Tina Langkamp-Wedde

Basic drift values in the authorisation procedure for biocidal products (PT 18)

Abdrifteckwerte im Zulassungsverfahren für Biozidprodukte (PT 18)

Affiliation
Julius Kühn Institute (JKI) – Federal Research Centre for Cultivated Plants, Institute for Application Techniques in Plant Protection, Braunschweig, Germany.

Correspondence
Dr. Tina Langkamp-Wedde, Julius Kühn Institute (JKI) – Federal Research Centre for Cultivated Plants, Institute for Application Techniques in Plant Protection, Messeweg 11-12, 38104 Braunschweig, email: tina.langkamp-wedde@julius-kuehn.de

Abstract

Biocidal products are very diverse. Therefore, biocidal products are divided into 4 main groups and 22 product types. Product type 18 includes products for the control of insects, acaricides and agents against other arthropods. There is an overlap of products for plant protection, but biocides are subject to their own regulation, the Biocidal Products Regulation. In addition, in contrast to plant protection, it is not known how and where the biocidal products are used, what environmental impact these products have and what measures can be taken to minimise the environmental impact. Thus, there is no scientific knowledge available for the risk assessment of biocidal products. On behalf of the Federal Environment Agency, the JKI carried out large-scale measurements of drift at various application areas, such as solitary tree, avenue and forest edge, and with various devices, such as cannon sprayer, helicopter and UAV, for the control of the oak processionary moth. The result was a list of recommended basic drift values for three application areas in combination with five devices. At the beginning of 2022, these basic drift values were recognised by the member states of the European Commission and will in future be included in the risk assessment of biocidal products for the control of the oak processionary moth.

Keywords

Biocidal products, drift measurement, basic drift values, oak processionary moth controlling

Zusammenfassung

Biozidprodukte sind sehr vielfältig. Daher werden Biozidprodukte in 4 Hauptgruppen und 22 Produkttypen unterteilt. Der Produkttyp 18 umfasst Produkte zur Bekämpfung von Insekten, Akarizide und Mittel gegen andere Arthropoden. Eine Überschneidung der Produkte zum Pflanzenschutz liegt vor, jedoch unterliegen Biozide einer eigenen Verordnung, der Biozidverordnung. Zudem ist im Gegensatz zum Pflanzenschutz nicht bekannt, wie und wo die Biozidprodukte angewendet werden, welchen Umwelteinfluss diese Produkte ausüben und welche Maßnahmen zur Minimierung des Umwelteintrages vorgenommen werden können. Es liegen somit keine wissenschaftlichen Erkenntnisse zur Risikobewertung von Biozidprodukten vor. Im Auftrag vom Umweltbundesamt führte das JKI großangelegte Messungen zur Abdrift an verschiedenen Anwendungsbereichen, wie Einzelbaum, Allee und Waldrand, und mit verschiedenen Geräten, wie Sprühkanone, Hubschrauber und UAV, zur Bekämpfung des Eichenprozessionsspinners durch. Heraus kam eine Liste von empfohlenen Abdrifteckwerten für drei Anwendungsbereichen in Kombination mit fünf Geräten. Anfang 2022 wurden diese Abdrifteckwerte von den Mitgliedsstaaten der Europäischen Kommission anerkannt und werden in Zukunft in die Risikobewertung von Biozidprodukten für die Bekämpfung des Eichenprozessionsspinners einfließen.

Stichwörter

Biozidprodukte, Abdriftmessung, Abdrifteckwerte, Eichenprozessionsspinnerbekämpfung

Introduction

Biocidal products are pesticides that are used to protect people, animals and materials from vermin, pests and harmful organisms (EU, 2012). According to this, people are using unconsciously or consciously biocidal products as insect spray, facade protection, wood stain, disinfectant or shoe polish. However, not every user knows how to handle these products, as they are freely available and not everyone reads the warnings, which can lead to considerable environmental impacts. What is also not known to everyone is that façade paints used to protect house façades contain active substances that may no longer be used in plant protection and that there are significant environmental discharges when toxic degradation products enter the groundwater as a result of precipitation events (UBA, 2017). To prevent this and other misuse of biocidal products, the Biocidal Products Regulation coordinates the placing on the market and use of biocidal

Submitted/accepted for publication: 16 February 2023/9 May 2023

products. The aim of this regulation is to identify potential risks that may arise from the use of biocidal products for human and animal health or for the environment and to derive appropriate measures to ensure the safe use of biocidal products (EU, 2012). A large number of biocidal products on the market are currently subject to transitional arrangements, as they were already on the market before the deadline of 14 May 2000. These active substances and products can still be marketed untested. It is expected to take until 2024 for all biocidal products to be tested and officially authorised across the EU (ECHA, 2022b). Lack of knowledge about how biocidal products are used in the different product types delays the testing of the products.

The field of application of biocidal products is very diverse. Therefore, biocidal products have been divided into 4 main groups and 22 product types. Main group 3 Pest control contains product type 18 with insecticides, acaricides and agents against other arthropods. At first view, there are a few overlaps, but on closer inspection, there are major differences, especially in the regulation of authorisation. In the field of plant protection, research on drift has been going on for 30 years. Basic drift values for drift are based on more than 100 trials for different application areas such as arable crops, orchards, vines and hops. Lists of approved plant protection nozzles and drift reducing devices are also maintained. All these data contribute to the risk assessment of plant protection products. In the biocide sector, there is no knowledge about the areas in which products of product type 18 are applied, how they are applied in practice, whether and how they reach adjacent environmental compartments and what measures can be taken to reduce drift. There is therefore no scientific basis for a risk assessment of biocidal products. The Julius Kühn Institute (JKI), Institute for Application Techniques in Plant Protection, was then commissioned by the Federal Environment Agency to close these gaps in knowledge due to its great expertise in the field of drift measurement. An obvious question is whether the basic drift values from plant protection can be adopted for the biocide sector. To answer this question, the JKI has been working on measuring drift in biocide applications since 2017. The main tasks of this research project are: Identification of applications with high drift potential, measurement of drift in the application of biocides, calculation of basic drift values for the risk assessment, and development of drift mitigation measures for risk management and sustainable use of biocides.

Material and Method

Literature and market research show that oak processionary moth (OPM) control is an application with high drift potential. Challenging, however, is that oak processionary moth control involves not just one system, but a variety of devices with different spraying systems and types of atomisation. Cannon sprayers with pneumatic or hydraulic atomisation, helicopters with attached Simplex systems, unmanned aerial vehicles with spraying equipment or motorised knapsack sprayers with pneumatic atomisation from a lifting platform can be used. The reason for this large variety of equipment is the wide variation in the field of application areas. For example, OPM have been observed on solitary trees, on oak avenues or on forest edges and can/must be controlled there to protect the public. Thus, different devices can be used depending on the area of application. Table 1 shows an overview of the devices and the application areas that were used for the drift measurement.

For the drift measurement in the use of biocides, the JKI guideline 7.1-5 "Measuring of direct drift when applying plant protection products outdoors" (JKI, 2013) was used. According to this guideline, more than 100 trials were carried out after the basic drift values for plant protection had been determined. For the biocide sector, there is currently no guideline according to which drift tests should be carried out. For this reason this guideline was taken from the plant protection sector. According to this guideline, the application areas shown in Table 1 were divided into treated area and measuring area. The measuring area is located next to the treated area on the downwind side. Petri dishes with a diameter of 145 mm, which collect the drift as ground sediment, were distributed on wooden slats on the measuring area. According to JKI guideline 7-1.5, the Petri dishes are distributed in such a way that a representative section of the entire drift is recorded. The measuring distances to the crown edge of the treated area were 5, 10, 20, 30, 50, 75 and 85 or 100 m, depending on the size of the measuring area. At each measuring distance, 10 collectors were set up at a distance of 2 m from each other. Since the drift from the treatment of a solitary tree had never been measured before, the guideline was slightly adjusted here. In this case, the Petri dishes were placed in a V-shape on the downwind side in order to capture a large part of the total drift (Fig. 1, Table S.).

Five minutes after each treatment, the collectors were closed and immediately protected from light. The analysis of the tracer took place in the laboratory with a fluorometer (RF-6000, Shimadzu Duisburg, Germany). In addition, collectors were set up outside the measuring area to determine the blank value.

The spray liquid was water with Pyranine (CAS number 6358-69-6) as fluorescent tracer dye in a concentration of 2 g L^{-1}. Pyranine is a green-yellow, powdery sodium salt (trade name: Pyranine 120%, colour index: Solvent Green 7) and has a recovery rate of almost 100% (Herbst & Wygoda, 2006). Herbst

Table 1. List of techniques and areas where direct environmental exposure through drift can occur and was measured.

Application technique	Application area
Cannon sprayer (pneumatic atomizer)	Solitary tree
	Avenue
	Forest edge
Helicopter	Avenue
	Forest edge
UAV	Solitary tree
Motorised knapsack mistblower	Solitary tree
Cannon sprayer (hydraulic atomizer)	Avenue

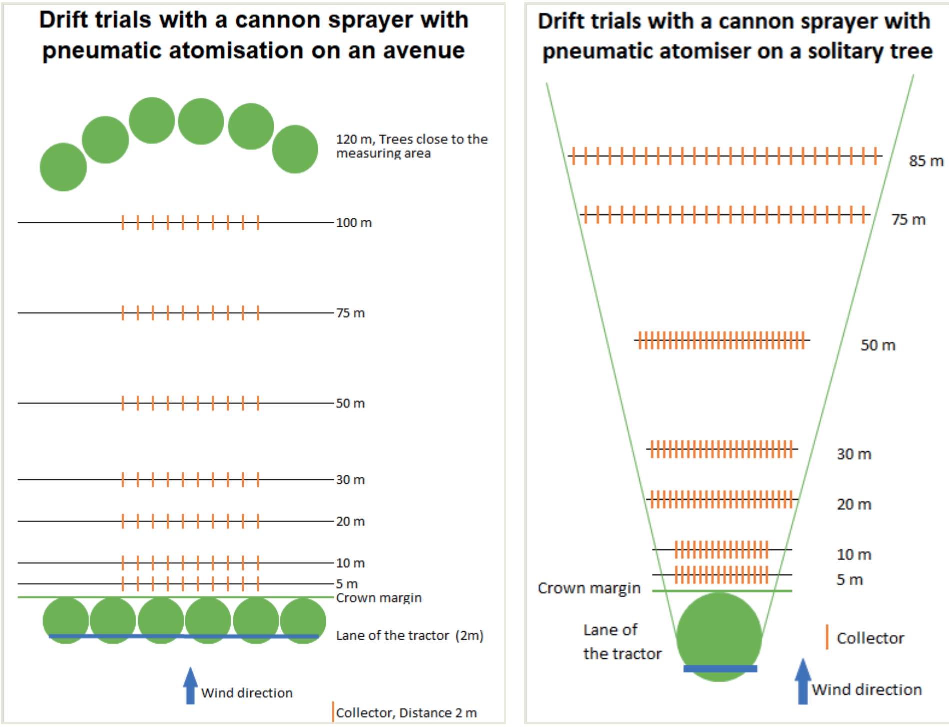

Fig. 1. Schematic illustration of the trial area avenue with a "normal" measuring area (left) and of the trial area solitary tree with a slightly adjusted measuring area (right).

& Wygoda (2006) found that the use of Pyranine for measurements with plastic collectors proves its suitability without major restrictions. If the tracer is used outdoors with filter paper or plant leaves, problems with decay by ultraviolet light may occur. For this reason, the collectors were immediately protected from light. Tank samples were taken during the trials to check the application rate and to determine whether the tracer concentration was stable throughout the application. For the analysis, the tracer was extracted from the collectors with distilled water. For this purpose, 40 mL of distilled water was filled into the collectors and shaken for 10 min on a shaking table at 65 rpm. The frequency and amplitude were chosen so that the inner walls of the collectors were completely washed around. For the analysis of Pyranine concentration in the wash water of the collectors, the fluorometer RF-6000 (Shimadzu Duisburg, Germany) with an excitation wavelength of 405 nm and an emission wavelength of 515 nm was used.

Spray drift is expressed as ground sediment in percentage of the application rate. A calibration line is used to calculate the spray drift (equation 1).

$$\beta_{dep} = \frac{(\rho_{smpl} - INT)}{\Delta_{calib}} * \frac{V_{dist}}{A_{colle}} \quad (1)$$

where β_{dep} is the spray drift deposit [µg cm^{-2}]; ρ_{smpl} is the fluorometer reading of the sample [-]; *INT* is the intercept of the calibration curve [-]; Δ_{calib} is the slope of the calibration curve [L µg^{-1}]; V_{dist} is the volume of distilled water [L] and A_{colle} is the area of the collector to collect the spray drift [cm^2].

The percentage compared to the application rate was calculated using equation 2:

$$\beta_{dep\%} = \frac{\beta_{dep}}{TR} * 100\ \% \quad (2)$$

where $\beta_{dep\%}$ is the spray drift [%] as ground sediment to the application rate.

Drift values for biocide applications are based on the 90th percentile of the measured data, in line with the assessment of plant protection products. Ganzelmeier et al. (1995) still used the 95th percentile in the early days of basic drift values. German authorities involved in the authorisation of plant protection products have agreed to use the 90th percentile instead of the 95th percentile, which corresponds to the proposals of the FOCUS Group Surface Waters (Maund, 1999; FOCUS, 2001).

Deviating from these specifications, the maximum values rather than the 90th percentile were used to calculate the basic drift values for a solitary tree. As described above, drift values have never been measured on a solitary tree, which is why the Petri dishes were arranged in such a way that the entire drift was recorded as far as possible. As a result, very low drift values were measured in a series of measurements even in the close range to the treated area, which meant that the 90th percentile was falsely lower than the true value. To better represent a worst-case scenario, the maximum value for this application area was chosen.

Similarly, the basic drift values had to be optimised when treating a forest edge with a cannon sprayer. To determine a worst case scenario, the forest edge was not treated with the wind direction, but against the wind direction. And this was also reflected in the drift values. Thus, the drift values first increase up to a distance of 20 m and then decrease again. The maximum value of the 90th percentile was therefore used for the distances 5, 10 and 20 m.

Results

Figure 2 shows the recommended basic drift values derived from the measured drift values from the drift trials. It can be seen that for all applications, regardless of the device used,

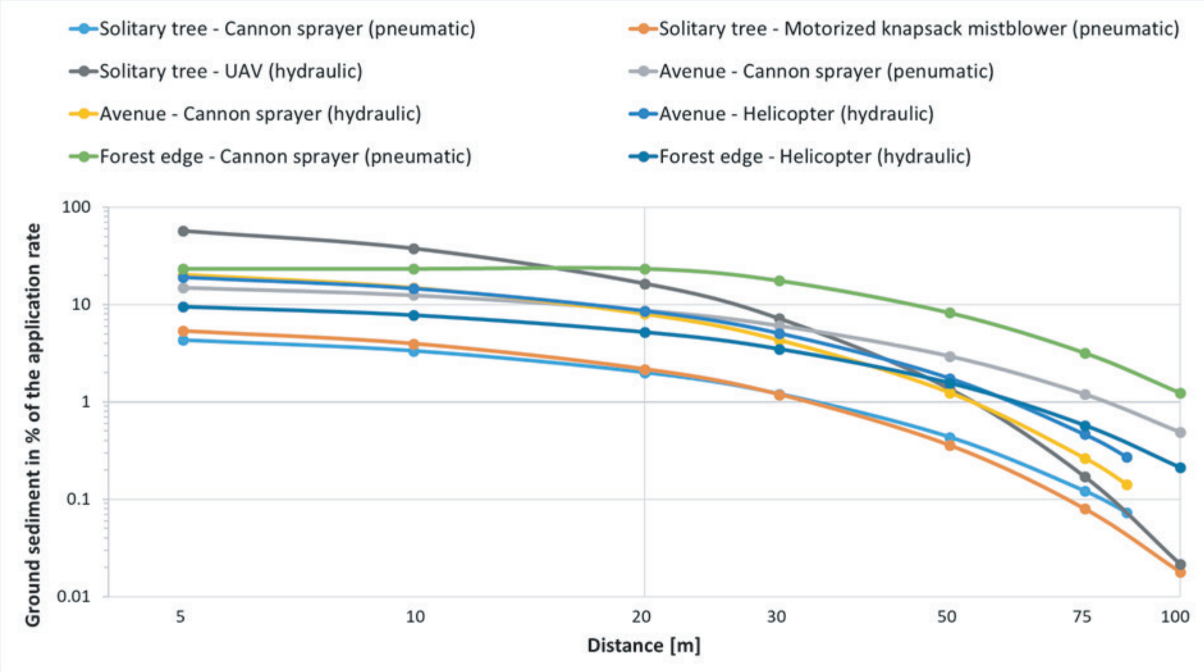

Fig. 2. Recommended basic drift values for the single application of biocidal products in the field for the application areas solitary tree, avenue and forest edge with different devices as ground sediment in % of the application rate (90th percentile).

drift decreases with increasing distance from the treated area. Furthermore, the applications on a solitary tree with a cannon sprayer and a motorised knapsack sprayer show the lowest basic drift values despite the use of the maximum values. Close to the treated area, the application with a UAV on the solitary tree shows the highest basic drift values. At a distance of 100 m from the treated area, the application areas forest edge with cannon sprayer (pneumatic) and avenue with cannon sprayer (pneumatic) show the highest basic drift values.

Discussion

To answer the question posed at the beginning: is it possible to adopt the basic drift values from plant protection for biocides, Figure 3 shows the basic drift values from plant protection. Basic drift values in plant protection are significantly lower in the close range to the treated area and decrease more rapidly with increasing distance. Reasons for the higher values in biocide are the technique, the direction of spraying

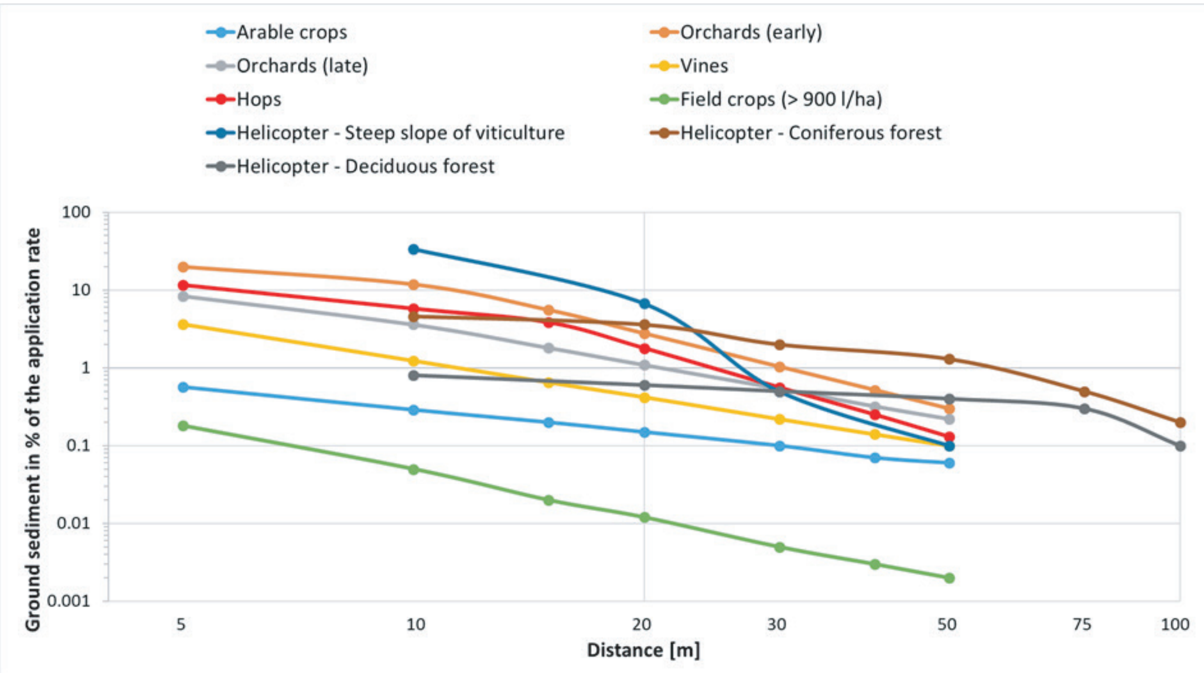

Fig. 3. Recognised basic drift values for the single application of plant protection products in the field (professional applications) as ground sediment in % of the application rate (90th percentile), (JKI, 2022)

and the distance between nozzles and treated area. While in the treatment of arable crops the distance between nozzle and crop is typically around 50 cm, depending on the technique, the distance between a cannon sprayer or a helicopter and a tree crown is several metres (Fig. 4). Similarly, a field sprayer sprays vertically from top to bottom and a cannon sprayer sprays from bottom into the treetop.

For the application of plant protection products with a helicopter in deciduous forest, the basic drift values are significantly lower than for the application of biocides. This is due to the fact that only the forest may be treated when applying plant protection products and not the forest edge. (BMJV, 2012). If the forest edge is treated, it is a biocide measure. The distance between the treated area and the measuring area is therefore greater for a plant protection treatment than for a biocide treatment and the basic drift values are therefore also lower.

Due to the size of the plants, it seems reasonable to assume that the basic drift values are taken from the hops for the control of the oak processionary moth. However, as these drift experiments show, it is not only the crop but also the technique that plays a decisive role. When treating hops, devices with radial blowers are used, which also treat the lower part of the plants and thus produce a different drift behaviour than when using a cannon sprayer.

Conclusion and outlook

A transfer from the area of plant protection therefore proved to be difficult. No application scenario from plant protection corresponded to the scenarios from the biocide area with the devices and application areas mentioned. Due to the topic, it is therefore recommended to define specific basic drift values for each application area and for each device.

At the beginning of 2022, the EU Member States agreed to use the recommended basic drift values in future when assessing applications against the oak processionary moth (ECHA, 2022a). This means that the basic drift values developed in this work are officially recognised and will be taken into account in the risk assessment of biocidal products for oak processionary moth control in future.

Funding

This study was financially supported by the German Environment Agency through the project FKZ 3716 67 404 0 and FKZ 3719 67 404 0. The views expressed herein are those of the authors and do not necessarily represent the opinion or policy of the agency.

Conflicts of interest

The author(s) declare that they do not have any conflicts of interest.

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Fig. 4. Treatment of an avenue (left) and a forest edge (right) with a cannon sprayer.

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Supplementary information

Table S. Recommended basic drift values derived from the measured drift values for different application areas and devices [%], based on the 90th percentile.

Distance [m]	Solitary tree			Avenue			Forest edge	
	Cannon sprayer (pneumatic)**	Motorized knapsack mistblower from a lifting platform	UAV (hydraulic)	Cannon sprayer (pneumatic)	Cannon sprayer (hydraulic)	Helicopter (hydraulic)	Cannon sprayer (pneumatic)	Helicopter (hydraulic)
5	4.29	5.32	57.00	14.91	20.24	18.98	23.41*	9.43
10	3.32	3.94	37.64	12.45	14.85	14.56	23.41*	7.72
20	2.00	2.16	16.41	8.69	7.99	8.57	23.41*	5.18
30	1.20	1.19	7.16	6.06	4.30	5.04	17.61	3.47
50	0.43	0.36	1.36	2.95	1.24	1.75	8.24	1.56
75	0.12	0.08	0.17	1.20	0.26	0.46	3.19	0.57
85	0.07				0.14	0.27		
100		0.02	0.02	0.49			1.23	0.21

* Maximum value of the 90th percentile is used for the basic drift values.
** Basic drift values are based on the maximum values.