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ВЛИЯНИЕ НА СЪСТАВА НА СМЕСКАТА ВЪРХУ РЕПРОДУКТИВНИТЕ ПРОЯВИ НА ОРАНЖЕРИЙНИ ДОМАТИ

Костадин П. Костадинов,Стоян В. Филипов

Аграрен университет – Пловдив

Ключови думи:
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Резюме

За опредяне влиянието на изследваните субстрати върху генеративните прояви на растенията се заложи оранжериен опит с контейнерно отглеждане на домати, като се изпитаха следните варианти: 1. Лубмрикомпост30+Перлит70; 2. Лумбрикомпост40+ Перлит60; 3. Лумбрикомпост50+ Перлит50; 4. Лумбрикомпост60+ Перлит40. Установи се, че отделните фенофази настъпват най-рано при ЛК60+ Перлит40 и ЛК50+ Перлит50**,** поради по-добрата обезпеченост на растенията с хранителни вещества. Вариантите ЛК60+ Перлит40 и ЛК50+ Перлит50 формират най-голям брой цветове и плодове в I-во и II-ро съцветие и съответно имат най-голям биологичен потенциал за формиране на висок ран добив. Както при първо, така и при всички останали съцветия ЛК60+ Перлит40 и ЛК50+ Перлит50 имат най-висок процент на плодообразуване, а оттам и най-добри продуктивни възможности.

EFFECT OF COMPOSITION OF MIXTURE ON REPRODUCTIVE MANIFESTATIONS IN GREENHOUSE TOMATO

Kostadin P. Kostadinov, Stoyan V. Filipov

Department of Vegetable Growing, Agricultural University, Plovdiv, Bulgaria

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Abstract

Experiment in greenhouse conditions with tomato grown in containers are set in order to be determined the effect of the studied substrates on the generative manifestations of plants as the following variants are examined: 1. Lumbricompost30+Perlite70; 2. Lumbricompostт40+ Perlite60; 3. Lumbricompost50+ Perlite50; 4. Lumbricompost60+ Perlite40. It was established that the particular phenophases come at the earliest in LC60+ Perlite40 and LC50+ Perlite50**,** because of the better plant supplying with nutrients. The variants with LC60+ Perlite40 and LC50+ Perlite50 form the greatest flower and fruit number in I-st and II-nd fluorescence and the greatest biological potential for obtaining of high early yield, respectively. The highest percentage of fruit formation was read both in the first and the remaining inflorescences in LC60+ Perlite40 and LC50+ Perlite50 and therefore the best productive abilities.

INTRODUCTION

The small size of the main part of the farms for vegetable production in Bulgaria and extensive production in them are part of the reasons for poor economic results (Todorova and Lulcheva, 2005). The biological production is a possibility for improvement of the effectiveness in that subsector (Pochaleev and Todorova, 2009).

There are great traditions and a rich experience is accumulated in tomato growing in our country that is a prerequisite for applying of biological production. Tomato biological production is an object of a range of studies as different biological products are used (Gravel at. all., 2012; Cruz-Lázaro at. all., 2010; Reinaldo at al., 2008; Boteva and Petkova, 2007; Surrage at al., 2010).

Tomato container growing is one of the technological solutions for bioproduction of greenhouse tomato. Different substrates with natural origin could be used in this method of production as components and one of them is the Lumbricompost (Tringovska, 2005).

The effect of nutrition on the reproductive manifestations of tomato has been also studied by other researchers (Mitova at. all, 2009). The effect of Lumbricopmoston as a component of the mixture on the growth, development and generative manifestations of greenhouse tomato in container growing is not clearly expressed.

Experiment in greenhouse conditions is set for determination of the effect of the substrate with different proportion of Lumbricompost.

The purpose of the present study is the show the effect of the mixture with Lumbricompost on the generative manifestations

MATERIAL AND METHODS

The experimental work was conducted in greenhouses at the experimental field of the Agricultural University – Plovdiv with indeterminate tomato variety Fado F_1. The plants were planted in 15 liter containers with 12 liter mixture and they were grown by the technology of late production. It was used drip irrigation system. Biological plant protection products were used. The following treatments were studied: 1. $Lumbricompost_{30}$ + $Perlite_{70}$; 2. $Lumbricompost_{40}$ + $Perlite_{60}$; 3. $Lumbricompost_{50}$ + $Perlite_{50}$; 4. $Lumbricompost_{60}$ + $Perlite_{40}$.

Plants were grown from seedlings in heated greenhouse with term of sowing in the first ten days of January and planting in the third ten days of March. The pot experiment was set in 4 replications with 5 plants in each one. The planting scheme was: 40+90+60+90+40/42.5 cm при 2800 plants/da and 3400 cm^2 nutrient area per plant. The plants were with one stem and the tops were thinned 50 days before the last harvesting.

Indexes of study:

2. Agrochemical analysis of the substrate – substrate samples were taken before setting of the experiment. It was determined the ammonium and nitrate from of nitrogen – by distillation; absorbed P_2O_5 – colorimatrically; absorbed K_2O – flame photo-metrically, pH and salt concentration - EC / µS/cm/.

RESULTS AND DISCUSION

In 2012 and 2013 prerequisite that are favourable for the generative manifestations of the plants are created by the fact that the whole potential vegetation period from April to June is hot and the air humidity varies in the optimal limits (50-70 %) for blossoming and fertilization.

The results from the phenological observations in the two years of study demonstrate that the start of particular phenophases is in similar terms (Table 2). The blossoming has occurred 2-3 days earlier in 2013 compared to 2012. Identical tendency is also observed for other indexes – fruit formation and fruitage as the differences are 2-5 days, respectively in second and 4-6 days in third index in favour of 2013.

General tendency is marked in starting of the corresponding phenophases in the variants that are set. The earliest blossoming (initial and mass) is observed in variant with LC_{60}+ $Perlite_{40}$ and LC_{50} + $Perlite_{50}$, 3 and 2 days towards the control, respectively. This tendency is kept in fruit formation. The strongest expressed is observed during fruitage.

The nutrition is a basic factor that exerts an influence on the dynamics of the blossoming and fruit formation in the greenhouse tomato. The effect of mixture on the reproductive manifestations of greenhouse tomato was established in the present study.

The economic effectiveness of this production depends in a great degree on the early yield which forming is concern with blossom and fruit formation and the percentage of fruit formation in I-st and II-nd inflorescence because of the higher prices of early produce (Table 3).

Table 1

Agrochemical analysis of substrate

Treatment	pH (KCl)	N_NH_4, mg/1000g	N_NO3, mg/1000g	общ N mg/1000g	P_2O_5, mg/100g	K_2O, mg/100g	Ca+Mg, meq/100g
1.LC_{30}+Perlite$_{70}$	6.80	28.87	715.86	744.72	992.02	511.50	23.13
2.LC_{40}+ Perlite$_{60}$	6.70	40.41	762.04	802.45	976.07	1067.50	23.38
3.LC_{50}+ Perlite$_{50}$	6.70	40.41	1033.37	1073.79	1116.73	1178.90	24.88
4.LC_{60}+ Perlite$_{40}$	6.80	57.73	1004.51	1062.24	1174.74	1508.90	22.14
LC_{100}	6.70	51.96	941.01	992.96	1203.74	1494.20	32.84

Table 2

Phenology of tomato – pot experiment 2012 - 2013 г

Phenophase / Tretment	Blossoming				Fruit formation				Fruitage				End of vegetation	
	start		total		start		total		start		total			
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
1.LC_{30}+Perlite$_{70}$	10.04	7.04	17.04	15.04	21.04	16.04	29.04	24.04	18.05	14.05	20.06	14.06	30.07	30.07
2.LC_{40}+ Perlite$_{60}$	9.04	7.04	17.04	12.04	20.04	16.04	28.04	24.04	17.05	10.05	19.06	11.06	30.07	30.07
3.LC_{50}+ Perlite$_{50}$	7.04	5.04	15.04	10.04	28.04	15.04	25.04	22.04	14.05	8.05	29.06	11.06	30.07	30.07
4.LC_{60}+ Perlite$_{40}$	7.04	4.04	14.04	10.04	17.04	15.04	24.04	22.04	12.05	8.05	17.06	10.06	30.07	30.07

Table 3

Genetarive manifestations – first and second inflorescence, 2012 – 2013 r.

Index	Blossoms				Fruits				Fruit formation, %	
	2012		2013		2012		2013			
	Number	% to K	Number	% to K	Number	% to K	Number	% to K	2012	2013
Treatment	I-st inflorescence									
1.LC_{30}+$Perlite_{70}$	4.43	100.00	4.38	100.00	3.52	100.00	3.18	114.01	82.51	72.59
2.LC_{40}+ $Perlite_{60}$	5.24	118.28	4.53	103.49	3.83	108.81	3.43	123.03	83.02	75.69
3.LC_{50}+ $Perlite_{50}$	6.10	137.70	5.94	135.74	5.15	146.31	5.11	183.33	84.43	85.99
4.LC_{60}+ $Perlite_{40}$	6.15	138.83	6.31	144.07	6.22	176.70	5.46	195.95	86.99	86.59
	II-nd inflorescence									
1.LC_{30}+$Perlite_{70}$	5.18	100.00	5.24	100.00	4.23	100.00	4.24	96.50	81.65	80.85
2.LC_{40}+ $Perlite_{60}$	5.36	103.47	5.48	104.50	4.43	109.68	4.48	101.97	82.65	81.76
3.LC_{50}+ $Perlite_{50}$	6.50	125.48	6.64	126.73	5.42	122.58	5.45	124.05	83.38	82.02
4.LC_{60}+$Perlite_{40}$	7.12	137.45	7.21	137.45	5.99	134.79	5.98	136.13	84.13	82.98

Table 4

Percentage of fruit formation per plant till forming of 5 inflorescences, 2012 – 2013 г.

Index / Treatment	Blossoms				Fruits				Fruit formation, %	
	2012		2013		2012		2013			
	Number	% to K	Number	% to K	Number	% to K	Number	% to K	2012	2013
1.LC_{30}+$Perlite_{70}$	24.7	100.00	25.00	100.00	20.56	100.00	20.04	100.00	83.24	80.13
2.LC_{40}+ $Perilte_{60}$	26.12	105.75	26.44	105.75	21.84	106.23	22.33	111.43	83.61	84.44
3.LC_{50}+ $Perlite_{50}$	27.45	111.13	28.06	112.23	23.56	114.59	23.21	115.85	85.83	82.72
4.LC_{60}+ $Perlite_{40}$	29.15	118.02	29.72	118.86	25.54	124.22	25.85	129.03	87.62	86.99

The daily temperatures in the greenhouses in April 2012 have been with optimal and close to optimal values for crop development (26-28^{o}C). In 2012 the greatest blossom number was observed in Ist inflorescence in plant grown in mixture LC_{50}+ $Perlite_{50}$ and LC_{60} + $Perlite_{40}$ - 6.10 and 6.15 blossoms as the exceeding towards the control was 37.70 and 38.83 %, respectively. They were followed by the plants grown in LC_{40} + $Perlite_{60}$ - 5.24 blossom number that is 18.28 % exceeding towards the control. Blossoms formed in control plants were 4.43.

The similar tendency is observed regarding the number of the formed fruits as in LC_{60} + $Perlite_{40}$ the value of this character is with 76.70 % higher towards the control (LC_{30} + $Perlite_{70}$).

Particular mixtures exert different influence on the percentage of fruit formation. This depends on different supplying of nutritional substances and different ability for retentive of different mixtures.

The values of the percentage of fruit formation are the highest in the first inflorescence (86.99 %) when LC_{60} + $Perlite_{40}$ is used followed by LC_{50} + $Perlite_{50}$ (84.43 %). The lowest values regarding this character are the plants grown on LC_{30} + $Perlite_{70}$ (82.51 %).

The mixtures containing LC_{50} + $Perlite_{50}$ and LC_{60}+ $Perlite_{40}$ give the best results for the reproductive manifestations in the first inflorescence that makes them the most suitable for obtaining of early produce.

The fruit formation and the percentage of the fruit formation in the second inflorescence are important in obtaining of early yields. The number of the formed fruits in the second inflorescence id the highest in LC_{60} + $Perlite_{40}$ - 5.99 as the exceeding towards the control is 34.79 %. The percentage of fruit formation in the second inflorescence varies from 80.85 % in the control to 84.13 % in LC_{60} + $Perlite_{40}$.

In the beginning of Mai was observed gradually increase of daily temperatures over 35^{o}C that reflects on an increase of external temperatures. Daily temperatures from the end of May to July are mainly within 37 and 43^{o}C. Very high values of the temperatures are recorded in individual days as on Mai the 21st is read 48^{o}C, and on June the 6th the daily temperature reaches the extreme 50^{o}C. The substrate moisture is in optimal limits form plant development - 65-85 %, but any differences are observed between the particular variants. The highest humidity is recorded after growing of plants in mixture containing LC_{60} + $Perlite_{40}$ 70-85 % that could be explained with higher percentage of lumbricompost being with greater retentive ability compared to the perlite. The lowest humidity is observed in the substrate LC_{30} + $Perlite_{70}$ - 65-75 %, because of the fact that in this variant the Lumbricompost is the the lowest content and the agroperlite predominates being with lower retentive ability. In this conditions the percentage of fruit formation up to vegetative top thinning is the highest in LC_{60} + $Perlite_{40}$ and LC_{50} + $Perlite_{50}$ - 87.62 % and 85.83 %, respectively (Table 4). These variants exceed the variant with LC_{40} + $Perlite_{60}$ where the value of this character is 85.83 %.

The growing of plants in mixtures containing LC_{60} + $Perlite_{40}$ and LC_{50} + $Perlite_{50}$ cause formation of the greatest fruit number resulting in higher early and total yield.

In 2013 the potential of high early yield formation keeps the greatest in LC_{60} + $Perlite_{40}$ and LC_{50} + $Perlite_{50}$ which exceed the control in fruit number with 95.55 and 83.33 % in first and with 86.99 and 84.43 % in second inflorescence, respectively.

The variants LC_{60} + $Perlite_{40}$ and LC_{50} + $Perlite_{50}$ are with higher percentage of fruit formation compared to the control in all inflorescences.

CONCLUSIONS

The particular phenophases come the most early in LC_{60}+ $Perlite_{40}$ and LC_{50}+ $Perlite_{50}$, because of the better supplying of plants with nutritional substances.

The variants with LC_{60} + $Perlite_{40}$ and LC_{50} + $Perlite_{50}$ form the greatest blossom and fruit number in I-st and II-nd inflorescence and the greatest biological potential for formation of high early yield, respectively.

The highest potential of fruit formation in first and all remaining inflorescences and therefore the best productivity is observed in LC_{60} + $Perlite_{40}$ and LC_{50} + $Perlite_{50}$.

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