THE AGRICULTURAL TECNOLOGIES AND THE FOOD SAFETY

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REZUMAT. Tehnologiile agricole de mediu sunt elemente importante ale agriculturii durabile şi a siguranţei alimentare. Din perspectiva siguranţei alimentelor tehnologiile de protecţie a plantelor reprezintă cel mai important element al producţiei agricole. Cantitatea minimă necesară de pesticid poate fi redusă prin utilizarea instrumentelor tehnice noi bazate pe pulverizatori. S-a făcut o examinare cu diferite tipuri de pulverizatoare unguresti şi din import în cadrul unor proiecte. Rezultatele testelor au dovedit întotdeauna avantajele utilizării metodelor noi în comparaţie cu utilizarea pulverizatoarelor tradiţionale. Metodele moderne de depunere a pesticidelor pe frunze sunt favorabile faţă de aplicarea aceleiaşi cantităţi de pesticide cu pulverizatoarele tradiţionale. Depunerea pesticidelor astfel crează posibilitatea economisirii de pesticide şi a producţiei de alimente cu conţinut minim de pesticide.

Cuvinte cheie: siguranța poduselor alimentare, tehnologie de protecție a plantelor, reducerea pesticidelor, experimente.

ABSTRACT.The environment friendly agricultural technologies are very important elements of the sustainable agriculture and the food safety. From aspect of the food safety the plant protection technology is the most important element of the agricultural production. The necessary minimal quantity of pesticide can be decreased by using the new technical instruments on sprayers. We have made examination on deposit of pesticides with different types of hungarian and import sprayers in the frame of some project. Test results always proved the advantages of usage of new technology methods compared to the usage of traditional sprayers. The modern methods yielded more favourable pesticide deposition on the leaves next to the application of same quantity of pesticides than traditional sprayers. The favourable pesticide deposition gives good possibility to pesticide saving and to food production with minimal pesticide content.

Keywords: food safety, plant protection technology, pesticide reduction, experiments

1. INTRODUCTION

In the interest of food safety there will probably be need for applying chemical environmental protection processes. Nowadays, however, the proper basic requirement for the principle sustainable development would be to get the necessary minimum amount of pesticides into the environment only to exterminate the determined number of the species of parasites, to prevent the diseases from spreading, with the least possible environment burden. In spite of the environment friendly methods, the significant pesticide and other cost reduction, however, it can be experienced that the up-to-date chemical saving, environment friendly plant protection technologies have not been widespread in home practice.

We started to make experiments with different types of Hungarian and import sprayers in the frame of some projects financed by Hungarian government more than 15 years ago.

Objective of the research work: to promote home widespread of chemical reducing, environment friendly plant protection technology by the approach of technologies producing diversities in the accumulation of the aimed surface, under the given outdoor circumstances.

In the last years of our projects we compared the work of a made-in-abroad plantation spraying machine with a similar category of a homemade spraying machine with plant sensor, in all the cherry plantations and made examination on work quality a new developed field sprayer.

2. PRESENTATION OF THE EXAMINATION METHOD

Methods of the experiments in plantation

The character of the examination and examination

To be completed examinations:
- determination of coverage characteristics, and
- control of pesticide saving.

The steps of controlling pesticide reduction:
- recording the examination circumstances,
- filling up the tank with the given amount of pesticide,
- spraying the pesticide,
- re-measuring the remaining pesticide,
- measuring the section length of the sprayed plantation with the given amount of pesticide,

- determining the pesticide doses,
- evaluation of examination results.

Compared machines:
KERTITOX BORA equipped with plant sensor (Figure 1) and VULKANO without plant sensor (Figure 2)

Fig. 1 KERTITOX BORA *axial fan spraying machine equipped*

Fig. 2.VULCANO *axial fan spraying machine with plant sensor*

Parameters of the applied machine set-up
The applied set up values of the machines during examination can be seen in table 1.

Table 1. The set-up data of the machines

Machine type	*Work speed (km/h)*	*Pressure (bar)*	*Liquid doses (dm^3/ha)*
KERTITOX BORA	7,0	25,0	230
VULCANO	8,0	16	245

Work quality examinations were carried out with the KERTITOX BORA spraying machine, during on and off of the plant sensor. The characteristics of the examined area: cherry plantation, lane distance 6m, stem distance 4m, age 2 and 3 years

The experiments method and circumstances in field experiments

The scope of the examination method is the measuring of the frame's amplitude during work and the measuring of the coverage parameters of the water sensitive papers. After that from these dates we make connections.

Circumstances of the examination

We made these experiments with a Kertitox Fullspray 3000/24 sprayer on an artificial stumbling-court. The stumbling court was built regarding to the BBA (Braunschweig) standards. During the examinations, also on the edges and on the middle of the frame we put out water sensitive papers in 2.5 m distance. We sparkled water on the papers while we recorded the motion of the frame. After the test papers went dry, we collected them. During the evaluation of the recorded dates we examined two designated points on each test paper (2.34 cm2) and recorded them digitally. After that by a spectrum analysis software we could claim the coverage values, the relative number of drops, the average coverage values, and the variation coefficiences (CV%).

3. RESULTS OF THE EXAMINATIONS

Results of the coverage examinations in cherry plantation
The examinations were performed with applicable similar pesticide doses determined by the technical characteristics of the spraying machine. It may be highlighted on the basis of the derived examination results that the back side of leafs coverage during the plantation spraying with much lower than usual pesticide doses of about 250 dm^3/ha applied was also suitable in the case of KERTITOX BORA spraying machine. It is significant because the pathogens and parasites can be usually found on the abaxial leaf surface.

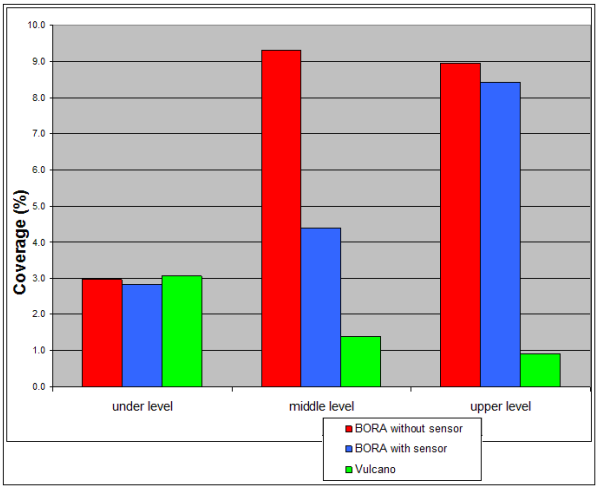

Fig. 3. *Coverage on the back side of leafs*

The coverage ratios of about 1.00 front-backside can be counted as excellent by the application of KERTITOX BORA machine without plant sensor, however, on the lower level of the leafage it brought forth too coverage.

On the basis of the examination results it can be established that the specific drop values (diagram4) of the KERTITOX BORA machine during spraying significantly over-passed in every case the expected minimum 50-70 drops/cm^2 value of fungicide spraying.

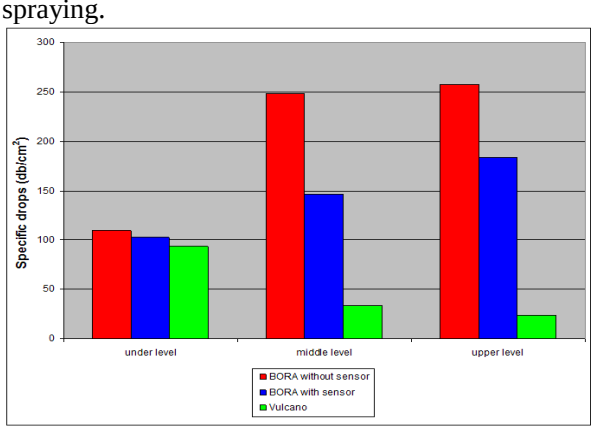

Fig. 5. *Specific drops on the abaxial leaf surface*

The results of controlling obtainable spraying reduction

The examination results of pesticide carried out with KERTITOX BORA spraying machine with plant sensor switched on and off, under similar operation characteristics, can be seen in table 2.

The results show that 34.2% was the pesticide saving with the application of plant sensor at practically smaller 2-year-old leafage plantation. The 24.6% saving at the 3-year-old plantation treatment can be considered significant as well. On the course of protection one-third of pesticide can be saved in younger fruit-gardens, while one-quarter results at the older ones.

Table 2. *The examination results of pesticide reduction*

Machine type	*Operation mode*	*Plantation*	*Specific pesticide use (dm^3/ha)*	*Savings (dm^3/ha)*	*Savings (%)*
KERTITOX BORA	Plant sensor switched off	2 years cherry	234	0	0
KERTITOX BORA	Plant sensor switched off	3 years cherry	175	0	0
KERTITOX BORA	Plant sensor switched on	2 years cherry	154	80	34,2
KERTITOX BORA	Plant sensor switched on	3 years cherry	132	43	24,6
VULCANO	Plant without plant sensor	3 years cherry	212	-	-

Results of the examinations of the field sprayers

The scope of the coverage examinations was the comparison of the working quality while using the old frame and the newly developed frame. After the sparkling we took photos of the coloured test papers and sent them to laboratorial examinations. The differences in the colours of the papers –especially at the ends of the frame- were visually well recognizable even on the field.

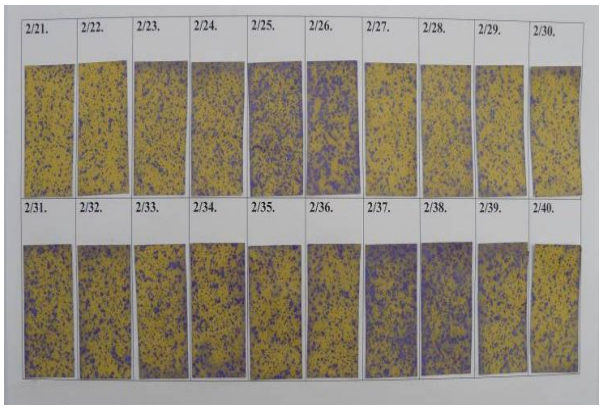

Fig. 6. *Coloured test papers*

The coverage values allocated by laboratorial examinations of the newly developed sparkling frame are seen on the figure 7.

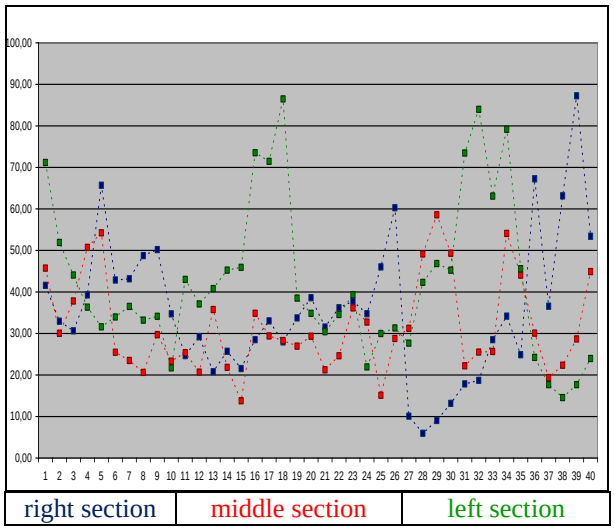

Fig. 7. *Coverage values reached with experimental sparkling frame*

In the figure we can see that in the middle of the frame the values of coverage vary between 14% and 59%. The average coverage is 31.8%. We can see that regarding to the traditional sparkling frame the coverage values are better especially in the middle. At the edges of the frame these values vary between 7-87%. The average value was 38,3% and the CV also decreased. The relative number of drops can be seen on the figure 8.

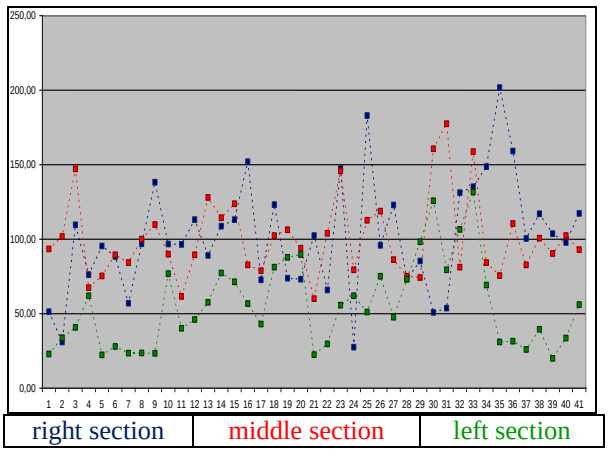

Fig. 8. *The relative number of drops*

In the figure we can see that the relative number of drops vary between 64 and 171 drop/cm^2. The average dropnumber is 100 drops/cm^2, CV is 27,3%. At the edges of the frame the number of drops vary between 20 and 206 drops/cm^2. Here the average was 78 drops/cm^2, and CV was 42,3%. We can say that regarding to the traditional spraying frame we got more favourable numbers, the differences between number of drops decreased, we got lower CV and there was no lower values than 20 drops/cm^2. But values over 30 drops/cm^2 and the high value of CV shows that the amplitude of the frame was even yet significant.

4. CONCLUSIONS

On the basis of the comparison examination it can be established that of all the machines applied in the examination with similar parameters, KERTITOX BORA ensured more favourable work quality values than the VOLCANO spraying machine besides the given examination air circumstances and machine set-up parameters. The standard deviation of work quality characteristics with such set-ups adjusting better to the given plantation characteristics, can be reduced at each leaf crown level.

It can be clearly established from the examination results that without a significant change of the coverage characteristics meaningful liquid and pesticide savings can be obtained in loose lined young plantation as well. The examination of the field experimental spraying frame shows that regarding to the traditional spraying frame we got more favourable coverage values. The high values of CV are possibly caused by the stumbling-court which was built for demonstrate extreme circumstances.

The favourable coverage values reached by modern sprayers give the possibility that we can use less amount of pesticide. The lesser amount of pesticide causes lower environmental pollution rate and lesser remnants of pesticide in food provided by the agriculture.

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