

The Effect of the Pressure of the Pneumocylinder Pressure of the Plant Preparation Device on the Quality Indicators of the Biogumus Plant

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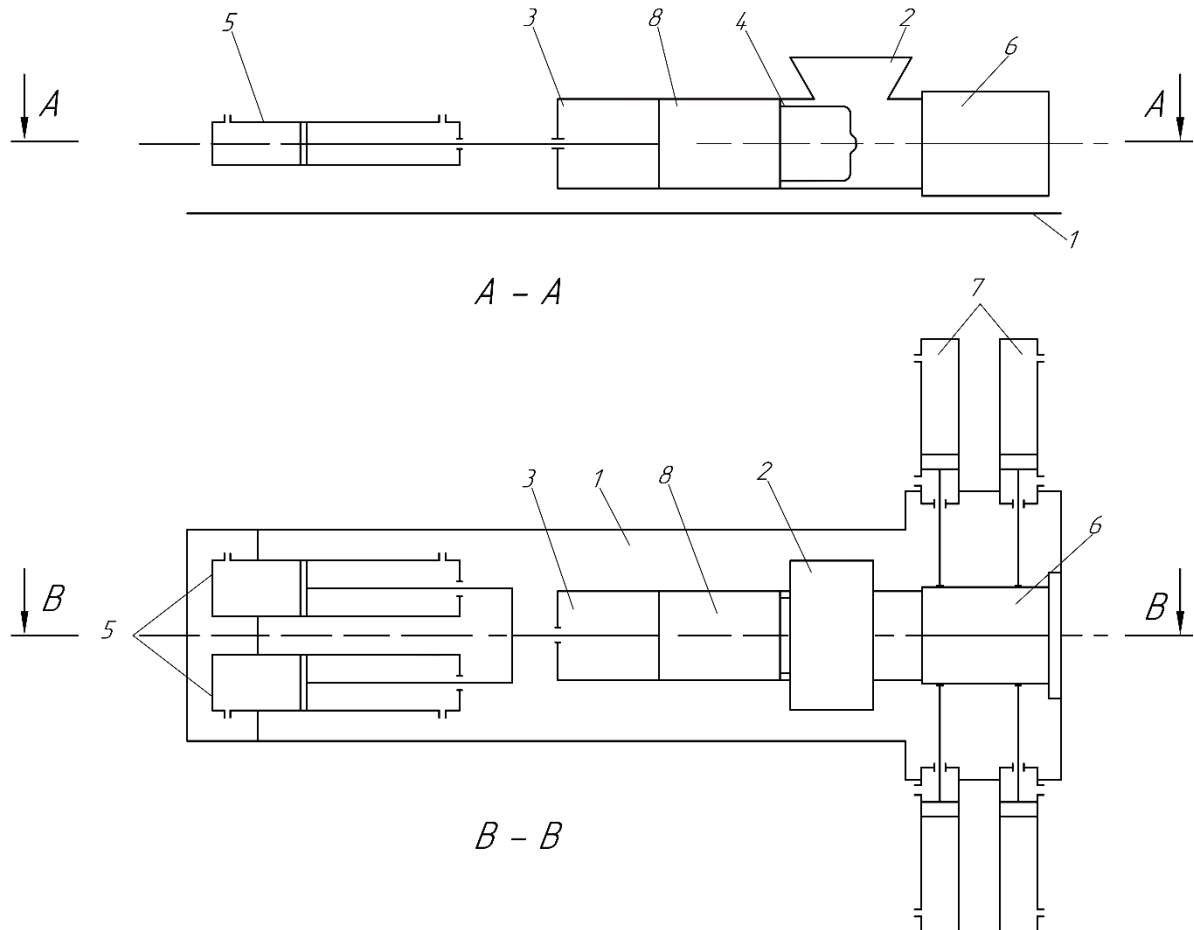
Abstract:

The article presents the results of an experimental study on the effect of the pressure applied to arc molds from pneumatic cylinders on the parameters of the quality of the seedlings, prepared graphical relationships and empirical formulas.

Keywords: Pot, biohumus, compacting piston, arched mold, damage, arched molds, density of pumice walls, strength, moisture, pressure, pneumocylinder, empirical formula.

Introduction. The device makes it possible to prepare pots for growing vegetable seedlings from soil and biohumus (organic fertilizer) from the biogas reactor. The technology of operation of the device for making pots from biohumus for growing seedlings is as follows. The biohumus and soil mixture (hereinafter referred to as biohumus) from the biogas plant is loaded into the biohumus compression cylinder 3 installed on the device frame 1 through the loading tank 2. Due to the advancing movement of the compacting piston 4, the product falling into the compacting cylinder 3 is delivered and compacted into arc-shaped molds 8 that form the shape of biohumus bags [1]. In this case, the bottom and wall of the holes are formed from biohumus in the space of 1 cm between

the arc-shaped mold 6 and the piston. The movement of the compacting piston 4 is provided by the pneumatic cylinders 5 installed on it, and the movement of the arc-shaped molds 6 forming the shape of the biohumus trays is provided by the pneumatic cylinders 7. Compressed air is supplied to pneumatic cylinders 5 and 7 by means of a compressor driven by an electric motor. The controller ensures simultaneous movement of the compacting piston 4 and the arc-shaped molds 6 that form the shape of the biohumus trays.



1 - frame, 2 - container for loading biohumus (organic fertilizer), 3 - biohumus compression cylinder, 4 - compacting piston, 5 - pneumatic cylinders moving the compacting piston, 6 - arc molds, 7 - pneumatic cylinders moving arc molds, 8 - protective plug

Figure 1. Constructive scheme of the device for making trays from biohumus

The protective plug 8 ensures that biohumus does not fall from the loading tank into the biohumus pressing cylinder when the compacting piston moves forward.

Methods. In experimental studies, experiments were conducted by increasing the pressure of the pneumocylinders of arc molds from 200 kPa to 500 kPa in every 100 kPa interval for the preparation of quality tubes. In this case, biohumus with 19 and 21% humidity was prepared for the preparation of pots. The pressure of the compression piston pneumocylinders was taken as 400 kPa.

In the study of the required pressure of pneumocylinders of arc-shaped molds, the main quality indicators were the amount of preparation of the mold, adhesion of the wall of the mold to the molds and their average square deviations, and damage during the fall of the mold.

The results obtained from the experiments are presented in Table 1 and Figures 1-5.

It can be seen from Table 1 that changing the pressure of the pneumatic cylinders of the molds from 200 kPa to 500 kPa led to a uniform increase in the amount of preparation and a decrease in its mean square deviation even at different moisture levels of biohumus. In this case, when the pressure of the pneumatic cylinders increased from 200 kPa to 500 kPa, the amount of preparation of the pot increased from 76% to 89% and from 78% to 93%, respectively, at 19 and 21% moisture content of biohumus, and its average square deviation was the same. Reduced from $\pm 4\%$ to $\pm 1\%$. This can be explained by the fact that the pneumocylinders cannot hold the molds in a closed position when the pressure is low when the biohumus-condensing piston between the arc-shaped molds gives the shape of a cup.

From the obtained results, it can be seen that when the pressure of pneumatic cylinders increases from 200 kPa to 400 kPa, the adhesion of the pot wall to molds at 19% humidity of biohumus decreases from 18% to 6%, and from 16% to 7% at 21% humidity, the pressure of pneumatic cylinders is 500 kPa and in the case of , the adhesion of the tube wall to the molds increased at different moisture levels, and when the pressure of the pneumatic cylinders increased from 200 kPa to 500 kPa, the mean square deviation was $\pm 3\%$ to $\pm 1\%$, corresponding to the moisture content of 19 and 21% of biohumus. was found to have decreased to

This can be explained by the fact that when processing biohumus, when the pressure is low, the compacting piston does not give the required amount of density to the wall of the container due to the fact that the pneumatic cylinders cannot keep the molds in a closed position.

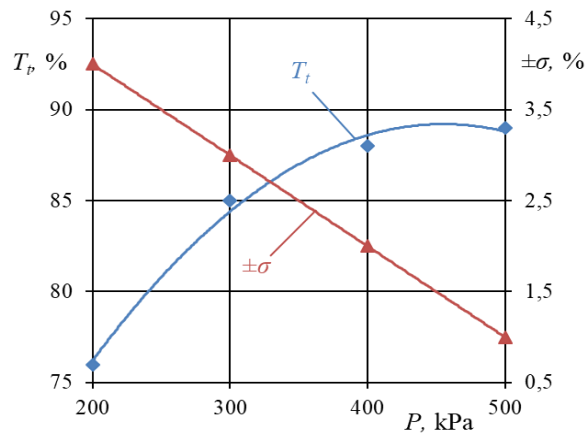
When the pressure of pneumocylinders increases from 200 kPa to 500 kPa, the damage of the cones in the drop is corresponding to the moisture content of 19 and 21% of biohumus.

Reduced from $\pm 21\%$ to $\pm 10\%$ and from $\pm 23\%$ to $\pm 8\%$.

This can be explained by the fact that the compaction piston does not give the required amount of density to the wall of the container due to the fact that the pneumocylinders cannot keep the molds in a closed position when the pressure is low, and the container's strength decreases.

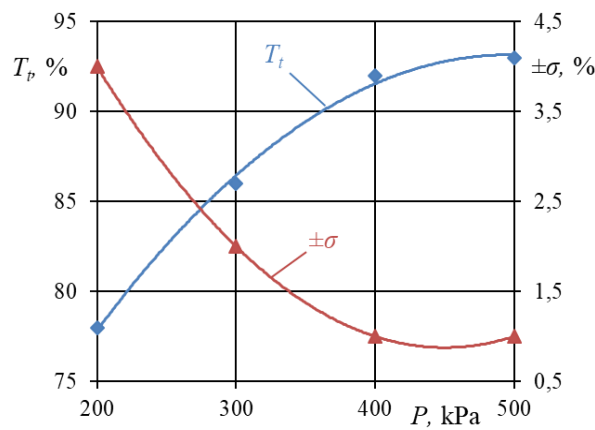
4.2-table. The effect of the pressure of the pneumocylinders of arc-shaped molds on the quality indicators of the biohumus layer

T/r	Name of indicators	Value of indicators							
		Pressurization of pneumocylinders of arc molds; P , kPa							
		200		300		400		500	
		Moisture content of biohumus, W %							
		19	21	19	21	19	21	19	21
1	The amount of pot's preparation								
	%								
	T_t	76	78	85	86	88	92	89	93
	$\pm\sigma$	4	4	3	2	2	1	1	1
2	Adhesion of the pot wall to the molds,%								
	T_{yo}	18	16	13	11	6	7	10	11
	$\pm\sigma$	3	3	3	2	2	2	1	1
3	Tuvakchanning tushishdagi shikastlanishi, $T_{t.sh}$ %	21	23	18	14	11	8	10	8



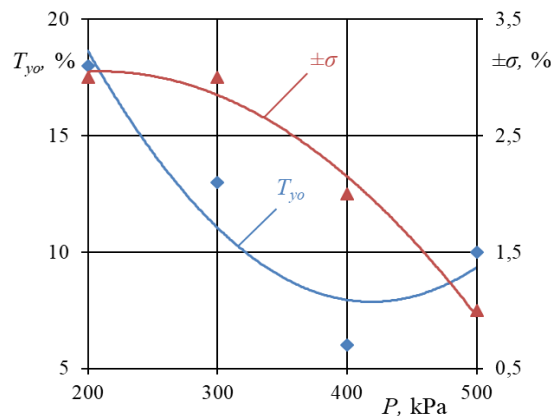
when the moisture content of biohumus is $W = 19\%$

Figure 4.11. The graph of the change of the amount of preparation (T_t) and its average square deviation ($\pm s$) depending on the pressure (P) of the pneumocylinders of arc-shaped molds



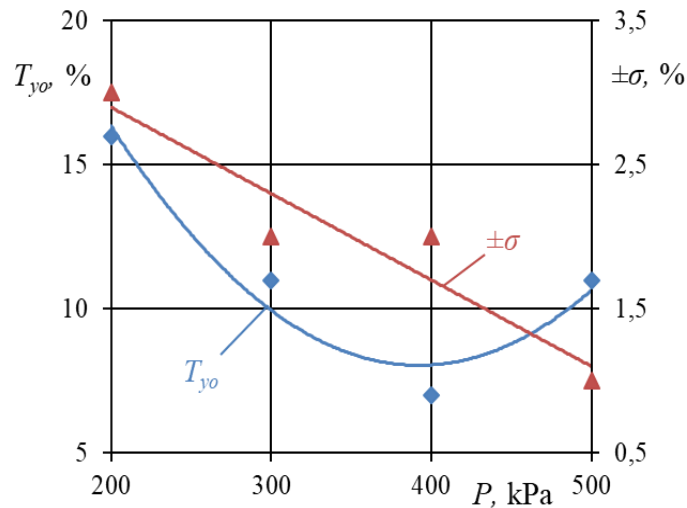
when the moisture content of biohumus is $W = 21\%$

Figure 4.12. The graph of the variation of the amount of mold preparation (T_t) and its mean square deviation ($\pm s$) depending on the pressure (P) of the pneumocylinders of arc molds



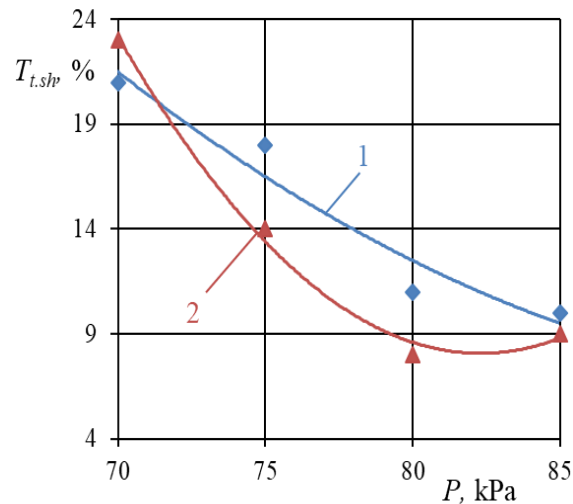
when the moisture content of biohumus is $W = 19\%$

Figure 4.13. The graph of changes in the adhesion of the pot wall to the molds (T_{yo}) and its mean square deviation ($\pm s$) depending on the pressure (P) of the pneumocylinders of the arc-shaped molds



when the moisture content of biohumus is $W = 21\%$

Figure 4.14. The graph of changes in the adhesion of the wall of the pot to the molds (T_{yo}) and its mean square deviation ($\pm\sigma$) depending on the pressure (P) of the pneumocylinders of the arc-shaped molds



when the moisture content of biohumus is 1 - $W = 19\%$;

2 - when $W = 21\%$

Figure 4.15. The graph of the change of the fall damage (T_{tsh}) of the tube depending on the pressure (P) of the pneumocylinders of the arc-shaped molds

4.13-4.17- graphic relationships [51]. can be expressed by the following empirical formulas

For Fig. 4.11

$$T_t = -0,0002P^2 + 0,182P + 47,8 \quad (R^2 = 0,9924) \% \quad (4.11)$$

$$\pm\sigma = -0,01P + 6 \quad (R^2 = 1) \% \quad (4.12)$$

For Fig. 4.12

$$T_t = -0,0002P^2 + 0,1735P + 50,15 \quad (R^2 = 0,9968) \% \quad (4.13)$$

$$\pm\sigma = 5E-05P^2 - 0,045P + 11 \quad (R^2 = 1) \% \quad (4.14)$$

For Fig. 4.13

$$T_{yo} = 0,0002P^2 - 0,1885P + 47,35 \quad (R^2 = 0,8899) \% \quad (4.15)$$

$$\pm\sigma = -3E-0,5P^2 + 0,0105P + 1,95 \quad (R^2 = 0,9818) \% \quad (4.16)$$

For Fig. 4.14

$$T_{yo} = 0,0002P^2 - 0,1765P + 42,65 \quad (R^2 = 0,9399) \% \quad (4.17)$$

$$\pm\sigma = -5E-20P^2 - 0,006P + 4,1 \quad (R^2 = 0,9) \% \quad (4.18)$$

For Fig. 4.15

When $W = 19 \%$:

$$T_{t,sh} = 0,02P^2 - 3,9P + 196,5 \quad (R^2 = 0,9419) \% \quad (4.19)$$

When $W = 21 \%$

$$T_{t,sh} = 0,1P^2 - 16,46P + 685,4 \quad (R^2 = 0,9943) \% \quad (4.20)$$

Results. According to the results of the pilot study, the pressure of pneumatic cylinders of arc molds was assumed to be 400 kPa. In this case, the production rate of the mold reached a high level, and the percentage of the wall of the mold sticking to the molds and the damage when the mold fell between the molds was relatively low.

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