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THEORETICAL SUBSTANTIATION OF THE PARAMETERS OF THE EARTH TEXLAICH WITH A SCREW WORKING BODY

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ABSTRACT

The results of theoretical analyzes on the basis of the parameters of the auger working bodies of the soil compactor are presented. The results of research on determining the performance of the leveler are given.

Keywords: auger rotary speed, coefficient of soil softening, bucket coverage, longitudinal distance between the leveler bucket and auger.

INTRODUCTION

The process of technological operation of a leveler equipped with an auger working body is as follows: the soil collected in the bucket of the leveler is pushed in a transverse direction using augers. In this case, the augers push the soil in different directions: one auger pushes the soil to the left of the bucket, and the other pushes it to the opposite side, i.e. to the right. As a result, the soil is evenly distributed over the coverage width of the bucket and has a positive effect on the level and quality of leveling of the plot. The rotation of the soil with the augers and the impact of the cut stalks and large pieces on each other ensures their crushing, improving the structural composition of the soil surface layer before planting and the formation of a soft layer.

The parameters that affect the performance of a leveler equipped with an auger working body are the follow (Fig. 1 and 2):

- type of auger;
- auger diameter $D_{Ш}$;
- auger step $l_{Ш}$;
- auger rotation speed $n_{Ш}$;
- auger length $L_{Ш}$;
- longitudinal distance between the leveling bucket and the auger L ;
- longitudinal distance between augers $L_{б}$;
- vertical distance between the augers L_{T};
- movement speed of the unit V_{H} .

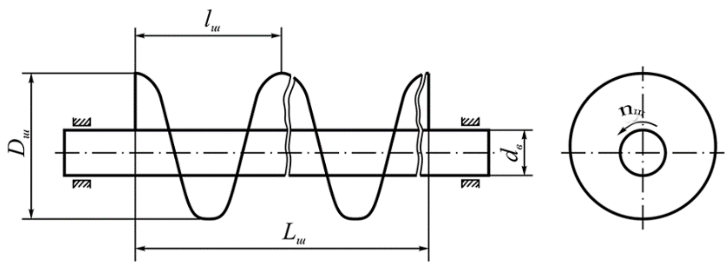

Fig. 2. Parameters of auger work member

RESULTS AND DISCUSSIONS

Let us calculate the diameter of the auger using the following expression, considering the formation of a soil pile in front of the leveling bucket [3]

$$D_{ш} \geq K_{у}\sqrt{П_{б}K_{p}\left(900V_{a}K_{\alpha}K_{н}K_{\beta}\right)^{-1}+d_{в}^{2}}, \quad (1)$$

where K_y is the coefficient that considers the formation of a soil pile in front of the bucket of the leveler; [6]

$П_б$ is the specified working capacity of the auger, m³/sec;

K_p is the soil-softening coefficient;

V_a is the rotational speed of the point on the auger cutting blade, m/sec;

K_α is coefficient that considers the angle of deflection of the cutting blade of auger from the horizon;

$K_н$ is the coefficient that considers the filling of the auger into the soil;

K_β is the coefficient that considers the angle of inclination of the auger relative to the horizon;

$d_в$ is diameter of the auger shaft, m.

We determine $П_б$, the defined work product of the auger included in the expression (1). To do this, we assume that the roughness of the field surface in the transverse direction, i.e. along the axis of the auger, varies according to the following law (Fig 3):

$$Y = h_{н}\sin\frac{\pi X}{A}, \quad (2)$$

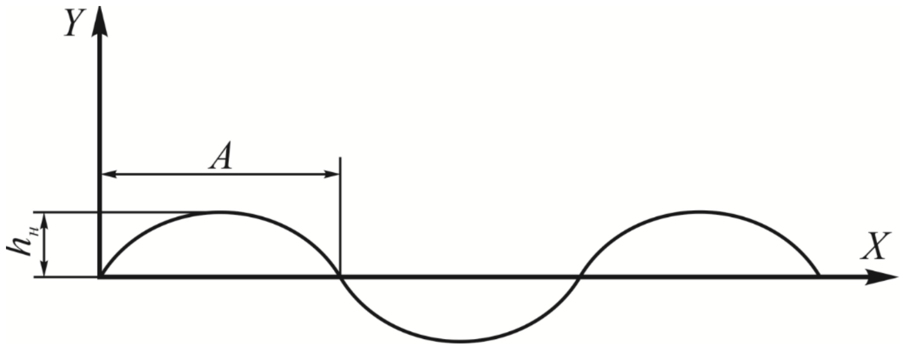

Fig. 3. The law of change in the transverse direction of the profile of the roughness of the field surface

where Y, X are coordinate axes;

$h_н$ is half the height of the roughness;

A is the length of the roughness.

(2) Given the expression, the specified performance of the auger is equal to:

$$П_{б} = \frac{B}{2A}V_{u}\int_{0}^{A}h_{н}\sin\frac{\pi X}{A}dx = \frac{Bh_{н}}{2A}V_{u}\int_{0}^{A}\sin\frac{\pi X}{A}dx == \frac{Bh_{н}}{2A}V_{u}\left(-\frac{A}{\pi}\cos\frac{\pi}{A}X\int_{0}^{A}\right) =$$

$$= \frac{Bh_{н}}{2A}V_{u}\left[-\frac{A}{\pi}\left(\cos\frac{\pi}{A}A - \cos\frac{\pi}{A}0\right)\right] = \frac{Bh_{н}}{2A}V_{u}\left[-\frac{A}{\pi}(-1-1)\right]$$

or

$$П_{б} = \frac{B}{\pi}V_{u} \quad (3)$$

where B is the coverage width of the leveling bucket;

V_u the forward motion speed of the unit.

We determine the number of revolutions of the auger on the condition that its product in the direction along the axis of rotation is greater than the product Pb.

$$П_у > П_б. \qquad (4)$$

Failure to comply with this condition will result in the accumulation of soil in front of the auger, resulting in a violation of the technological process of the machine.

The productivity of the auger in the longitudinal direction is determined by the following expression [6,7,8.]:

$$П_у = S_ш V_T K_н K_у, \qquad (4)$$

where the soil is pushed sideways by the auger section surface;

V_T is the speed of soil movement;

Ky - in the longitudinal direction of the profile of the field surface coefficient taking into account the variability.

The surface of the cross-section of the soil pushed sideways by the auger and its transport velocities are as follows [9]:

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