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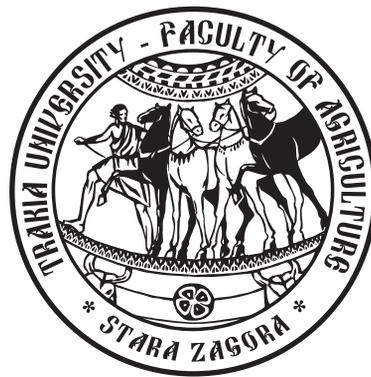
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Possibilities for increasing the yield and quality of asters (*Callistephus chinensis* L.) cut flower

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Abstract. Asters (*Callistephus chinensis* L.) are one of the basic annual sorts for growing in the open with big economic importance for getting cut flower. This is defined not only by their high decorative qualities because of the variety of structure and colouring of the raceme but also by their usage. The aim of the present paper is to study the influence of nitrogen fertilization on the vegetation and generational activities of the plants. Experiments were carried out as field tests. The results show that a higher dosage of nitrogen stimulates plant growth. It has also been established that mineral fertilization has a positive effect on the size of the raceme – larger racemes with bigger tubular discs are formed with many more lingulated petals, defining the fascicularity of the plants.

Keywords: *Callistephus sinensis*, yield, quality, cut flower, nitrogen fertilization

Introduction

The use of varieties of asters to produce cut flower necessitates the introduction of activities for control of the height of the flowering stems and the size of the racemes, indicators, defining the quality of the cut flower yield. The regulation of these indicators is most often achieved through the application of the optimum nutritive plant control. Publications show that asters need nitrogen fertilization in a dosage of 90–200 kg/ha (Gencheva, 1983; Jayabalakrishnan and Seker, 2002). Research on the influence of mineral fertilization on the growth and development of *Callistephus chinensis* is restricted or pertaining to areas with climatic conditions different from ours. This defined the aim of the present study to trace the influence of the increasing doses of nitrogen on the vegetation and generational activities of *Callistephus chinensis*, grown for the production of cut flower.

Material and methods

The experiment was carried out in the period 2009 – 2010 at the Institute of Introduction and Vegetable resources in the town of Sadovo with *Crimson* variety (pink, group Princess). Variants with increasing dosage of nitrogen were tested: $N_0P_{80}K_{120}$ – control, $N_{60}P_{80}K_{120}$, $N_{120}P_{80}K_{120}$, $N_{180}P_{80}K_{120}$, $N_{240}P_{80}K_{120}$ and $N_{300}P_{80}K_{120}$ kg/ha. The nitrogen fertilizer (ammonium nitrate – 33 % a.v.) was applied twice – the first half after planting (phase 5–6 leaf) and the other half – at the butonization phase.

Plants were grown from seedlings and the sowing of the seeds was done in the third decade of April in steel-glass hothouses. They were planted in the open air during phase 5-6 leaf, in beds, according to the 70x25 cm scheme. The experiment was carried out according to the block method with four repetitions on an experimental plot of 3.5 m². Ten plants were reported at each repetition.

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Results and discussion

The length of the flowering stem is the main indicator, defining the quality of the cut flower produce. We found out that with the increase of the dose of the nitrogen fertilizer, the length of the flower-bearer grew from 58.82 cm in variant N_{60} to 59.88 cm in variant N_{90} (Table 1). Higher doses of nitrogen (N_{240} and N_{300}) suppress the growth of the flower-bearer. Although higher than the control plants, plants from this variant form 2 - 3 cm shorter flowering offshoots. The results with respect to this indicator were substantiated at the highest levels of GD. Analogous tendency was observed when reporting the number of offshoots in each plant. With the increase in nitrogen levels to 180 kg/ha, the number of offshoots grows and exceeds control from 61.34 to 62.67 items and goes down to 57.54 in the variant with 300 kg N/ha.

The number of racemes on each plant is directly dependent on the number of offshoots and nitrogen fertilization. Asters fertilized with 180 kg/ha - nitrogen formed the biggest number of racemes – respectively 59.95 items or 14.83 items more than the control plants – 45.12 items. The results substantiate Gencheva's study (1983), according to which higher levels of nitrogen fertilization decrease the number of racemes in a plant (Table 2).

The aesthetic value of asters depends largely on the size of the racemes. This biennial study ascertained the positive dependence of the diameter of the racemes of the central flower-bearer on the doses of nitrogen fertilizer. The differences in values for this indicator and the control plants vary from 0.23 cm for variant N_{30} to 0.38 cm for variant N_{120} and were substantiated at GD 0.1%. We can note here the tendency of soils with high nitrogen content to suppress growth. Although bigger than the ones of the control plants, the diameter of the racemes of the variants with the highest dosage of nitrogen (N_{240} and N_{300}) is considerably smaller - from 0.13 cm to 0.16 cm in comparison with the racemes of variant N_{120} .

Table 1. Length of central flower-bearer and number of offshoots per plant

Variant	Length of central flower-bearer (cm)			Number of offshoots per plant (item)		
	Mean	± D	Rank	Mean	± D	Rank
N ₀ P ₈₀ K ₁₂₀ control	43.28	0	IV	54.66	0	IV
N ₆₀ P ₈₀ K ₁₂₀	58.82	+15.54	I	61.34	+6.68	III
N ₁₂₀ P ₈₀ K ₁₂₀	59.99	+16.71	I	62.67	+8.00	III
N ₁₈₀ P ₈₀ K ₁₂₀	59.88	+16.6	I	61.91	+7.25	III
N ₂₄₀ P ₈₀ K ₁₂₀	58.11	+14.83	I	58.45	+3.79	IV
N ₃₀₀ P ₈₀ K ₁₂₀	56.84	+13.58	I	57.54	+2.88	IV
GD	5%	2.45		6.31		
	1%	3.55		9.14		
	0.1%	5.32		13.72		

Table 2. Number of racemes per plant and diameter of central racemes

Variant	Number of racemes per plant(item)			Diameter of racemes (cm)		
	Mean	± D	Rank	Mean	± D	Rank
N ₀ P ₈₀ K ₁₂₀ control	45.12	0	IV	6.00	0	IV
N ₆₀ P ₈₀ K ₁₂₀	57.46	+12.34	I	6.32	+0.32	III
N ₁₂₀ P ₈₀ K ₁₂₀	59.61	+14.49	I	6.39	+0.38	III
N ₁₈₀ P ₈₀ K ₁₂₀	59.95	+14.83	I	6.36	+0.36	III
N ₂₄₀ P ₈₀ K ₁₂₀	57.77	+12.65	I	6.29	+0.29	IV
N ₃₀₀ P ₈₀ K ₁₂₀	56.59	+11.47	I	6.23	+0.23	IV
GD	5%	6.02		0.10		
	1%	8.72		0.14		
	0.1%	13.08		0.22		

Conclusion

Nitrogen fertilization has a positive influence on the indicators related to the quality of cut flower produce of *Callistephus chinensis*. With the increase in dosage of nitrogen fertilizer of up to 120 - 180 kg/ha, the length of the flower stem, the number of offshoots, the number of racemes as well as the size of the racemes increase. High nitrogen content of 240 – 300 kg/ha suppresses the development of asters and results in produce of lower quality.

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CONTENTS

1 / 2

Reviews

- 1. Lameness scoring systems for cattle in dairy farms** 291
T. Penev

Genetics and Breeding

- 2. Body and carcass parameters of sea bream (*Sparus aurata* L.) and sea bass (*Dicentrarchus labrax* L.)** 299
M. Marinova, I. Sirakov, Y. Staykov, E. Ivancheva
- 3. Effect of breed upon blood lysozyme and complement activity in different sheep breeds** 302
L. Sotirov, Ts. Koynarski, V. Semerdjiev, D. Dimov, S. Laleva, P. Slavova, M. Iliev, D. Yarkov
- 4. Winter wheat productivity under favorable and drought environments III. Effect of fertilization** 306
A. Ivanova, N. Tsenov
- 5. Evaluation of perspective sorghum breeding forms in their reaction to some diseases in field conditions** 310
M. Georgieva – Andreeva, K. Tanova, S. Raykov

Nutrition and Physiology

- Effect of dietary coconut oil supplementation on some blood biochemical indices in yearling rams** 313
T. Slavov, V. Radev, K. Sivkova, I. Varlyakov
- Pharmacokinetics of tilmicosin after oral application of Pulmotil G 200 – premix in pigs** 318
D. Dimitrova, V. Katsarov, D. Dimitrov, D. Tsoneva
- Epidermal growth factor content in rabbit doe milk during the different lactation stages** 323
E. Vachkova, B. Bivolarski
- Intraorbital glands in turkey broilers. III. Lacrimal gland histometry** 327
D. Dimitrov
- Effect of body condition score at calving on body condition during lactation in Holstein and Brown Swiss cows** 330
Zh. Gergovska, T. Angelova, D. Yordanova, Zh. Krastanov, Ch. Miteva
- Use of brewer's grains for feeding of lambs** 336
A. Kirilov, K. Ivanov

Production Systems

- The effect of the milking liner design on the parameters of the milking machine pulsation system** 339
V. Vlashev, B. Banev, K. Peichev, G. Dineva
- Accumulation dynamic of *Ruta graveolens* L. essential oil** 343
A. Dzurmanski, G. Zhekova, D. Angelova
- Research on the water regimen of soil upon the production of vine planting material** 346
N. Kovachev, N. Taneva, V. Kovachev, L. Halil

Agriculture and Environment

- Influence of the farming, soil cultivation and Fertilization on the yield of wheat** 351
M. Nankov, L. Glogova
- Study on the applicability of a natural geomaterial for mononitrophenol removal from simulated agricultural run-off water** 354
Z. Yaneva, B. Koumanova, N. Georgieva

CONTENTS

2 / 2

Comparative technical and economic analysis of variants for cleaning and storage of manure on a farm for 108 – 120 dairy cows	359
V. Dimova, D. Dinev, Y. Popova, Y. Mitev	
Distribution of the black mussel <i>Mytilus galloprovincialis</i> (L.) along the Bulgarian Black Sea coast	368
E. Petrova, St. Stoykov	
Toxicity of plant protection products towards the imago of <i>Encarsia Formosa</i> Gah.	374
V. Yankova, S. Masheva, B. Boev, K. Toskov	
Effect of the rhizobacterium <i>Bacillus subtilis</i> on the development of the root-knot nematode <i>Meloidogyne arenaria</i> at different temperatures	378
M. Mohamedova, H. Samaliev	
Product Quality and Safety	
<hr/>	
Fatty acid composition of yogurt supplemented with walnut extract	384
S. Boycheva, N. Naydenova, G. Mihaylova, T. Dimitrov, D. Pavlov	
Near Infrared Spectroscopy for monitoring changes during yellow cheese ripening	390
S. Atanassova, N. Naydenova, T. Kolev, T. Iliev, G. Mihaylova	
Short communications	
<hr/>	
Mechanical correction the traction weight of a farm wheeled tractor	395
D. Irinchev	
Possibilities for increasing the yield and quality of asters (<i>Callistephus chinensis</i> L.) cut flower	397
N. Miteva, O. Tafradziiski	

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