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INFLUENCE OF THE NURSERIES MIXTURE ON GROWTH AND DEVELOPMENT OF LETTUCE SEEDLINGS (*LACTUCA SATIVA* L.)

Stoyan FILIPOV[1], Kostadin KOSTADINOV[1], Toni SHOPOVA[2], Radi RADEV [2]

[1]Agricultural University of Plovdiv, 12 Mendeleev Blvd., Plovdiv, Bulgaria
[2]POLIMEX LTD, 128A Dimitar Petkov Blvd., Sofia, Bulgaria

Corresponding author email: stoyanf@abv.bg

Abstract

A greenhouse study was conducted to evaluate the effect of different seedling mixture on growth and development of lettuce transplants cv. Melvine for winter greenhouse production. As a main substrate of mixture was used peat – Dorpet. Three types of medium was an analyzed: Peat Perlite and pine shavings in the following combination: 1.Peet-100% (control); 2.Peet 88% + Perlite 12%; 3.Peet 80% + Perlite 10% + Pine shavings 10%; 4.Peet 70% + Perlite 10 % + Pine shavings 20%. Three readings were made in 7 days. On the 30th day of germination, the plants of all varieties are at same phase – second true leaf. In all indicators of the plant's organs and at the mass of whole plant with the highest values is the control. On the 37th day the tendency of first reading is retained, as the plants of four variants are in phase 3th true leaf. At the 44th day, the main trends and characteristics of the previous two are preserved. In conclusion, it can be said that the addition of pine sawdust influences the development but keeps the growth. At 10% addition of pine sawdust nurseries have similar characteristics to those of variant 2 with Peat 88% + Perlite 12%.

Key words*: salad, container production, substrates, seedlings, greenhouses.*

INTRODUCTION

Modern container production of vegetable nurseries is characterized by a high degree of mechanization and automation of technological processes.

The intensification of this particular greenhouse production area requires the use of appropriate and economically beneficial seed mixtures. Development and testing of such mixtures to ensure good growth and development of salad seedlings is the subject of a number of studies.

Mixes zeolite and pearlite salad mixture are studied by Güla at all (2005).

They find that zeolite increases the growth of nurseries and increases N and K.

Christoulakia at al (2014) reports that adding up to 25% sawdust in seedlings improves plant growth and increases greenhouse yields.

Another study states that the use of 25 to 50% compost of marrow + poultry manure instead of peat does not reduce the yield and nutritional value of the salad (Bustamantea at al 2008.).

In such a study, the effect of a mixture of compost from forest waste + porcine manure in the cultivation of salad seedlings on the productivity of the production crop (Ribeiro at all 2006) was followed.

Marques at all. (20014), carried out an experiment with different volumes of used compost mushroom (substrate) on the growth, development and quality of the head salad seedlings.

In a container cultivation seedlings of salad Silva. at all (2014) explore different components as additives to mixtures. The following additives have been tested: 1.pig bed base with wood chips; 2. bedding of straw of coffee straw; 3. Hummus from a earth worm.

Olso, object of research is carbonized rice huskswith different percentage of wisdom (Freitas, G.A at all 2013).

Studies on the new seed mixtures of salad are conducted by Costa K.D. at all (2012). Four mixtures have been studied; 1. K - Bioplant; 2. black soil + humus; 3. black soil + humus + coconut; 4. black soil + humus + coconuts + filtered sludge.

To improve the growth and development of salad seedlings Medeiros, D.C. de Freitas at all (2008) evaluate the impact of organic fertilizer as a supplement to the substrate.

Similar experiments are conducted by several other researchers: Lopes, J. L.W at al (2007). Nadia de Souza Bastos, Thamer Merizio, Fábio Fernando de Araújo. (2011).

Research into the selection of new, economically viable and suitable for industrial seedlings in a salad has been carried out in many countries and the problem is up to date.
Developing and testing economically viable and ensuring good growth and development of salad plantings seedlings is the subject of this development.

MATERIALS AND METHODS

1. Establishment of experience and study materials.
The experiment was carried out during the period 2014-2015 in the production base of Polimex OOD - Sofia, Plovdiv Branch in a heated steel-glass greenhouse. The greenhouse is oriented along its long north-south direction. For seedlings cultivation, seeds of the direct Melvine variety of Claus were used.
To determine the impact of the seedlings on plant growths, four variants with different composition of the mixture were tested. The main substrate for preparation is DURPETA peat with the following main characteristics: 250 mg / l nitrogen; 250 mg / l phosphorus; 270 mg / l of potassium and 1.2 mg / l of trace elements Fe, Cu, Mn, Mo, Bu, Zn. Saline concentration 1.2 μS and pH 6.5-7 (Table 1).

Table. 1. Chemical composition of seedling substrates

Variant	pH (H_2O)	P_2O_5 mg/kg	K_2O mg/kg	CaO mg/kg	MgO mg/kg	Na_2O mg/kg	S mg/kg	N total%	C organic %	C/N
1	6.17	560.07	869.16	17583.80	1390.65	352.88	472.35	0.88	44.12	50.14
2	6.01	541.79	753.44	16212.11	1311.77	263.18	373.81	0.81	40.76	50.32
3	6.26	413.29	775.72	12766.75	906.10	155.50	365.92	0.72	41.41	57.51
4	6.28	312.34	722.89	11086.44	1074.88	140.33	341.56	0.64	42.69	66.70
Pine bark pulp	5.28	9.41	904.78	1086.89	223.27	62.87	4.82	0.06	48.23	803.83

The following options have been studied:
1. Peat - 100% - control;
2. Peat 88.24% + perlite 11.76%;
3. Peat 79.85% + Perlite 10.52% + Pine sawdust 10.53%;
4. Peat 71,43% + perlite 9,52% + pine shavings 19,05%.
The seeds were sown on 01.11. in styrofoam 228-cell trays, based on the standard technology of Polimex for seedlings growing. The seeds seedlings were placed for 48 hours in a germination chamber having a constant temperature of 15-16 ° C and air circulation. After this period before the beginning of the sprouting process, the trays were sputtered in special compartments of the steel-glass greenhouse - covice (small warmth-type tunnels) with a daily temperature of 16-20 ° C. Each variant was set in four replications of 228 seeds, respectively four styrofoam trays.

2. Indicators and methods of the study.
2.1. Meteorological observations.
Daily from 03.11.to 17.12. at 8.30 and 14.30 hours the air temperature was recorded; substrate temperature; RH of air and solar radiation (Table 2).

Table 2.Mainagro-climatic indicators for the region of Plovdiv, adopted for climatic norm

Year	I	II	III	IV	V	VI	VII	VIII	IX
Avg. month. (t 0C)	-0,4	2,2	6,0	12,2	17,2	20,9	23,2	22,7	18,3
Precipitation (mm)	42	32	38	45	65	63	49	31	35

The temperature and RH were recorded with sensors in the steel-glass greenhouse, and the solar radiation with the Digital lux meter.

2.2. Biometric metrics.
In order to determine the growths of the nursery plants, the biometric measurements of 12 pcs. plants of each variant of 3 pcs. by repetition.
The biometry was done three times. The first measurement was performed on day 30 post-emergence and the next at seven days (37th and 44th day of germination) respectively.

Indicators were determined:
- Fresh whole plant mass - (g);
- The fresh mass of the leaf rosette - (g);
- Leaves:
  - number,
  - Width - L (mm),
  - length - H (mm);
- Rootsystem
  - Mass - (g);
  - Volume - (cm^3).
- Diameter of the stem - D (mm).

2.3. Agrometeorological conditions.

The average daily solar radiation for the Plovdiv regionis 1326 and 1513 KWh / m^2, respectively, at a horizontal surface and at a noptimum slope.

Analysis of daily agrometeorological data for the 2014/2015 period is presented inTable. 3.

Table 3. Climate characteristic for the 2014/2015 experimental period

Months	Meteorological Indicators 2014-2015				
	Average 24-hour temperature, °C	Average maximum temperature, °C	Average minimum temperature, °C	Relative humidity,%	Rainfall, mm
XI 2014	7.9	11.1	5.6	85	49.5
XII 2014	5.1	8.9	2.0	82	93.0
I 2015	3.1	8.3	-1.3	77	17.4
II 2015	3.7	8.6	-0.7	77	76.6
III 2015	6.7	11.7	3.4	76	138.0

RESULTS AND DISCUSSIONS

As a result of thestudy, it was found that at day 30 post-emergence, stronger growth induced the mixture with 100% peat (control) (Table 4).

The formed seedlings have higher values for stem thickness, leaf width and length, and also for the freshmass of the leaf rosette.

The values for the sevalues are the lowest for lime. 4, the differences being statistically proven.

Table 4. Vegetativemanifestations of thesaladplantsonthe 30th dayaftergermination - averagefortheperiod

Variant	Diameter of the stem		Leaves			A fresh mass of leaf rosette		Root system			A fresh mass of a whole plant	
	mm	%	number	weight (mm)	length (mm)	(g)	%	weight (g)	%	volume (cm^3)	(g)	%
1(к)	1.24	100.0	2	13.5	30.1	0.279	100.0	0.037	100.0	0.025	0.327	100.0
2	0.99	79.8	2	13.3	28.4	0.258	92.5	0.041	110.8	0.025	0.306	93.6
3	0.99	79.8	2	11.1	25.0	0.241	86.4	0.055	148.6	0.05	0.303	92.7
4	0.88	71.0	2	12.9	22.1	0.213	76.3	0.037	100.0	0.025	0.265	81.0
GD 5%	0.43					0.06		0.011			0.06	
GD 1.0%	0.67					0.09		0.018			0.09	
GD 0.1 %	0.93					0.13		0.021			0.14	

Despite the stronger stimulating effect of seedlings in control variant 1 over the organs above the roo tsystem, it is weaker. Highest values were reported for Option 2 with a 48% excess over the control followed by Option 3 with an excess of 10.8%.

Lower values reported in theVariant 1 control with respect to root indicators do not have a negative effect on the fresh mass of the whole plant. The highest value for this indicator for Option 1 (K) is 0.327g. In option 4, the highest percentage of sawdust recorded the lowest value. 0.26g.

Our results correlate with those obtained from Christaulakia at al. (2014).

They highlight the good effect of adding sawdust to a salad planting seedling.

As a summary, it can be noted that with the increase in the percentage of sawdust the values of most measured indicators decrease, except for the characteristics of the rootsystem.

On the 37th day, the measurements showed a retention of the indicated trend from day 30. The 100% fertilizer variant produces higher growth of the organs above ground (Table 5).

The stem diameter, width and length of the leaves, the fresh root mass of the leaves and the fresh weight of the whole plant have the highest values forVariant 1 (K).

Table 5.Vegetativemanifestations of thesaladplantsonthe 37th dayaftergermination - averagefortheperiod

Variant	Diameter of the stem, mm		Leaves			A fresh mass of leaf rosette		Root system			A fresh mass of a whole plant	
	cm	number	number	weight (mm)	length (mm)	weight (g)	%	weight (g)	%	volume (cm^3)	weight (g)	%
1(к)	1.38	100.0	3	21.5	42.5	0.545	100.0	0.113	100.0	0.2	0.678	100,0
2	1.30	94.2	3	20.1	41.3	0.535	98.2	0.122	108.0	0.2	0.657	96,9
3	1.33	96.4	3	19.9	39.5	0.468	85.9	0.106	93.8	0.2	0.574	84,7
4	1.15	83.3	3	16.9	34.6	0.413	75.8	0.098	86.7	0.2	0.512	75,5
GD 5%	0.21					0.10		0.02			0.11	
GD 1.0%	0.33					0.14		0.03			0.16	
GD 0.1%	0.53					0.21		0.05			0.24	

It can be noted that the number of leaves and the volume of the root system in all variants is the same - 3 pcs. Leaves and 0.2 cm3 root. With regard to root mass, the dominant position of Option 2 is retained, with an 8% over-control, the difference being statistically proven.

At the last day of the 44th day, all variants were compared to most indicators (Table 6). Differences in stem diameter are insignificant, with minimal over-control (Option 1), although statistically unproven in Option 3. With the fresh mass of the leaf rosette and the fresh mass of the whole plant, the control significantly out performs the other variants.

The results obtained in the scoring report are consistent with the good effect of adding carrageenated rice flakes as a percentage of 6 to 50 Freitas, G.A. at al (2013).They report that alternative substrates provide salad mixtures with excellent quality compared to more expensive substrates such as Plantmax.

Table 6. Vegetativemanifestations of saladplantsonthe 44th dayaftergermination- averagefortheperiod

Variant	Diameter of the stem, mm		Leaves			A fresh mass of leaf rosette		Root system		A fresh mass of a whole plant	
	cm	%	number	weight (mm)	length (mm)	(g)	%	weight (mm)	%	weight (g)	%
1(к)	1.44	100.0	4	23.1	53	0.709	100.0	0.131	100.0	0.841	100.0
2	1.39	96.5	4	23	46.5	0.614	86.6	0.138	105.3	0.751	89.3
3	1.45	100.7	4	21.1	41.1	0.541	76.3	0.127	97.0	0.67	79.7
4	1.33	92.4	4	16.5	30.6	0.440	62.1	0.122	93.1	0.564	67.1
GD 5%	0.17					0.13		0.03		0.31	
GD 1.0%	0.29					0.19		0.05		0.43	
GD 0.1%	0.42					0.29		0.08		0.64	

Despite the lower values of the studied variants: 2, 3 and 4, at leaf width and length, the number of leaves in all is kept the same, respectively 4 pcs.

In the root system in terms of mass, it retained its leadership position also in the third reporting Option 2, exceeding the control by 105.3%.

CONCLUSIONS

The plants grown in the studied blends with varying percentages of wood coniferous sawdust show good biological potential for achieving high yield, with their biometric indicators approaching the control variant.

The nearest values are plants grown in peat mixture 88.24% + pearlite 11.76% and in peat mixture 79.85% + pearlite 10.52% + pine wood 10.54%.

In the finished planting seedlings at the end of the reporting period on the 44th day after the germination, they exceeded the diameter control of the stem by 100.7% and the root system mass 105.3%.

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