PLANT PROTECTION

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ANALYSIS OF THE MODERN EQUIPMENT APPLYING FOR SPRAYING OF VINEYARDS UNDER CONDITIONS OF THE CRIMEA

Natalia Vasiliyevna Aleinikova, Liana Vladimirovna Didenko

SBE RC "National research Institute of grape and wine "Magarach", 298600, Republic of the Crimea, the city of Yalta, 31, Kirova str.
plantprotection-magarach@mail.ru

Introduction

Nowadays cultivation technology and their elements need to be upgraded for reducing the expenditure of energy for grapes production. This point is the urgent for most researchers.

Spraying the cultures vegetans is the most popular and spread protection method that suppose to use pesticides. It`s obviously improvement of technologies applied to realize this method has a direct connection with reliability, ecological compatibility and safety of chemical protection against harmful organisms [2].

"Increasing the efficiency" of protection system includes the following parameters: expansion of biological efficiency intended for a certain object, accelerating and prolonging the protection effect of applied preparations, reducing the phytotoxic effect on a culture, following the antiresistant programs. "Reducing the expenditure" for manufacturing work includes such parameters as cost dropping of 1 hectare cultivation, decreasing a number of treatments [1, 9].

Effective applying the plant defenders is possible having reliable equipment and qualified skills of necessary settings. Established practice of "error process" causes preparation waste, extra expenditure of time for settings, environmental protection, sometimes it brings exceeding the limits of acceptable defender concentration. Correct settings of a sprayer are possible if there are all necessary component units, a specialist well knows points of effective pesticide preparation and strict adhearance to fixed mode of aggregate.

Actually more than 90% of used plant defenders are applied by different sprayers. The most important parameter of a sprayer technical level is stability of its supplies, which is determined by material endurance of jets and initial fabrication accuracy. It`s necessary to replace sprayers in time according to their service life. Statistics presents that majority of sprayer disrepairs, fixed during equipment check-up, goes to atomizers. Atomizers with more or less 10% error must be replaced by new ones [4].

Leading foreign industries package their machines by different automatic adjusting devices. It`s well-known, that minimal loss of preparation during spraying occurs applying aerosol with drops till 100 mkm. Monodisperse sprayers are considered as high expensive technologies, but equipment with such level will be able to make out agriculture competitive [5, 8].

Recently home-made sprayers are supplied by import equipment. Having such a package and affordable prize they meet all demands of production. In many enterprises sprayers don`t give necessary effect. In practice it`s a well-known fact that the most effective preparations being applied by modern sprayers in terms of the latest technologies won`t bring a high quality and efficiency of chemical treatment in case of a wrong atomizer. So further investigations to find out optimal regulations for modern equipment application are still urgent.

The objective of this research is to assess and analyze modern equipment, which is in use for chemical treatment of fruit grape plantations in the Crimea.

Objects and methods of the research

The field experiments were carried out in 2013-2014 on Rkatsiteli grape plantations in south-west zone of the Crimean vineyard (AO "Agrofirma"Chernomorets"). The following methods, agreed in viticulture and plant protection, were applied during these researches:

- Itinerary inspections to reveal disease development on industrial vineyards;
- Field research to investigate dynamics of diseases development, determine grape crop capacity;
- Laboratory researches to determine sugars and titrable acids content in grape berry juice;
- Rated-statistical researches to find out development of diseases and biological efficiency of fungicides [3, 6, 7].

Water-sensitive paper was used to define a number of drops and their size for spraying by pesticide solution. It`s a cartridge paper with a special yellow cover, which gets dark blue if to contact with water drops. It was provided by company "Syntega" to intensify result rating of spraying by water solution under field conditions.

Water-sensitive paper was steppled directly on grape leaves on their border and inside the bush on the top, middle and down part before spraying. After spraying water-sensitive paper got dark-blue in case of contact with pesticide water solution. Colored paper was put away from the leaves at ones after it`s drying. In laboratory conditions spraying quality was determined.

Results and discussion

Dispersion of solution is one of the most important parameters that determine spraying quality of plants vegetans. It effects not only on chemical preparation containment by plants but on its falling out, covering of vegetative and generative organs, preparation penetration into tissue (leaf absorption) and its toxic properties for pesticides as well.

It was found out that principal technological parameters of slot atomizers set on various sprayers didn`t have any differences and corresponded to agrotechnical requirements: middle diameter of solution drops was 193,7 – 203,3 mkm, concentration of covering– 61,7 – 62,7 drops/sm^2, total working surface – 1,9 – 2 mm^2 (table 1).

Table 1

Quality rating of process solution spraying, using tractor atomizers OPV – 2000 ad IDEAL (AO "Agrofirma "Chernomorets", grape cultivar Rkatsiteli, on average per 2013-2014)

Layers of grape bush	Drop diameter, mkm	A number of drops (n), n/sm^2	Total working surface. mm^2
Eperiment – atomizer IDEAL (centrifugal atomizers)			
Top layer	210	62	2,1
Middle layer	202	64	2,04
Lower layer	198	59	1,8
Average	203,3	61,7	2
Etalon– atomizer OPV (centrifugal atomizers)			
Top layer	203	67	2,2
Middle layer	186	61	1,7
Lower layer	192	60	1,7
Average	193,7	62,7	1,9

At the same time biological efficiency against mildew was rated allowing for different atomizers. Biological efficiency against mildew working with tractor atomizers was rated as high – 88,2% in all experimental variations. Applying the injector atomizers which were set on sprayer IDEAL gave the best efficiency – 90,1% on leaves and on bunches – 91,6% (the beginning of ripening). Experiments where centrifugal atomizers were used resulted at the same phase 86,6 – 88,2% on leaves and bunches relatively (table 2).

Due to lack of favorable days for spraying and higher biological efficiency of injector atomizers in this research area (table 2), their technological parameters were rated through experiments conducted on vineyards.

Table 2

Biological efficiency against mildew applying tractor atomizers OPV – 2000 and IDEAL (AO "Agrofirma "Chernomorets", grape cultivar Rkatsiteli, 2013-2014)

Cultivar	Biological efficiency, %					
	Phase "pea-sized"		Phase "development of berries and shoots"		Phase "beginning of ripening"	
	leaves	bunches	leaves	bunches	leaves	bunches
IDEAL (injector atomizers)	100	-	99,5	98,7	90,1	91,6
OPV – 2000 (centrifugal atomizers)	100	-	90,7	93,6	86,6	88,2

Injector atomizers were set on sprayer IDEAL. They have a unique design what makes it possible to inhaust air, mixing it with process solution of pesticides, as a result it increases drop weight and size, which in this case can stand the wind, resist to evaporation and even runoff having correct settings.

During tests in 2013-2014 scientists compared characteristics of spraying quality by ceramic slot injector (IDEAL) and centrifugal atomizers (OPV – 2000). Study results are presented in table 3.

Table 3

Quality rating of process solution spraying using tractor atomizers OPV – 2000 ad IDEAL (AO "Agrofirma "Chernomorets", grape cultivar Rkatsiteli, on average per 2013-2014)

Layers of grape bush	Drop diameter, mkm	A number of drops (n), n/sm^2	Working surface, mm^2
Experiment-sprayer IDEAL (injector atomizer)			
Top layer	311	42	3,2
Middle layer	347	55	5,2
Lower layer	323	38	3,1
Average	327	45	3,8
Etalon – sprayer OPV (centrifugal atomizer)			
Top layer	210	61	2,1
Middle layer	198	70	2,2
Lower layer	221	65	2,5
Average	209,7	65,3	2,3

As a result drops ranging from 311-347 mkm applying sprayers IDEAL with injector atomizers are capable to get better treatment cover under non-optimal environmental conditions and reduce development of harmful organisms (table 2). Therefore we have

considerable advantages of injector atomizers as follows: level of falling out tends to decrease significantly, more even distribution of process solution across the whole grape bush and a large total surface of projection – on average 3,8 mm^2 of working surface in comparison with etalon - 2,3mm^2.

Conclusions

As a result of researches occurred on vineyards of Rkatsiteli cultivar in south-west zone of the Crimean viniculture the following was found out:

1. At present modern equipment and injector atomizers are actual during chemical treatment of plants.
2. Principal technological parameters of centrifugal atomizers meet the agrotechnical requirements: middle drop diameter of the process solution made 193,7 – 203,3 mkm, covering concentration – 61,7 – 62,7 drops/sm^2 and total surface of projection is 1,9 0 2 mm^2.
3. Sprayer IDEAL with injector atomizers produce drops ranges from 311 till 347 mkm what made it possible get better covering of the working surface under non-optimal environmental conditions, reducing level of harmful organisms development.
4. Biological efficiency of treatments using injector atomizers was rather high and during "beginning of ripening" it made 90,1% across leaves and 91,6% across bunches, what was higher than during the same phase presented by centrifugal atomizers (86,6 – 88,2% across leaves and bunches relatively).

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Sprayers applying for chemical protection of vineyards in the Crimea were analyzed and assessed. It was revealed that modern spraying equipment provides accurate dosage of preparation, its uniform distribution

over the work surface, good penetration through the grape bush, high or rather good degree of drip precipitation using injector or centrifugal atomizers. In terms of this research it was determined that applying the large-drop injector sprayer reduces drift of chemical preparations, improves quality and efficiency of pesticidal treatments.

Key words: *grape; equipment; spraying; dispersibility; sprayers; biological efficiency.*

PLANT CULTIVATION

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REGENERATIVE PRUNING PECULIARITIES OF *NERIUM OLEANDER* CULTIVARS WITHIN SOUTH COAST OF THE CRIMEA

Yelena Nikolayevna Spotar

Nikita Botanical Gardens – National Scientific Centre
298648, Republic of the Crimea, the city of Yalta, urban vil. Nikita
E-mail: elen_persic@mail.ru

Introduction

Due to warm Mediterranean climate on South Coast of the Crimea there is a large collection of evergreen arboreal plants, which are successfully used in green building to create landscape compositions of sanatoria - resorts zones and embankments. A quite important role goes to summer ornamental plants, capable to make resort guests and inhabitants happy. Oleander with high ornamental characteristics takes a special place here as it presents prolong continuous flowering period in summer-autumn. Though damaged shoots in severe for SCC winters cause some difficulties for this culture to be used in green building. As a result of hard damages by frosts some plants are subjected to renewal pruning till the stub.

Objective of our research is to determine regeneration terms of above-ground parts of oleander after pruning till the stub and its capacity to blossom the same year.

Objects and methods of the research

Material for our research was oleander collection of Nikita Botanical Gardens (NBG) aged by 4-30 years. At the same time visual observation after oleander plants being pruned till stub took part. These plants grow within detached areas under conditions of sufficient illumination and irrigation that is territory of parks: Alupka, Paradise, park of sanatorium Miskhor, Krym, Frunzenskoye; and embankments of Yalta and urban village Gurzuf, as well as unirrigated illuminated areas of some street plantations.

Phenological and biometrical observations after shoots were carried out by methodics developed in department of Dendrology and Floriculture [1], and making visual observations as well. As model specimens following plants were sorted out: 24 plants of 4 years (21 cultivars). growing under similar conditions on area with regular irrigation, 10 plants (6 cultivars) of 15-30 years, growing on different exposition sites under different care conditions, 30 plants of 70 years growing in Alupka (Vorontsov) park being under similar conditions with area regularly irrigated.

Results and discussion

Representatives of the only cultivar of *Nerium* L. Genus are plants with a high drought-resistance due to their xeromorphy. Ornamental properties combined with prolong flowering period (up to 90 days or more) make this culture widespread on the coast. Gardeners pay much attention to this oleander due to its easy cultivation, evergreen leaves