STUDIES ON THE MECHANIZATION OF WORKS TO CONTROL DISEASES AND PESTS IN GRAPEVINE

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Abstract: Experiments on sprinkler machines were carried out at the vineyard-wine company in Vânju Mare, in 2018, during the treatments applied to prevent and control diseases and pests. These treatments largely complied with the unitary programme previously drawn up. The treatments were carried out with MC-300P and MST-900 machines, in aggregate with tractors of 45 HP. Pneumatic dispersion of a rosette type with 10 dispersing heads (in the MC-300P machine) and 5-head palmette (MST-900 machine) were used. In these experiments, samples were made to determine the following indices: actual working speed; flow of the machine; flow of dispersion; liquid rules; adjustment of the actual flow according to the theoretical one. The working speed was determined by going through the aggregate, under working conditions, on a distance of 100 m and the timing necessary for this distance to be completed. Three measurements were made for each speed and their arithmetic mean was taken into account. The engine speed has been kept steady. The flow of the dispersion and the machine was determined by the Volumetric method depending on pressure. The dispersed liquid during a 1-minute period was collected in graded vessels. Three measurements have been made for each pressure value and type of dispersion. To adjust flow rates, the above indications, as well as the adjustment tables and the adjusting diagrams of the sprinkler machines were used. Reducing environmental pollution and energy consumption in the process of controlling diseases and pests is mainly achieved by reducing the liquid norm per hectare, using sprinkler systems in which we can control and steer the droplet size, as well as droplet distribution on plants, requiring the use of sprinkler machines complying with these technological requirements. Compromising treatment or treated culture is always linked to material loss, often irrecoverable, and with adverse economic consequences for the farmer in question. Machines currently used in the world to control diseases and pests are of particular importance in the technological process of plant cultivation. The implementation of new technologies for the preparation of germinal bedding and the use of new varieties of plants do not lead to the expected results without the application of appropriate plant health treatments and, by default, without the use of machines for proper control.

Key words: sprinkler machines, controlling diseases and pests, determination of indices

INTRODUCTION

A retrospective look reveals that the 20th century will remain in the memory of mankind primarily as a period of extraordinary development of science and technology, as well as of agriculture. (DRAGOȘ T., şi colab., 1981; GUȘ P., STĂNILĂ S., RUSU T., 2003)

Development, namely the shift from extensive agriculture to intensive agriculture, characteristic of industrialised states and high living standards in the Northern hemisphere, is primarily due to the following three factors:

-Mechanization of agriculture;

-Chemigation, i.e. fertilisation and plant protection;

-Production of high-yielding biological material. (ŞANDRU A., NIȚĂ I., ŞTEFAN C., 1980; GOGA ANA – MARIA, Duma – COPCEA ANIȘOARA, MIHUȚ CASIANA, ROBU VIORICA, 2016)

As regards plant protection, the huge intake due to chemigation in increasing agricultural production should be highlighted. FAO specialists appreciate that more than one third of the current agricultural production is due to the chemical control of diseases and pests.

In the same context, it should be noted that the use of chemical control substances of diseases and pests is not completely risk-free and that improper use leads to pollution of the environment with toxic residues, with repercussions on the health of all organisms in the ecosystem and, in the end, on human health.(ILEA R., 2013; ILEA R., 2013)

This is the main reason why those dealing with plant protection must possess deep knowledge both in the field of pest biology, plant protection products intended to control them, and the equipment used in the application of plant health treatments. (TONEA CORNELIA, 1996)

Ignoring the technique used in the application of plant protection substances entails the application of qualitatively inadequate treatments, so it can diminish but also compromise the biological effect of these treatments. (ILEA R., 2003)

Compromising treatment or treated culture is always linked to material loss, often irrecoverable, and with adverse economic consequences for the farmer in question.(ILEA R., 2013)

Machines currently used in the world to control diseases and pests are of particular importance in the technological process of plant cultivation.

The implementation of new technologies for the preparation of germinal bedding and the use of new varieties of plants do not lead to the expected results without the application of appropriate plant health treatments and, by default, without the use of machines for proper control. (ŞANDRU A. şi colab., 1983)

In order to have performing agricultural productions, it is imperative that we execute these works at high quality indices.

The protection of grapevines against pathogens is of particular importance for ensuring high-quality production. The use of means to control is also seen from the perspective of the protection of the environment, of the vineyard, harvest, humans, useful entomofauna and animals. (TECUȘAN N., IONESCU E., 1982)

Due to the ease of application, accuracy in terms of dosage and high productivity, the application of plant protection products in the form of sprinkles is still one of the most effective methods of prevention and treatment.

Increasing the efficiency of spraying is done by improving sprinkler systems and using new generation pesticides, with low doses per hectare, without remanence and with reduced toxicity. Reducing the volume of fluid is achieved based on increasing the degree of spraying. (R. ILEA, ANIȘOARA DUMA COPCEA, R. MILOȘ, 2017)

There is a lower limit to the size of the droplets that can be used in this type of sprinkler, because a large number of drops will have a moment of insufficient impact with the plants and tend to be worn by the air through "drift". Production loss because of diseases and pests can sometimes reach, in our country, 35%, while energy direct and indirect consumptions for applying sprinkling treatments are, in the case of grapevine, up to 28% of the annual consumption of technology. (Reviste de "Mecanizarea agriculturii, 2012)

An important role in increasing the efficiency of control treatments is that planting systems (area, distance between rows, length of rows, access roads, variety, driving and cutting methods, etc.) are correlated with production methods. (TOMA D., 1981)

MATERIAL AND METHOD

The studies in this paper were carried out at the vineyard-wine Vânju Mare company in the year 2018. The territory taken in the study belongs to the village of Vânju Mare.

The study refers to mechanization of works for grapevine. The main mechanized works were carried out to control weeds, diseases and pests.

Land maintenance mechanised works between grapevine rows was carried out for shredding, trimming, levelling of the land and removal of weeds. The following soil-working machines were used: the Mainardi C-1.4 combiner and the rotary harrow Vigneron 1500. Both machines worked in aggregate with the tractor John Deere 5100 GF.

In the pesticide use technology for grapevine, the method of application seeks to achieve maximum effectiveness in terms of controlling diseases and pests, and removing negative effects on it.

In close dependence with the aforementioned objectives, the method of application is determined by the absorption of pesticides in plants and, implicitly, by the mode of action, their selectivity for culture and the physicochemical traits of the products used.

Physicochemical attributes influence the choice of the method of application in direct relation to the elements that determine the intensity and duration of the effect of pesticides: the form of conditioning, the washing of pesticides, the loss of the active substance because of volatility, etc.

Treatments with insect- and fungus-control substances in grapevine are made during two distinct periods, namely:

-The vegetation period;

-The dormancy period.

The application of herbicides to control weeds distinguishes two main methods of application:

-Before weed sprouting;

-After weed sprouting.

Depending on the method, the efficiency of the application of pesticides is dependent on several factors such as nature of the foliar area, precipitation, air humidity, temperature, light, period of application, supply of nutrients, agri-technical measures, etc.

Retaining the solution on leaves and, implicitly, entering the plant in the case of the application of pesticides during vegetation, reduced by various mechanical or chemical barriers, which characterize the foliar area, can be partially or totally adjusted by using supporting substances such as softeners, activation agents, or adhesives.

For a successful treatment of vegetation, one of the conditions is the lack of precipitation both before and after the application of pesticides. The time without precipitation of 6-12 hours provides other factors conducive to the absorption and complete translocation of pesticides by the plants. A dew fallen 10-12 hours after treatment favours the action of pesticides applied to vegetation.

Dew present during sprinkling favours the outflow of the solution, but to a lesser extent than during rains. Temperature, light and relative humidity in the air are other climate elements that influence differently the effectiveness of application methods.

The effect of contact or hormone pesticides is all the higher the physiological processes in the plant are carried out with maximum intensity.

From a practical point of view, maximum effectiveness of the treatments on vegetation is predictable when, at the time of application, there is consistency between the climate elements at the optimum level and phenophase of the cultivated plant.

The efficiency of the application of pesticides is also dependent on the age of application, phenophase of the cultivated plant, storage and preservation of products, etc.

Between these elements, there is organic balance: each of them has its importance in the sense that, if it is properly respected and pursued, it enhances the influence of the other one, and vice versa. When minimising the role of an element, this diminishes the overall effect of the treatment.

Basically, the range of factors with influence on the effectiveness of treatment methods make up the basic principles of pesticide application technique.

RESULTS AND DISCUSSION

The winemaking centre has been modernized and reengineered for the production of high-quality wines.

Primary processing of grapes is made with stainless steel machines and state-of-the-art programmable pressure presses.

Fermentation is carried out in temperature-controlled stainless-steel tanks to ensure fermentation regimes for both red wines and white wines.

Wine maturation is carried out in Bordeaux oak barrels.

The current equipment of the winery allows bottling in glass cylinders with the bottling plant under inert gas or in the "bag-in-box" system.

To preserve the good tradition of wines produced from Romanian varieties, the vineyard-wine company in Vânju Mare carries out a replanting project on an area of 45 ha in the programmes for reconversion/restructuring of vineyards, carried out with community support.

The planted varieties are Fetească Neagră and Tămâioasă Românească.

When applying high-efficacy modern pesticides, it is of particular importance to evenly distribute reduced amounts of active substance.

This can, of course, only be achieved with machines that work accurately.

The quality of sprinkling treatments in the vineyard requires that, while working, the sprinkler aggregates comply with the following requirements:

-Ensure a high degree of droplet uniform distribution;

-Ensure uniform coating with dispersed liquid of the entire foliar area of the grapevine, including the clusters, which are subjected to treatment;

-Ensure the homogeneous concentration of the liquid throughout the control;

-Ensure that sprinkler machines provide a wide range of liquid rules;

-Ensure the integrity of the grapevine without harming it during sprinkling.

In order to achieve high-quality work that complies with the technological requirements imposed, for as long as possible, plant protection machines should be periodically adjusted and maintained.

Disease and Pest Control Programme

For the production of large, high-quality productions every year, a significant role is the prevention and controlling of diseases and pests of grapevine. The most effective method of prevention and control is chemotherapy, i.e. chemical control using pesticides.

The vineyard-wine company in Vânju Mare annually draws up a unified programme for controlling diseases and pests.

CONCLUSIONS

Following the experiments carried out with the MPSP-3x300 and MST-900 sprinkler machines, the following main conclusions were reached:

-The machines are intended to control diseases and pests by spraying between the rows of grapevine at a distance between rows of 1.8-3.6 m;

-The rates of solution made were between 500-700 l/ha, corresponding to the agri-technical requirements providing for rates of 300-1,200 l/ha;

-The pneumatic spraying heads have functioned properly by carrying out the flows between 1.0-1.5 l/min;

-The pneumatic drop-down system ensures proper treatment on both sides of the leaves;

-The machines have complied with the uniformity of distribution of the solution on the area;

-By conducting treatment with several pesticides simultaneously, the period of therapy and the number of sprays were reduced, and significant savings have been achieved;

-Observance of treatment periods resulted in the prevention of diseases and pests in grapevine;

-The quality of treatment applications in vineyard depends on the thorough knowledge of sprinkler machines and the precision execution of the adjustments;

-The main quality indices of the works performed relate to the application of the dose of the active substance indicated per area unit and the uniformity of the treatment executed, on the width and length of the course;

-Performing quality work avoids pollution and ensures the full control of diseases and pests in grapevine.

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