

Study on quality of oriental tobacco seedling, grown in float tray system in depend of different volume of substrat`s cells

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Citation

Kochev, H., Bozukov, H., & Kasheva, M. (2020). Study on quality of oriental tobacco seedling, grown in float tray system in depend of different volume of substrat`s cells. *Rastenievadni nauku*, 57(6) 62-65

Abstract

Tobacco is an economically important crop in Bulgaria. To improve tobacco production is necessary good agricultural practice, which also involves the implementation of new technologies for production of tobacco. The modern method of float tray (float system) is responsible for this requirement - healthy seedlings suitable, aligned in height. This technology was developed for use in large-leaf tobacco - Virginia, Burley. These tobaccos have relatively low density in the field – 20 000-25 000 plants / ha. In recent years, there is increasing interest in this technology from growers of oriental tobacco, since its field density is up to 120 000 plants / ha. This density at current volumes of substrate cells requires significant areas with float trays. Quality seedlings should be of optimum dimensions: length of stem 14 - 15 cm and a thickness of 4.5 -5.5 mm.

The aim of the study was the quality of the seedlings of Oriental tobacco, grown in a water bed in the different volumes of cell substrate

Key words: tobacco seedlings, float tray, float system, oriental tobacco seedling

INTRODUCTION

Tobacco is one of the important agricultural crops in Bulgaria. A defining condition for the production of high quality tobacco is the producers using good quality healthy seedlings. High quality seedlings have the following optimum characteristics: stem length of 14 – 15 cm and thickness of 4.5 - 5.5 mm without distortion and with good hardening (Dimitrov, et al., 2005).

Seedlings should be ready in time for transplanting; they should be free from disease or other damage and sufficiently resistant to endure the transplant shock. Successful production requires good quality of tobacco seedlings for the purpose of uniformity of morphological and biological characteristics of tobacco plants in the field. In general, early transplanted plants give more harvest than late transplanted tobacco (David et al., 2004; Kabranova, et al., 2012, 2017). In the vegetation period, lots of factors affect tobacco, allowing or preventing the

tobacco plant from achieving its biological or production potential.

There are different methods for the production of tobacco seedlings. The oldest one is seedling production on soil beds. However, this technology requires lots of manual labour and the quality of produced seedlings is strongly affected by meteorological conditions, pest attacks, fertilization and regular irrigation and this makes it necessary to use new, modern methods for growing tobacco seedlings (Bozukov, 2002, 2012).

The modern method for seedling production on float trays (float system) avoids such dependencies and meets the requirement – production of healthy seedlings of equal height that are suitable for mechanized transplanting (Hoyert, 1979).

Growing tobacco seedlings as hydroculture is a highly successful worldwide used method. The technology for production of tobacco seedlings as hydroculture (float trays) is relatively new. It was developed in the last two decades of the past cen-

tury. It is most used in the USA where tobacco areas reach about 90% of seedlings grown this way. The method is widely used in Brazil, India and lots of traditional producers of large-leaf tobacco in Europe.

Float tray system is a method for the production of seedlings meeting the above requirements. In this method, styrofoam trays with plants float on beds with feeding solution from the moment of seeding to transplanting under controlled conditions. It can be applied in greenhouses or outdoors.

In Bulgaria, this method of growing tobacco seedlings is mainly applied for large-leaf tobaccos (Virginia, Burley). There are many advantages of seedlings produced this way; the most important ones are – plant uniformity, intact root system, quick rooting in the field, higher yield (Bozukov & Kochev, 2014).

The technology was developed for large-leaf tobacco - Virginia and Burley (Pearce et al., 2008; Mundell et al., 2012). These tobaccos have relatively low sowing density – 20,000-25,000 plants/ha. The standardly used styrofoam trays have 250-300 cells /substrate cells/; 100 trays provide seedlings for planting an area of 1 ha. In recent years the interest of oriental tobacco producers in this technology has been increasing; for this tobacco type the number of plants on the field is about 120,000 plants/ha. Such density with the present volume of substrate cells require large areas for seedling production - 400-500 trays for planting an area of 1 ha. Reduction of substrate cell volume will allow the increase of substrate cells to 500 and seedlings for 1 ha will be provided by only 200 - 250 trays.

The purpose of the study is to examine the quality of oriental tobacco grown in float trays with reduced substrate cell volume and the possibility for industrial production of seedlings in float systems.

MATERIALS AND METHODS

The object of study are tobacco seedlings from the Bulgarian oriental tobacco variety Krumovgrad 58. Its seeds are granulated in the Tobacco and Tobacco Products Institute – Plovdiv /TTPI/.

As we had no trays with different number of substrate cells, for this experiment we used trays for seedlings of the Virginia variety with equal number of cells but with three different thicknesses (60 mm,

40 mm and 20 mm); this reduces their volume and they may be recalculated and converted into different number of cells per tray:

- With standard dimensions of 480 x 600 x 60 mm, volume of substrate cells of 17 cm³ and 288 cells in a tray;

- With dimensions of 480 x 600 x **40 mm** and volume of substrate cells of 14 cm³ (350 cells in a tray);

- With dimensions of 480 x 600 x **20 mm** and volume of substrate cells of 9.5 cm³ (515 cells in a tray);

The experiment was conducted in the vegetation house of TTPI.

As the technology required, two feedings were performed with doses smaller than the ones for large-leaf tobacco - of 100 ppm nitrogen (N) /80 % of the dose for Virginia tobacco/.

The seedlings were pruned 4 times (for large-leaf tobacco it may be up to 10 times). On the 48th day the seedlings were ready to be brought out to the field.

30 plants were separated from the ready seedlings for biometric data collection:

- total height
- number of leaves
- stem diameter
- raw and dry weight of plant and root

RESULTS AND DISCUSSION

Figure 1. presents the development of ready tobacco seedlings. It can be seen that with different volume of substrate cells, respectively number of cells per tray, the plants differ by habitus and condition of the root system.

The results from the biometric measurements are given in Table 1. As can be seen from the data in the table, the seedlings from substrate cells with volume of 9.3 cm³ have the best values, followed by the ones from volume of substrate cells of 17 cm³ and the worst values are for volume of substrate cells of 14 cm³. The values of raw and dry weight of the plants and their roots show that the plants from substrate cells with volume of 9.5 cm³ have the highest raw weight and the ones with cells with volume of 14 cm³ have the lowest.

The comparison of the raw weight of the roots of such plants shows that the plants grown in substrate

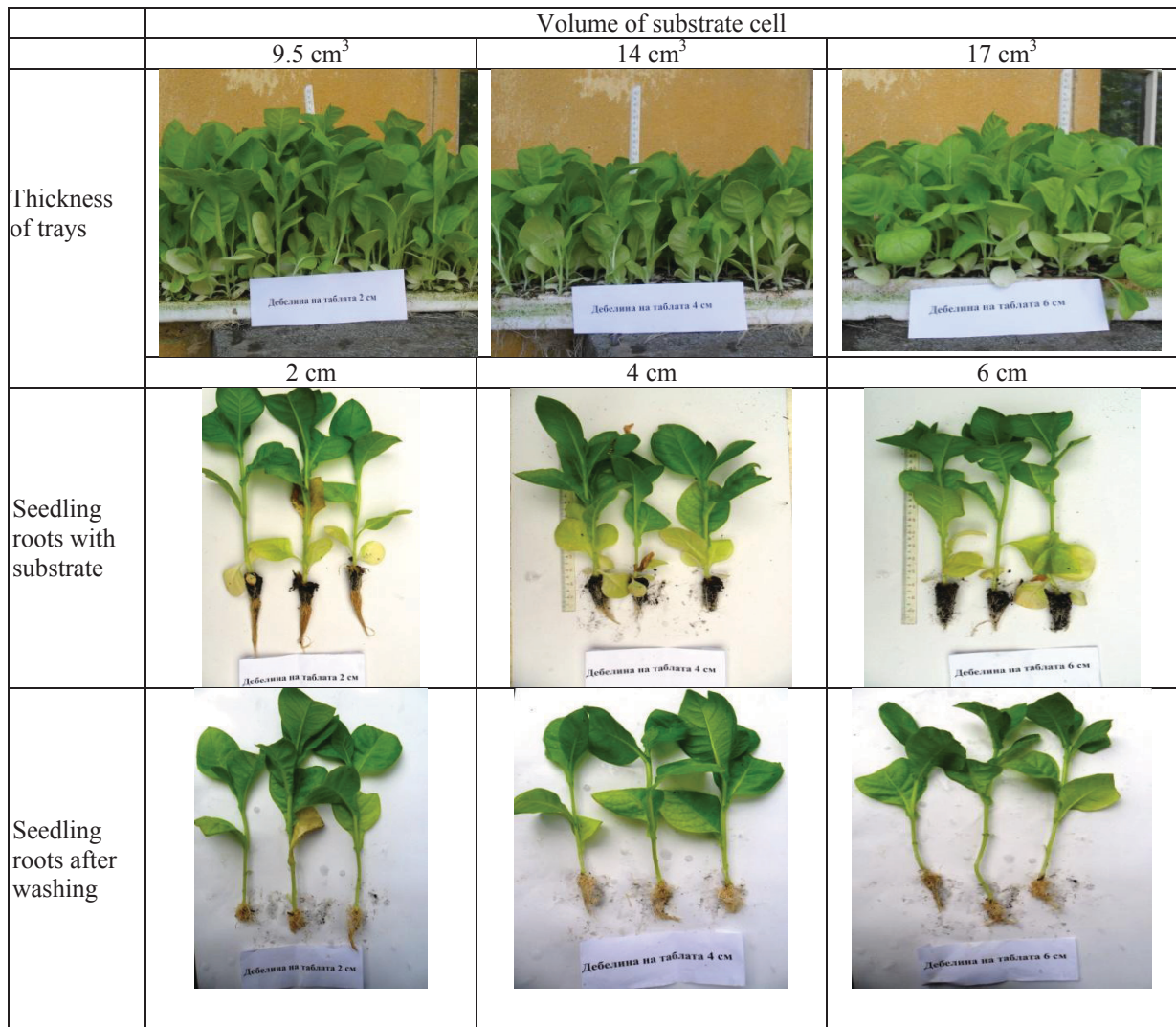


Figure 1. Development of ready tobacco seedling

Table 1. Biometric measurements of seedlings

Volume of substrate cells		Total height, mm	Number of leaves	Stem diameter, mm	Raw weight		Dry weight	
					Plant, g	Root, g	Plant, g	Root, g
9.5 cm ³	Average	188.000	4.900	4.750	6.745	0.776	0.551	0.072
	Standard deviation	17.192	0.876	0.755	1.541	0.305	0.201	0.020
	Confidence interval *	12.298	0.626	0.540	1.103	0.218	0.144	0.014
14 cm ³	Average	144.500	4.000	4.550	5.963	0.844	0.541	0.059
	Standard deviation	13.834	0.667	0.685	1.306	0.165	0.115	0.012
	Confidence interval *	9.896	0.477	0.490	0.934	0.118	0.082	0.008
17 cm ³	Average	186.500	4.700	4.650	6.601	0.856	0.559	0.065
	Standard deviation	16.675	0.483	0.530	0.702	0.219	0.104	0.015
	Confidence interval	11.929	0.346	0.379	0.502	0.157	0.074	0.011

* - Confidence interval at 95%

cells of 14 cm³ have the highest values and the lowest values are for cells with volume of 9.5 cm³.

The comparison of the dry weight of plants and their roots shows that the plants grown in cells with volume of 17 cm³, (or 288 cells in a tray) have the highest dry weight and the plants in cells with volume of 14 cm³ (or 350 cells in a tray) have the lowest weight. Roots of seedlings grown in cells with volume of 9.5 cm³ (or 515 cells in a table) have the highest dry weight.

The study results show that substrate cells with volume of 9.5 cm³ (or 515 cells in a tray) ensure the production of quality tobacco seedlings with equal characteristics, good biometric and physical values and this is a prerequisite for the successful cultivation of seedlings from oriental tobacco in float systems, with normal areas of cultivation facilities and reduced growing costs.

CONCLUSIONS

Growing tobacco seedlings from oriental tobacco is possible with reduction of the volume of substrate cells in containers /styrofoam trays/ thus increasing their number to 515 in a tray.

The most important problem with growing seedlings of oriental tobacco in float systems is solved, i.e. the need for a large area of cultivation facilities.

The seedlings from oriental tobacco produced this way are of good quality and uniform, with good biometric and physical values.

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