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Theoretical Researches on Justification of Minimum Necessary Quantity of the Consumption of Working Treaterya Suspension for the Covering of the Surface of Sowing Seeds of the Cotton

A.A.Akramov

Chief researcher, Joint-stock company «Paxtasanoat ilmiy markazi», Uzbekistan

ABSTRACT: Results of theoretical researches on determination of minimum necessary quantity of a consumption of working suspension of a treater for a covering of a surface of sowing seeds of a cotton are given in article.
The consumption of working suspension of a treater for a covering of a surface of the pickled sowing seeds of cotton is the most important characteristic of the work of treater defining quality and cost efficiency of process of a treater. The theoretical dependence the required minimum flow of working suspension of a treater allowing to calculate for sowing seeds of a cotton of any selection grades is received.

KEY WORDS: Treater, working suspension, an expense, dependence, cotton seeds, diameter, the sprayed particle.

I.INTRODUCTION

The quality of a make treater depends on a set of the factors connected with a condition of sowing material, characteristic of a treater and his preparative form, the constructive and technological scheme of the car for a treater. It is also necessary to note that the qualitative treater is possible only if it is carried out by skilled staff taking into account the correct combination of all listed components. The high quality of a treater is reached only at respect for the following criteria:
– in the first, observance of the recommended consumption rates, that is the quantity of a treater necessary for a certain volume of sowing material has to be precisely sustained;
– in the second, medicine, respectively and active ingredient, has to be distributed evenly on all surface of everyone separate seeds;
– in the third, the prilipatel used in a treater has to provide preservation of all dose of the active ingredient applied on seeds even after such mechanical influences as storage, casing in bags, transportation and crops;
– in the fourth, the trauma of seeds, after a treater, should not exceed standards of agrotechnical requirements.
The quality of a treater depends on a set of various factors.
The analysis shows that the factors defining quality of a treater of seeds of a cotton can be united in four main groups:
– physicomechanical properties of sowing seeds;
– physical and chemical properties of a treater;
– technology factors;
– the factors depending on a design of a treater.
The operating mode and technological adjustments of a treater belong to the first group of factors. As installation on an operating mode and technological adjustments of a treater is made by working personnel, this group of factors can be carried to human factors. Therefore the persons knowing the device, technological adjustments and operating modes of a treater are allowed to work. A lot of things depend on qualification of working personnel, from that as it will adjust a treater on operating modes as will prepare working solution.

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It is possible to refer the constructive and technological scheme of a treater, a design of separate working bodies, material of working bodies and geometrical parameters of working bodies to efficiency factors. Physicomechanical properties of seeds: the humidity, contamination, the size of seeds, bulk weight, uniformity by the sizes, the hardness, weight are one thousand seeds and another.

II. FORMULATION OF THE PROBLEM

The consumption of working suspension of a treater for a covering of a surface of the pickled sowing seeds of a cotton is the most important characteristic of the work of treater defining quality and cost efficiency of process of a treater.
The task by theoretical researches justification of minimum necessary quantity of a consumption of working suspension of a treater for a full and uniform covering of a surface of sowing seeds is set.
At theoretical researches provisions of analytical geometry were used.

III. SOLUTION OF THE TASK

The theoretical consumption of working suspension of a treater on one ton of sowing seeds of a cotton is determined by a formula [1]:

$$Q_l = V_l n \tag{1}$$

where Q_l – a consumption of working suspension of a treater, l/t;

V_l – volume of the working suspension necessary for a covering of a surface of one seed, l;

n – quantity of seeds in one ton, pieces/ton.

We determine the volume of working suspension of a treater of a surface of one seed, necessary for a covering, by a formula:

$$V_l = V_p n_p \tag{2}$$

where V_l – volume of working suspension, dm^3 (l);

V_p – the volume of one sprayed particle of working suspension, dm^3;

n_p – quantity of the sprayed particles of working suspension sufficient for a covering of a surface of one seed.

Accepting assumption that the form of the sprayed particle of working suspension represents a sphere, its volume can be calculated on a formula [1]:

$$V_p = \frac{\pi d_e^3}{6} \tag{3}$$

where d_e – diameter of the sprayed particle of working suspension, dm.

The quantity of the fine particles sufficient for a covering of a surface of one seed is calculated by a formula:

$$n_k = \frac{S_s}{S_k} \tag{4}$$

where S_s – surface area of one seed, dm^2;

S_k – area of a trace of one particle of working liquid, dm^2.

The area of a trace of a particle of working suspension depends on its diameter and is determined by expression:

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$$S_k = \frac{\pi d_k^2}{4} \quad (5)$$

where d_k – diameter of a trace of working liquid, dm.

Diameter of a trace put with the spray is accepted:

$$d_k = k_d d_e \quad (6)$$

where k_d – coefficient of spreading of drops.

Depending on physicomechanical properties of cotton seeds, physicomechanical properties of working suspension and the size of drops the coefficient of spreading of drops makes - k =1,02…1,58 [2, 3, 4]. For our researches we accept coefficient of spreading of drops equal k =1,5.

Then expression (5) after mathematical transformations and calculations will register in the following look:

$$S_k = 1{,}8 d_e^2 \quad (7)$$

The surface area of cotton seeds is on a formula:

$$S_s = \pi d_z^2 \quad (8)$$

where d_z – diameter of a sphere which volume is equivalent to an average to the volume of sowing seeds of a cotton, dm.

Substituting formulas (7) and (8) in a formula (4) we will receive expression for determination of quantity of the sprayed fine particles of working suspension of a treater sufficient for a covering of a surface of one seed:

$$n_k = 1{,}7 \frac{d_z^2}{d_e^2} \quad (9)$$

Theoretical dependence for determination of quantity (volume) of the working suspension necessary and a surface of one seed, sufficient for a covering, we will receive after substitution of formulas (3) and (9) in a formula (2) of both performance of some mathematical transformations, and calculations of constant numerical values in the following look:

$$V_l = 0{,}9 d_z^2 d_e \quad (10)$$

The received theoretical dependence allows to calculate the required minimum flow of working suspension of a treater for sowing seeds of a cotton of any selection grades.

Table-1. Estimated amount of working suspension of a treater -V_l, surface of one seed, necessary for covering, $\times 10^{-6}$ l.

Equivalent diameter of cotton seeds d_z, mm	Diameter of the sprayed particle of working suspension of a treater d_e, mkm						
	30	35	40	45	50	55	60
5,0	0,67	0,79	0,90	1,0	1,12	1,24	1,35
5,5	0,82	0,95	1,09	1,22	1,36	1,50	1,63
6,0	0,97	1,13	1,29	1,46	1,62	1,78	1,94
6,5	1,14	1,33	1,52	1,71	1,90	2,09	2,28
7,0	1,32	1,54	1,76	1,98	2,20	2,42	2,65
7,5	1,52	1,77	2,02	2,28	2,53	2,78	3,04
8,0	1,73	2,02	2,30	2,59	2,88	3,17	3,46

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For definition of a theoretical consumption of working liquid on one ton of seeds it is necessary to calculate quantity of seeds in one ton in the beginning. It depends on weight of one thousand pieces of seeds m_{1000} and is equal:

$$n = \frac{10^9}{m_{1000}} \tag{11}$$

where m_{1000} - weight is thousands of pieces of seeds, g.

Taking into account formula (10) and (11) finally theoretical expression for definition of a consumption of working suspension of a treater will register in the following look:

$$Q_l = 0{,}9 \cdot 10^9 \frac{d_z^2 d_e}{m_{1000}} \tag{12}$$

Apparently from the received formula (12), the consumption of working suspension of a treater depends on the geometrical sizes of the processed seeds, the size of the sprayed particles of working suspension.

VI. CONCLUSION AND FUTURE WORK

It is received theoretical expression (12) by means of which it is possible to calculate expenses of working suspension of a treater on one ton of seeds for different values of equivalent diameters of seeds (at possible values of diameters of the sprayed particles of working suspension).

Are in the future planned carrying out experimental works on definition of the valid consumption of working suspension of a treater on one ton of sowing seeds of the chosen selection grades for test and justification of operating modes of an experimental treater.

REFERENCES

[1] Salakhov I.M. Theoretical substantiation of the working fluid consumption in the pneumomechanical seed dresser of grain crops / I.M. Salakhov, E.G. Nurullin // Innovative development of the agro-industrial complex Materials of the All-Russian Scientific and Practical Conference. Volume 78, part 2. - Kazan: The Kazan State Autonomous University, 2011, pg no: 217-219.

[2] Lyubimov A.I. Workshop on agricultural machinery / A.I. Lyubimov, Z.I. Votsky V.V. Pale and others - M .: Kolos 1997, pg no:191

[3] OST 10.6.-2000. Plant protection machines. Sprayers. Test methods.

[4]Spiridonov Yu.Ya. Scientific and practical aspects of the technology of application of modern herbicides in plant growing - Spiridonov Yu.Ya., Shestakov V.G. - M .: Printing city, 2010, pg no:78