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RESEARCH REGARDING THE INFLUENCE OF FERTILISER RATES ON MORPHOLOGICAL FEATURES IN COMMON BEAN (*PHASEOLUS VULGARIS* L. CONVAR. *VULGARIS*) PODS CULTIVATED IN SOLARIUM AT THE DIDACTIC AND RESEARCH BASE IN TIMIŞOARA, ROMANIA

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Abstract

Common bean or green bean (Phaseolus vulgaris L. - Family Papilionaceae syn. Fabaceae) is cultivated for its young pods before seed formation, used in some dishes and in the preserve industry. Trial was conducted in the solarium of the Didactic and Research Base in Timisoara, Romania, on 400 m^2. It was a poly-factorial trial with sub-divided plots and three replicates: Factor A (supplementary fertilisation) with 3 graduations (a_1 - Cropmax; a_2 - Lithovit; a_3 - Trainer); Factor B (basic fertilisation) with 3 graduations (b_1 - Orgevit; b_2 - Phenix; b_3 - Italpollina) and Factor C (cultivar) with 3 graduations (c_1 - Goldfield; c_2 - Ecaterina; c_3 - Aurie de Bacău). As far as pod length is concerned, there are distinctly significantly positive differences (1.54-1.70 cm) between the cultivar Ecaterina and the trial mean. As for pod width. there are very significantly positive differences (0.05-0.15 cm) between the three supplementary foliar fertilisers. From the perspective of pod diameter, there are very significantly positive differences (0.01-0.05 cm) also between the three supplementary foliar fertilisers.

Key words: *Phaseolus vulgaris* L. convar. *vulgaris, common bean, morphological characters, fertiliser rates, solarium type.*

INTRODUCTION

Common bean or **green bean** (*Phaseolus vulgaris* L. - Family *Papilionaceae* syn. *Fabaceae*) is cultivated for its young pods harvested before seed formation that are used in meals and in the can industry (Apahidean and Apahidean, 2000; Broughton et al., 2003).

The species originates in Central America and South America (Peru, Mexico), where Aztec tribes used to cultivate it in times immemorial. It was brought to Europe in the 16th century by the Spaniards and the Portuguese (Indrea et al., 2007). It spread from Spain and Portugal to the Netherlands, France, Germany and England (Ciofu et al., 2004).

Common bean is an annual. herbaceous. thermophilous plant. Two convarieties are cultivated: *nanus*, covering plants with determined growth, and *vulgaris*, covering plants with undetermined growth (Poşta, 2008).

The root system is superficial and it goes 30-40 cm deep in the soil. Some toots even reach 100 cm deep in the soil. The roots have nodosities containing nitrogen-fixing bacteria.

The stem is cylindrical-edged; it is covered by hairs. ramified in dwarf common bean cultivars, 25-30 cm tall, and voluble; it is less ramified in climbing common bean cultivars, and 4-5 m tall (Poşta, 2008).

Common bean cultivars with undetermined growth bloom 60-70 days after sprouting and continue to bloom.

The fruit is a dehiscent pod characteristic in size, shape and colour depending on the common bean cultivar.

As a plant originating from warm areas, it is heat demanding. Seed minimum germination temperature is 15°C, when sprouting occurs in 12-14 days. Optimum temperature is 20-27°C, when sprouting occurs in 4-8 days. During vegetation, optimum temperature is 20-25°C, while minimum temperature is 10-12°C (Konsens et al., 1991). Below 10°C growth stops and at -0.5°C, the plants die.

Common bean is a short-day plant. With long-day conditions, vegetative growth is intense. detrimental to fructification, which asks, in climbing common bean cultivars, the removal of leaves and branches once a week to favour

larger numbers of flowers and, implicitly, of pods. Critical water phases are when seeds germinate, at blooming and at pod formation (Beebe et al., 2013). Lack of soil water hinders blooming, while low air moisture causes flower abortion. Common bean responds well to phosphorus and potassium fertilisation. On poor soils, it is recommended to apply nitrogen fertilisers during the first vegetation phases (Araújo et al., 2004; Soratto et al., 2010; Turuko and Mohammed, 2014).

MATERIALS AND METHODS

Experiments were carried out at the Experimental Station of the Faculty of Horticulture and Forestry of Timisoara in a 400 m^2 solarium, built and equipped with environmental automated control systems and equipments.

Experiments carried out during 2016-2017 had a polyfactorial character; variants were set after the randomised block method with three replicates specific to experiments in forced protected areas of vegetable culture.

Factor A (supplementary fertilisation) with 3 graduations: a_1 - Cropmax; a_2 - Lithovit; a_3 - Trainer.

Factor B (basic fertilisation) with 3 graduations: b_1 - Orgevit; b_2 - Phenix; b_3 - Italpollina.

Factor C (cultivar) with 3 graduations: c_1 - Goldfield; c_2 - Ecaterina; c_3 - Aurie de Bacău.

The growth bio stimulator Cropmax (Holland Farming B.V., Holland) contains amino acids, macro- and micro-elements, vitamins and polysaccharides, being 100% organic. This fertiliser contains N (0.2%), P (0.4%), K (0.02%), Fe (220 mg/l), Mg (550 mg/l), Zn (49 mg/l), Mn (54 mg/l), Cu (35 mg/l), Bo (70 mg/l), Ca + Mo + Cb + Ni (10 mg/l), vitamins C and E, enzymes and carotenoids. Recommended concentration rate in solarium crops is 0.2%, every 7-10 days.

Foliar fertiliser Lithovit standard (zeovita GmbH. Roter) contains 75% $CaCO_3$, 4% $MgCO_3$, 0.25% Fe, 5.0% SiO_2, 0.1% K_2O, 0.015% N, 0.015% P_2O_5, 0.01% Mn, 0.002% Cu and 0.005% Zn. This ecological fertiliser is applied in concentrations of 0.5%, every 15 days.

Foliar organic fertiliser Trainer (Italpollina spa. Italy) contains organic nitrogen (5%), vegetal amino acids (26.3%) and organic matter (35.5%). Application concentration is 0.3-0.4%.

Certified ecological organic fertiliser Orgevit contains N (4.0%), P_2O_5 (2.5%), K_2O (2.3%), Ca (9.3%), MgO (1.1%), organic substances (65% guano) and microelements (Fe, Mn, Bo, Zn, Cu, Mo). In vegetables cultivated in greenhouses and solaria. application rate is 1.5-2.0 t/ha.

Phenix is an organic fertilizer containing N (6.0%), P_2O_5 (8.0%), K_2O (15.0%), MgO (3.0%), organic carbon (29.0%) and organic substances (50.0%). Application rate in greenhouses and solaria is 5.0 t/ha.

Natural organic fertiliser Italpollina (Italpollina spa. Italy) used to fertilise the soil contains 4.0% N, 4.0% P_2O_5, 4.0% K_2O, 0.5% MgO and 41% C (organic carbon). Application rate homologated in vegetables cultivated in greenhouses and solaria is 3-4 t/ha.

The biological material used in the trials consisted in nursery seedlings sown directly in 9 cm diameter pots; seedling age upon planting was 25-30 days. The planting scheme was on 90 cm equidistant rows, while planting distance per row was 35-40 cm.

During vegetation, we monitored the soil to determine the variability of the main soil morphological features.

Observations were made using the current technique of descriptors and evaluation grades specific to the species (Ciulca, 2002).

RESULTS AND DISCUSSIONS

Soils favourable to common bean are rich in humus and have a neutral to alkaline reaction (pH = 6.5-7.5) (Indrea et al., 2007).

Having a short vegetation period. climbing common bean extracts from the soil small amounts of easily assailable nutrients. Common bean responds well to fertilisation with phosphorus and potassium and. on poor soils, it is recommended to apply nitrogen fertilisers during the first vegetation phases, upon blooming and upon pod formation (Mourice and Tryphone, 2012). Specific nutrient consumption per ton of fresh produce is 7-9 kg

a.s. N, 2.5 kg a.s. P_2O_5, 6.5-7.0 kg a.s. K_2O, 10 kg CaO (Davidescu and Davidescu, 1992).

Assessing the influence of fertiliser rate on some morphological and yielding features in common bean was done from the perspective of the interdependence between basic and supplementary fertilisations and genetic factor (cultivar). Table 1 below show trial results regarding the unilateral influence of supplementary fertilisation on pod length.

Table 1. Influence of supplementary fertilisation on climbing common bean pod length (Didactic Base Timişoara, 2016-2017)

Supplementary fertilisation	Pod length (cm)	Relative values (%)	Difference/Significance
Cropmax	23.79	103.80	0.87**
Lithovit	22.36	97.60	-0.56^{0}
Trainer	22.60	98.60	-0.32
Control (average exp.)	22.92	100.00	0.00

$LSD_{5\%}$ = 0.39 cm; $LSD_{1\%}$ = 0.59 cm; $LSD_{0.1\%}$ = 0.94 cm.

Comparative analysis of the three products used in supplementary fertilisation shows distinctly significant positive differences of climbing common bean pod length (+0.87 cm) when applying the product Cropmax. This difference is due to the composition and concentration in macro- and micro-elements of the fertiliser Cropmax.

Our research also aimed at assessing the influence of basic fertilisation on climbing common bean pod length. Trial results are shown in Table 2 below.

Table 2. Influence of basic fertilisation on climbing common bean pod length (Didactic Base Timişoara, 2016-2017)

Basic fertilisation	Pod length (cm)	Relative values (%)	Difference/Significance
Orgevit	22.75	99.30	-0.17
Phenix	23.80	103.90	0.88***
Italpollina	22.20	96.90	-0.72^{000}
Control (average exp.)	22.92	100.00	0.00

$LSD_{5\%}$ = 0.36 cm; $LSD_{1\%}$ = 0.49 cm; $LSD_{0.1\%}$ = 0.67 cm.

When using the three basic fertilisers cultivated in solaria, there is a very significant positive difference in pod length (+0.88 cm) when applying the fertiliser Phenix.

The genetic factor (cultivar) used in the trial has a primordial influence on yield per area unit due to its biological and morphological features (Poşta and Berar, 2005). Trial data regarding the influence of soil on climbing common bean pod length are shown in Table 3 below.

Table 3. Influence of cultivar on climbing common bean pod length (Didactic Base Timişoara, 2016-2017)

Cultivar	Pod length (cm)	Relative values (%)	Difference/Significance
Goldfield	25.33	110.50	2.42***
Ecaterina	22.01	96.10	-0.90^{000}
Aurie de Bacău	21.40	93.40	-1.51^{000}
Control (average exp.)	22.92	100.00	0.00

$LSD_{5\%}$ = 0.32 cm; $LSD_{1\%}$ = 0.43 cm; $LSD_{0.1\%}$ = 0.56 cm.

As for the data shown in Table 3 above, there is a very significant positive difference in pod length (+2.42 cm) in the Goldfield climbing common bean. This significant change of the morphological feature is due to the biological improved cultivar feature (Madoşă, 2000; Nedelea and Madoşă, 2004).

For better assessment of the interdependence between trial factors we assessed the combination between basic fertilisation. supplementary fertilisation and cultivar. Trial results are shown in Table 4 below.

Table 4. Interdependence of the combination basic fertilisation x supplementary fertilisation x cultivar on climbing common bean pod length (Didactic Base Timişoara, 2016-2017)

Factor combination	Pod length (cm)	Relative values (%)	Difference/Significance
Orgevit x Cropmax x Goldfield	25.50	111.30	2.59***
Phenix x Cropmax x Goldfield	27.10	118.28	4.19***
Italpollina x Cropmax x Goldfield	26.30	114.79	3.39***
Orgevit x Cropmax x Ecaterina	22.42	97.86	-0.49^{00}
Phenix x Cropmax x Ecaterina	24.39	106.46	1.48**
Italpollina x Cropmax x Ecaterina	21.74	94.89	-1.17^{0}
Orgevit x Cropmax x Aurie de Bacău	22.94	100.13	0.03
Phenix x Cropmax x Aurie de Bacău	22.13	96.59	-0.78
Italpollina x Cropmax x Aurie de Bacău	21.59	94.23	-1.32^{0}
Orgevit x Lithovit x Goldfield	23.96	104.58	1.05*
Phenix x Lithovit x Goldfield	25.44	111.04	2.53***
Italpollina x Lithovit x Goldfield	24.45	106.72	1.54**
Orgevit x Lithovit x Ecaterina	21.07	91.96	-1.84^{000}
Phenix x Lithovit x Ecaterina	23.17	101.13	0.26
Italpollina x Lithovit x Ecaterina	20.21	88.21	-2.70^{000}
Orgevit x Lithovit x Aurie de Bacău	21.56	94.10	-1.35^{00}
Phenix x Lithovit x Aurie de Bacău	21.02	91.75	-1.89^{000}
Italpollina x Lithovit x Aurie de Bacău	20.07	87.60	-2.84^{000}
Orgevit x Trainer x Goldfield	24.22	105.71	1.31*
Phenix x Trainer x Goldfield	25.31	110.47	2.40***
Italpollina x Trainer x Goldfield	24.72	107.90	1.81***
Orgevit x Trainer x Ecaterina	21.28	92.88	-1.63^{00}
Phenix x Trainer x Ecaterina	23.41	102.18	0.50
Italpollina x Trainer x Ecaterina	20.43	89.17	-2.48^{000}
Orgevit x Trainer x Aurie de Bacău	21.79	95.11	-1.12^{0}
Phenix x Trainer x Aurie de Bacău	21.24	92.71	-1.67^{00}
Italpollina x Trainer x Aurie de Bacău	20.29	88.56	-2.62^{000}
Control (exp. average)	22.91	100.00	Mt

$LSD_{5\%}$ = 1.00 cm; $LSD_{1\%}$ = 1.35 cm; $LSD_{0.1\%}$ = 1.79 cm.

As far as trial results in Table 4 above are concerned. we need to note the very significant positive differences in the length of the pods (2.59-4.19 cm) in the Goldfield common bean cultivar treated with the foliar fertiliser Cropmax and the three basic fertilisers.

The second morphological feature analysed in this trial was common bean pod width with direct impact on yield quality and quantity. We made phonological observations and biometric measurements on pod width. Trial results are shown in Table 5 below.

Table 5. Influence of supplementary fertilisation on climbing common bean pod width (Didactic Base Timişoara, 2016-2017)

Supplementary fertilisation	Pod width (cm)	Relative values (%)	Difference / Significance
Cropmax	2.05	102.20	0.04***
Lithovit	1.97	98.40	-0.03^{000}
Trainer	1.99	99.40	-0.01^{0}
Control (average exp.)	2.00	100.00	0.00

$LSD_{5\%}$ = 0.01 cm; $LSD_{1\%}$ = 0.01 cm; $LSD_{0.1\%}$ = 0.02 cm.

Comparative analysis of the unilateral influence of supplementary fertilisation during vegetation on climbing common bean pod width shows a very significant positive difference (+0.04 cm) when using the product Cropmax.

Table 6 below shows trial results regarding the unilateral influence of basic (organic) fertilisation on climbing common bean pod width.

Table 6. Influence of basic fertilisation on climbing common bean pod width (Didactic Base Timişoara, 2016-2017)

Basic fertilisation	Pod width (cm)	Relative values (%)	Difference/Significance
Orgevit	1.95	97.50	-0.05^{000}
Phenix	2.04	101.90	0.04***
Italpollina	2.01	100.60	0.01**
Control (average exp.)	2.00	100.00	0.00

$LSD_{5\%}$ = 0.01 cm; $LSD_{1\%}$ = 0.01 cm; $LSD_{0.1\%}$ = 0.01 cm.

As for the influence of basic fertilisation on common bean pod width, there is a very significant positive difference (+0.04 cm) when applying the fertiliser Phenix on a soil treated with more potassium. The genetic factor (cultivar) is definitory in higher quality and quantity yields. We noted the unilateral influence of the common bean cultivar used in the trial on climbing common bean pod width in table 7 (Mercati et al., 2013).

Table 7. Influence of cultivar on climbing common bean pod width (Didactic Base Timişoara, 2016-2017)

Cultivar	Pod width (cm)	Relative values (%)	Difference / Significance
Goldfield	2.18	108.90	0.18***
Ecaterina	1.95	97.30	-0.05^{000}
Aurie de Bacău	1.88	93.80	-0.12^{000}
Control (average exp.)	2.00	100.00	0.00

$LSD_{5\%}$ = 0.01 cm; $LSD_{1\%}$ = 0.01 cm; $LSD_{0.1\%}$ = 0.01 cm.

In this case, the Goldfield climbing common bean cultivar is above the trial mean from the perspective of pod width (2.18 cm).

Trial data regarding the interdependence between fertiliser combinations and common bean cultivars are shown in Table 8 below.

Table 8. Interdependence of the combination basic fertilisation x supplementary fertilisation x cultivar on climbing common bean pod width (Didactic Base Timişoara, 2016-2017)

Factor combination	Pod width (cm)	Relative values (%)	Difference/Significance
Orgevit x Cropmax x Goldfield	2.29	114.50	0.29***
Phenix x Cropmax x Goldfield	2.21	110.50	0.21***
Italpollina x Cropmax x Goldfield	2.19	109.50	0.19***
Orgevit x Cropmax x Ecaterina	1.86	93.00	-0.14^{000}
Phenix x Cropmax x Ecaterina	2.02	101.00	0.02*
Italpollina x Cropmax x Ecaterina	1.97	98.50	-0.03^{00}
Orgevit x Cropmax x Aurie de Bacău	1.86	93.00	-0.14^{000}
Phenix x Cropmax x Aurie de Bacău	1.91	95.50	-0.09^{000}
Italpollina x Cropmax x Aurie de Bacău	1.99	99.50	-0.01
Orgevit x Lithovit x Goldfield	2.19	109.50	0.19***
Phenix x Lithovit x Goldfield	2.13	106.50	0.13***
Italpollina x Lithovit x Goldfield	2.12	106.00	0.12***
Orgevit x Lithovit x Ecaterina	1.78	89.00	-0.22^{000}
Phenix x Lithovit x Ecaterina	2.03	101.50	0.03**
Italpollina x Lithovit x Ecaterina	1.91	95.50	-0.09^{000}
Orgevit x Lithovit x Aurie de Bacău	1.78	89.00	-0.22^{000}
Phenix x Lithovit x Aurie de Bacău	1.83	91.50	-0.17^{000}
Italpollina x Lithovit x Aurie de Bacău	1.93	96.50	-0.07^{000}
Orgevit x Trainer x Goldfield	2.18	109.00	0.18***
Phenix x Trainer x Goldfield	2.14	107.00	0.14***
Italpollina x Trainer x Goldfield	2.14	107.00	0.14***
Orgevit x Trainer x Ecaterina	1.80	90.00	-0.20^{000}
Phenix x Trainer x Ecaterina	2.04	102.00	0.04**
Italpollina x Trainer x Ecaterina	1.93	96.50	-0.07^{000}
Orgevit x Trainer x Aurie de Bacău	1.80	90.00	-0.20^{000}
Phenix x Trainer x Aurie de Bacău	1.85	92.50	-0.15^{000}
Italpollina x Trainer x Aurie de Bacău	1.95	97.50	-0.05^{000}
Control (exp. average)	2.00	100.00	Mt

$LSD_{5\%}$ = 0.02 cm; $LSD_{1\%}$ = 0.03 cm; $LSD_{0.1\%}$ = 0.04 cm.

Based on comparative assessment of the combinations of trial factors we noted again very significant positive differences in common bean pod width (0.19-0.29 cm) in the Goldfield common bean cultivar fertilised supplementarily with Cropmax with the three basic fertilisations.

The quality of climbing common bean also depends on pod diameter.

From this perspective, we assessed the unilateral influence of supplementary fertilisation on common bean pod diameter. Trial results are shown in Table 9 below.

Table 9. Influence of supplementary fertilisation on climbing common bean pod diameter
(Didactic Base Timişoara, 2016-2017)

Supplementary fertilisation	Pod diameter (cm)	Relative values (%)	Difference / Significance
Cropmax	0.691	101.61	0.01***
Lithovit	0.670	98.52	-0.01^{000}
Trainer	0.677	99.55	-0.003^{000}
Control (average exp.)	0.680	100.00	0.00

$LSD_{5\%}$ = 0.001 cm; $LSD_{1\%}$ = 0.001 cm; $LSD_{0.1\%}$ = 0.001 cm.

Trial data shown in the table above show a very significant positive difference in pod diameter when using the foliar fertiliser Cropmax given its macro- and micro-element composition.

As in the morphological features analysed above, we assessed the unilateral influence of basic fertilisation on common bean pod diameter (Table 10).

Table 10. Influence of basic fertilisation on climbing common bean pod diameter
(Didactic Base Timişoara, 2016-2017)

Basic fertilisation	Pod diameter (cm)	Relative values (%)	Difference / Significance
Orgevit	0.671	98.82	-0.008^{000}
Phenix	0.684	100.73	0.005***
Italpollina	0.683	100.58	0.004***
Control (average exp.)	0.679	100.00	0.00

$LSD_{5\%}$ = 0.001 cm; $LSD_{1\%}$ = 0.001 cm; $LSD_{0.1\%}$ = 0.001 cm.

Comparing the three basic fertilisations of climbing common bean cultivated in solaria. we can note the very significant positive differences when using Phenix and Italpollina.

A synthesis of trial results regarding the unilateral influence of climbing common bean cultivar on pod diameter is shown in Table 11 below.

Table 11. Influence of cultivar on climbing common bean pod diameter
(Didactic Base Timişoara, 2016-2017)

Cultivar	Pod diameter (cm)	Relative values (%)	Difference/Significance
Goldfield	0.717	105.50	0.03***
Ecaterina	0.699	102.90	0.01***
Aurie de Bacău	0.622	91.50	-0.06^{000}
Control (average exp.)	0.680	100.00	0.00

$LSD_{5\%}$ = 0.01 cm; $LSD_{1\%}$ = 0.01 cm; $LSD_{0.1\%}$ = 0.01 cm.

From the perspective of pod diameter, we noted the very significant positive differences in the common bean cultivars Goldfield and Ecaterina.

Trial results regarding the interdependence between treated soil and common bean cultivar on the diameter of common bean pods are shown in Table 12 below.

Table 12. Interdependence of the combination basic fertilisation x supplementary fertilisation x cultivar on climbing common bean pod diameter (Didactic Base Timişoara, 2016-2017)

Factor combination	Pod diameter (cm)	Relative values (%)	Difference/Significance
Orgevit x Cropmax x Goldfield	0.709	103.65	0.025***
Phenix x Cropmax x Goldfield	0.724	105.84	0.040***
Italpollina x Cropmax x Goldfield	0.785	114.76	0.101***
Orgevit x Cropmax x Ecaterina	0.729	106.57	0.045***
Phenix x Cropmax x Ecaterina	0.735	107.45	0.051***
Italpollina x Cropmax x Ecaterina	0.695	101.60	0.011*
Orgevit x Cropmax x Aurie de Bacău	0.628	91.81	-0.056^{000}
Phenix x Cropmax x Aurie de Bacău	0.650	95.02	-0.034^{000}
Italpollina x Cropmax x Aurie de Bacău	0.641	93.71	-0.043^{000}
Orgevit x Lithovit x Goldfield	0.683	99.85	-0.001
Phenix x Lithovit x Goldfield	0.697	101.90	0.013*
Italpollina x Lithovit x Goldfield	0.749	109.50	0.065***
Orgevit x Lithovit x Ecaterina	0.712	104.09	0.028***
Phenix x Lithovit x Ecaterina	0.717	104.82	0.033***
Italpollina x Lithovit x Ecaterina	0.669	97.80	-0.015^{00}
Orgevit x Lithovit x Aurie de Bacău	0.610	89.18	-0.074^{000}
Phenix x Lithovit x Aurie de Bacău	0.629	91.95	-0.055^{000}
Italpollina x Lithovit x Aurie de Bacău	0.612	89.47	-0.072^{000}
Orgevit x Trainer x Goldfield	0.695	101.60	0.011
Phenix x Trainer x Goldfield	0.702	102.63	0.018***
Italpollina x Trainer x Goldfield	0.762	111.40	0.078***
Orgevit x Trainer x Ecaterina	0.716	104.67	0.032***
Phenix x Trainer x Ecaterina	0.712	104.09	0.028***
Italpollina x Trainer x Ecaterina	0.671	98.09	-0.013^{00}
Orgevit x Trainer x Aurie de Bacău	0.612	89.47	-0.072^{000}
Phenix x Trainer x Aurie de Bacău	0.630	92.10	-0.054^{000}
Italpollina x Trainer x Aurie de Bacău	0.616	90.05	-0.068^{000}
Control (average exp.)	0.684	100.00	Mt

$LSD_{5\%}$ = 0.01 cm; $LSD_{1\%}$ = 0.013 cm; $LSD_{0.1\%}$ = 0.015 cm.

As for the comparative analysis of the combination of trial factors, we can say here are very significant positive differences in pod diameter in the common bean cultivar Goldfield cultivated on a soil treated with Italpollina and treated with foliar fertilisers.

CONCLUSIONS

Based on trial results in the three climbing common bean cultivars cultivated in solaria with different basic and supplementary fertilisation, we can draw the following conclusions:

- Comparative assessment of the three climbing common bean cultivars from the perspective of the three morphological features points out the Goldfield common bean cultivar;
- Applying the product Phenix as basic fertiliser in climbing common bean cultivated in solaria has a very significant influence on the three morphological features under study;
- Common bean pod length and width are very significantly influenced by supplementary fertilisation with Cropmax on the three basic fertilisations;
- Climbing common bean pod diameter is very significantly influenced by the three foliar fertilisers (Cropmax, Trainer and Lithovit) on the soil with basic fertilisation (Italpollina);
- From the perspective of climbing common bean pod diameter, we noted the Ecaterina common bean cultivar with trial results close to those of Goldfield common bean cultivar;
- Ensuring optimum fertilisation rate with macro- and micro-elements during vegetation in climbing common bean cultivated in solaria influences morphological features and. Therefore, yielding capacity.

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