

Changing of Phytotoxicity N-(Phosphonomethyl)-Glycine Under the Influence of Frequency of An Ultrasonic Atomizer

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Abstract – In article results of laboratory researches on studying of influence of frequency of an ultrasonic atomizer on changing of phytotoxicity of not selective system herbicide on the basis of N-(phosphonomethyl)-glycine (glyphosate) are presented. Joint application of herbicide, organic acids in midget concentration and ultrasonic atomization with frequency 22 kHz has led to inhibition of all live plants at lower concentration of herbicide in a solution and has allowed to lower norm of entering of herbicide on 40 %. Applying of ultrasonic atomization with frequency of 2.5 MHz has led to hydrolysis N-(phosphonomethyl)-glycine and decrease in its phytotoxicity.

Index Terms - N-(phosphonomethyl)-glycine, VSC, frequency of an ultrasonic atomizer.

I. INTRODUCTION

THE MODERN agriculture is impossible without application of chemical protection frames of plants among them the most widespread are herbicides. At processing of plantings and crops about 99 % of pesticides get to soil, atmosphere, ponds and has toxic influence on biocenosis [1]. The rests of herbicides remain in agricultural production. In a human body, they destroy immune system and become the reason of hereditary and cancer diseases. Therefore researches on decrease in norms of entering of herbicides, for example, at the expense of their application together with the additives raising their efficiency, for example [2] – [4] are conducted.

Therefore researches on decrease in norms of entering of herbicides are urgent.

II. PROBLEM DETERMINATION

The purpose of the given work is in studying of influence of frequency of an ultrasonic atomizer on change of phytotoxicity N-(phosphonomethyl)-glycine (glyphosate) at its joint application with organic acids in midget concentration.

III. THEORY

Earlier we had been conducted microfield and field experiences of joint application of herbicide on a basis N-(phosphonomethyl)-glycine with a mix of organic acids in midget concentration (VSC) which have shown increase of

phytotoxicity of herbicide approximately twice [5]. Also earlier increase of activity VSC of organic acids at joint application with an ultrasonic irradiation [6] has been shown.

Therefore we had been undertook research of influence of frequency of ultrasonic atomization on phytotoxicity of herbicides on a basis N-(phosphonomethyl)-glycine with VSC.

IV. APPLICATION OF ULTRASOUND FOR DISPERSION OF LIQUID MEDIA

It is now widely used property of high-intensity ultrasonic liquid is atomized in the gas phase for various aerosols.

Liquid transfer in an aerosol condition occurs at the expense of increase in superficial energy of a film of a liquid which is reached at the expense of imposing on it of mechanical fluctuations of high intensity ultrasonic frequencies.

The acoustic way of reception of aerosols has a number of advantages before existing chemical and mechanical as modern ultrasonic atomizer equipment allows to intensify considerably process, to improve quality of a product, to replace bulky devices with more compact. Thus at high concentration of an aerosol the torch of dispersion monodisperse and homogeneous for structure with the set size of particles turns out.

For carrying out of researches the device of ultrasonic atomization of model USS-0.15/44-EM (working frequency 22 kHz, average diameter of atomized particles 40...50 microns) and an ultrasonic inhaler of “Musson-2”-03 (working frequency of 2.5 MHz, average diameter of 80 % of atomized particles no more than 4 microns) were used:



Fig. 1. An ultrasonic atomizer of model USS-0.15/44-EM.



Fig. 2. An ultrasonic inhaler of "Musson-2"-03.

V. RESULTS OF EXPERIMENTS

For research 2 cultures of plants white mustard (*Sinapis alba* L.) and phacelia (*Phacelia* L.) were taken. In work used herbicide of continuous action "Raundap" containing 360 g/l glyphosate and 180 g/l surface-active substances (the Manufacturer VR Monsanto Europe C.A., Belgium, the manufacturer Joint-Stock Company Firm "August", Russia. It is let out in 2009). Herbicide was applied with a solution of organic acids, intermediate a cycle of Krebs with concentration by of 10^{-11} M (VSC).

Processing spent for 14 day after landing of plants manually (a garden sprayer), by means of an ultrasonic atomizer of type USS-0.15/44-EM with frequency 22 kHz and an ultrasonic inhaler of type-03 "Musson-2" with frequency of 2.5 MHz.

Solutions for spraying prepared by dilution a standard working solution of herbicide on a basis N-(phosphonomethyl)-glycine water or water and solution VSC of organic acids, concentration of herbicide in a solution made from 20 to 100 %. For both cultures similar results have been received. Results of experience are presented to Tab. I.

TABLE I
INFLUENCE OF CONDITIONS OF PROCESSING ON THE
KEEPING OF PLANTS WHITE MUSTARD IN THREE WEEKS AFTER
PROCESSING BY HERBICIDE ON THE BASIS
N-(PHOSPHONOMETHYL)-GLYCINE

The concentration of herbicide in solution		The share of the surviving plants, %		
		Hand spraying	Ultrasonic atomizing	
			22 kHz	2.5 MHz
20	In water	100	96.8	100
	In VSC	71.4	57.0	100
40	In water	25.9	26.0	100
	In VSC	22.9	17.0	100
60	In water	21.4	0	100
	In VSC	12.5	0	100
80	In water	7.3	4.6	100
	In VSC	3.3	0	100
100	In water	0	0	100

According to Tab. I it is possible to draw a conclusion that application of ultrasonic atomization of herbicide on a basis N-(phosphonomethyl)-glycine and VSC with frequency 22 kHz has led to increase of its phytotoxicity approximately on 40 %, is possible at the expense of diffusion strengthening in a plant fabric.

At use of the ultrasonic atomizer having working frequency of 2.5 MHz, loss of phytotoxicity of a preparation was observed 100 %. Therefore before ultrasonic processing spectroscopic research of working solutions of preparations has been conducted in a range of length of waves 200...800 nm (spectrophotometer SHIMADZU UV2401 PC):

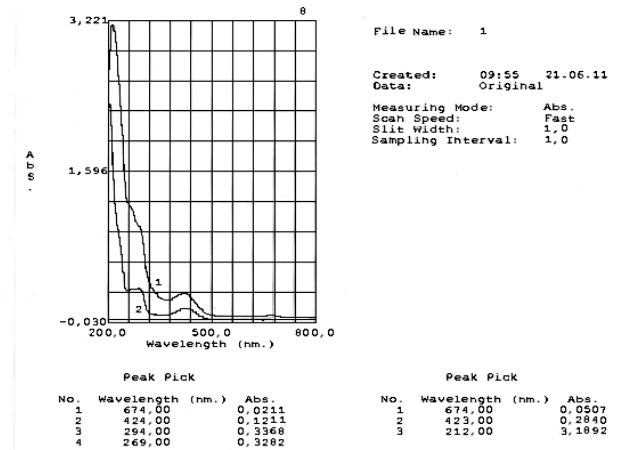


Fig 3. Spectra of a working solution of a preparation on a basis N-(phosphonomethyl)-glycine to (1) and after (2) passing through the ultrasonic device.

Comparing the spectra it is possible to assume that as a result of ultrasonic processing of herbicide to frequency of 2.5 MHz there is a hydrolysis N-(phosphonomethyl)-glycine that further can be used for recycling of herbicides on its basis.

VI. DISCUSSION OF RESULTS

All plants white mustard and phacelia have been completely suppressed in three weeks at 100 % concentration of herbicide on the basis of N-(phosphonomethyl)-glycine in a solution with using of a manual sprayer.

Application of an ultrasonic atomizer with frequency 22 kHz and organic acids in midget concentration has allowed to reduce to a minimum all plants at 60 %, 80 % and 100 % concentration of herbicide in a solution.

Using of an ultrasonic atomizer with frequency of 2.5 MHz has led losses of phytotoxicity of herbicide in all variants of experience. Spectroscopic research of a preparation before such ultrasonic processing have shown possibility of hydrolysis of the components which are a part of herbicide.

VII. CONCLUSION

Thus, it is possible to draw a conclusion that joint application of solution N-(phosphonomethyl)-glycine, midget concentration of organic acids and ultrasonic atomization with frequency 22 kHz allows to raise phytotoxicity of herbicide on 40 %, and application of ultrasound with frequency of 2.5 MHz leads to hydrolysis N-(phosphonomethyl)-glycine and can be used for recycling of herbicides on its basis.

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