

DETERMINING THE PERFORMANCE OF A CHEMICAL TREATMENT SPRAYER

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Abstract: The article presents the results of economic tests to determine the performance of a universal suspension sprayer. The overall balance (ts) of the technological process of the sprayer was determined by chronometry. When analyzing the process of operation of sprayer technical means, it became clear that their operation consists of a certain technological cycle, which is constantly repeated, and the economic efficiency of the sprayer is determined.

Keywords: garden, sprayer, working part, aggregate, capacity, shredder, productivity, fluid consumption.

Аннотация: В статье представлены результаты экономических испытаний по определению работоспособности универсального навесного опрыскивателя. Общий баланс ($t_{\text{ц}}$) рабочих характеристик опрыскивателя был определен путем определения затраченного времени. При анализе работы опрыскивающего оборудования выяснилось, что их работа состоит из определенного технологического цикла, который постоянно повторяется, а также экономической эффективности опрыскивателя.

Ключевые слова: сад, опрыскиватель, рабочий орган, агрегат, бак, распылитель, производительность, расход жидкости.

Chemical treatment of plants to protect them from pests and diseases is an important part of technological processes in agriculture. The effectiveness of this process largely depends on the efficiency of the equipment used. Therefore, determining the efficiency of sprayers is relevant from the point of view of scientific and technical analysis.

To obtain high yields from vineyards and orchards, it is important to protect them from pests and diseases. This measure has recently been carried out chemically.

Chemical control of pests and diseases of vineyards and orchards is carried out using sprayers. That is why we have created a highly efficient universal suspension sprayer for chemical treatment of orchards and developed an industrial model of it.

Using formulas for determining the performance of sprayer equipment, it is necessary to evaluate it in specific conditions, analyze performance indicators and justify optimal operating conditions.

Below we will determine the performance of a universal suspension sprayer by chemical treatment of vineyards.

The work to determine the performance of the universal mounted sprayer was carried out in the vineyards of the “Zikrillaev Dilshodbek” farm in the Kitab district of the Kashkadarya region.

Tests were carried out on vineyards planted with sprayers in the same conditions and in two areas. The average length of the agates in the areas was 350 meters.

To determine the performance of the universal mounted sprayer and compare it with the currently used OH-400 sprayer, two units were created:

- Universal mounted sprayer mounted on MTZ-82 tractor;
- OH-400 sprayer mounted on MTZ-82 tractor.

The experimental area was supplied with water from both sides by a tractor trailer with a capacity of 6 m³. Before starting the sprayers, the working fluid rate for spraying per 1 ha of area was 400 l/ha, the operating speed of the unit was 9.8 km/h, and the number of shredders was 10, and the experiment was prepared. We determine how many rows the sprayer will process when the tank is filled with liquid once using the following expression:

$$m = \frac{10^4 \cdot V \cdot K}{q \cdot B \cdot L}, \quad (1)$$

where m - number of rows processed with one full tank, row;

V - tank capacity, l;

K - tank capacity utilization coefficient ($K=0.97$);

q - working fluid consumption rate per hectare, l/ha;

B- working width, m;

L- row length, m;

The capacity of the universal suspension sprayer is 500 liters, and it is used for two-way processing.

For the universal suspension sprayer with a suspended unit, $V=500$ l, $q=400$ l/ha, $B=7$ m and $L=350$ m, the number of rows of processing is $m=5$.

The capacity of the OH-400 sprayer is 400 liters, and it is used for one-way processing.

For the OH-400 sprayer with a suspended unit, $V=400$ l, $q=400$ l/ha, $B=7$ m and $L=350$ m, the number of rows of processing is $m=4$.

The total balance of the technological process of the sprayer (t_s) is equal to the sum of the total time spent on the work performed and is determined by the following expression [1,2].

$$t_s = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10}$$

where t_1 - the net working time;

t_2 - the time of the turn;

t_3 - the time to go to and from the water source;

t_4 - the time to move from one field to another;

t_5 - the time to transfer the unit to the working and transport position;

t_6 - the time to fill the tank with water;

t_7 - the time to stop for technological reasons;

t_8 - the time to perform technical maintenance on the unit during operation;

t_9 - the time to stop (lack of work);

t_{10} - the time to stop unexpectedly.

The overall balance (ts) of the technological process of the sprayer was determined by timing the time spent. The work began with pouring water into the sprayer tank and recording the time, and the time fund was determined by timing [2].

After the above work was completed, the performance of the sprayers was timed and a monitoring sheet was filled out.

As can be seen from the monitoring sheet obtained during the operation of the universal suspended sprayer, the sprayer tank was filled with water 16 times, transferred from the working position to the transport position and vice versa 16 times, turned 64 times, and the unit covered a distance of 28 km during the working day.

During the working day, the unit with the universal mounted sprayer processed an area of 19.6 hectares and the unit with the OH-400 mounted sprayer processed an area of 11.0 hectares, and the fuel consumption of the units was 91 liters for the MTZ-82 tractor with the universal mounted sprayer and 96 liters for the MTZ-82 tractor with the OH-400 mounted sprayer. If we calculate this indicator per 1 hectare of area, then 4.6 l/ha of diesel fuel was consumed for the MTZ-82 tractor with the universal mounted sprayer and 8.7 l/ha for the MTZ-82 tractor with the OH-400 mounted sprayer.

The economic efficiency of chemical treatment per hectare of land was determined based on the above-defined indicators in the universal suspension sprayer. When treating gardens with a universal suspension sprayer, the costs per hectare were 29,683 soums/ha, and with an OH-400 sprayer - 56,803 soums/ha. When treating the same area with a universal suspension sprayer, the costs were saved by 27,120 soums/ha.

When analyzing the operation of spray equipment, it became clear that their operation consists of a certain technological cycle, which is constantly repeated.

Based on the above data, the average time taken by the sprayers to complete 1 cycle of technological work was determined. These figures were 27 minutes 9 seconds for the universal suspension sprayer and 41 minutes 33 seconds for the OH-400 sprayer. [3].

When chemical treatment of orchards was carried out using a universal suspension sprayer, the following advantages were identified compared to the previously used OH-400 sprayer:

- productivity increased by 78% due to double-sided processing in one pass;
- fuel consumption decreased by 89%;
- chemical treatment costs per hectare of garden decreased by 93%;

- economic efficiency amounted to 27.1 thousand soums/ha.

Estimating the performance of a sprayer on a mathematical basis helps to determine its technical and technological efficiency.

Along with choosing the optimal speed and spray width, it is necessary to take into account the organizational and technological conditions in the field.

In practice, these calculations are used to select technical equipment and develop planned chemical treatment schedules.

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