

**THE ANALYSIS OF THE PHENOMENON OF „DRIFT” OF THE DROPS  
AFTER THE SPRAYING ON OAKEN SAPLINGS PLACED IN  
NEIGHBOURING, EQUIDISTANT AND GROUPED ROWS WITH THE  
ATOMISER STIHL SR 420**

**ANALIZA FENOMENULUI „DE DERIVĂ” A PICĂTURILOR ÎN URMA  
STROPIRII PUIEȚILOR DE STEJAR GRUPAȚI PE RÂNDURI  
ALĂTURATE, ECHIDISTANTE ȘI GRUPATE CU APARATUL  
STIHL SR 420**

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**Abstract:** *This paper deals with the phenomenon of „drift” of the drops and the means to diminish it in order to obtain an optimal treatment and a less contamination of the environment with pesticides. This is how average values of the drops which get to drift by using different types of grills placed at the end of the spraying tube are given. In this paper the covering percentage of the drifting drops and their number per cm<sup>2</sup> were also established.*

**Rezumat:** *În această lucrare este studiat fenomenul „de derivă” a picăturilor și modul de diminuare a acesteia pentru a obține un tratament optim și o contaminare minimă a mediului înconjurător cu substanțe pesticide. Astfel sunt redate valori medii ale picăturilor ce ajung în derivă folosind diverse tipuri de grilaje montate la capătul tubului de pulverizare. Tot în această lucrare sunt determinate și procente de acoperire ale picăturilor ajunse în derivă și numărul acestora pe cm<sup>2</sup>.*

**Key-words:** *drift, hydro-sensitive paper, type of grid.*

**Cuvinte cheie:** *derivă, hârtie sensibilă la apă, tip de grilaj.*

**PURPOSE OF RESEARCH**

The concentration of the production of saplings in the central large tree nurseries is mainly determined by the necessity to maximally mechanize the technical processes of production, but also by the measures for the prevention and the fight of the pests, by using the most appropriate work methods.

The present research has as a purpose the analysis and the distribution of the „drifting” drops by sample spraying on neighbouring, equidistant and grouped rows in the tree nurseries.

The quantity of liquid which is drawn laterally and vertically by the air currents, or which because of its diameter keeps floating and does not get to the treated surface is called „drift” (German *abdrift*, French *derive*, Spanish *deriva*).

**PRESENT STATE OF THE RESEARCH**

The uncontrolled circulation of the small drops and their deposit at great distances from the place of treatment is known as „phenomenon of drift” or simply as „drift”. Because of the sediment of pesticides at great distances, a part of them is lost at the very place where the treatment is being applied, contaminating at the same time other cultures, intra-village perimeters, surface waters, which finally constitutes a problem for the protection of the environment.

This is why solutions of compromise have been found in order to ensure both the efficiency of the treatment and the protection of the environment.

One of these solutions may be the spraying with drops of medium and large diameters, which are less affected by the phenomenon of „drift”, combined with:

- the reduction of the superficial tension of the sprayed liquid by adding additives (like the product *Breck-Thru S 240*) or detergents;
- the usage of ramps in the tunnel type or in the tunnel with recycling type, which reduce the percentage of loss triggered by the drift;
- the usage of sprayers with injection which produce drops of larger diameters, because of the air bubbles encapsulated in the drop;
- the augmentation of the dosage of the solution on the surface unit;

The dosage of solution applied when spraying the horticultural and forestry plantations is dependent on a range of factors like:

- type of spraying;
- type of treatment (herbicides, fight of diseases, insects, etc.);
- the phytopharmaceutical substance used;
- the number of trees and bushes per surface unit;
- the stage of development of the vegetation, including the mass volume of the leaves of the culture;
- the dimension of the treetop.

Theoretically, it was considered that for obtaining a good biological effect there must be an average number of 100 drops per cm<sup>2</sup> on the sprayed subject. Taking into consideration the fact that together with the evolution of the stage of the vegetation there appears a growth of the mass of the leaves of the culture, it is obvious that the dosage of liquid will also grow correspondingly with the volume and the surface of the mass of leaves treated (Syngenta, BBA)

### **OBJECTIVES**

In order to reach the purpose mentioned above, the following main objectives were established:

- The determination of the number of drops per cm<sup>2</sup> which get in the “drift” on the four rows neighbouring the row of saplings which was sprayed, two rows in the right and two rows in the left.
- The determination of the percentage of covering on each sample of hydro-sensitive paper.
- The analysis of the drops which got in the “drift” after the spraying with the atomizer Stihl SR 420, having placed at the end of the spraying tube different types of grids.
- The calculation of the surface of the drops which get in the “drift” and their influence on the phenomenon.

### **METHODS AND MATERIALS USED**

In order to accurately put into evidence the “drift” phenomenon of the drops, the distribution of these “drifting” drops (when only one row is being sprayed) were analyzed in the case in which the equipment is being used at the sixth step of discharge, because the probability that the drops of water or of toxic substance released by the equipment and transported by the “drifting” air current should be at its maximum level at this released quantity of liquid.

Thus, some cards of hydro-sensitive papers were placed on two neighbouring rows, at the right and at the left of the row of saplings which was about to be sprayed, so as to observe

and analyze the “drifting” drops.

On those four rows which are used for the analysis of the “drift” phenomenon, the samples of hydro-sensitive papers are placed on two levels as it follows: in the superior part of the sapling and in the middle part, through stapling, one on the superior part of the leaf and one on the inferior part, along the main vein of the leaf. It was considered to be necessary to place hydro-sensitive paper even on the inferior part of the leaf, because a great deal of pests can be found in these particular spots, hidden from the solar rays and being much more numerous than those found on the superior part of the leaf.

It must be mentioned that at each type of spraying, positioning and handling of the samples of hydro-sensitive paper, there were used rubber or polyethylene gloves in order to avoid their colouring and contamination. It is also very important that the collecting recipient, in our case the leaves of the saplings, is dry; the samples of hydro-sensitive paper must not be put when the plants are still damp by the rain and morning dew. The cards of hydro-sensitive paper must not be taken while the leaves of the saplings are still watery.

The processing of the cards of hydro-sensitive paper placed on the leaves of the saplings was fulfilled by using the method of the image analysis which required the determination for this purpose of the number of drops per  $\text{cm}^2$  and the covering percentage for each and every sample (BOJA 2008).

The sprayings were done with the atomizer Stihl SR 420.

#### **IMPORTANCE OF THE PAPER**

The present paper is important because it offers concrete values as far as the number of drops which get to be “drifted” per  $\text{cm}^2$  and their covering percentage are concerned, by using the atomizer Stihl SR 420 equipped with different types of grids placed at the end of the spraying tube.

The spraying part is equipped with grids which have the possibility to accurately fraction the particles of liquid; (**conical grid** – with which the sprayed substance is transformed in fine drops – small, wide and dense spraying clouds; **deflecting grid** – with which there is a modification of the direction of the spray – the moistening of the low cultures from bottom-up; **double deflecting grid**- with which the deviation of the spray is split in two directions; at the narrow cultures two rows can be sprayed at the same time)

#### **RESULTS OBTAINED. CONCLUSIONS**

After the present research, the following average values of the “drifting” drops were inferred and they were centralized in table 1.

They are called average values because there were placed 6 test markets in which the “drift” phenomenon was observed and analyzed, after which an average value was established regarding the number of drops per  $\text{cm}^2$ , covering percentage and the dimension of the surface of the drops.

After analyzing the drift phenomenon, the following conclusions can be drawn:

- the lowest average values of the number of drops per  $\text{cm}^2$  appear in the case in which sprayings are made with a deflecting grid, because the spray of drops is directed towards the row of saplings and the “drifting” drops are relatively few, below 100 per  $\text{cm}^2$ .

- similar values are also obtained when the conical grid is used, the number of drops being a little larger, but not surpassing 100 drops per  $\text{cm}^2$ ; it must be noted that in this case, there are higher values for the covering percentage in the superior part of the sapling;

- while analyzing the sprayings when at the end of the spraying tube a double deflecting grid is placed, the situation radically changes, because in this case there appear the highest average values both regarding the number of drops per  $\text{cm}^2$  and the covering

percentage.

Table 1

Average values of the “drifting” drops on the row of saplings sprayed with different types of grids placed at the end of the spraying tube

The analysis of the “drift” phenomenon in the case of the spraying on one row at the 6th discharge step of the conical grid.						
Indexes	Position of the cards of hydro-sensitive paper on the leaf	Left Drift 2	Left Drift 1	Right Drift 1	Right Drift 2	Position of the samples on the sapling
No. drops /cm <sup>2</sup>	Superior part of the leaf	11	13	85	23	Superior part of the sapling
Percentage of covering		0,14	0,45	3,94	1,44	
No. drops /cm <sup>2</sup>	Inferior part of the leaf	8	8	8	1	
Percentage of covering		2,19	0,15	0,36	0,04	
No. drops /cm <sup>2</sup>	Superior part of the leaf	43	15	34	6	Inferior part of the sapling
Percentage of covering		0,38	0,74	2,56	0,25	
No. drops /cm <sup>2</sup>	Inferior part of the leaf	0	6	6	1	
Percentage of covering		0,00	1,17	0,24	0,09	
The analysis of the “drift” phenomenon in the case of the spraying on one row at the 6th discharge step of the deflecting grid.						
Indexes	Position of the cards of hydro-sensitive paper on the leaf	Left Drift 2	Left Drift 1	Right Drift 1	Right Drift 2	Position of the samples on the sapling
No. drops /cm <sup>2</sup>	Superior part of the leaf	5	26	27	14	Superior part of the sapling
Percentage of covering		0,48	0,90	0,78	0,27	
No. drops /cm <sup>2</sup>	Inferior part of the leaf	6	15	30	22	
Percentage of covering		1,31	1,57	0,77	0,19	
No. drops /cm <sup>2</sup>	Superior part of the leaf	3	65	12	9	Inferior part of the sapling
Percentage of covering		0,15	2,59	0,47	0,86	
No. drops /cm <sup>2</sup>	Inferior part of the leaf	0	9	6	67	
Percentage of covering		0,00	0,12	0,22	0,34	
The analysis of the “drift” phenomenon in the case of the spraying on one row at the 6th discharge step of the double deflecting grid.						
Indexes	Position of the cards of hydro-sensitive paper on the leaf	Left Drift 2	Left Drift 1	Right Drift 1	Right Drift 2	Position of the samples on the sapling
No. drops /cm <sup>2</sup>	Superior part of the leaf	129	107	91	79	Superior part of the sapling
Percentage of covering		7,78	18,58	3,86	3,14	
No. drops /cm <sup>2</sup>	Inferior part of the leaf	41	77	75	57	
Percentage of covering		2,32	34,86	13,14	1,84	
No. drops /cm <sup>2</sup>	Superior part of the leaf	33	24	71	37	Inferior part of the sapling
Percentage of covering		1,95	2,18	4,14	2,36	
No. drops /cm <sup>2</sup>	Inferior part of the leaf	15	36	34	71	
Percentage of covering		0,28	2,06	3,67	1,89	

In order to increase the precision of the results, it is advisable that the particles of toxic substance that are being deposited near the base of the sapling (surface close to the limit between the root and the stem of the sapling) should not be taken into consideration. The reason why you should not do so is because it was noticed that particles of water belonging to

the soil are also being deposited on the hydro-sensitive paper placed in the low part of the sapling. At this level, it was observed that even the value of the dew was relatively high. This observation is also substantiated by the value of the dew determined at the surface of the soil.

The dimension of the “drifting” drops for all types of spraying is centralized in table 2.

Table 2

Average surface of the „drifting” drops (mm<sup>2</sup>)

Types of Grid	Left Drift 2	Left Drift 1	Right Drift 1	Right Drift 2	Position on the leaf	Position on the sapling
Conical grid	0,023	0,029	0,134	0,067	Superior part of the leaf	Superior part of the sapling
	0,558	0,018	0,027	0,008	Inferior part of the leaf	
	0,007	0,030	0,034	0,024	Superior part of the leaf	Inferior part of the sapling
	0,000	0,305	0,019	0,014	Inferior part of the leaf	
Deflecting grid	0,050	0,064	0,023	0,012	Superior part of the leaf	Superior part of the sapling
	0,332	0,384	0,024	0,007	Inferior part of the leaf	
	0,022	0,153	0,027	0,208	Superior part of the leaf	Inferior part of the sapling
	0,000	0,011	0,022	0,006	Inferior part of the leaf	
Double deflecting grid	0,054	3,147	0,032	0,021	Superior part of the leaf	Superior part of the sapling
	0,436	9,047	1,214	0,165	Inferior part of the leaf	
	0,044	0,263	0,035	0,189	Superior part of the leaf	Inferior part of the sapling
	0,021	0,251	0,523	0,290	Inferior part of the leaf	

After analyzing the research made, the following conclusions resulted.

- The risk that the drops can “drift” is higher when the double deflecting grid is used and the atomizer is employed at the 6<sup>th</sup> discharge step. This can be somehow kept under control if the atomizer is used at an inferior discharge step.

- The fewest “drifting” drops appear when the deflecting grid is used, because the cloud of drops is directed towards the row of saplings.

- As for the dimension of the drops, it was observed that they vary in each case: in the case in which the conical grid is used they vary between 0,007-0,558 mm<sup>2</sup>, with the deflecting grid the values are between 0,007-0,384 mm<sup>2</sup>, while with the double deflecting grid the dimension of the drops ranges from 0,021-9,047mm<sup>2</sup>.

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