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STUDY OF BODY FOR SURFACE TILLAGE IN MEDIUM SANDY - CLAY SOILS WITH LOW HUMIDITY

Ivan IVANOV, Manol DALLEV

Agricultural University of Plovdiv, 12 Mendeleev Blvd, 4000, Plovdiv, Bulgaria

Corresponding author email: manol_dallev@abv.bg

Abstract

The article studied the fragmentation of medium sandy - clay soil with low humidity with active disk operating body for the surface treatment of the soil, combining kinematics tiller with horizontal axis of rotation and lateral displacement of soil from disk work body.
The study was conducted at different forward speed of the unit - 1.9; 4.6 and 7.9 km/h.
The results were processed statistically, are derived regression equations and built graphs describing the fragmentation of soil.

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

INTRODUCTION

In building technology for growing crops mainly prevail tillage. It is inextricably linked part of any agricultural production. According to the depth of which is carried tillage is - basic and surface tillage (additional). 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 medium sandy - loam with low humidity with active disk authority for the surface treatment of the soil, combining kinematics tillage machine with horizontal axis of rotation and lateral displacement of soil from disk working 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 25mm.

$$P = \frac{G_{ФР}}{G_{П}}.100\%$$

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 machine.

Size length and width of the test area for an experience are determined by the following considerations:

$l = V \cdot t$

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 the "old a cemetery" of soil representative of an average sandy - clay soils with a clay content 42.9%. Soil background - stubble. 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 with which carry out the surveys (Dallev, 2013) is equipped with a cut discs:

Figure 1. Half disk

Studies of the aggregate composition of the medium 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	10,46	21,7	70,3	8
2	1,89	11,49	19,4	73,5	7,1
3	1,89	12,69	21,3	70,9	7,8
4	1,89	18,25	19,1	72,2	8,7
5	5,48	10,46	11,7	65,1	23,2
6	5,48	11,49	9,8	68,2	22
7	5,48	12,69	11,4	65,4	23,2
8	5,48	18,25	10,2	67,9	21,9
9	7,97	10,46	5,2	52,6	42,2
10	7,97	11,49	7,4	57,5	36,1
11	7,97	12,69	5,7	59,1	33,5
12	7,97	18,25	6,4	53,1	41,2

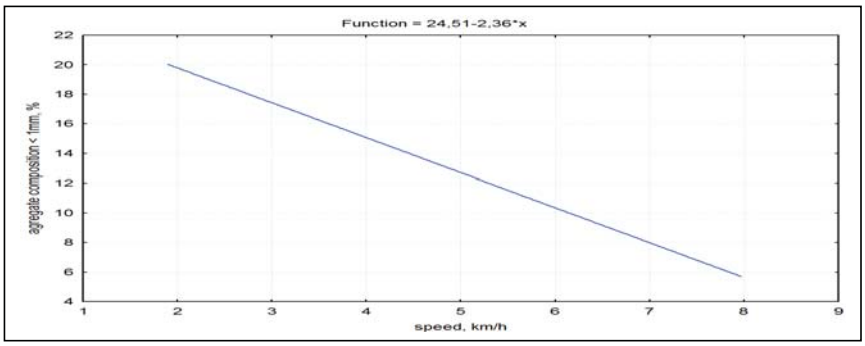

Figure 2. Aggregate composition < 1 mm

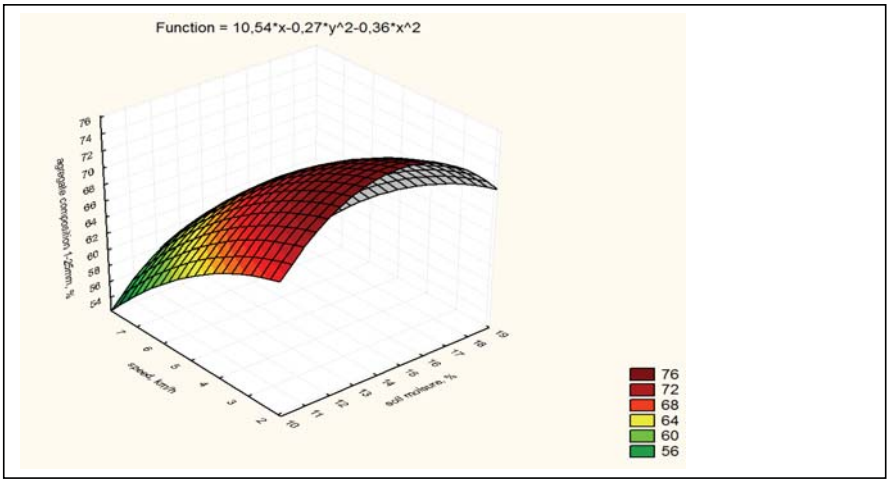

Figure 3. Aggregate composition 1-25 mm

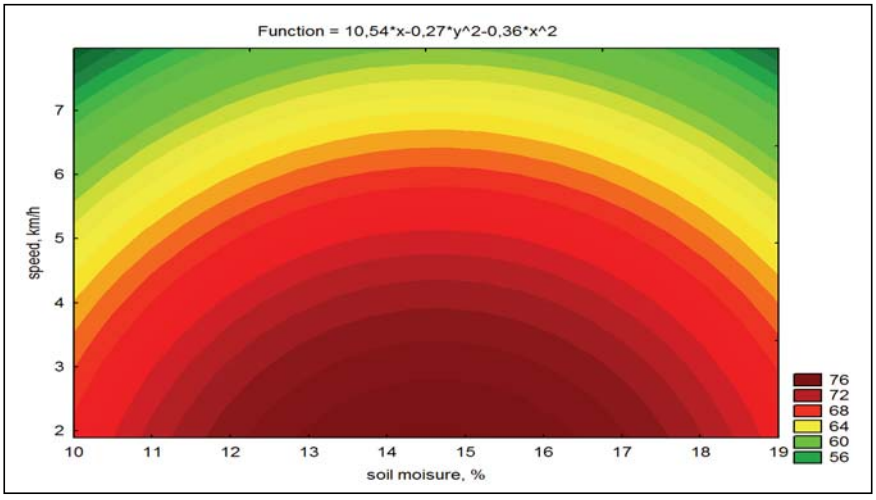

Figure 4. Aggregate composition 1-25 mm

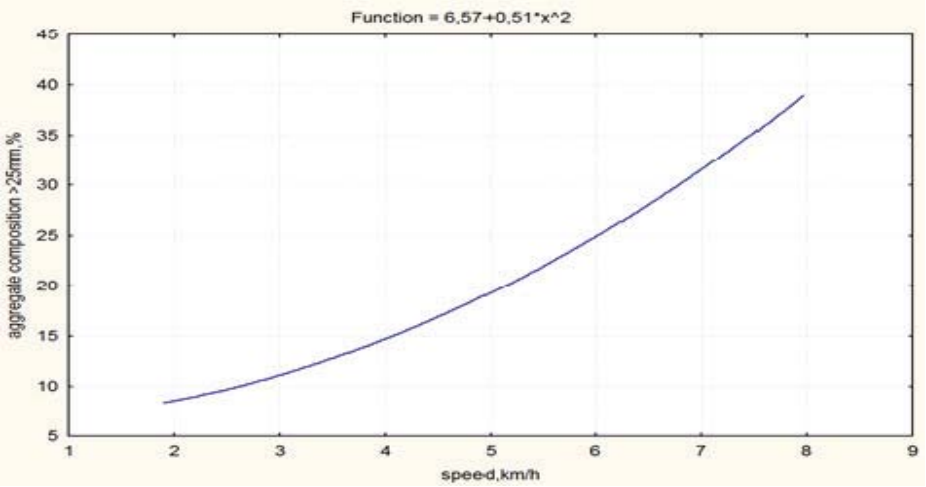

Figure 5. Aggregate composition > 25 mm

CONCLUSIONS

From the resulting regression lines and surfaces of the same response can draw some conclusions:

1. Fragmentation of soil aggregates to 1 mm becomes linear law, humidity (in the studied range) does not have significant effects, but only forward speed of the machine.
2. With increasing forward speed is increased the aggregates with a size above 25 mm, but these reduce to 1 mm. This is due to the fact that with increasing forward speed at a constant speed of the rotor to the tool body is reduced interaction with the soil disc.
3. In the studied range of work of the working body is established that an average sandy loam soils with low humidity recommended speed of the unit with the corresponding cut disk is about 3-3.5 km/h, where the aggregates:
   < 1 mm have values - 15%;
   1-25 mm - 71%;
   > 1 mm - 14%.

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REFERENCES

Dallev M., 2013. Investigation of a working body surface tillage. Abstract.

Mitkov D. Minkov, 1993. Statistical methods for the study of agricultural machinery part II, S., Zemizdat.

Stanev S. Shishkov, 1968. Machinery for tillage, sowing and cultivation. "Zemizdat", Sofia.