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STUDY OF BODY FOR SURFACE TILLAGE IN HEAVY SOILS WITH LOW HUMIDITY

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Abstract

The article discusses the work of the active disk for the surface tillage of the soil, combining kinematics tiller with horizontal axis of rotation and lateral displacement of soil from disk work body in heavy soil with low humidity.
This paper examines the fragmentation of the soil at a certain speed range of the machine - at a speed 1.9; 4.6 and 7.9 km/h.
The data were processed statistically and are alleging regression equations built and graphics describing fragmentation of the soil.

Key words*: surface tillage, soil, active machine.*

INTRODUCTION

Surface active cultivation machinery soil led to a suitable condition for conducting subsequent operations sowing or planting.
This condition is characterized by the term - garden soil conditions - 70% of the aggregates have a size of 1 to 25 mm.
One of the main objectives of the surface treatment is to create a suitable aggregate composition and structure of the soil meets the requirements for growing the crop.
This study aims to clarify the fragmentation of heavy sandy - loam with low humidity with active disk operating authority for the surface treatment of the soil, combining kinematics surface tillage machine with horizontal axis of rotation and lateral displacement of soil from disk operating authority.

MATERIALS AND METHODS

Fragmentation is determined for each trial in equal distances along the test bed into 5 soil samples as follows: thrust is a metal box without a bottom with dimensions 400 x 300 x 300 mm. The bottom is introduced into it and the box with the soil is removed. The samples taken were left indoors, in which the air dried to a dry state and are separated into fractions by sieves with holes 1 and 25 mm. Fractions are weighed to the nearest 1 g and determine the percentage composition.
The indicator for the erosive dangerous condition of the soil is characterized by size fraction to 1 mm.
Indicator valuable agronomic soil is determined by the fraction size of 1 to 25 mm.

$$P = \frac{G_{ФР}}{G_{П}}.100\%$$

where:

Gfr is the mass of a fraction, g;

Gp - the mass of the entire sample, g (Stanev, 1968).

The moisture content is determined by taking daily samples before and after lunch on the diagonals of the test area at a certain depth the depth of work. Samples taken in airtight cups dried at 105 ° C to constant weight. Measure the weight before and after drying. Soil moisture was determined in the following manner:

$$Wa = \frac{G_B - G_C}{G_C}.100\%$$

where:

GB is the mass of wet soil;

Gc - the mass of the dried soil.

Soil moisture at depth is defined as the average of all samples for a given depth. When choosing a field of performing experiments with the following requirements:
The plot has a slope to the horizon is not more than 2-3°. Surface no bumps, lumps, ridges and

overthrew that provides safe operation of a Size length and width of the test area for an experience are determined by the following considerations:

$l = V . t$

Length / l / is determined by the maximum forward speed / V / and duration / t /
The width / B / limited working width / Bp / machine.
The dimensions of the whole experimental field are determined taking into account the number of attempts, mode of deployment in length and width. Because of errors some trials may be repeated. Before beginning the test, the test machine is adjusted to operate at the specified depth.
The experimental study was conducted according to a plan of experiments (Mitkov et al., 1993).
Speed is controlled by the transit time through the test section, measured by GPS Garmin 12.
Crop residues and weeds on the surface of the field is not controlled as in the selection of the experimental field has been respected for they are relatively evenly distributed.

RESULTS AND DISCUSSIONS

The studies were conducted in the village Bryagovo, region Plovdiv, in place "Demir Alan " soil representative of heavy sandy - clay machine.
soils with a clay content 56.5%. Soil background - deep plowing.
Energy source is MTZ-82 with speed PTO - 540 min-1 at speeds v1 = 1.89 km/h; v2 = 5.48 km/h; v3 = 7.97 km/h, respectively, of I, III and V gear.
Machine which carry out the surveys (Dallev, 2013) is equipped with a cut discs:

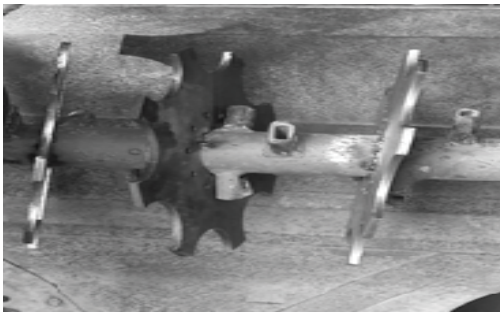

Figure 1. Disk machine

Studies of the aggregate composition of the heavy sandy-loam according to the speed and the humidity was done using a regression analysis on the basis of a passive conducting an experiment at a significance level $\alpha = 0.05$.
After a data-processing software STATISTICA 7 are derived regression equations describing fragmentation (Z) of the three factions (up to 1 mm; from 1 to 25 mm; over 25 mm) of soil illustrated with regression lines and surfaces at the same level:

Table 1. Plan the experiment

	1 speed, km/h	2 Soil Moisture, %	3 aggregate composition < 1mm,%	4 aggregate composition 1-25mm, %	5 aggregate composition >25mm,%
1	1,89	9,21	10,9	47,3	41,8
2	1,89	9,94	10,4	51,8	37,8
3	1,89	10,26	13,5	54,1	32,4
4	1,89	11,29	9,6	61,7	28,7
5	5,48	9,21	13,4	35,3	51,3
6	5,48	9,94	11,7	38,2	50,1
7	5,48	10,26	7,9	43,7	48,4
8	5,48	11,29	7,7	51,1	41,2
9	7,97	9,21	9	36,4	54,6
10	7,97	9,94	6,4	40,9	52,7
11	7,97	10,26	3,9	44,8	51,3
12	7,97	11,29	1,8	49,3	48,9

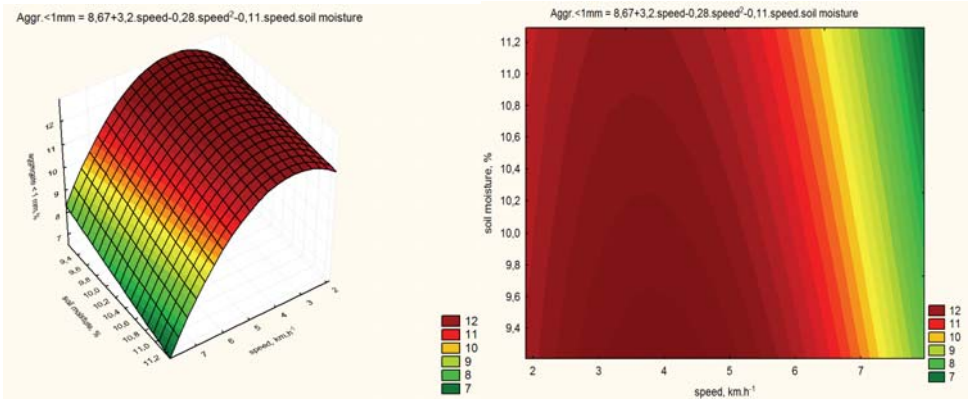

Figure 2. Aggregate composition < 1 mm

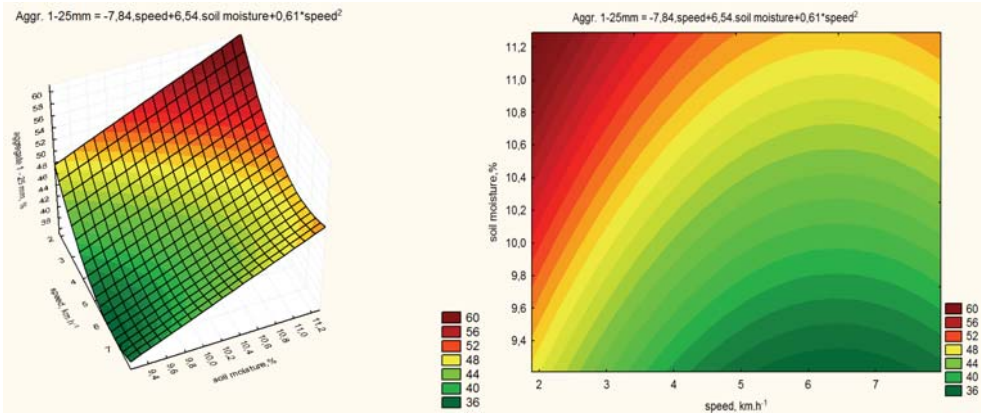

Figure 3. Aggregate composition 1-25 mm

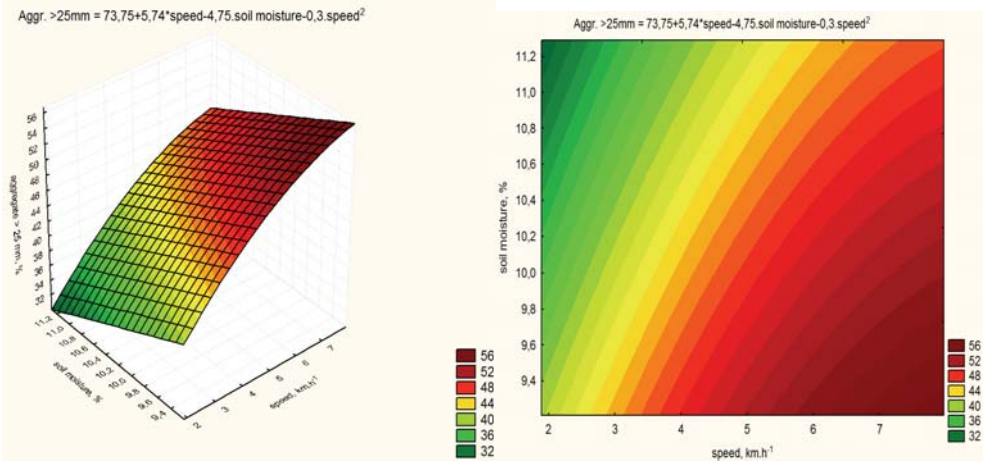

Figure 4. Aggregate composition > 25 mm

CONCLUSIONS

Due to the heterogeneous composition of the plowed field at low soil moisture working body starts hopping and shuffling only lumps of plowing.

In order to observe agrotechnical requirements, units from 1 to 25 mm to be ≥70%, respectively, while those to 1 mm and over 25 mm up to 30%, the measured values of moisture can be seen that it is impossible. Closest values to agrotechnical requirements are obtained at a speed of the unit around 2 km/h and 11% humidity.

During this process, the following will occur aggregate composition:

- 1 mm - 10%
- From 1 to 25 mm - 60%
- Over 25 mm - 30%.

ACKNOWLEDGEMENTS

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