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CONDITION OF AIR ASSISTED SPRAYERS IN STIP REGION AND POSSIBILITY OF APPLYING EUROPEAN STANDARD EN 13790

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Abstract

The research was performed in Stip region in 2015. Stip region is located in the eastern part of the Republic of Macedonia where an intensive agricultural production takes place. Republic of Macedonia, as a candidate country for the European Union must harmonize its legislation with the European, including the European standard EN 13790. This standard includes, among other things, the introduction of mandatory inspection of machinery and equipment for pesticide application. Therefore, the main objective of this study was to collect data (number, model, age, safety ….) on the air assisted sprayers, as well as basic information about the owners of these machines (education, farm size, culture type, basic knowledge and trainings for safe and proper use of these machines etc.)

Key words: *Pesticides, inspection, visual flows, operational flows, nozzle*

INTRODUCTION

The overuse and misuse of pesticides pose a threat to the environment and health hazards for the farmers in the agricultural production. Pesticide residues in food affect directly the health of consumers and the increasing number of infected people. In addition, exporters of food must comply with the standards on the minimum allowed presence of residues in processed foods, fresh fruits and vegetables. The non-compliance with these standards can have catastrophic effect on the increasing of export, which is one of the primary economic objectives of our country.

With the new law on plant protection, the agricultural policy of our country pays special attention to the protection of agricultural land from pollution and to the principles of environmental protection. The law deals with the economic, health, environmental and social role of agriculture and establishes the principle of agricultural policy measures that are to be aimed at encouraging sustainable agricultural activities. The measures are aimed at maintaining the diversity of animal and plant species, conservation of soil and of its fertility and protection of natural conditions necessary for life in soil, water and air.

However, the outdated technology in Macedonia, worn and poorly maintained machinery and pesticide application equipment cause directly the increased number of treatments, poor protection and uncontrolled spread of diseases and pests in the agricultural production (Dimitrovski et al., 2016).

In the last few years, the European Commission adopted a whole set of rules (directives) and broadened the scope of all those regulations. According to the guidelines presented in the directives, all national regulations in the Member States must be harmonized when the countries introduce new laws. The Directive 2009/128 / EC of the European Parliament establishes a framework for the implementation of the National Action Plan in each country, which refers to the sustainable use of pesticides. One of the areas covered by the Directive relates directly to the introduction of mandatory monitoring and inspection of pesticide application equipment (Gil, 2006). Considering that in the Republic of

Macedonia the inspection is not mandatory, and as a country candidate it is bound to harmonize its regulations, the main goal of this research is to determine the current condition of the air assisted sprayers. The results are a good basis for further research and an opportunity to apply standardized procedures for mandatory inspection of machinery for pesticide application.

MATERIAL AND METHODS

The research was conducted in the Stip region in 2015 covering the municipality of Stip with larger villages: Tri Cesmi, Balvan and Argulica.

The instrument used during the field research was the questionnaire including data divided into three groups:

a) General information about the owner
b) General information on the pesticide application equipment
c) Visual and operational flaws of the machines

RESULTS AND DISCUSSION

In the Republic of Macedonia, despite the inventory of farmstead and agricultural machinery, there is no exact number of pesticide application equipment. In the questionnaire, according to the last list, there was no graph for these machines. That is why in Macedonia it is assumed that the number of these machines is about 14-15000. However, according to our initial research in the Stip region and wider, the number of pesticide application equipment is far smaller. The introduction of the EN 13790 standard, the identification of the required number of test stations, and the need for training for proper and safe operation with these machines were the motive for this first research in this field.

The aim of the research is to determine the current status of one part of air assisted sprayers and how much they meet the prescribed norms of the European standard EN 13790 and the new EN ISO 16122.

The Stip region is part of the Southeastern Mediterranean region, which is one of the major agricultural regions in the Republic of Macedonia. In this region, the most important are field crops (Fig. 1).

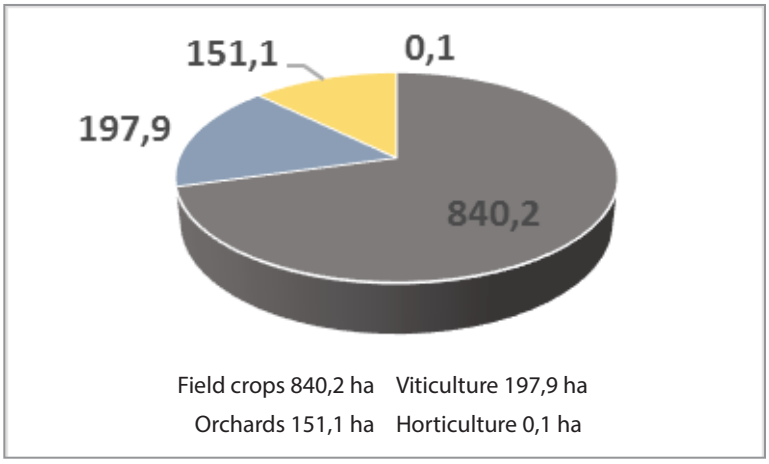

Figure1. Land structure in ha.

In the last 7-8 years as a result of the division of state land and subsidies given by the state, number of hectares with vineyard and orchards is growing. However, if irregular plant protection is carried out on these 1172 ha, on which various agricultural crops are grown, this directly affects the spread of pests and diseases, pollution of the environment and human and animal health.

Figure 2 and Figure 3 show general data about farmers who have pesticide application equipment. According to the data, it can be noted that, of the total number of farmers surveyed, 22 (88%) have secondary education, and most of them, in total 18 (72%), in this part of the Stip region are not registered farmers, because agriculture is not the main activity.

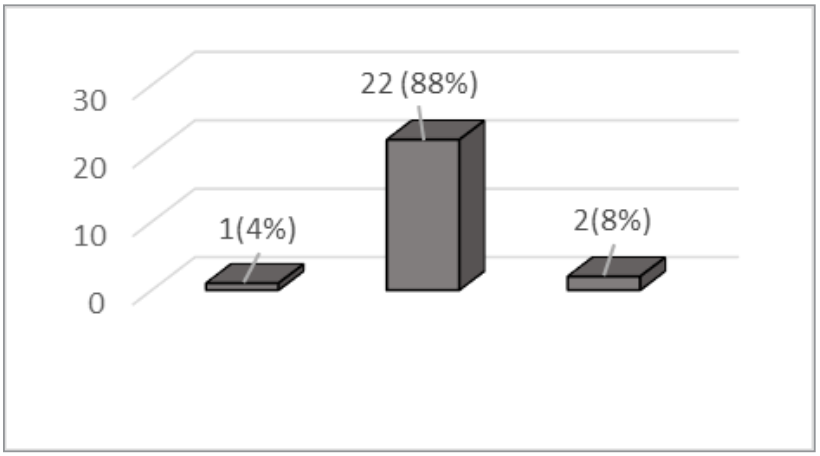

Figure 2. Education of interviued farmers.

The fact that all surveyed farmers have not attended any training on quality and on handling these machines is worrying. This means that these machines are used according to their personal experience or according to the experience of their relatives and friends which is often misleading and unsafe. However, all farmers have said they would like to participate in training to expand their knowledge, reduce plant protection costs, protect their health and reduce environmental pollution.

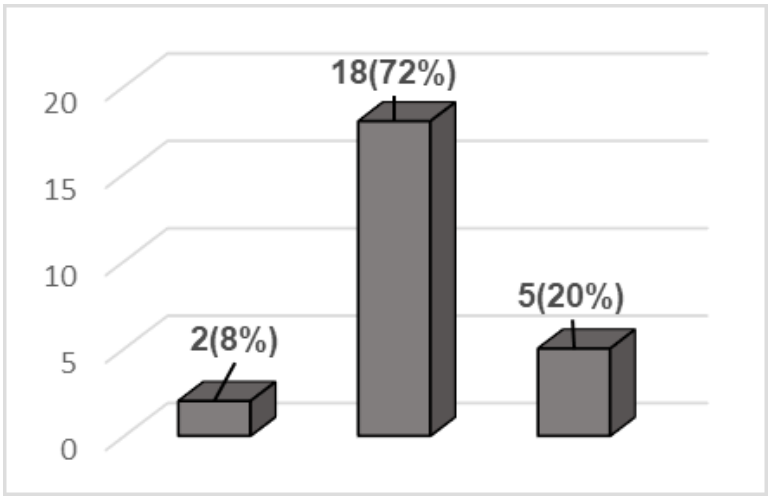

Figure 3. Regisrered farmers/firm.

The brands of pesticide application equipment, which are most prevalent in this part of the Stip region, are shown in Table 1. According to the data from the table, the most important brand is Agromehanika Kranj 15 (39.47%). Particularly satisfactory is the fact that 17 machines are aged up to 5 years, but also a large number of machines (14), are between 10-20 and over 20 years old. Improper maintenance and exploitation of these machines has a direct impact on poor quality plant protection and increased environmental pollution.

A large number of new pesticide application machines are the result of the state's help to farmers through subsidies to procure new machinery.

Table 1. Basic data for pesticide application equipment in part of Stip region.

Pesticide application equipment						
Number	Brand	Total %	Age			
			0-5	5-10	10-20	20<
1.	Agromehanika Kranj	15 (39.47)	8	4	1	2
2.	Evrotech	1 (2.63)	0	0	1	0
3.	Morava	9 (23.68)	2	1	3	2
4.	Agron Niš	7 (18.42)	7	0	0	0
5.	Metalbraneks Prokuplje	1 (2.63)	0	1	0	0
6.	Fisher	1 (2.63)	0	0	0	1
7.	Miterrer	2 (5.26)	0	0	0	2
8.	Vreček Kranj	1 (2.63)	0	1	0	0
9	Atomizatori	1 (2.63)	0	0	0	1
	Total	38 (100)	17	7	5	9

From the total number of tested machines in this region, the number of air assisted sprayers is 25. In Table 2, the number of air assisted sprayers is shown according to the way of hitching with the tractor and volume of the tank. According to the table, almost obsolete carried air assisted sprayers 13 and 12 trailered air assisted sprayers are used to protect the orchards and vineyards.

Table 2. Data for air assisted sprayers in part of Stip region.

Way of hitching	Carried	Trailered	Total
Tank	≤ 600 l	> 600 l	/
Total	13	12	25

Table 3. Visual flows on air assisted sprayers in part of Stip region.

Parts of the machine	Visual flaws of PAE		Total	%
	No parts	Modifications		
Chassis	/	4	4	13.33
Hitching device	/	/	/	0
Power take-off	/	/	/	0
Wheels / pneumatic tires	1	/	1	3.33
Tank	1	5	6	20.00
Agitator	/	/	/	0
Pump	/	2	2	6.67
Filters	2	/	2	6.67
Command valve	/	/	/	0
Manometer	1	/	1	3.33
Hoses	/	2	2	6.67
Sprayer boom	/	3	3	10.00
Nozzles	1	2	3	10.00
Ventilator	/	4	4	13.33
Total	6	24	30	100

Further research on air assisted sprayers relates to the operational and visual flows are shown in Table 3 and Table 4.

According to the results of Table 3, it can be concluded that after the visual inspection of the machine the biggest disadvantage and modification was found on the tank 6 (20%), chassis 4 (13.33%) and fan 4 (13.33%). Of the total of 30 flaws and modifications, visual defects are most often related to various adaptations of the armature with nozzles, broken or laminated cover on the tank, as well as the reinforcement of the chassis due to spinning and breaking on the machine itself. Of the total number of machines, 6 machines did not have any vital parts for proper operation and exploitation.

Analyzing the current state of air assisted sprayers it can be concluded that the most common malfunction in machines is determined in the manometer – 9 machines (36.00%), and one machine did not have any manometer at all (Tab. 4). It should be noted that this tool directly shows the operating pressure in the system and is one of the main control tools for proper and quality application of pesticides. Regarding the modifications of these machines they are usually observed in the hoses 8 (32.00%) of the machines. The great pressure and the quality of hoses affect directly the length of their use and the need for replacement (Declercq et al., 2012).

Table 4. Operational flows on air assisted sprayers in part of Stip region.

Parts of the machine	Operational flows			
	Functioning properly	%	Malfunctioning	%
Chassis	25	100	/	0
Hitching device	25	100	/	0
Power take-off	25	100	/	0
Wheels / pneumatic tires	21	84.00	4	16.00
Tank	25	100	/	0
Agitator	21	84.00	4	16.00
Pump	23	92.00	2	8.00
Filters	22	88.00	3	12.00
Command valve	19	76.00	6	24.00
Manometer	16	64.00	9	36.00
Hoses	17	68.00	8	32.00
Sprayer boom	21	84.00	4	16.00
Nozzles	21	84.00	4	16.00
Ventilator	20	80.00	5	20.00

During the conversation with the farmers about their experience the most common defects and problems encountered when using these machines were discussed. According to the results of the research it can be concluded that most defects occur in the hoses and pump of the pesticide application equipment (Tab. 5).

Table 5. Most common problems with air assisted sprayers in part of Stip region.

Chassis	Hitching device	Power take off	Wheels/ Pneumatic tires	Tank	Agitator	Pump	Filters	Command valve	Manometer	Hoses	Sprayer boom	Nozzles	Ventilator
1	0	0	0	1	0	7	3	0	0	9	1	5	1
4%	0	0	0	4%	0	28%	12%	0	0	36%	4%	20%	4%

Unfortunately, according to the first results, we can conclude that a large number of controlled air assisted sprayers can not meet the requirements of European Standard EN 13790 and the new EN ISO 16122. All surveyed machines have only one tank and many of them have modifications that are not in accordance with the above mentioned standards.

CONCLUDING REMARKS

According to the results of the research it can be stated that in the Stip region:

- The largest number of surveyed farmers is not registered farmers 18 (72%) and most of them have secondary education 22 (88%)
- None of the farmers interviewed visited training on the safe and proper exploitation of pesticide application machines (100%)
- The most common brand of pesticide application machines is Agromehanika Kranj 15 (39.47%)
- The largest number of machines is between 0-5 years old (17), but also a large number of machines (14), which are between 10-20 and over 20 years old
- The largest number of visual defects was noted due to various modification 6 (20%) due to broken or laminated cover on the tank
- Operating disadvantages were most pronounced 9 (36.00%) due to the defect of the manometer
- During the exploitation, farmers had the most problems with the intestines (36%) and the pump (28%) in pesticide application machines

In the Republic of Macedonia there is no compulsory inspection of pesticide application equipment. But as a candidate country, Macedonia is bound to apply and harmonize its laws and standards to the European Union laws and standards. The introduction of mandatory inspection, as well as other laws regarding the proper use and handling of waste pesticides, affects directly the protection of the environment and human health.

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СОСТОЈБА НА ОРОСУВАЧИТЕ ВО ШТИПСКИОТ РЕГИОН И МОЖНОСТ ЗА ВОВЕДУВАЊЕ НА ЕВРОПСКИОТ СТАНДАРД EN 13790

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Резиме

Истражувањата во овој труд се спроведени во Штипскиот регион во 2015 година. Регионот се наоѓа во источниот дел на Република Македонија, каде што се одвива интензивно зејоделско производство. Македонија како земја кандидат за членство во Европската Унија мора да ги хармонизира своите законски прописи со европските, вклучувајќи го и Европскиот стандард EN 13790. Покрај другото, овој стандард предвидува и задолжително воведување на инспекција на машините и опремата за апликација на пестициди. Поради овие причини, главна цел на ова истражување е прибирање податоци за број, модел, години на старост, безбедност и сл. на оросувачите, како и основните информации за сопствениците на овие машини (образование, големина на фармите, основни познавања и посетување на обуки за правилно и безбедно подесување и користање на овие машини итн.)

Клучни зборови: *пестициди, инспекција, визуелни недостатоци, оперативни недостатоци, млазници*