THE RADICULAR AND FOLIAR FERTILIZATION INFLUENCE UPON GRAINS YIELD TO COWPEA

RETA DRĂGHICI
Research - Development Center for Field Crops on Sandy Soils, Dabuleni, Dolj County, Romania,
Phone: +40251334402, Fax: +40251334347, E-mail ccdcpndabuleni@yahoo.com;
http://www.ccdcpndabuleni.ro/
Corresponding author: ***retadraghici@yahoo.com***

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ABSTRACT

Due to the low content of organic matter, high content of coarse sand and clay very low reserves of the sandy soils micro elements are very small and rapidly depleting under irrigation conditions. To mitigate the negative impact that these soil deficient qualities have on soil plants were carried out research on the implications extraroot and radicular fertilization on yield of cowpea, specific plant sandy soils. The results obtained, highlight the role of foliar fertilization with Green Plant products, which are composed of NPK + microelements, in achieving production increases of 21-56%, compared to foliar unfertilized. The highest production of cowpea (2757 kg / ha) was recorded by foliar fertilization with Green Plant, which is composed $N_{15}P_{45}K_{15}$ + 6 microelements on the $N_{60}P_{60}K_{60}$ agrofond.

INTRODUCTION

Valorisation of sandy soils with low natural fertility supposes a specific farming system, rational and integrated with less demanding plants to soil fertility and tolerance to stress factors that ensure profitability and environmental protection (Gheorghe D. et al, 2001, Grings E.E. and S.S. Tarawali, 2010). Due to the low content of organic matter (0.59%), high content of coarse sand, 74.34% and clay very low, 2.5-3%, reserves of microelements on the sandy soils are very small and rapidly depleting conditions irrigation. Studies in West Africa, shows that low levels of mobile phosphorus in the sandy soils, can significantly affect the growth and development of cowpea root system (Yvonne Ohui Kugblenu et al, 2014). Research conducted at the cowpea crop in terms of sandy soils in southern Oltenia have shown higher effect on the quantity and quality of cowpea production of fertilization on soil and plant with Mo, Zn, Mg (Drăghici Reta et al, 1994). Based on these considerations, research in this experiment were aimed at optimizing plant growth and development of cowpea, under the influence radicular and foliar fertilization, in order to maximize grain yield.

MATERIAL AND METHOD

The research was conducted at Research - Development Center for Field Crops on Sandy Soils, Dabuleni, in the 2012-2014 period, to the cowpea culture, placed under irrigation conditions on a psamosoil, characterized by physico-chemical properties poor (high of coarse sand, 74.3%, very low percentage of clay, between 2.5-3%, containing less, than 1% organic matter, porosity and aeration great). The goal of research, aimed at radicular and foliar fertilization influence on the optimizing the nutritional status of the cowpea plant, with implications for the development of a healthy metabolism, leading to the normal physiological processes in plants and to achieving high yields. Were studied three levels of radicular fertilization ($N_0P_0K_0$, $N_{60}P_0K_0$, $N_{60}P_{60}K_{60}$), that were experienced

four foliar fertilized with foliar application compared to foliar unfertilized. The radicular fertilization was performed as follows:

- phosphorous, potassium and nitrogen 1/3 of the dose, was applied in seedbed preparing;
- 2/3 of nitrogen dose was applied in the vegetation phase, of 4-5 true leaves.

Foliar fertilization was conducted in two phases of cowpea vegetation:
- treatment I was applied at a concentration 0.5%, to 4-5 true leaf stage;
- treatment II was applied in a concentration of 1%, in the phase of 3-5 ramifications of the plant.

Was determined the plant productivity (number of pods per plant, number of grains per pod, grain yield) and cowpea plant photosynthesis rate.
The results were interpreted using analysis of variance and mathematical functions.

RESULTS AND DISCUSSIONS

Grown on a psamosoil with poor physicochemical properties (high of 74.3% coarse sand, very low percentage of between 2.5-3% clay, containing less than 1% organic matter, porosity and aeration great), cowpea plant reacted positively to radicular and foliar fertilization. Analyzing the influence of NPK fertilization on the grain yield at cowpea, was highlighted the plant nutrition role in the formation of productivity elements. Cultivated on the poorest land, although synthesizes on the symbiotic way approx. 80.6% of the nitrogen in the feed, the cowpea plant needs this macroelement at the beginning of vegetation until install microbial activity in the soil. (Gheorghe D., Şuteu G.E.,1988). Also, the role of phosphorus and potassium was highlighted by significant results in the fructification and ripening of cowpea pods.
Production results obtained, emphasizes achieving a production increase of 31% at applying the formula $N_{60}P_0K_0$ fertilization and 48% at fertilization with $N_{60}P_{60}K_{60}$, compared to unfertilized control (Table 1).

Table 1

Influence of radicular fertilization on the cowpea yield

No.	Dose of NPK	Grain yield in cowpea		Difference compared to the control	
		Kg/ha	%	kg/ha	significance
1	$N_0P_0K_0$	1705.5	100	Control	Control
2	$N_{60}P_0K_0$	2228	131	522.5	**
3	$N_{60}P_{60}K_{60}$	2534.1	148	828.6	***

LSD 5% - 242 kg/ha
LSD 1% - 451 kg/ha
LSD 0.1% - 750.5 kg/ha

The results obtained, under the influence of foliar fertilization, highlight the importance of cowpea the plant nutrition with macroelements, alongside with microelements contained in the 4 types of foliar fertilizers tested (Table 2). Application, in phases to 4-5 true leaves and 3-5 of the cowpea plant ramifications, of two foliar fertilization with the Plant Green product, which has in its composition sa $N_9P_{45}K_{15}$ + 6 microelements, determined to obtain the highest yields (2347 kg / ha), increase very significantly, to foliar unfertilized. The results obtained, highlights the best effect foliar fertilizers, that have in their composition the smallest nitrogen content. The high concentration of nitrogen in foliar fertilizers applied in the growing season, has influenced significant increases in vegetative growth to the detriment of of productive or training the pods.

Table 2

Influence of foliar fertilization on the cowpea yield

No.	foliar fertilizer		Grain yield in cowpea		Difference compared to the control	
	Name	foliar fertilizer composition (N-P-K + microelements)	kg/ha	kg/ha	Kg/ha	significance
1	Foliar unfertilized	-	1875.3	100	Control	Control
2	Green Plant	26-5-12+Zn	2083.3	110	208.0	-
3	Green Plant	20-20-20+microelem	2230.5	119	355.2	**
4	Green Plant	9-45-15+6 microelem	2347	125	471.7	***
5	Timasol	15-15-30+13 microelem	2243.5	120	368.2	**

LSD 5% - 233.5 kg/ha
LSD 1% - 317.5 kg/ha
LSD 0.1% - 423 kg/ha

Analyzing the influence of foliar fertilization on the grain yield obtained at cowpea, there is production increases differentiated by agrofond ensured basic NPK fertilization (Table 3). From the interaction of the two factors studied (radicular and foliar fertilization), the maximum grain yield of 2757 kg / ha, was recorded at fertilization the cwpea plannt with $N_{60}P_{60}K_{60}$ + Green Plant (9-45-15 + 6 microelem). The foliar fertilization has brought production increases, statistically assured at agrofunds of $N_0P_0K_0$ and $N_{60}P_0K_0$.

Table 3

The radicular and foliar fertilization influence on production obtained in cowpea

Variant of fertilization				Grain yield in cowpea		Difference compared to the control	
No. var.	Radicular fertilizer	Foliar fertilizer		kg/ha	%	Kg/ha	significance
		Name	foliar fertilizer composition (N-P-K + microelements)				
1	$N_0P_0K_0$	Foliar unfertilized	-	1262.5	100	Mt.	Mt.
2		Green Plant	26-5-12+Zn	1811.5	143	549	*
3		Green Plant	20-20-20+microelem	1964	156	701.5	**
4		Green Plant	9-45-15+6 microelem	1791.5	142	529	**
5		Timasol	15-15-30+13 microelem	1699	135	436.5	*
6	$N_{60}P_0K_0$	Foliar unfertilized	-	1976.5	100	Mt.	Mt.
7		Green Plant	26-5-12+Zn	2069.5	105	92.52	-
8		Green Plant	20-20-20+microelem	2215	112	238.5	-
9		Green Plant	9-45-15+6 microelem	2492.5	126	515.5	**
10		Timasol	15-15-30+13 microelem	2386.5	121	410	**
11	$N_{60}P_{60}K_{60}$	Foliar unfertilized	-	2387	100	Mt.	Mt.
12		Green Plant	26-5-12+Zn	2369	99	-18	-
13		Green Plant	20-20-20+microelem	2512.5	105	125.5	-
14		Green Plant	9-45-15+6 microelem	2757	116	370	-
15		Timasol	15-15-30+13 microelem	2645	111	258	-

LSD 5% - 408 kg/ha
LSD 1% - 554.5 kg/ha
LSD 0.1% - 740 kg/ha

Analyzing the functional connection between production obtained at cowpea and average daily photosynthesis, registered in the 15 fertilization variants, there is a positive

correlation, showing growth obtained in cowpea production with increasing intensity of the plant photosynthetic process, phenomenon highlighted well by using the tool polynomial of degree 2 with coefficient r = 0.934 **, which highlights a significant distinct correlation between cause and effect (Fig. 1).

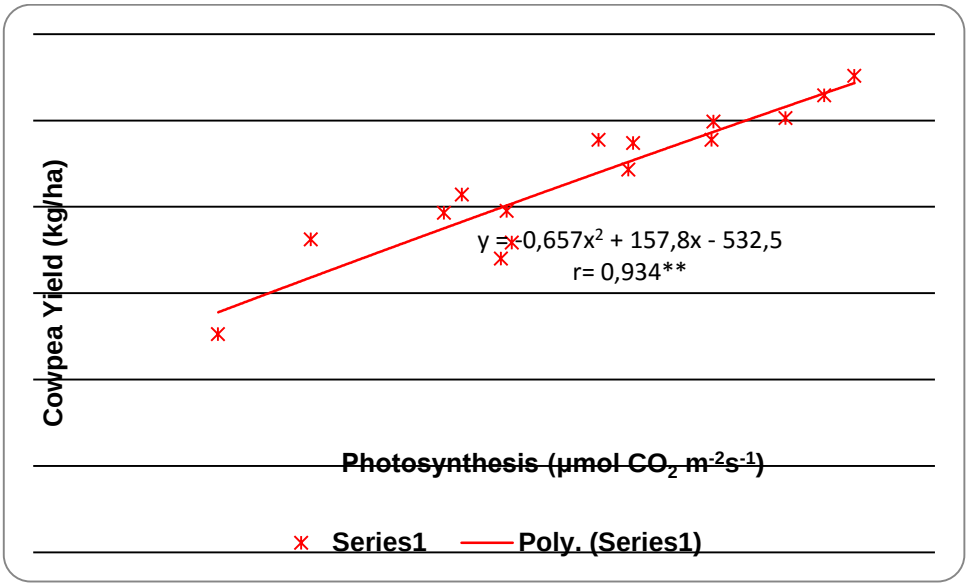

Figure 1. Correlation between cowpea production and photosynthesis rate registered in different fertilization variants

The grain yield at cowpea, obtained in different fertilization variants, was distinct significantly positively correlated with the number of pods / plant and number of grains per pod (Fig. 2).

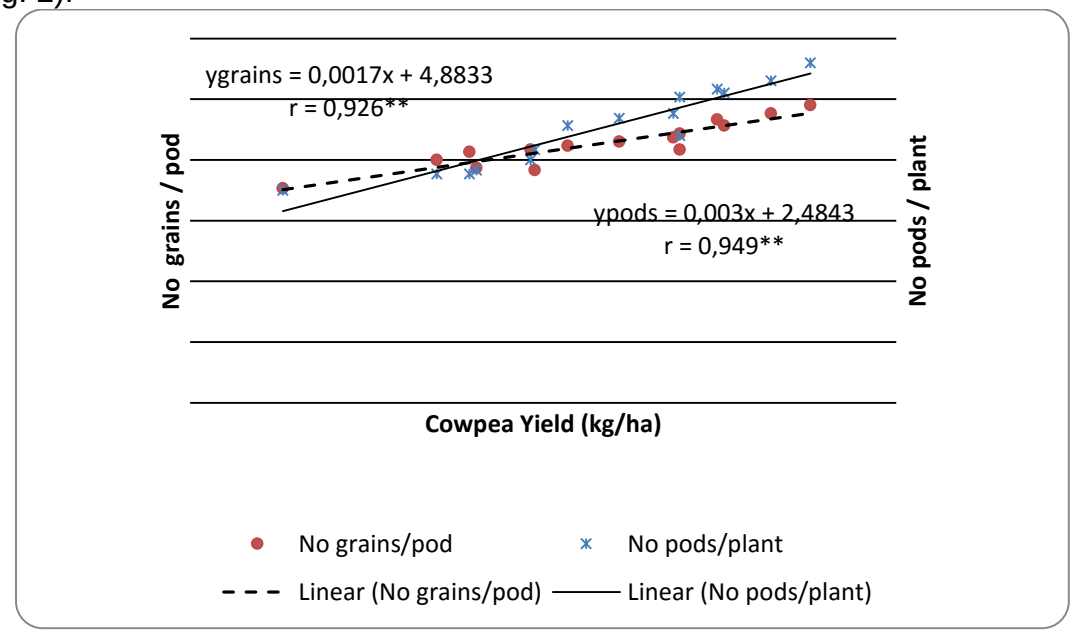

Figure 2. Correlation between grain yield and productivity elements of cowpea plant (number pods / plant, number of seeds / pod)

CONCLUSIONS

1. Cultivated on a psamosoil with poor physicochemical properties, the cowpea plant has reacted positively at radicular and foliar fertilization.
2. Application, in phases to 4-5 true leaves and 3-5 of the cowpea plant ramifications, of two foliar fertilization with the Plant Green product, which has in its composition sa $N_9P_{45}K_{15}$ + 6 microelements, on $N_{60}P_{60}K_{60}$ agrofond has determined the obtaining of a maximum of 2757 kg / ha.
3. The grain yield, obtained in different variants fertilization cowpea, was positively correlated, significantly distinct, with photosynthesis rate (r = 0.934 **), number of pods per plant (r = 0.949 **) and the number of beans in the pod (r = 0.926 **).

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