THE INFLUENCE OF CHEMICAL FERTILIZERS ON SOME MORPHOLOGICAL CHARACTERS AND FLOWERING PERIODS AT EUPHORBIA PULCHERRIMA WILLD. EX KLOTZSCH

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Abstract

Euphorbia pulcherimma is a shrubby plant that is of particular interest for pot culture. In order to enrich the knowledge on its culture, experiments were performed on the influence of chemical fertilizers in different doses and combinations on the height of the plants, the diameter of the inflorescence and the flowering season. The experiments were performed on two cultivars (Cardinal and Barbara Ecke) and included two variants with 20 plants in four repetitions each. The doses of chemical fertilizers were applied in two periods: in the growth phase (30 days after the last planting) and at the beginning of the differentiation of flower buds. Plant height increased in all variants where nitrogen fertilizers were administered. increases maximum growth was recorded in plants that in the first stage received only nitrogen, and in the phase of flower bud differentiation they received complete fertilizer with high doses of nitrogen. In plants that have received a complex fertilization, in parallel with the increase in the height of the plants, the diameter of the inflorescence also increases. Application of chemical fertilizers during the growing season extends the flowering period by 2 to 10 days, so the average duration of the flowering period increases from 78-80 days in the control plants to 85-89 days in the fertilized plants.

Keywords: chemical fertilizers, cultivars, Euphorbia pulcherrima Willd. ex Klotzsch

INTRODUCTION

The experiments took place in the period 2020-2023 and were located in the Propagation Greenhouse of the "Alexandru Buia" Botanical Garden of the University of Craiova. The culture substrate was composed of a mixture of leaf mold, peat, fallow-soil and sand in equal parts, with a content in the main fertilizing substances of 36.4 mg N, 86.4 mg P_2O_5 and 72.4 mg K_2O per 100 g dry substrate. The reaction of the substrate used at the beginning of the culture was slightly acidic, with a pH value of 6.4. The amount of nutrients in the substrate used falls within the optimal limits, 20-40 mg N and 80-100 mg P_2O_5 and K_2O per 100 g of soil.

MATERIAL AND METHOD

In order to establish the need for chemical fertilizers, experiments were performed in the period 2020-2023 in which the influence of chemical fertilizers in different doses and combinations on the general development of plants was followed, following the height of the plants, the diameter of the inflorescence and the flowering season.

The experiments carried out with Euphorbia plants from the Cardinal and Barbara Ecke cultivars included 12 variants with 20 plants in each repetition: Variant 1 – 0 (Control) Variant 2 - N_{32} + N_{32} Variant 3 - P_{36} + P_{36} Variant 4 - K_{40} + K_{40} Variant 5 - $N_{32}P_{36}$ + $N_{32}P_{36}$ Variant 6 - $N_{32}K_{40}$ + $N_{32}K_{40}$ Variant 7 - $P_{36}K_{40}$ + $P_{36}K_{40}$ Variant 8 - $N_{32}P_{36}K_{40}$ + $N_{32}P_{36}K_{40}$ Variant 9 - N_{32} + $N_{32}P_{36}K_{40}$ Variant 10 - N_{32} + $N_{64}P_{72}K_{40}$ Variant 11 - N_{32} + $N_{64}P_{36}K_{40}$ Variant 12 - N_{32} + $N_{64}P_{72}K_{60}$.

Fertilizer doses are expressed in mg of active substance for each pot, and the application was made in two periods: during the growth phase and at the beginning of the differentiation of flower buds. In the first

8 variants, chemical fertilizers were administered in the same doses and combinations at both stages. In the plants from variants 9-12, only nitrogen was applied in the growth phase, and in the second phase a complete fertilization, within these 4 treatments only varying the ratio between the nutritional elements.

The chemical fertilizers used were: ammonium nitrate with 32% active substance, superphosphate with 18% P_2O_5 and potassium salt with 40% K_2O. Fertilizers were applied in the form of a solution in the amount of 100 cm^3 for each plant and stage. Biometric determinations and measurements were performed through quantitative and qualitative research, and calculation was done through statistical methods, analysis of variance based on DL, meaning limit differences, analytical mode developed by R. A. Fisher..

RESULTS AND DISCUSSION

The influence of chemical fertilizers on morphological characters

Changes in plant nutritional conditions during the growing season are reflected by more or less obvious changes in some morphological characters.

Plant height was increased in all experimental years by the application of chemical fertilizers. The plants that received nitrogen fertilizers during the growing season showed a higher height than the control ones, with differences between 2.12 and 6.82 cm in the *Cardinal* cultivar and between 2.39 and 8.15 cm in *Barbara Ecke* (Table 1 , Table 2).

Unilateral fertilization with phosphorus or potassium, as well as with both elements (PK) caused a slight decrease in plant height compared to the control, more evident in the cultivar *Cardinal* (-0.5 and -1.72 cm). The reduction in the height of the plants, especially in those fertilized only with potassium, is due both to the reduced nitrogen content and to an unfavorable intake that is created between these two elements, on the one hand through the gradual depletion of nitrogen, and on the other through the addition of potassium. The high content of potassium in the culture substrate, through the ionic antagonism between it and nitrogen, inhibits the absorption of already unsatisfactory amounts of nitrogen. The increase in height in the plants that received complex fertilizer (NPK) in the two stages is very close to that achieved in the plants fertilized in the first stage only with nitrogen, and in the second with NPK in minimal doses (V9). The differences are between 3.13 and 3.21 cm in the cultivar *Cardinal* and between 3.79 and 4.52 cm in the cultivar *Barbara Ecke*.

Fertilization differentiated in the two phases of vegetation, respectively the application of nitrogen fertilizer in the growth phase and complex fertilizer in large doses at the beginning of the differentiation of flower buds, determined a vigorous growth of the plants. The average growth increments achieved in these variants, compared to the control plants, were between 5.23 and 6.82 cm for the cultivar Cardinal and between 5.98 and 8.16 cm for Barbara Ecke. The average differences in plant height in the years of experimentation, due to the variation of climatic factors from July to September, are insignificant.

Although the increase in plant height is an effect that was not observed for fertilizer application, given that Euphorbia is too tall for pot culture anyway, this character was analyzed only as an element that reflects plant vigor and is closely correlation with the development of other organs (leaves, flowers, inflorescences).

Knowing that the height of the plants can be kept within certain limits by treatments with retardants or pinching and also that the application of fertilizers is not incompatible

with these treatments, we appreciate that there is the possibility of obtaining vigorous plants, but with size determined.

Table 1 Influence of chemical fertilizers on the height of the plants of the *Cardinal* cultivar, in cm

No. crt.	Treatment	2021				2022				2023				Average over 3 years				
		Height cm	%	Differrence	Meaning	Height cm	%	Differrence	Meaning	Height cm	%	Difference	Meaning	Height	%	Difference	Meaning of	
																	E	Vxa
1	0-Martor	41,35	100,00	-		43,20	100,00	-		42,60	100,00	-		42,38	100,00			
2	N_{32}	43,50	105,20	+2,16	-	45,25	104,74	+2,05	-	44,75	105,04	+2,15	-	44,50	105,00	+2,12	-	-
3	P_{36}	41,25	99,75	-0,10	-	42,00	97,22	-1,20	-	42,40	99,53	-0,20	-	41,88	98,82	-0,50	-	-
4	K_{40}	39,40	95,28	-1,95	-	40,37	93,45	-2,83	-	42,20	99,06	-0,40	-	40,66	95,94	-1,72	-	-
5	$N_{32}P_{36}$	43,75	105,80	+2,40	-	44,95	104,05	+1,75	-	45,10	105,68	+2,50	-	44,60	105,24	+2,22	x	-
6	$N_{32}K_{40}$	41,65	100,72	+0,30	-	43,82	101,43	+0,62	-	44,20	103,75	+1,60	-	43,22	101,98	+0,84	-	-
7	$P_{36}K_{40}$	40,60	98,18	-0,75	-	42,27	97,84	-0,93	-	42,70	100,23	+0,10	-	41,86	98,77	-0,52	-	-
8	$N_{32}P_{36}K_{40}$	44,65	107,98	+3,30	-	45,82	106,06	+2,62	-	46,07	108,14	+3,47	-	45,51	107,38	+3,13	xx	x
9	N_{32} + $N_{32}P_{36}K_{40}$	44,40	107,37	+3,05	-	46,07	106,64	+2,87	-	46,30	108,68	+3,70	-	45,50	107,57	+3,21	xx	x
10	N_{32} + $N_{64}P_{72}K_{40}$	46,60	112,69	+5,25	x	47,80	110,64	+4,60	x	48,42	113,66	+5,82	xx	57,61	112,34	+5,23	xxx	xxx
11	N_{32} + $N_{64}P_{36}K_{40}$	48,25	116,68	+6,90	xx	49,35	114,23	+6,15	xx	49,70	116,66	+7,10	xx	49,10	115,85	+6,72	xxx	xxx
12	N_{32} + $N_{64}P_{72}K_{60}$	47,55	114,99	+6,20	xx	49,75	115,16	+6,55	xx	50,30	118,07	+7,70	xxx	49,20	116,09	+6,82	xxx	xxx
	DL 5%			3,77					3,73						3,77			2,13
2,71																		
	DL 1%			6,05					5,00			5,05				2,82		3,72
	DL 0,1%			6,67					6,60			6,67				3,65		5,02

Table 2 Influence of chemical fertilizers on the height of the plants in the *Barbara Ecke* cultivar, in cm

No. crt.	Treatment	2021				2022				2023				Average over 3 years				
		Height cm	%	Differrence	Meaning	Height	%	Difference	Meaning	Height cm	%	Difference	Meaning	Height cm	%	Differrence	Meaning of	
																	E	Vxa
1	0-Martor	42,55	100,00	-		44,15	100,00	-		42,67	100,00	-		43,19	100,00			
2	N_{32}	45,62	107,21	+3,07	-	45,70	103,51	+1,55	-	45,42	105,94	+2,55	-	45,58	105,53	+2,39	xx	xx
3	P_{36}	45,55	102,35	+1,00	-	43,65	98,86	-0,50	-	43,17	100,69	+0,30	-	43,45	100,60	+0,26	-	-
4	K_{40}	42,72	100,39	+0,17	-	42,90	97,16	-1,25	-	42,22	98,48	-0,65	-	42,61	98,65	-0,58	-	-
5	$N_{32}P_{36}$	46,10	108,34	+3,55	x	46,10	104,41	+1,95	-	45,80	106,84	+2,93	-	46,00	106,50	+2,81	xx	xxx
6	$N_{32}K_{40}$	44,92	105,57	+2,37	-	45,90	103,96	+1,75	-	45,47	106,07	+2,60	-	45,43	105,18	+2,24	x	xxx
7	$P_{36}K_{40}$	42,85	100,70	+0,30	-	43,95	99,54	-0,20	-	43,25	100,87	+0,38	-	43,35	100,37	+0,16	-	-
8	$N_{32}P_{36}K_{40}$	46,20	108,57	+3,65	x	47,55	107,70	+3,40	x	47,20	110,10	+4,33	x	46,98	108,77	+3,79	xxx	xxx
9	N_{32} + $N_{32}P_{36}K_{40}$	47,65	111,98	+5,10	xx	47,80	108,26	+3,65	x	47,70	111,26	+4,83	xx	47,71	110,46	+4,52	xxx	xxx
10	N_{32} + $N_{64}P_{72}K_{40}$	50,40	118,45	+7,85	xxx	48,75	110,41	+4,60	xx	48,37	112,83	+5,50	xx	49,17	113,84	+5,98	xxx	xxx
11	N_{32} + $N_{64}P_{36}K_{40}$	52,05	122,33	+9,50	xxx	50,90	115,29	+6,75	xxx	51,08	119,15	+8,21	xxx	51,34	118,87	+8,15	xxx	xxx
12	N_{32} + $N_{64}P_{72}K_{60}$	50,75	119,27	+8,20	xxx	51,70	117,10	+7,55	xxx	51,50	120,13	+8,63	xxx	51,32	118,96	+8,13	xxx	xxx
	DL 5%			3,08					3,00			3,32				1,79	0,86	
	DL 1%			4,13					4,02			4,46				2,38		1,18
	DL 0,1%			5,45					5,31			5,88				3,07	1,61	

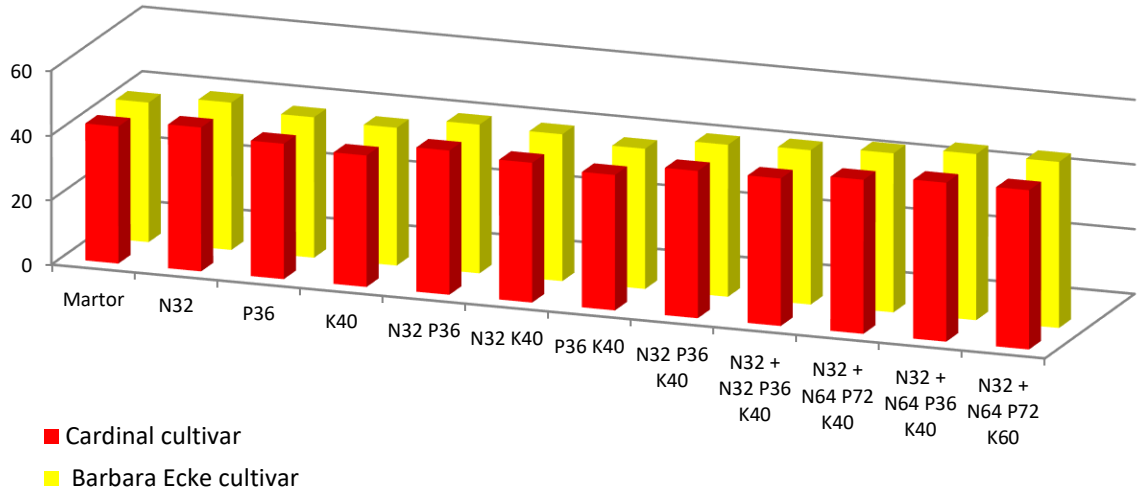

Figure 1 Variation in plant height (cm) of *Euphorbia pulcherrima* Willd. ex Klotzsch under the influence of chemical

Inflorescence diameter

Apart from the color and shape of the bracts, the decorative value of Euphorbia is also given by the size of the inflorescence, namely the rosettes of colored leaves at the base of the compound inflorescence, an element that is of interest both from an aesthetic and commercial point of view.

In the results of the experiments performed for 3 years (Table 3, Table 4) it is found that fertilization during the vegetation affects the sizes of the inflorescence in the same sense in which they affected the waist of the plants. The average values of the diameter of the inflorescence remain, in both varieties, very close to those of the control plants when fertilized in the two vegetation phases only with nitrogen, phosphorus or potassium, the differences being positive when fertilized only with nitrogen and negative, insignificant, when with phosphorus or potassium. The growth spurts are small and unsecured also in plants that have received partial nitrogen associated with phosphorus or potassium, as well as in the combined application of fertilizers with phosphorus and potassium. Parallel to the increase in height, the growth and diameter of the inflorescence in the plants that received complete fertilizer, the differences when applying the minimum doses being insignificant (V8 and V9).

When applying double doses of fertilizers, especially those with nitrogen, the inflorescence increases in diameter to 27.59-28.27 cm in the *Cardinal* cultivar or to 26.85-28.43 cm in *Barbara Ecke*. Based on the biometric determinations performed on the two cultivars of *Euphorbia*, some correlations could be established between the analyzed morphological characters. In those that received chemical fertilizers during the growing season, there is an obvious interaction between the height of the plants and the diameter of the inflorescence. The obtained data show that when the height of the plates increases, the diameter of the inflorescence also increases and vice versa, the diameter of the inflorescence decreases in plants with a smaller size.

Table 3 The influence of chemical fertilizers on the diameter of the inflorescence in the cultivar *Cardinal*, in cm

No. crt.	Treatment	2021				2022				2023				Average over 3 years				
		Height cm	%	Differrence	Meaning	Height cm	%	Differrence	Meaning	Height cm	%	Differrence	Meaning	Height cm	%	Differrence	Meaning of	
																	E	Vx a
1	0-Martor	24,65	100,00	-		25,70	100,00	-		25,15	100,00	-		25,16	100,00			
2	N_{32}	24,87	100,89	+0,22	-	25,65	99,80	-0,05	-	25,30	100,59	+0,15	-	25,27	100,43	+0,11	-	-
3	P_{36}	24,60	99,79	-0,05	-	25,20	98,05	-0,50	-	25,00	99,40	-0,15	-	24,93	99,08	-0,23	-	-
4	K_{40}	24,60	99,79	-0,05	-	24,70	96,10	-1,00	-	24,70	98,21	-0,45	-	24,66	98,01	-0,50	-	-
5	$N_{32}P_{36}$	25,23	102,43	+0,60	-	25,45	99,03	-0,25	-	26,20	104,17	+1,05	-	25,63	101,87	+0,47	-	-
6	$N_{32}K_{40}$	25,30	102,63	+0,65	-	25,95	100,97	+0,25	-	25,75	102,38	+0,60	-	25,66	101,98	+0,50	-	-
7	$P_{36}K_{40}$	24,50	99,39	-0,15	-	24,85	96,69	-0,85	-	24,55	97,61	-0,60	-	24,63	97,89	-0,53	-	-
8	$N_{32}P_{36}K_{40}$	25,60	103,85	+0,95	-	26,20	101,94	+0,50	-	26,03	103,57	+0,90	-	25,95	103,14	+0,79	-	-
9	N_{32} + $N_{32}P_{36}K_{40}$	25,65	104,05	+1,00	-	26,65	103,69	+0,95	-	26,45	105,16	+1,30	-	26,25	104,33	+1,09	-	x
10	N_{32} + $N_{64}P_{72}K_{40}$	27,20	110,30	+2,55	-	27,85	108,36	+2,15	-	27,72	110,21	+2,57	-	27,59	109,65	+2,43	xx	xx x
11	N_{32} + $N_{64}P_{36}K_{40}$	27,70	112,37	+3,05	-	28,40	110,50	+2,70	x	28,25	112,32	+3,10	x	28,11	111,72	+2,95	xx x	xx x
12	N_{32} + $N_{64}P_{72}K_{60}$	28,05	113,79	+3,40	-	28,45	110,70	+2,75	x	28,32	112,60	+3,17	x	28,27	112,36	+3,11	xx x	xx x
	DL 5%			3,85					2,27				2,61			1,69	0,84	
	DL 1%			5,16					3,04				6,50			2,24		1,15
	DL 0,1%			6,82					4,02				4,63			2,90	1,57	

Table 4 The influence of chemical fertilizers on the diameter of the inflorescence in the cultivar *Barbara Ecke*,in cm

No. crt.	Treatment	2021				2022				2023				Average over 3 years				
		Height cm	%	Differrence	Meaning	Height cm	%	Differrence	Meaning	Height cm	%	Differrence	Meaning	Height cm	%	Differrence	Meaning of	
																	E	Vx a
1	0-Martor	23,85	100,00	-		25,95	100,00	-		25,50	100,00	-		25,10	100,00			
2	N_{32}	25,85	108,38	+2,00	x	26,60	102,50	+0,65	-	26,25	102,94	+0,75	-	26,23	104,50	+1,13	x	xx x
3	P_{36}	24,30	101,88	+0,45	-	25,55	98,46	-0,40	-	24,85	97,45	-0,65	-	24,90	99,20	-0,20	-	-
4	K_{40}	24,30	101,88	+0,45	-	24,95	96,15	-1,00	-	24,45	95,88	-1,05	-	24,57	97,89	-0,53	-	x
5	$N_{32}P_{36}$	26,00	109,01	+2,15	x	26,65	102,69	+0,70	-	26,40	103,53	+0,90	-	26,35	104,98	+1,25	x	xx x
6	$N_{32}K_{40}$	25,90	108,59	+2,05	x	26,15	100,77	+0,20	-	26,05	102,15	+0,55	-	26,03	103,70	+0,93	-	xx x
7	$P_{36}K_{40}$	24,60	103,14	+0,75	-	25,00	96,34	-0,95	-	24,70	96,86	-0,80	-	24,77	98,68	-0,33	-	-
8	$N_{32}P_{36}K_{40}$	26,50	111,11	+2,65	xx	26,75	103,08	+0,80	-	26,95	105,78	+1,45	-	26,73	106,49	+1,63	xx	xx x
9	N_{32} + $N_{32}P_{36}K_{40}$	27,65	115,93	+3,80	xxx	28,10	108,28	+2,15	x	27,80	109,02	+2,30	xx	27,85	110,95	+2,75	xx x	xx x
10	N_{32} + $N_{64}P_{72}K_{40}$	26,70	111,95	+2,85	xx	27,05	104,24	+1,10	-	26,80	105,09	+1,30	-	26,85	106,97	+1,75	xx x	xx x
11	N_{32} + $N_{64}P_{36}K_{40}$	28,15	118,03	+4,30	xxx	28,55	110,02	+2,60	xx	28,60	112,15	+3,10	xx x	28,43	113,26	+3,33	xx x	xx x
12	N_{32} + $N_{64}P_{72}K_{60}$	27,95	117,19	+4,10	xxx	28,60	110,21	+2,65	xx	28,05	110,00	+2,55	xx	28,20	112,35	+3,10	xx x	xx x
	DL 5%			1,68					1,78				1,66			0,98	0,42	
	DL 1%			2,25					2,39				2,23			1,29		0,58

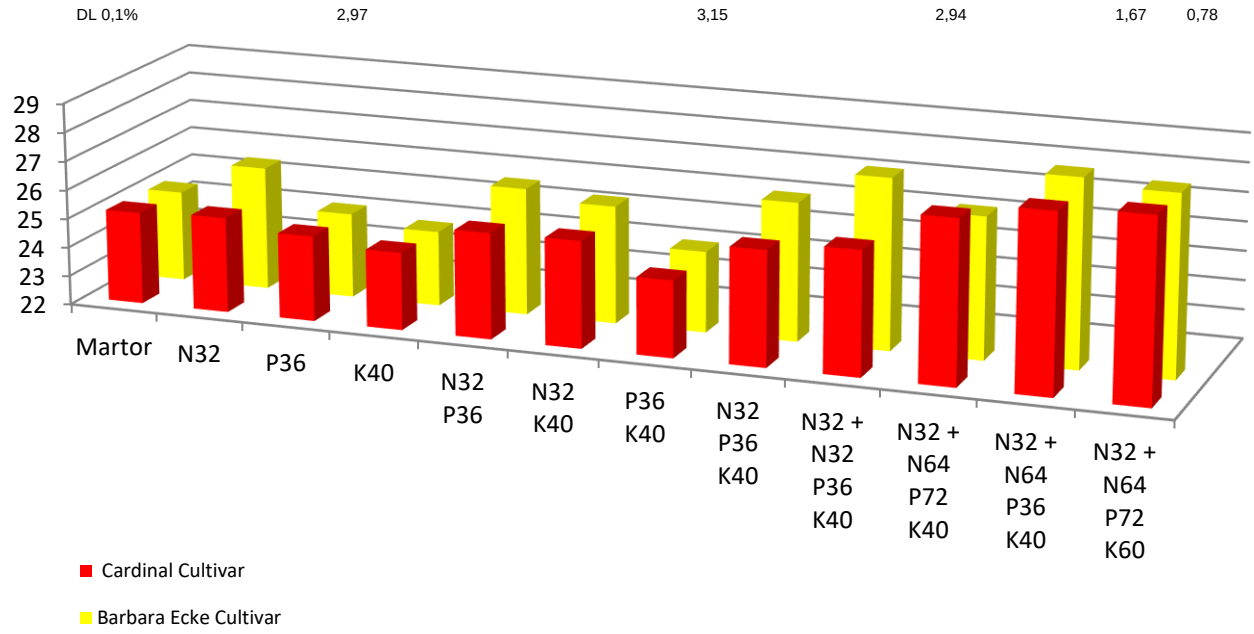

Figure 2 Variation of inflorescence diameter (cm) in *Euphorbia pulcherrima* Willd. ex Klotzsch under the influence of chemical fertilizers

The influence of chemical fertilizers on flowering period

Observations on the beginning and end of plant flowering in the *Cardinal* and *Barbara Ecke* cultivars revealed remarkable differences in the initiation of these phenophases depending on the treatments applied and the cultivar. Thus, in the control plants of the *Cardinal* cultivar, the first flowers start to appear between November 14-18, and the last ones fall around February 1, while in the *Barbara Ecke* cultivar, flowering begins between November 17-19 and ends between 4- February 8 (Table 5).

In plants that received only nitrogen fertilizer or nitrogen in various combinations with phosphorus and potassium, flowering was delayed in the *Cardinal* cultivar by 5-7 days compared to the unfertilized control. Fertilization with phosphorus and potassium caused, in all years of experimentation, flowering 3-4 days earlier than the control plants and 6-12 days compared to the plants that received nitrogen alone or together with other fertilizers. The cultivar *Barbara Ecke*, which is later than *Cardinal*, also reacts to the application of fertilizers in the same way, having a longer average flowering time (Table 6).

The end of flowering occurs later than in the control plants both in the unilateral fertilization and in the combined application of the three fertilizers and is influenced differently by them. Thus, the administration of phosphorus and potassium fertilizers, which accelerated flowering by 3-4 days given separately or 5-6 days given together, caused an extension of the duration of flowering by 4-10 days in the *Cardinal* cultivar and by 4-6 days to the cultivar *Barbara Ecke*. Nitrogen applied alone only extended the duration of flowering by 2-3 days beyond that of flowers from control plants. Complete fertilization delays the end of flowering, especially when applying phosphorus doses.

The application of fertilizers during the growing season influences the duration of flowering and the rate of bract fall after flowering, while in unfertilized plants the

first flowers and bracts begin to fall at the end of January and the first days of February, in fertilized plants, especially in those that received complete fertilizer and in high doses, flowering ends 15-20 days later, so the average duration of the flowering period increases from 77-80 days, as in the control plants, to 87- 89 days. Phase fertilization extends the duration of bract fall. Compared to the control plants, in which the total fall of the bracts occurs after about 17 days, the rate of fall is much slower in unilaterally fertilized or fully fertilized plants.

From the data obtained regarding the duration of flowering and the rate of bract fall in the two Euphorbia cultivars, it emerged that they are influenced to the greatest degree by the presence of phosphorus administered alone or associated with the other fertilizers. In all variants where phosphorus fertilizer was applied, the duration of the flowering period is longer by 4-12 days, and the rate of bract fall is slower by 7 to 10 or 12 days at double doses of phosphorus.

Table 5 The influence of chemical fertilizers on the flowering of plants of the cultivar *Cardinal*

No.crt	Treatment	The beginning of flowering			The end of flowering			Average duration of the flowering period	The rate of bract fall from the beginning to the end of fall, in days			
		2021	2022	2023	2021	2022	2023		2021	2022	2023	Average
1	0-Martor	14 XI	18 XI	15 XI	28 I	2 II	5 II	77,66	17	19	16	17,33
2	N_{32}	20 XI	23 XI	19 XI	31 I	5 II	7 II	75,33	20	20	18	19,33
3	P_{36}	11 XI	15 XI	13 XI	8 II	11 II	10 II	88,66	25	26	22	24,33
4	K_{40}	11 XI	14 XI	12 XI	4 II	6 II	8 II	85,66	24	22	21	22,33
5	$N_{32}P_{36}$	18 XI	20 XI	15 XI	5 II	6 II	7 II	81,00	26	26	24	25,33
6	$N_{32}K_{40}$	18 XI	22 XI	15 XI	6 II	8 III	9 II	81,33	21	20	19	20,00
7	$P_{36}K_{40}$	10 XI	14 XI	12 XI	8 II	11 II	10 II	89,66	24	26	24	24,67
8	$N_{32}P_{36}K_{40}$	16 XI	19 XI	15 XI	5 II	10 II	10 II	83,66	25	25	23	24,33
9	N_{32} + $N_{32}P_{36}K_{40}$	16 XI	19 XI	18 XI	6 II	9 II	10 II	83,33	26	23	25	24,67
10	N_{32} + $N_{64}P_{72}K_{40}$	19 XI	18 XI	16 XI	15 II	16 II	16 II	89,66	26	27	27	26,67
11	N_{32} + $N_{64}P_{36}K_{40}$	20 XI	24 XI	22 XI	16 II	17 II	19 II	87,33	27	26	24	25,67
12	N_{32} + $N_{64}P_{72}K_{60}$	20 XI	23 XI	22 XI	18 II	20 II	20II	89,67	27	28	28	27,67

Table 6 The influence of chemical fertilizers on the flowering of plants of the cultivar *Barbara Ecke*

No.crt	Treatment	The beginning of flowering			The end of flowering			Average duration of the flowering period	The rate of bract fall from the beginning to the end of fall, in days			
		2021	2022	2023	2021	2022	2023		2022	2023	2021	Average
1	0-Martor	17 XI	19 XI	17 XI	4 II	8 II	6 II	80,33	15	18	16	16,33
2	N_{32}	21 XI	23 XI	21 XI	7 II	10 II	6 II	78,00	16	18	16	16,66
3	P_{36}	15 XI	14 XI	13 XI	8 II	12 II	10 II	88,00	21	24	22	22,33
4	K_{40}	14 XI	12 XI	11 XI	9 II	10 II	8 II	88,66	22	24	20	22,00
5	$N_{32}P_{36}$	20 XI	21 XI	17 XI	8 II	11 II	9 II	81,66	24	25	24	24,33
6	$N_{32}K_{40}$	20 XI	21 XI	18 XI	8 II	11 II	10 II	81,66	21	20	21	20,67
7	$P_{36}K_{40}$	14 XI	15 XI	13 XI	10 II	12 II	10 II	88,66	25	24	24	24,33
8	$N_{32}P_{36}K_{40}$	20 XI	21 XI	18 XI	8 II	12 II	11 II	82,66	23	25	22	23,33
9	N_{32} + $N_{32}P_{36}K_{40}$	20 XI	19 XI	18 XI	10 II	11II	10 II	83,33	25	26	22	24,33
10	N_{32} + $N_{64}P_{72}K_{40}$	23 XI	25 XI	22 XI	19 II	19 II	18 II	87,33	27	25	26	26,00
11	N_{32} + $N_{64}P_{36}K_{40}$	21 XI	24 XI	23 XI	17II	18 II	16 II	86,33	25	24	26	25,00
12	N_{32} + $N_{64}P_{72}K_{60}$	21 XI	24 XI	23 XI	19 II	21 II	19 II	89,00	27	26	28	27,00

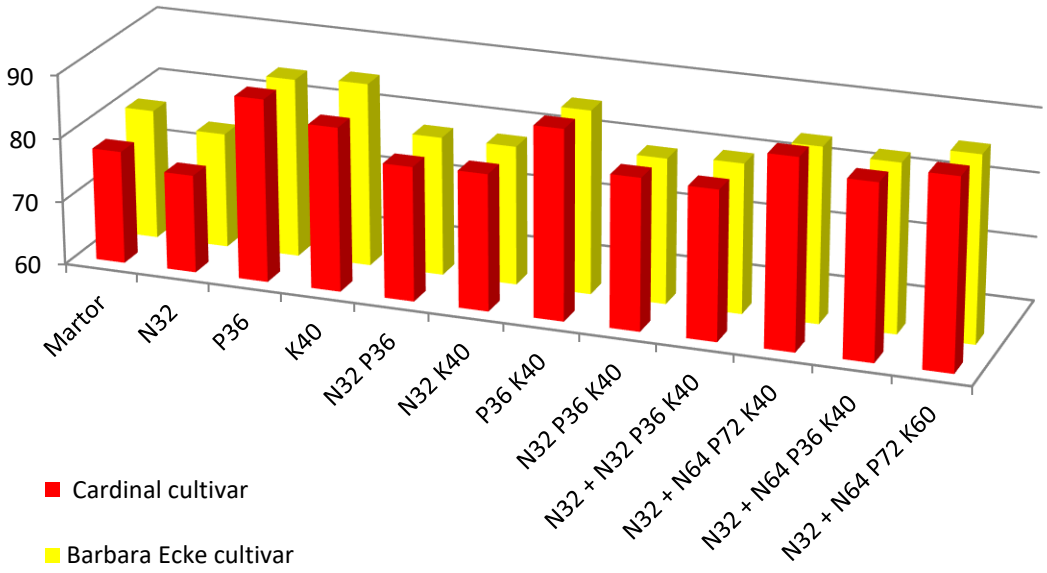

Figure 3 Variation of flowering duration (days) in *Euphorbia pulcherrima* Willd. ex Klotzsch under the influence of chemical fertilizers

Phasial fertilization in Euphorbia causes some disturbances in the biorhythm of the plant - stimulators or inhibitors in its metabolism. The favorable influence of fertilization on the decorative properties, for example: the longer duration of decoration, is the result of the changes they cause in the development of some physiological processes.

CONCLUSIONS

Although the increase in plant height is an effect that was not followed by the application of fertilizers, given that *Euphorbia* is too tall a plant for pot culture, this character was analyzed only as an element that reflects the vigor of the plants and which is in close correlation with the development of other organs (leaves, flowers, inflorescences). Knowing that the height of the plants can be kept to certain limits by treatments with retardants or pinching and also that the application of fertilizers is not incompatible with these treatments, we appreciate that there is the possibility of obtaining vigorous plants, but with a determined size. The obtained data show that when the height of the plants increases, the diameter of the inflorescence also increases, and vice versa, the diameter of the inflorescence decreases in plants with a smaller size. The application of fertilizers during the growing season influences the duration of flowering and the rate of bract fall after flowering. Phase fertilization in Euphorbia causes some disturbances in the biorhythm of the plant. The favorable influence of fertilization on the decorative features – the longer duration of decoration, is the result of the changes on which they cause in the development of some physiological processes.

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