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Five years observation of Phytobac work efficiency at Institute of Plant Protection

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Introduction

Filling of a sprayer and washing it down are processes posing potential risk for the environment from the use of pesticides, both being a source of the so called point-source pollution.

It is important to find environmentally safe procedure for filling and washing sprayers and to evaluate the efficiency of pesticide decomposition in the biobed mix.

So called biobeds give protection against point-source pollution generated during:

- * mixing and loading of the sprayers,
- * cleaning the outer surface of sprayers,
- * wash sprayers inside,
- * management of not used spray solution,
- * storing the sprayers.



Introduction continued

- * Following an analysis of available technological, legal and organizational solutions, we developed a PHYTOBAC - based technology and we drafted a construction plan.
- * The objective was to build and start the station.
- * The project intended to introduce an organized and orderly procedure to be followed during filling and washing of sprayers and it was needed by both Polish regulations and the European Parliament's Directive on the sustainable use of pesticides.
- * In addition to constructing a station for filling, washing and storage of sprayers at IOR-PIB, Sosnicowice Branch, the project has also research efficiency of the method and assess the rate of decomposition for pesticide residues under Polish conditions.



Legal aspects

DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009

establishing a framework for Community action to achieve the sustainable use of pesticides:

Article 13

Handling and storage of pesticides and treatment of their packaging and remnants

1. Member States shall adopt the necessary measures to ensure that the following operations by professional users and where applicable by distributors do not endanger human health

or the environment:

- (a) storage, handling, dilution and mixing of pesticides before application;*
- (b) handling of packaging and remnants of pesticides;*
- (c) disposal of tank mixtures remaining after application;*
- (d) cleaning of the equipment used after application;*



Legal aspects continued

REGULATION OF THE MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
of 24 June 2002 (Dz.U.2002.99.896) on health and safety at the handling and storage
of pesticides and mineral fertilizers.

*§ 16 After completion of the work associated with the use of plant protection products
and fertilizers, vehicles and equipment shall be cleaned and washed in the washer
equipped with a sewage treatment plant or trap to neutralize the effluents.*

REGULATION OF THE MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
of 22 May 2013 on how to proceed with the handling and storage of plant protection
products

*the preparation of plant protection products for use and cleaning the sprayers: should
take place:*

- 1) in a way that minimizes the risk of contamination of surface water and groundwater
within the meaning of the Water Law and ground, including through leakage of plant
protection products in soil profile;*
- 2) not less than 30 meters from a well, water intake and water bodies and watercourses,
in the case of cleaning equipment.*



The scale of the problem

- * The scale of the problem in Poland:
- * about 1 650 000 households (farms) - over 1 ha
- * about 486 thousand units - the number of field sprayers,
- * about 50 thousand units - the number of orchard sprayers,
- * Over 20 thousand tons - the sale of the active substance
- * Near 60 thousand tons - the sale of PPP.

Millions of places every year are contaminated with effluents during filling up and rinsing the sprayers all over the World.



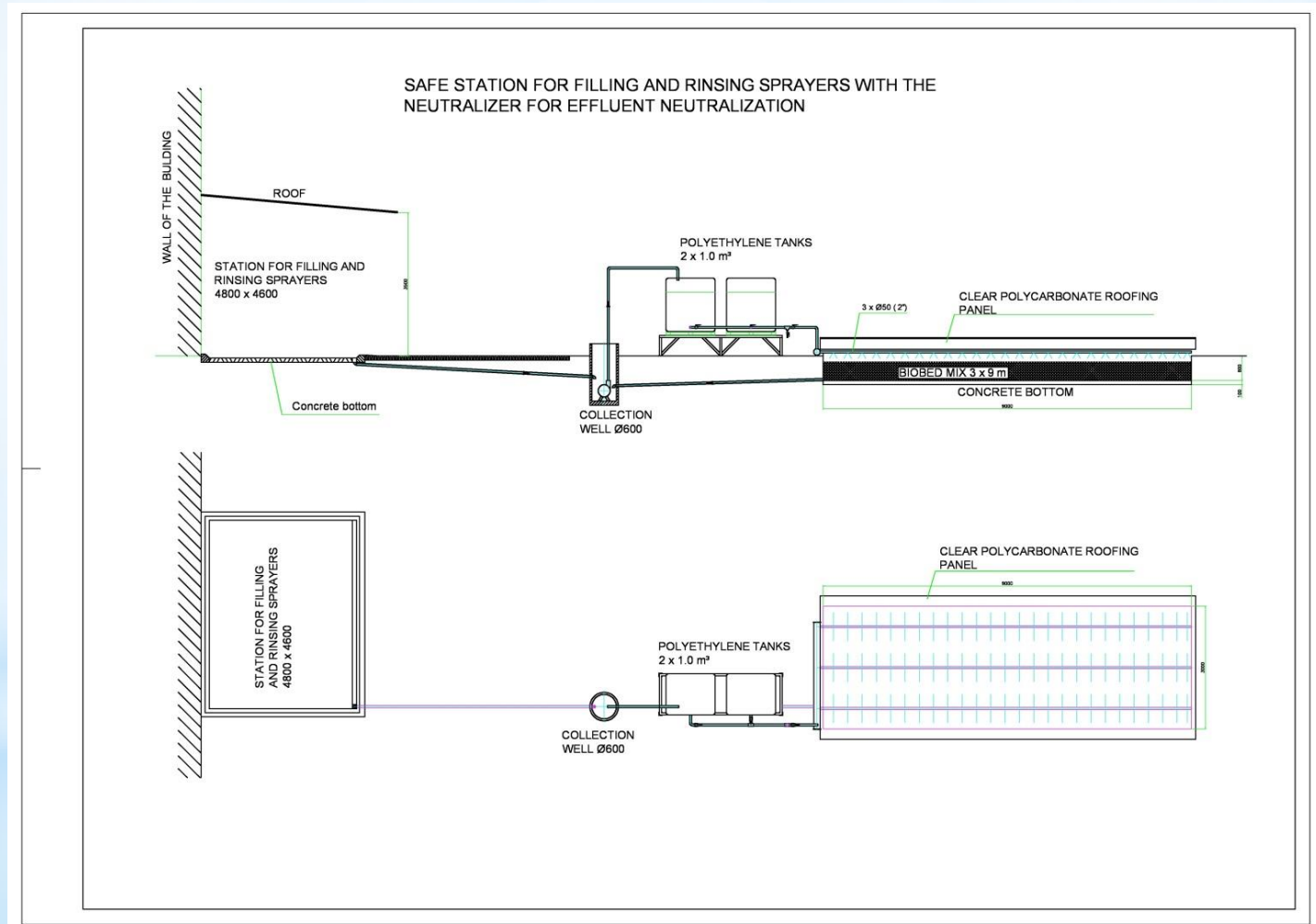
The installation in Institute of Plant Protection consists of two major components:

- a sprayer washing station and
- a biological neutralizer unit for the effluents.

Shelter (washing and filling)	Biobed mix (effluent neutralization)
concrete, leak proof slab 4.8 x 4.9m	concrete tank 9 x 3 m
shelter with a roof	movable polycarbonate roofing
access to water for filling the sprayer	biobed - 0.7 m thick layer
pressure washer	soil from a trial plots
drain line connected to the collection well	straw (3% of weight)
concrete, leak proof slab 4.8 x 4.9m	collection well with pump.



Phytobac in Plant Protection Institute technical data and flowsheet.



- * The installation is closed, so the remnants of plant protection products can not escape outside.
- * The installation is equipped with a valve allowing taking samples of water circulating through the system.
- * Samples are tested at the Laboratory of Pesticide Residue Testing of the Institute in Sosnicowice.
- * The samples are analyzed for the presence of near 90 different active ingredients found in pesticides.
- * The results indicates that the concentrations present in water after washing the sprayer range from a few to over a dozen $\mu\text{g/l}$ for an individual ingredient.





Concrete neutralizer chamber under construction.





Shelter under construction.





Preparing biobed mix.





Neutralizer with polyethylene tanks and collection well.





Filling up of the neutralizer.





Place for filling up and rinsing sprayers ready to use.











Effluent distribution system (gravitationally).



Effluent distribution system.



Reserches

- * Water is sampled every two weeks during growing season.
- * Soil from four different depths is sampled every two weeks (from 2015)
- * Every activity on the station is listed in a notebook (cleanig of sprayer and others)
- * Near 90 active substances are analysed in water.
- * By measuring the water supply to Phytobac we determine the quantity of evaporated water in the season.
- * The phytobac mixture is mixed with additional straw every year.



REJESTR PRAC PROWADZONYCH NA STANOWISKU DO NAPEŁNIANIA I MYCIA OPRYSKIWACZY

Lp	DATA	CZYNNOŚĆ*	ŚOR	UWAGI
1	12.03	1	AFALON OYSPERSYJNY 450 SC + COMMAND 480	
2	22.03.	1	NAVIGATOR 360 SL	
3	22.03.	1	FOX 480 SC	
4	23.03	1	Huzar 05WG + Esteron 565 EC	
5	27.03.	1	Huzar activ 387 OD	
6	27.03	oprysk	Wach 1	
7	28.03	zapalanie	Vitavax 200 FS	
8	2.04	1	COMMAND 480 EC + METAZANEX 300 SC	
9	2.04.	4	Mustang Forte 195 SE	
10	3.04.	1	Tulius 200 EC	
11	11.04.	1	MODDUS 250 EC	
12	12.04.	1	CERONE 480 SL	

*CZYNNOŚĆ

1 – mycie dużego opryskiwacza

2 – mycie opryskiwaczy plecakowych i WACH

3 – mycie innego sprzętu

4 – rozlanie śor przy napełnianiu

5 –

6 –





Soil sampling.

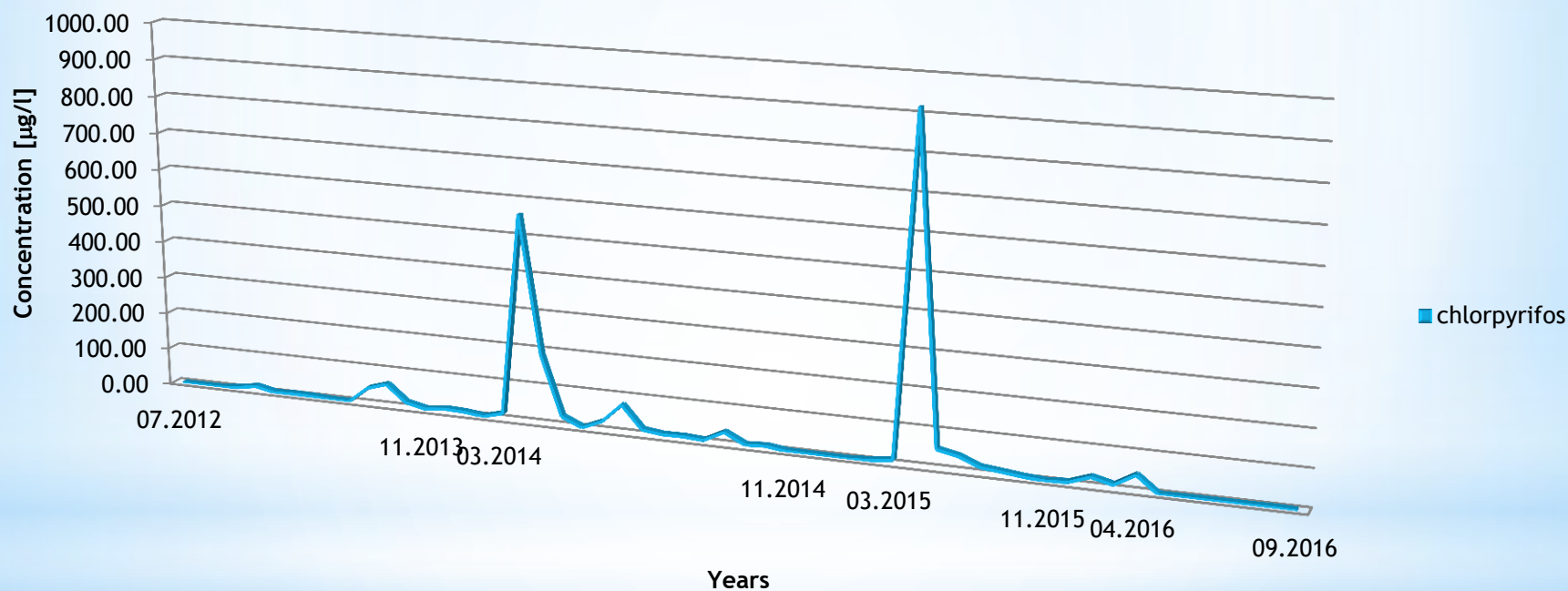




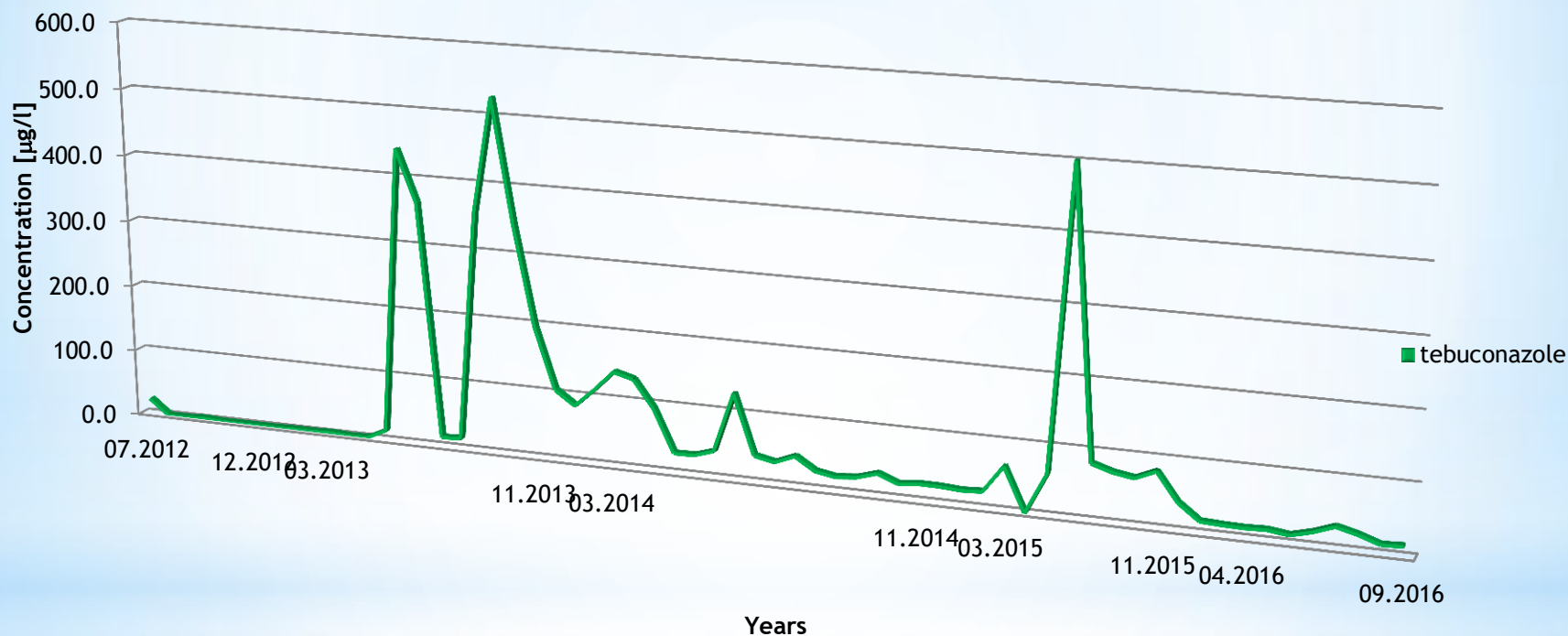
Change the concentration of metrybuzin in water (2012-2016)



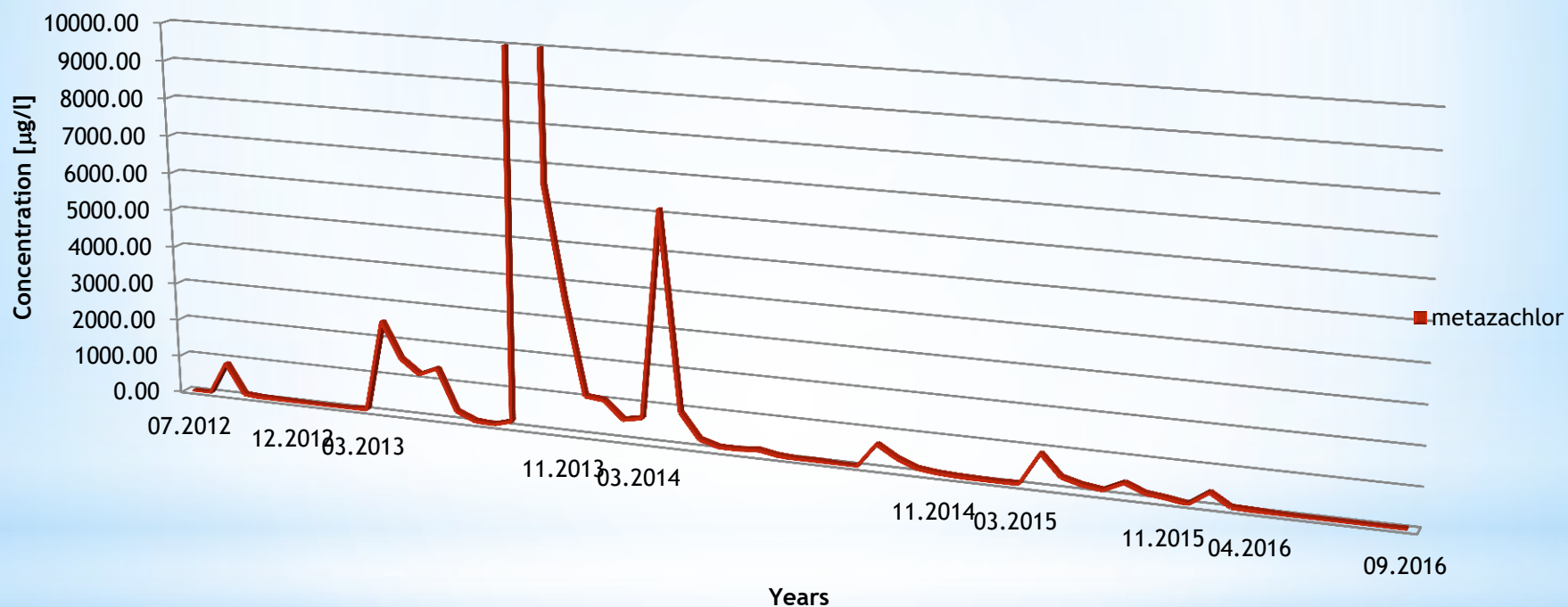
Concentration of chlorpyrifos in water



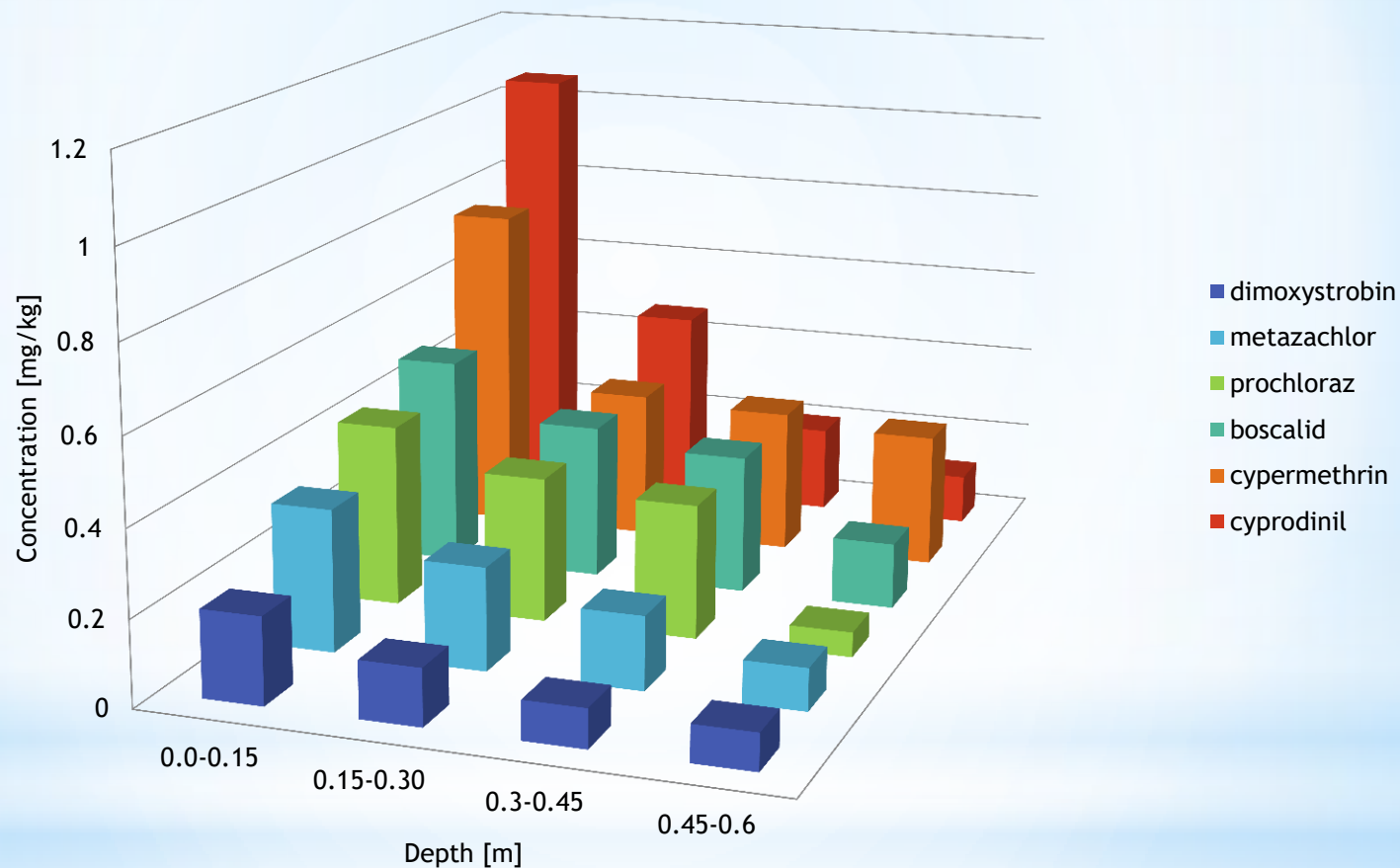
Concentration of tebuconazole in water (2012-2016)



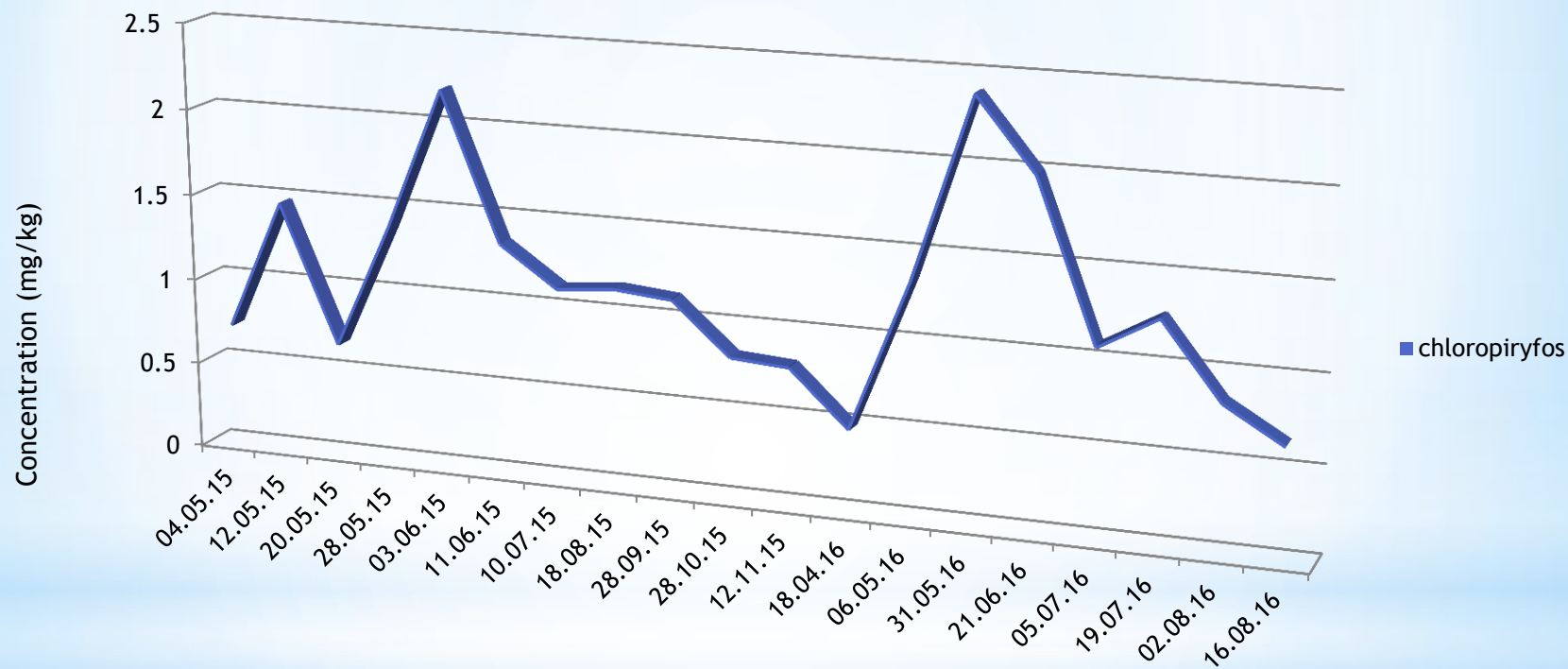
Concentration of metazachlor in water (2012-2016)



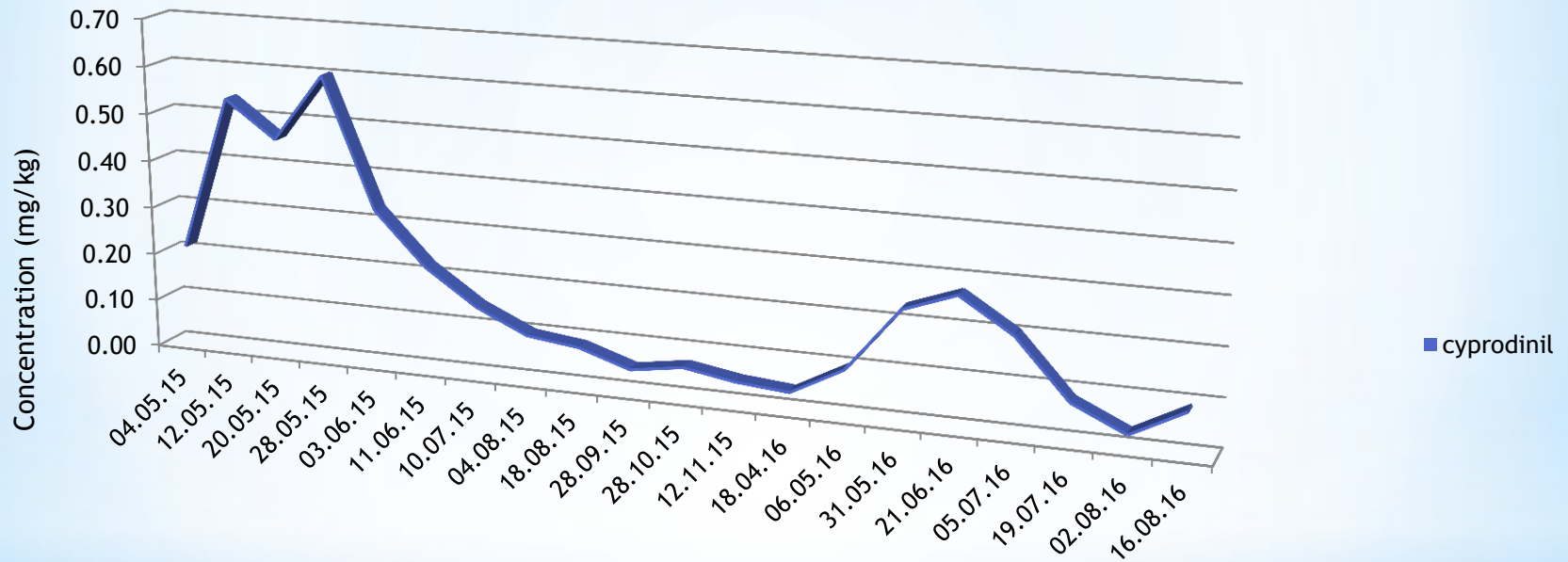
Concentration of pesticides in biobed mixture on different depths



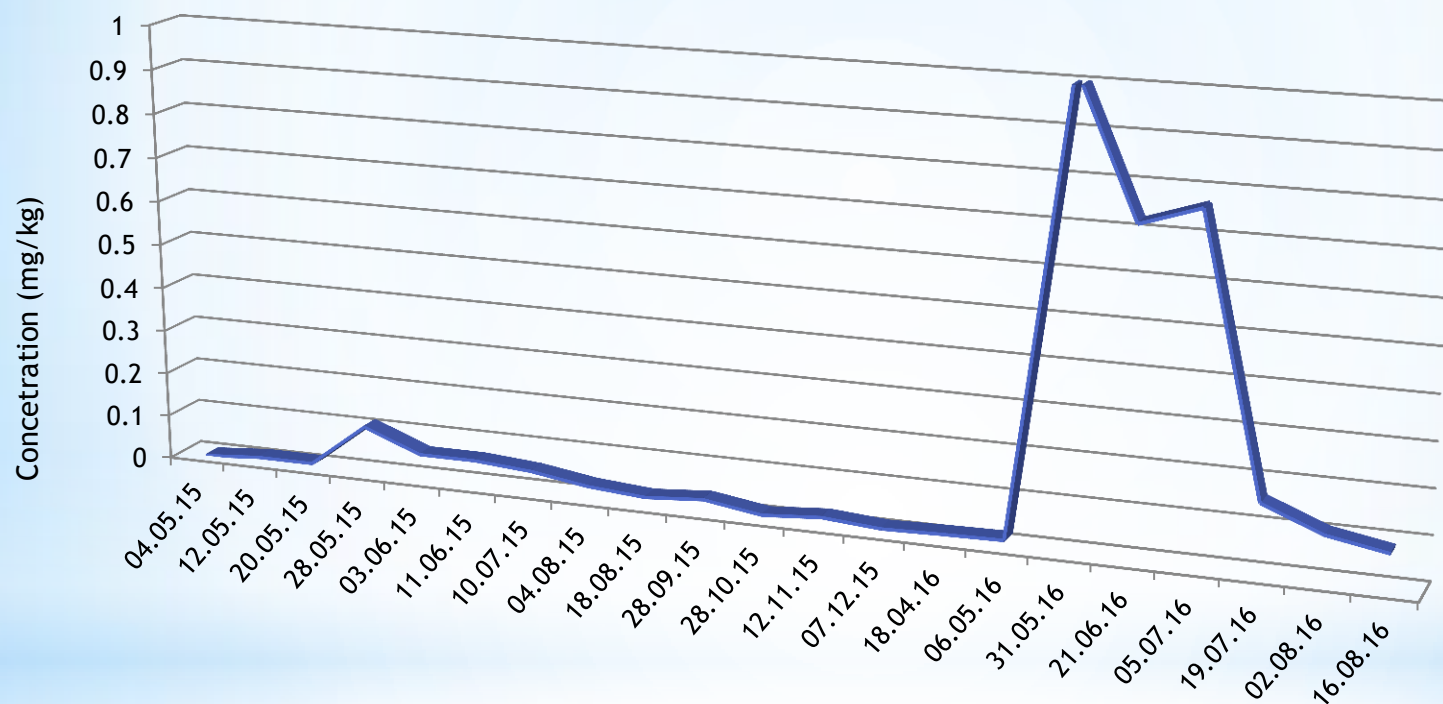
Concentration of chlorpiryphos in soil (2015-2016)



Concentration of cyprodinil in soil (2015-2016)



Concentration of metribuzin in soil (2015-2016)



Evaporation

* 2013 – 5335 l

* 2014 – 5840 l

* 2015 – 3760 l

* 2016 –

* ~ 150-175 l of water for cleaning (500 l sprayer)



Key findings and conclusions

- * The project resulted in construction and start-up of a sprayer filling and washing station
- * During five years the station operates smoothly.
- * Biobed volume and water evaporation capabilities seem to be optimal.
- * Analyses also indicate that the biobed works properly.
- * The station serves a practical as well as experimental purpose: it meets the IPP needs for sprayer washing and allows to conduct a study on the rates of decomposition of active substances.
- * It also has an eco-friendly effect in terms of protecting the environment against the point-source pollution of soil and underground water.
- * Over time, we found that there is a significant decrease in the substance concentration levels.
- * During whole growing season 5-6 cubic meters of effluents can be evaporated.



Thank You very much for your attention

