STUDIES ON THE IMPROVEMENT OF THE PLANTING PROCESS OF THE VEGETABLE SEEDLINGS IN LEGUME

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ABSTRACT

The objective of the study is to evaluate the comparative data on the mechanized planting works of seedlings, made with the rotating seed pot planter compared to the work done with the planer with flexible disc distributor. It was followed by the qualitative indices of the work, namely: the rows planted to be as straight as possible, the percentage of plants caught, the vertical fixation of the plants, the planting depth to be equal and constant, the distance between the plants to be uniform and constant, between rows to be equal.

As a result of the study, the increase of the qualitative indices of the work in the case of the rotary distributor with nutrient pots was found, compared to the planer with flexible disc distributor.

INTRODUCTION

The establishment of vegetable crops can be achieved by: sowing directly into the field (carrots, onions, tomatoes, peas, beans etc.), planting seedlings obtained by sowing in pots (tomatoes, eggplants, marshmallows etc) vegetative parts.

The proper choice of the method of setting depends on the species and crop system (in the field, in the solariums, greenhouses) (Ruxandra Ciofu, 2004).

Thus, for tomato cultivation, seedlings can be produced in heated greenhouses, warmed by hot soils. Sowing in greenhouses is done 45-60 days before planting, repel into 7 × 7 × 7 cm nutritional cubes, 20 to 30 days after sowing to be planted in the field after 30-40 days . Sowing can also be produced by sowing directly into nutritious pots without the need for reprocessing, planting is done directly in the field.

The preparation of planting seedlings consists in eliminating diseased, injured or poorly developed plants.

For planting, only well-developed seedlings are used to represent a good start for a strong and healthy plant. 4-7 days before planting a calcium fertilizer "start" fertilizer is recommended, which provides a reserve of mineral substances for the plant immediately after planting.

The phytosanitary treatments are applied the day before the planting date and watering until saturation is applied.

Planting in the field is done when the temperature in the soil at a depth of 10-15 cm stabilizes at 12 C^0. The distance between the rows can be 60 cm, 70 cm, 80 cm, and between plants the distance is 25 cm, 30 cm or 40 cm, achieving a density of 40,000 to 50,000 plants / ha. Planting can be done manually on small surfaces or mechanized using automatic planters (fig.

1) or semi-mechanized (fig. 2) for large areas.

The depth of planting is given by the shape and size of the nutrient pot.

Fig.1 Automatic planting machine

Fig 2 Semi-mechanical planting machine

MATERIAL AND METHOD

In the present study, two of the most used types of vegetable planting machines were selected for analysis:

- with section equipped with rotating bucket distributor;
- with flexible planting discs;

In addition to planters, they also used:

- nutritious pots;
- seedlings of peppers, tomatoes, eggplant.

The method used to carry out the studies is the one presented in the literature, respectively the published scientific articles (I. Saracin and colab 2014, 2016)

Mechanized planting of seedlings involves the following agrotechnical and technological requirements:

- planted roots to be straight, maximum deviations of 5% within 20 mm;
- the distance between rows is adjustable to allow for mechanization of maintenance and harvesting;
- the distance between plants should be continuously adjustable or in steps of 5 cm;
- the planting depth should be between 3 and 15 cm;
- the percentage of plants inappropriately seeded to be below 5% (Mushroom R., 2012)

In the experiment, a seedbed planter equipped with a rotary bucket distributor was used. (Fig. 3 - Segment for rotary bucket planter). It is worn on the three-point suspension mechanism of the 45-hp tractor and consists of: machine frame, drive wheel, transmission, boom support and two planting sections, rotating bucket distributor, compaction wheel, seat. The seedlings are removed from the stalks by pulling the stalk or pushing it from the bottom. The size of the nutrient cubes that can be used is up to 70 mm.

The operator inserts the seedlings into the rotor distributor cup of the planting plant and carries them into the open cogwheel ribbon, then is covered at the root and pressed.

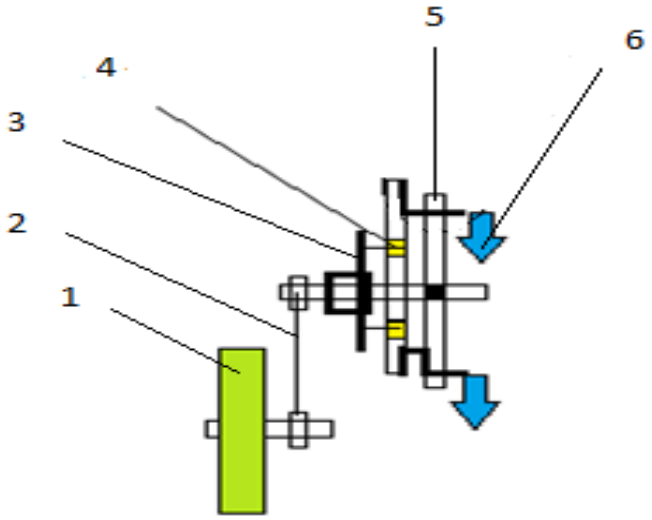

Fig.3 Section for planter with bucket rotary vane
1- the copying and driving wheel; 2 – chain transmission Gall;
3 – flange with rollers for adjusting eccentricity; 4 – eccentric wheel mounted
5- cup holder wheel; 6 - cups

The second machine used is the flexible disk planter (fig. 4). It is carried on the three-point suspension mechanism of the 45 HP tractors. This machine has a plantation section consisting mainly of: section frame, coulter, seat, chain drive, drive and compression wheels, flexible disc planter. The operator positions the stem seedlings between the flexible discs in the upright position with the tip down so that the seedling reaches 180^0 rotation ground with the pot in the ground in the open coulter bridges. By passing the compaction wheels, the nutrient pot is fixed in the soil.

Fig. 4. Planting machine with flexible discs

RESULTS AND DISCUSSIONS

The operating tests of the two types of seedlings were carried out in aggregate with the 45 HP vegetable tractor, under the same conditions, for different crops, on 100 m^2 square surfaces, with seedlings in nutritious pots, grade its development is presented in Table 1.

Table 1

Seedlings developing degree

Crt. No.	Seedlings	Dimensions of nutrient pot (mm)	Seedling developing degree		
			Height (mm)	Diameter of stem (mm)	No. of leaves (buc)
1	Tomatoes	70×70×70	100-150	6-8	4-6
2	Green pepper	70×70×70	100-150	4-6	3-5
3	Eggplants	70×70×70	100-150	5-6	3-5

The results of the experiments carried out with the rotary bucket planter and the planting machine with flexible planting discs are shown in Table 2 and Table 3.

Table 2

The distance between rows and between plants in a row, planting depth

Crt. No.	Seedlings	Between rows (cm)			Between plants in a row (cm)			Planting depth (cm)		
		Adjusted Value	Deviation (%)		Adjusted Value	Deviation(%)		Adjusted Value	Deviation(%)	
			Variant I	Variant II		Varianta I	Varianta II		Variant I	Variant II
1	Tomatoes	70	-1…2	-3…2	35	1…2,5	2,5…5,3	7	-1,2..+4	8,5…9
2	Green pepper	70	-0,5..1,5	-3,1..2,2	20	1,5…2,5	2,5…5,3	7	-1..+4,3	8,6..8,9
3	Eggplants	90	-0,5..1,6	-3…2.1	40	1,5…3	2,5…5,3	7	-0,7..+4	8,5..9

Variant I – planted with bucket planters
Variant II – planted with a planter with flexible discs

Table 3

Injured plants, vertebral deviations, inappropriate seedlings

Nr. No.	Seedlings	Injured plants			Deviations to vertical		Planting gaps	
			Percentage(%)		Percentage (%)		Percentage(%)	
		No. of seedlings planted	Variant I	Variant II	Variant I	Variant II	Variant I	Variant II
1	Tomatoes	400	0	3,2	0	9	0	5,2
2	Greed pepper	700	0	3	0	12	0	6,7
3	Eggplants	350	0	3,4	0	11	0	6,1

Variant I – planted with bucket planters
Variant II – planted with a planter with flexible discs

Based on the experiments and the results obtained, presented in Tables 2, 3, it can be seen that certain qualitative working indexes obtained with the seedbed plant equipped with a rotary bucket dispenser (variant I) are clearly superior to the quality indices determined for the machine planting seedlings equipped with a flexible disc section (variant II), except for the index referring to

the distance between plants per row where the values are close. The major differences are due to the constructive and functional differences between the two variants, as follows:

- the large deviations from the planting depth determined in variant II are mainly due to the positioning of the plant on the disc, positioning which largely depends on the size of the seedlings and the skill of the operator.

In case of variant I, the position of the seedling in the cup is the same regardless of the size of the seedling, it is supported by the nutrient pot on the end of the planting cup.

- the percentage of injured plants is higher in variant II due to the fact that the plant is caught by the stem and sometimes even by the leaves (for the shorter slopes) being subjected to a crushing in the area of the gripping by the discs.

In case of variant II the plant is free in the cup, the contact between the plant stem and the cup parts practically does not exist.

On the other hand, the vertical position of the plant in variant I, from positioning and its placing in the gutter, is due to the joint of the cup on the support which allows it to have a continuous vertical position;

- the higher percentage of gaps observed in planting in variant II is caused by the operator not feeding the transporter with seedlings. In case of variant I, the operator lets the plant fall simply into the cup.

The seedbed planter equipped with a rotary bucket distributor, variant I, has a much simpler construction which leads to less costly maintenance and a lower operating failure rate. Also, the position of the operator is vertical, thus more ergonomic, compared to the position of the seedbed planting machine equipped with a flexible planting section for planting,variant II, where the operator always moves towards the front leading to an increased fatigue.

CONCLUSIONS

The seedbed planter with rotary bucket distributor has developed qualitative work indexes that meet the agrotechnical requirements required by crop technology.

Flexible disk planters also comply with qualitative indices, but the working indices have significant deviations.

It may be advisable to use a rotary bucket planter with pots for planting seedlings in pots.

BIBLIOGRAPHY

1**. Ciofu R.**, 2004- *Tratat de legumicultură*, Ed. Ceres,București.

2. **Ciupercă R., Popa L., Eng. Lazăr G.Drăgan R. , Dos. Ph.D. Aliyev Ch.**,2012- *Comparative Study On Mechanized Process Of Planting Vegetable Seedlings*, Inmateh - Agricultural Engineering.

3. **I. Saracin, G. Paraschiv, Olimpia Pandia**, 2014- *Proposals for improving the process of seed distribution*, Metalurgija Journal Croatia Vol XV, nr 54/3.

4**. . I. Saracin, Olimpia Pandia**, 2016- *Section for machine of seedling plant in nutritive pots: precise, fast and secure*, Scientific Papers Series Management, ISSN 2284 – 795.

5*.* **I. Saracin, Olimpia Pandia, Marin Gh, Florea G**., 2007- *Energy base for agriculture, horticulture and foresty*, Ed. Aius, ISBN 978-606-8021-16-4.