

STUDY ON THE EFFECT OF 'RENI' COMPOSITIONS ON GROWTH AND PRODUCTIVITY OF GARDEN PEA

S. H. Kalapchieva, A. D. Tzimotoudis, G. T. Pevicharova, N. N. Popov

Possibilities of 'Reni' and 'Reni A' compositions (combination microelements) on some morphological indexes and pea green pod and green grains yields. The experimental work was carried out in 2005 – 2007 with three garden pea cultivars: 'Pulpudeva' – early, 'Skinado' – mid-early and 'Vyatovo' – late cultivar in the 'Maritsa' Vegetable Crops Research Institute – Plovdiv, Bulgaria. The treatment of mid-early cultivar 'Skinado' and late cultivar 'Vyatovo' with 'Reni' and 'Reni A' increased: plant weight up to 132.6 % towards the untreated variant; pod number per plant up to 140 %; pod weight per plant up to 184.1 %; grain number from plant to 158.6 % and grain weight per plant to 129.8 %. 'Reni' compositions have a strong effect or they haven't effect in early cultivar 'Pulpudeva'.

Key words: *Pisum sativum L., bio-stimulators, morphological characteristics, yield.*

INTRODUCTION

The application of physiologically active substances together with microelements in pea growing is an object of a number of studies. A stimulation effect in application of the Bulgarian leaf fertilizer 'Laktofol' was established by Manolov et al. [4] and Shaban [8]. The increased yield was obtained as a result of an increase in pod number per plant, the improved fruit formation, increase resistance to drought. The growth rate of the plant in drought and in treated with Ergostim (Farmoplant) and Fertilin NS (FNS) plants was with 10 % higher compared to the untreated ones [1], [3]. Similar effect was reported by Prasad et al. [7] in study of the effect of leaf added boron on the yield of different pea cultivars.

Taking into consideration the scientific information for the positive effect from the application of microelements and physiologically active substances on the yield and quality of the garden pea produce we aimed at studying the effect of 'Reni' compositions on same morphological characters and on the productivity of this crop.

MATERIALS AND METHODS

The experimental work was performed on the field of 'Maritsa' Vegetable Crops Research Institute – Plovdiv during the period 2005 – 2007. An object of the study was garden pea cultivars from the wrinkled type: 'Pulpudeva', 'Skinado' and 'Vyatovo'.

Treatment with 'Reni' and 'Reni A' was one time in bud-formation period – at blossoming start with 200 ml/da. 'Reni' compositions used in this investigation were combinations from microelements molybdenum, manganese, magnesium in different proportions and combinations (from 0.1 % to 0.00015 %) in respect of the microelement), [5]. The additional component in 'Reni A' with the same concentrations is cobalt.

Biometric measurements of 20 plants were made by the following characters: plant height (cm), plant weight with fruits (g), pods number per plant, pods weight per plant (g), grains number per plant and grain weight per plant (g). The green pods yield – kg/da and green grain – kg/da yield were studied. Data were processed statistically by classical one factor analysis of variance and Duncan's Multiple Range test [2].

RESULTS AND DISCUSSION

The pea plants treated with 'Reni' and 'Reni A' reacted with increased plant height and weight compared to the untreated ones (Table 1). The increase of plant height, expressed in percentage was from 1.6 % ('Pulpudeva', 'Reni A', 2007) to 16.4 % ('Skinado', 'Reni', 2007). In this study the plants treated with 'Reni' formed higher stems compared to the control variants in early (averagely 67.7 cm towards untreated variant 63.3 cm) and in mid-early (74.3 cm to 68.3 cm for the control) cultivars while in late cultivar the effect of 'Reni A' was stranger (averagely – 59.3 cm to 56.7 cm).

Changes in the plant weight after spraying with 'Reni' and 'Reni A' were the highest in second and third year of the investigation for 'Skinado' – from 55.9 % to 132.6 % towards the control and in the first and second year for 'Vyatovo' – from 62.4 % to 95.3%. Positive effect of the component 'Reni A' in 'Vyatovo' was recorded in 2007. The effect of the 'Reni' was stronger averagely for the period in 'Pulpudeva' – about 124 g and 'Skinado' – 119.8 g while in 'Vyatovo' the effect of 'Reni A' was the more considerable – average weight 143 g.

The amount of the formed pods per plant and their weight are given in Table 2. An increase of the pods number and pods weight per plant (an exception was the variant 'Reni A' in 2006, 'Pulpudeva') was observed in the three cultivars after treatment with the two components. The slight influence of 'Reni' and 'Reni A' in early cultivar 'Pulpudeva' made an impression.

The cultivar 'Skinado' formed from 12 (2005) up to 24 (2006) pods per plant with pods weight from 36.7 g (2005) to 82.0 g (2006) after treatment with 'Reni' and 'Reni A'. The treated variants increased in values significantly the controls – from 50.0 % to 140.0 % for pods number and from 40.1 % to 118.7 % for their weight in the three years of the experiment.

The late cultivar 'Vyatovo' reacted to the 'Reni' and 'Reni A' treatment also with the formation of greater number of pods (13 – 29) and higher pods weight (36.6 – 126.7 g). The plants exceeded the controls by the pods number per plant with 50.0 to 107.1 % and with 70.8 to 184.1 % for the weight.

The grains number per plant was derived both from the pods number, formed at the productive node and the grain number in pod. This was the reason because of that the grain number per plant and their weight were expressed analogous to the pods number and weight per plant in treatment with 'Reni' and 'Reni A' (Table 2). The component 'Reni' had a stronger effect on the two characters in early cultivar and on grains number only in mid-early cultivar while the effect of 'Reni A' was stronger on the two characters in the late cultivar and on the grains weight in mid-early cultivar.

'Reni' and 'Reni A' are connected with regulation of the activity of some basic enzyme systems, participating in the nitrogen metabolism and with increase of the symbiotic nitrogen fixation and as a result of that the quality and productivity was improved [6]. The difference in the responses of the three cultivars could be explained with the presence of different characteristics of the symbionts – number, amount, color of the tubers, their location along the roots. These results in the specialization in the nitrogen fixing ability of the tubercular bacteria in different pea cultivar groups and the concrete combination of the agro-meteorological conditions and action of the regulators 'Reni' and 'Reni A'.

The effect of the components 'Reni' and 'Reni A' on the yield of green pods and green grains per decare was not one-way in the years of the investigation (Table 1). Highest yields were recorded in 2006 for the three cultivars. In the same year strongest increase among the treated with 'Reni' and 'Reni A' was observed in mid- early cultivar 'Skinado' that was from 9.3 % to 12.7 % for the green pods yield and from 9.1 % to 13.6 % for green grains yield compared to the control. The differences in 'Vyatovo' were significant for the character green pods yield – 9.4 % after spraying with 'Reni' and 5.3 % after apply of 'Reni A' while for the character green grain yield after treating with 'Reni' – 14.0 %. 'Pulpudeva' increased only the green grain yield after spraying with 'Reni' (9.5 %, 2006).

The obtained results showed that 'Reni' and 'Reni A' had no one-way action in different groups of pea cultivars and on the obtained characters that was of importance for creation of cultivar technologies and differentiated use of the products.

CONCLUSIONS

Treatment of garden pea with the components 'Reni' and 'Reni A' results in increase of: Weight of a plant up to 132.6 % in mid-early cultivar 'Skinado' and to 95.3 % in the late cultivar 'Vyatovo'; pods number per plant up to 140 % for 'Skinado' and to 107.1 % for 'Vyatovo'; pods weight per plant up to 118.7 % for 'Skinado' and to 184.1 % in 'Vyatovo'; grains number per plant up to 158.6 % in the first cultivar and to 102.3 % in the second; grains weight per plant – 97.9 % for 'Skinado' and 129.8 % for 'Vyatovo';

The positive effect of 'Reni' and 'Reni A' on the green pods yield (from 5.3 to 12.7 % higher values) and green grains yield (kg/da) (from 6.8 to 14.0 %) was established for mid-early and late cultivars but in years with favorable climatic conditions (2006).

The 'Reni' compositions have a slight effect or they don't exert an effect on studied characters including the green pods and grains yields (kg/da) in early cultivar 'Pulpudeva'.

Table 1.

Influence of 'Reni' and 'Reni A' on plant height, plant weight, green pods yield and green grain yield.

Cultivar	Years	Plant height, cm					
		Control		Reni		Reni A	
		cm	%	cm	%	cm	%
Pulpudeva	2005	40	100,0	41	102,5	42	105,0
	2006	86	100,0	92*	107,0	78**	90,7
	2007	64	100,0	70*	109,4	65	101,6
	Mean	63,3		67,7		61,7	
Skinado	2005	54	100,0	57	105,6	53	98,2
	2006	84	100,0	88	104,8	86	102,4
	2007	67	100,0	78***	116,4	73*	109,0
	Mean	68,3		74,3		70,7	
Vyatovo	2005	47	100,0	50	106,4	49	104,3
	2006	61	100,0	66**	108,2	67**	109,8
	2007	62	100,0	57	91,9	62	100,0
	Mean	56,7		57,7		59,3	
		Green pods yield, kg/da					
		kg	%	kg	%	kg	%
Pulpudeva	2005	970,0	100,0	891,4	91,9	891,4	91,9
	2006	1233,2	100,0	1363,5	110,6	1298,6	105,3
	2007	1094,3	100,0	1147,3	104,8	1074,0	98,1
	Mean	1099,2		1134,1		1088,0	
Skinado	2005	1132,8	100,0	1106,2	97,7	1041,4	91,9
	2006	1499,2	100,0	1689,8***	112,7	1637,9**	109,3
	2007	1048,4	100,0	924,6	88,2	1051,0	100,2
	Mean	1226,8		1240,2		1243,4	
Vyatovo	2005	318,8	100,0	327,4	102,7	300,0	94,1
	2006	1058,2	100,0	1157,2**	109,4	1114,5*	105,3
	2007	615,6	100,0	880,9*	143,1	740,6	120,3
	Mean	664,2		788,5		718,4	

Cultivar	Years	Plant weigh with fruits, g					
		Control		Reni		Reni A	
		g	%	g	%	g	%
Pulpudeva	2005	64,7	100,0	76,9	104,9	66,8	103,2
	2006	147,7	100,0	166,5	112,7	145,7	98,6
	2007	96,7	100,0	128,6**	133,0	117,5	121,5
	Mean	103,0		124,0		110,0	
Skinado	2005	57,4	100,0	78,0	135,9	69,3	120,7
	2006	72,8	100,0	169,3***	232,6	157,1***	215,8
	2007	66,6	100,0	112,1***	168,3	103,8***	155,9
	Mean	65,6		119,8		110,1	
Vyatovo	2005	61,5	100,	101,9**	165,7	99,9**	162,4
	2006	110,2	100,	181,9***	165,1	215,2***	195,3
	2007	91,2	100,	106,3	116,6	115,8*	127,0
	Mean	87,6		130,0		143,6	
<i>Green grain yield, kg/da</i>							
Pulpudeva	2005	323,4	100,0	329,0	101,9	289,0	89,4
	2006	548,1	100,0	597,7**	109,5	568,4	103,7
	2007	345,7	100,0	313,3	90,6	328,9	95,1
	Mean	405,7		413,3		395,4	
Skinado	2005	395,4	100,0	393,8	99,6	355,4	89,9
	2006	689,9	100,0	784,0**	113,6	752,7**	109,1
	2007	477,9	100,0	412,7	86,4	514,8**	107,7
	Mean	524,1		530,2		541,0	
Vyatovo	2005	117,2	100,0	121,2	103,4	112,6	96,1
	2006	398,1	100,0	453,9**	114,0	423,1	106,8
	Mean	196,9	100,0	290,2**	147,4	246,7	125,3

***, **, * - significant at $p \leq 0.001$; $p \leq 0.01$ and $p \leq 0.05$

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Contact:

Slavka Kalapchieva, Ph.D.; Department of Breeding, Variety Maintenance & Introduction; Maritsa Vegetable Crops Research Institute; Plovdiv; Tel.: +359 (0)32 95 22 95(central), Email:s_kalapchieva@abv.bg

Apostolos Tzimotoudis, Ph.D.; Greece;

Prof. Galina Pevicharova, Ph.D., Maritsa Vegetable Crops Research Institute; Plovdiv;

Prof. Nanko Popov, Ph.D., Department of Plant Physiology and Biochemistry, Agricultural University, Plovdiv.

The paper is reviewed.