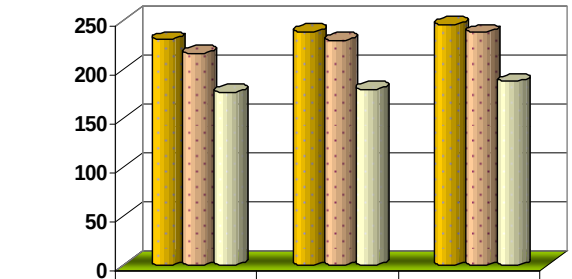
Table 1. Yield results in chickpea depending on chickpea cultivars and fertilisation rate

Cultivar	Fertilisation rate			Means of the factor A			
	$N_0P_{60}K_{60}$	$N_{50}P_{60}K_{60}$	$N_{100}P_{60}K_{60}$	Yield (kg/ha)	%	Dif. Kg/ha	Significance
Burnas	2,380	2,939	3,664	2,994	100	-	
Rodin	1,838	2,379	3,002	2,406	81	588	xxx
Cicer 1	1,402	1,881	2,552	1,945	65	1,049	xxx

DL 5% = 64 kg/ha, DL 1% = 106 kg/ha, DL 0.1% = 198 kg/ha

Averages of factor B			
Specification	$N_0P_{60}K_{60}$	$N_{50}P_{60}K_{60}$	$N_{100}P_{60}K_{60}$
Yield (kg/ha)	1,873	2,399	3,073
%	100	128	164
Difference (kg/ha)		526	1,200
Significance		xxx	xxx

DL 5% = 32 kg/ha, DL 1% = 43 kg/ha, DL 0.1% = 58 kg/ha



MMB g	230.09	238.25	245.17	216.57	228.93	237.44	175.83	179.42	187.42
Fertilisation rate	$N_0P_{60}K_{60}$	$N_{50}P_{60}K_{60}$	$N_{100}P_{60}K_{60}$	$N_0P_{60}K_{60}$	$N_{50}P_{60}K_{60}$	$N_{100}P_{60}K_{60}$	$N_0P_{60}K_{60}$	$N_{50}P_{60}K_{60}$	$N_{100}P_{60}K_{60}$

Cultivar	**Burnas**	**Rodin**	**Cicero 1**
$\bar{X}$	237.83	227.64	180.89
%	100	95.71	76.05

Figure 1. The evolution of the volume of 1,000 beans depending on cultivar and on fertilization rate

4. Conclusions

Research in the area were carried out on the experimental field of the Didactic Experimental Station of the Banat University of Agricultural Science and Veterinary Medicine in Timişoara (Timiş County, Romania), located in the Banat-Crişana Plain, subunit Câmpia Timişului interfluve Bega-Berecsău, on a cambic chernozem, lead us to the following conclusions:

1. Chickpea (*Cicer arietinum* L.) enjoys, in the studied area, very good soil and climate favourability conditions, which is also confirmed by the yields above 3,000 kg/ha.
2. Increasing the fertiliser rate from N_{50} to N_{100} is motivated because the yield increase, on the average for the three chickpea cultivars, was 36%, i.e. a very significant difference of over 674 kg/ha.
3. Nitrogen fertilisers applied at rates of N_{50} and N_{100} on an agri-fund of $P_{60}K_{60}$ were very well valorised by chickpea, which can be also explained by the good fertility potential of the soil on which we carried out our research and by the low nitrogen requirements of the species *Cicer arietinum* L.
4. The chickpea cultivar with the best results in the research area is Burnas that yielded 19% more than the chickpea cultivar Rodin and 35% more than the chickpea cultivar Cicero 1.

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