Ekspertyza

Modelowanie *in silico* narażenia i ocena ryzyka dla operatorów stosujących ręczne opryskiwacze z uwzględnieniem ich stanu technicznego.

Niniejsza ekspertyza została wykonana na zlecenie Ministerstwa Rolnictwa i Rozwoju Wsi w Warszawie

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Warszawa 2010 r.

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Spis treści:

1. Podstawowe definicje

AOEL [8] – Akceptowany poziom narażenia operatora (ang. Acceptable operator exposure level). Największa ilość substancji czynnej środka ochrony roślin lub produktu biobójczego, na jaką może być narażona osoba wykonująca zabiegi tym środkiem (operator), niepowodująca jakichkolwiek szkodliwych skutków zdrowotnych, wyrażony mg/kg m.c.

NOAEL [8] – **Poziom nie wywołujący dających się zaobserwować szkodliwych skutków** (ang. No observed adverse effect level). Najwyższa dawka substancji lub poziom narażenia, która w długoterminowych badaniach toksykologicznych na zwierzętach doświadczalnych nie powoduje statystycznie istotnego wzrostu występowania niekorzystnych skutków w stosunku do grupy kontrolnej.

Operator [1] – Osoba wykonująca czynności związane ze stosowaniem środka ochrony roślin z uwzględnieniem: mieszania i załadunku do opryskiwacza; wykonaniem zabiegu agrochemicznego; naprawa, konserwacją i myciem użytego sprzętu. Operatorzy mogą być profesjonalni np.: rolnicy i pracownicy grup chemizacyjnych oraz amatorzy.

UK-POEM model [4] – (ang. Predictive Operator Exposure Model), Model matematyczny stosowany w celu oszacowania przewidywanego poziomu narażenia operatora

BBA model [5] – (niem. Biologischen Bundesanstalt für Land- und Forstwirtschaft) Model matematyczny stosowany w celu oszacowania przewidywanego poziomu narażenia operatora

PPE [1] – ang. Personal Protective Equipment, środki ochrony indywidualnej **(ŚOI)**

Absorpcja dermalna [8] – dawka wchłonięta. Ilość substancji jaka przeniknęła do organizmu. Wyznaczana jest za pomocą iloczynu dawki pobranej i współczynnika wchłaniania danej substancji. Wyrażona jest jako masa substancji wchłoniętej w ciągu określonego czasu w przeliczeniu na jednostkę masy organizmu.

Ocena narażenia [8] (szacowanie narażenia) - jeden z etapów oceny ryzyka. Jej celem jest oszacowanie dawki lub stężenia substancji chemicznej, na która narażony jest człowiek lub populacja. Uwzględniać powinna okres i częstość narażenia oraz droge narażenia. Oszacowane narażenia powinno być reprezentatywne dla sytuacji której dotyczy, a w niektórych przypadkach, racjonalnie uzasadnionej najgorszego (scenariusz najgorszego przypadku).

Uprawy wysokie [7] wg. Instytut Sadownictwa i Kwiaciarstwa – drzewa o wysokości do 3 metra.

Uprawy średnio-wysokie [7] wg. Instytut Sadownictwa i Kwiaciarstwa – drzewa do wysokości 1,8 metra.

Uprawy niskie [7] wg. Instytut Sadownictwa i Kwiaciarstwa - np. truskawki

2. Cel Pracy

Chemiczne zabiegi ochrony roślin wykonywane przy użyciu ręcznych opryskiwaczy stanowią potencjalnie istotne żródło ekspozycji operatorów tych urządzeń na środki ochrony roślin. Prawidłowe funkcjonowanie ręcznych opryskiwaczy zależy od ich stanu technicznego i może bezpośrednio przekładać się na wielkość narażenia operatora. Stąd też wiedza o wpływie najczęściej stwierdzanych uszkodzeń opryskiwaczy na wielkość narażenia operatora ma zasadnicze znaczenie dla prawidłowego zarządzania ryzykiem, w tym dla formułowania zaleceń odnośnie potrzeby i częstotliwości przeglądów technicznych opryskiwaczy stosowanych w chemicznej ochronie roślin.

Niniejsza ekspertyza obejmuje ocenę ryzyka przeprowadzoną na podstawie komputerowego modelowania narażenia w symulowanych warunkach zakładających typowe scenariusze łączące różne rodzaje uszkodzeń opryskiwaczy z różnymi formulacjami środków ochrony roślin i różną ich toksycznością.

3. Wprowadzenie

Ocena szkodliwości środków ochrony roślin dla ludzi polega na szacowaniu ryzyka dla populacji osób zawodowo narażonych na te środki. Za grupę narażonych zawodowo uznaje się pracowników zatrudnionych nie tylko przy ich produkcji, ale również grupę tzw. operatorów wykonujących zabiegi rolnicze oraz pracowników rolnych wykonujących prace polowe na obszarach poddanych zabiegom z użyciem chemicznych środków ochrony roślin. Biorąc to pod uwagę Komisja Europejska wprowadziła obowiązek [1, 2] wykorzystania przy ocenie środków ochrony roślin odpowiedniego modelu oszacowania ryzyka zarówno dla operatora jak i osób postronnych oraz innych pracowników jako niezbędnego elementu procedury rejestracyjnej na poziomie Państw Członkowskich (MS) [3].

Podstawę takiej oceny stanowią wyniki badań toksykologicznych umożliwiających wyznaczenie toksykologicznych punktów krytycznych (*toxicological end points*) np. poziom nie wywołujący dających się zaobserwować szkodliwych skutków (NOAEL) umożliwiających oszacowanie ryzyka wynikającego z narażenia w określonych warunkach stosowania takich, jak formulacja i dawki środka ochrony roślin oraz liczba zabiegów wynikających z ustalonych indywidualnych warunków dobrej praktyki rolniczej (GAP).

Komisja Europejska zaleca zastosowanie jednego lub większej liczny spośród ogólnie stosowanych modeli oceny ryzyka: UK-POEM (model angielski) [4], model BBA (niemiecki) [5]. Wybór modelu jest bezpośrednio związany z GAP. Najczęściej jednak są stosowane modele angielski UK-POEM i niemiecki BBA. Najistotniejszym elementem oszacowania jest wyznaczenie wartości akceptowalnego poziomu narażenia operatora AOEL [6] w modelu angielskim (UK-POEM), bądź wartość ekspozycji E (Exposure) w modelu niemieckim (BBA). Obie te wartości AOEL i E określają wielkość narażenia operatora na określony pestycyd podczas różnych czynności polowych z zastosowaniem lub bez indywidualnych środków ochrony osobistej (PPE). W praktyce oznacza to, że oba modele stwarzają możliwość oszacowania narażenia zarówno dla operatorów wyposażonych w indywidualne środki ochrony osobistej, jak i osób, które nie są chronione. W niniejszej ekspertyzie zastosowano oba te scenariusze, aby uwzględnić tzw. „worst case scenario" wymagany przy ocenie ryzyka.

Niniejsze opracowanie uwzględnia dane eksperymentalne uzyskane podczas specjalnie zaprojektowanych badań polowych wykonanych z zastosowaniem opryskiwaczy ręcznych o różnym stopniu uszkodzenia [7]. Rzeczywiste wartości ekspozycji uzyskane w badaniach dozymetrycznych stanowiły podstawę do oceny ryzyka i bezpieczeństwa dla

operatorów i zostały porównane z teoretycznym narażeniem oszacowanym w wyniku matematycznego modelowania *in silico.*

Modelowanie przeprowadzone dla celów niniejszej ekspertyzy zakłada ocenę ryzyka dla 15 wybranych środków ochrony roślin posiadających aktualną rejestrację w Polsce. W celu zapewnienia reprezentatywności modelowania przy doborze parametrów wejściowych uwzględniono następujące kryteria:

1) Rodzaj chronionych upraw (z uwzględnieniem niskich, średnio-wysokich i wysokich polowych oraz sadowniczych),
2) Obecność przedstawicieli podstawowych grup środków ochrony roślin (insektycydy, fungicydy oraz herbicydy),
3) Różne wartości NOAEL charakteryzujące toksyczność związku,
4) Powszechność stosowania,
5) Zróżnicowanie formulacji.

Spis środków ochrony roślin wytypowanych do modelowania komputerowego przedstawiono w Tabelach 3.1 – 3.3

Tabela 3.1

Uprawy wysokie			
Nazwa środka	Nazwa substancji czynnej	Zawartość substancji czynnej	Kategoria środka
PIRIMOR 500 WG	pirymikarb	500g/l	Insektycyd
SADOPLON 75 WP	tiuram	75%	Fungicyd
RELDAN 400 EC	chlorpiryfos metylowy	400 g/l	Insektycyd
PENNFLUID 420 SC	mankozeb	420 g/l	Fungicyd
OWADOFOS EXTRA 480 EC	chloropiryfos	480 g/l	Insektycyd

Tabela 3.2

Uprawy średnio-wysokie			
Nazwa środka	Nazwa substancji czynnej	Zawartość substancji czynnej	Kategoria środka
SPARTA 250 EW	tebukonazol	250 g/l	Fungicyd
AMMO SUPER 100 EW	z-cypermetryna	100 g/l	Insektycyd
BUMPER 250 EC	propikonazol	250 g/l	Fungicyd
CAPTAN 80 WG	kaptan	80%	Fungicyd
MOSPILAN 20 SP	acetamipryd	20%	Insektycyd

Tabela 3.3

Uprawy niskie			
Nazwa środka	Nazwa substancji czynnej	Zawartość substancji czynnej	Kategoria środka
ROUNDUP MAX 680 SG	glifosat	680 g/l	Herbicyd
STARANE 250 EC	fluroksypyr	250 g/l	Herbicyd
CHWASTOX 750 SL	MCPA-DMA	750 g/l	Herbicyd
AMISTAR 250 SC	azoksystrobina	250 g/l	Fungicyd
MYTHOS 300 SC	pirymetanil	300 g/l	Fungicyd

4. Oszacowanie ekspozycji operatora

Dla potrzeb poniższej ekspertyzy wykorzystano komputerowe modele UK-POEM [4] opracowany przez zespół ekspertów The Chemicals Regulations Directorate (CRD) - Health and Safety Executive (HSE) dawniej PSD Wielka Brytania oraz model BBA [5] przygotowany przez zespół ekspertów The Federal Biological Research Center for Agriculture and Forestry (BBA) w Niemczech. Ocena środków ochrony roślin z zastosowaniem powyższych modeli jest jednym z elementów dokumentacji wymaganej w procesie rejestracyjnym. Oba modele są rekomendowane przez Komisje Europejską i znajdują zastosowanie przy wprowadzaniu substancji czynnych do Załącznika I Dyrektywy 91/414/WE [1, 2].

Kryterium oceny narażenia operatora stanowi wartość AOEL [6]. Podstawą do wyznaczenia tej wartości jest wartość NOAEL wyznaczona w badaniach toksykologicznych. Modele te uwzględniają wielkość absorpcji dermalnej, dawkę zastosowanego środka, czas pracy, ekspozycję inhalacyjną (jeśli wymagane) oraz stosowany sprzęt agrotechniczny. Otrzymane wartości oszacowanego narażenia są odnoszone do wartości referencyjnej AOEL i pozwalają określić wielkość potencjalnego ryzyka dla osób wykonujących zabiegi agrochemiczne.

Dla potrzeb dozymetrycznego oszacowania ekspozycji operatora przeprowadzono doświadczenie, w którym wykorzystano opryskiwacze plecakowe prawidłowo działające i o różnym charakterze uszkodzenia. W uprawie wysokiej i średnio-wysokiej stosowano opryskiwacz Kwazar typ Neptune 15, a w uprawie niskiej opryskiwacz Kwazar Solo [7]. W czasie pomiarów operator opryskiwacza plecakowego był ubrany w kombinezon ochronny, na którym rozmieszczone zostały punkty pomiarowe wg. schematu BBA [5].

Z uwagi na bezpieczeństwo pracowników, do oprysków stosowano specjalną nietoksyczną ciecz modelową zawierającą markery umożliwiające ilościowe określenie wielkości narażenia, które następnie odnoszono do wybranych środków ochrony roślin [7].

Przyrost narażenia na podstawie badania dozymetrycznego w zależności od typu uszkodzenia opryskiwaczy przedstawiono w Tabelach 4.1 - 4.3. Przyrost narażenia większy od jedności oznacza większą ekspozycję w stosunku do narażenia przy zabiegach dokonywanych sprawnym opryskiwaczem, przyrost mniejszy od jedności oznaczana obniżoną ekspozycję w stosunku do narażenia wynikającego z oprysków sprawną aparaturą.

Tabela 4.1) Uprawy wysokie

Stan techniczny opryskiwacza plecakowego	Oszacowanie dozymetryczne w ppm w badaniu polowym*	Przyrost narażenia
Sprawny	209,5	1
Uszkodzony zawór	3110,4	14,8
Uszkodzony rozpylacz	931,7	4,44

*raport ISiK Skierniewice

Tabela 4.2) Uprawy średnio-wysokie

Stan techniczny opryskiwacza plecakowego	Oszacowanie dozymetryczne w ppm w badaniu polowym*	Przyrost narażenia
Sprawny	712,1	1
Uszkodzony zawór	1089,4	1,5
Uszkodzony rozpylacz	432,7	0,6

*raport ISiK Skierniewice

Tabela 4.3) Uprawy niskie

Stan techniczny opryskiwacza plecakowego	Oszacowanie dozymetryczne w ppm w badaniu polowym*	Przyrost narażenia
Sprawny	104,9	1
Uszkodzony zawór	201,3	1,91
Uszkodzony rozpylacz	103,9	0,99

*raport ISiK Skierniewice

Przyrost narażenia wyrażono jako stosunek narażenia przy sprawnym sprzęcie do narażenia przy określonym typie uszkodzenia.

4.1 Modelowanie ekspozycji operatora po zastosowaniu ręcznego opryskiwacza plecakowego wg. Modelu BBA

4.1.1 Uprawa wysoka

Tabela 4.1.1-1) Wielkość ekspozycji operatora po zastosowaniu sprawnego opryskiwacza w uprawach wysokich

Model BBA / Środki ochrony roslin	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień
	brak PPE	z PPE
	Uprawy wysokie	
Pirimor 500 WG [pirymikarb]	0,029	0,006
Sadoplon 75 WP [tiuram]	0,48	0,063
Reldan 400 EC [chlorpiryfos metylowy]	0,02	0,005
Pennfluid 420 SC [mankozeb]	0,016	0,008
Owadofos Extra 480 EC [chloropiryfos]	0,09	0,014

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.1.1-2) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach wysokich

	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień
Model BBA	brak PPE	z PPE	brak PPE	z PPE
	Uprawy wysokie			
Pirimor 500 WG [pirymikarb]	0,129	0,027	0,429	0,0888
Sadoplon 75 WP [tiuram]	2,013	0,280	7,100	0,9324
Reldan 400 EC [chlorpiryfos metylowy]	0,089	0,022	0,296	0,0740
Pennfluid 420 SC [mankozeb]	0,071	0,036	0,237	0,1184
Owadofos Extra 480 EC [chloropiryfos]	0,400	0,062	1,332	0,2072

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.1.1-3) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach wysokich wyrażone w % AOEL

	wartość AOEL dla s.cz. [mg/kg m.c./dzień]	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **zawór**	% AOEL uszkodzony **zawór**
Model BBA		brak PPE	z PPE	brak PPE	z PPE
	Uprawy wysokie				
Pirimor 500 WG [pirymikarb]	0,035	368	76	1226	254
Sadoplon 75 WP [tiuram]	0,02	10656	1399	35520	4662
Reldan 400 EC [chlorpiryfos metylowy]	0,01	888	222	2960	740
Pennfluid 420 SC [mankozeb]	0,035	710	355	2368	1184
Owadofos Extra 480 EC [chloropiryfos]	0,01	1142	178	3806	592

Wniosek:
Narażenie operatora po zastosowaniu uszkodzonego opryskiwacza ręcznym plecakowym (zawór i rozpylacz) w uprawach wysokich przekracza wartość limitującą AOEL, dla wszystkich ocenianych środków ochrony roślin, zarówno przy braku jak i po zastosowaniu PPE.

Załącznik do Tabeli 4.1.1-1 i 4.1.1-2

Podsumowanie oczekiwanego i potencjalnego narażenia operatora dla różnych poziomów zabezpieczenia PPE, Model BBA (Uprawy wysokie)

1) pirimikarb – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Pirimor 500 WG**			Active substance		**pirymikarb**	
Formulation type	WG			a.s. concentration		**500**	g/kg
Dermal absorption from product	**0,1**	%		Dermal absorption from spray		**13**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	None						
PPE during application: Head	None		Hands	None	Body	None	
Dose	**0,75**	kg product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	21	mg/kg a.s.
Hand contamination/day	7,875	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	7,875	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,02	mg/kg a.s.
Inhalation exposure/day	0,0075	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0075	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	1,8	3,975	9,375	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	15,15	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,1125	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,1125	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	7,875	mg/day	15,15	mg/day
Percent absorbed	0,1	%	13	%
Absorbed dose (dermal route)	0,007875	mg/day	1,9695	mg/day
Inhalation exposure to a.s.	0,0075	mg/day	0,1125	mg/day
Total systemic exposure	0,015375	mg/day	2,082	mg/day

PREDICTED EXPOSURE

Total systemic exposure	2,097375	mg/day
Operator body weight	70	kg
Operator exposure	0,0299625	mg/kg bw/day

2) pirimikarb – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Pirimor 500 WG**			Active substance		**pirymikarb**	
Formulation type	WG			a.s. concentration		**500**	g/kg
Dermal absorption from product	**0,1**	%		Dermal absorption from spray		**13**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None	Hands		Gloves	Body	Coverall and sturdy footwear	
Dose	**0,75**	kg product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	21	mg/kg a.s.
Hand contamination/day	7,875	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	0,07875	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,02	mg/kg a.s.
Inhalation exposure/day	0,0075	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0075	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	1,8	3,975	9,375	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	2,3085	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,1125	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,1125	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,07875	mg/day	2,3085	mg/day
Percent absorbed	0,1	%	13	%
Absorbed dose (dermal route)	0,00007875	mg/day	0,300105	mg/day
Inhalation exposure to a.s.	0,0075	mg/day	0,1125	mg/day
Total systemic exposure	0,00757875	mg/day	0,412605	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,42018375	mg/day
Operator body weight	70	kg
Operator exposure	0,006002625	mg/kg bw/day

3) tiuram– brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target				
Product	**Sadoplon 75 WP**		Active substance	**tiuram**	
Formulation type	WP		a.s. concentration	**750**	g/kg
Dermal absorption from product	**10**	%	Dermal absorption from spray	**10**	%
RPE during mix/loading	None		RPE during application	None	
PPE during mix/loading	None				
PPE during application: Head	None	Hands	None	Body	None
Dose	**4,5**	kg product/ha	Work rate/day	**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	50	mg/kg a.s.	WARNING: Value not based on data
Hand contamination/day	168,75	mg/day	
Protective clothing	none		
Transmission to skin	100	%	
Dermal exposure to a.s.	168,75	mg/day	

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,8	mg/kg a.s.
Inhalation exposure/day	2,7	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	2,7	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	16,2	35,775	84,375	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	136,35	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	1,0125	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	1,0125	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	168,75	mg/day	136,35	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	16,875	mg/day	13,635	mg/day
Inhalation exposure to a.s.	2,7	mg/day	1,0125	mg/day
Total systemic exposure	19,575	mg/day	14,6475	mg/day

PREDICTED EXPOSURE

Total systemic exposure	34,2225	mg/day	
Operator body weight	70	kg	
Operator exposure	0,488892857	mg/kg bw/day	WARNING: Assumed value for hand contamination when mixing

4) tiuram– z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Sadoplon 75 WP**			Active substance		**tiuram**	
Formulation type	WP			a.s. concentration		**750**	g/kg
Dermal absorption from product	**10**	%		Dermal absorption from spray		**10**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	Hood and visor	Hands	Gloves	Body	Coverall and sturdy footwear		
Dose	**4,5**	kg product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	50	mg/kg a.s.	WARNING: Value not based on data
Hand contamination/day	168,75	mg/day	
Protective clothing	gloves		
Transmission to skin	1	%	
Dermal exposure to a.s.	1,6875	mg/day	

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,8	mg/kg a.s.
Inhalation exposure/day	2,7	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	2,7	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	16,2	35,775	84,375	
Protective clothing	hood and visor	gloves	coverall and sturdy footwear	
Transmission to skin	5	1	5	%
Total dermal exposure to a.s.	5,3865	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	1,0125	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	1,0125	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	1,6875	mg/day	5,3865	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	0,16875	mg/day	0,53865	mg/day
Inhalation exposure to a.s.	2,7	mg/day	1,0125	mg/day
Total systemic exposure	2,86875	mg/day	1,55115	mg/day

PREDICTED EXPOSURE

Total systemic exposure	4,4199	mg/day	
Operator body weight	70	kg	
Operator exposure	0,063141429	mg/kg bw/day	WARNING: Assumed value for hand contamination when mixing

5) Chlorpiryfos metylowy– brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Reldan 400 EC**			Active substance		**chloropiryfos metylowy**	
Formulation type	Liquid			a.s. concentration		**400**	g/l
Dermal absorption from product	**1**	%		Dermal absorption from spray		**1**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	None						
PPE during application: Head	None		Hands	None	Body	None	
Dose	**1,5**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	123	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	123	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,03	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,03	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	2,88	6,36	15	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	24,24	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,18	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,18	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	123	mg/day	24,24	mg/day
Percent absorbed	1	%	1	%
Absorbed dose (dermal route)	1,23	mg/day	0,2424	mg/day
Inhalation exposure to a.s.	0,03	mg/day	0,18	mg/day
Total systemic exposure	1,26	mg/day	0,4224	mg/day

PREDICTED EXPOSURE

Total systemic exposure	1,6824	mg/day
Operator body weight	70	kg
Operator exposure	0,024034286	mg/kg bw/day

6) Chlorpiryfos metylowy– z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Reldan 400 EC**			Active substance		**chloropiryfos metylowy**	
Formulation type	Liquid			a.s. concentration		**400**	g/l
Dermal absorption from product	**1**	%		Dermal absorption from spray		**1**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	None	
Dose	**1,5**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	123	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	1,23	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,03	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,03	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	2,88	6,36	15	
Protective clothing	none	gloves	none	
Transmission to skin	100	1	100	%
Total dermal exposure to a.s.	17,9436	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,18	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,18	mg/day

ABSORBED DOSE

	Mix/load		Application		
Dermal exposure to a.s.	1,23	mg/day	17,9436	mg/day	
Percent absorbed	1	%	1	%	
Absorbed dose (dermal route)	0,0123	mg/day	0,179436	mg/day	
Inhalation exposure to a.s.	0,03	mg/day	0,18	mg/day	
Total systemic exposure	0,0423	mg/day	0,359436	mg/day	

PREDICTED EXPOSURE

Total systemic exposure	0,401736	mg/day
Operator body weight	70	kg
Operator exposure	0,005739086	mg/kg bw/day

7) mankozeb– brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target				
Product	**Pennfluid 420 S.C.**		Active substance	**mankozeb**	
Formulation type	Liquid		a.s. concentration	**420**	g/l
Dermal absorption from product	**0,11**	%	Dermal absorption from spray	**0,24**	%
RPE during mix/loading	None		RPE during application	None	
PPE during mix/loading	None				
PPE during application: Head	None	Hands	None	Body	None
Dose	**4**	l product/ha	Work rate/day	**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	344,4	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	344,4	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,084	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,084	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	8,064	17,808	42	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	67,872	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,504	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,504	mg/day

ABSORBED DOSE

	Mix/load		Application		
Dermal exposure to a.s.	344,4	mg/day	67,872	mg/day	
Percent absorbed	0,11	%	0,24	%	
Absorbed dose (dermal route)	0,37884	mg/day	0,1628928	mg/day	
Inhalation exposure to a.s.	0,084	mg/day	0,504	mg/day	
Total systemic exposure	0,46284	mg/day	0,6668928	mg/day	

PREDICTED EXPOSURE

Total systemic exposure	1,1297328	mg/day
Operator body weight	70	kg
Operator exposure	0,01613904	mg/kg bw/day

8) mankozeb– z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Pennfluid 420 S.C.**			Active substance		**mankozeb**	
Formulation type	Liquid			a.s. concentration		**420**	g/l
Dermal absorption from product	**0,11**	%		Dermal absorption from spray		**0,24**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**4**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	344,4	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	3,444	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,084	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,084	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	8,064	17,808	42	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	10,34208	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,504	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,504	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	3,444	mg/day	10,34208	mg/day
Percent absorbed	0,11	%	0,24	%
Absorbed dose (dermal route)	0,0037884	mg/day	0,024820992	mg/day
Inhalation exposure to a.s.	0,084	mg/day	0,504	mg/day
Total systemic exposure	0,0877884	mg/day	0,528820992	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,616609392	mg/day
Operator body weight	70	kg
Operator exposure	0,008808706	mg/kg bw/day

9) Chlorpiryfos– brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Owadofos Extra 480 EC**			Active substance		**chloropiryfos**	
Formulation type	Liquid			a.s. concentration		**480**	g/l
Dermal absorption from product	**1**	%		Dermal absorption from spray		**1**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	None						
PPE during application: Head	None		Hands	None	Body	None	
Dose	**5**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	492	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	492	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,12	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,12	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	11,52	25,44	60	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	96,96	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,72	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,72	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	492	mg/day	96,96	mg/day
Percent absorbed	1	%	1	%
Absorbed dose (dermal route)	4,92	mg/day	0,9696	mg/day
Inhalation exposure to a.s.	0,12	mg/day	0,72	mg/day
Total systemic exposure	5,04	mg/day	1,6896	mg/day

PREDICTED EXPOSURE

Total systemic exposure	6,7296	mg/day
Operator body weight	70	kg
Operator exposure	0,096137143	mg/kg bw/day

10) Chlorpiryfos– z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Owadofos Extra 480 EC**			Active substance		**chloropiryfos**	
Formulation type	Liquid			a.s. concentration		**480**	g/l
Dermal absorption from product	**1**	%		Dermal absorption from spray		**1**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**5**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	492	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	4,92	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,12	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,12	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	11,52	25,44	60	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	14,7744	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,72	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,72	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	4,92	mg/day	14,7744	mg/day
Percent absorbed	1	%	1	%
Absorbed dose (dermal route)	0,0492	mg/day	0,147744	mg/day
Inhalation exposure to a.s.	0,12	mg/day	0,72	mg/day
Total systemic exposure	0,1692	mg/day	0,867744	mg/day

PREDICTED EXPOSURE

Total systemic exposure	1,036944	mg/day
Operator body weight	70	kg
Operator exposure	0,014813486	mg/kg bw/day

4.1.2 Uprawa średnio-wysoka

Tabela 4.1.2-1) Wielkość ekspozycji operatora po zastosowaniu sprawnego opryskiwacza w uprawach średnio- wysokich

Model BBA / Środki ochrony roslin	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień
	brak PPE	z PPE
	Uprawy średnio - wysokie	
Sparta 250 EW [tebukonazol]	0,08	0,003
Ammo Super 100 EW [z-cypermetryna]	0,01	0,0005
Bumper 250 EC [propikonazol]	0,01	0,0008
Captan 80 WG [kaptan]	0,2	0,03
Mospilan 20 SP [acetamipryd]	0,019	0,002

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.1.2-2) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach średnio-wysokich

	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień
Model BBA	brak PPE	z PPE	brak PPE	z PPE
	Uprawy średnio- wysokie			
Sparta 250 EW [tebukonazol]	0,048	0,002	0,120	0,0045
Ammo Super 100 EW [z-cypermetryna]	0,006	0,000	0,015	0,0008
Bumper 250 EC [propikonazol]	0,006	0,000	0,015	0,0012
Captan 80 WG [kaptan]	0,120	0,018	0,300	0,0450
Mospilan 20 SP [acetamipryd]	0,011	0,001	0,029	0,0030

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.1.1-3) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach średnio-wysokich wyrażone w % AOEL

	wartość AOEL dla s.cz. [mg/kg m.c./dzień]	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **zawór**	% AOEL uszkodzony **zawór**
Model BBA		brak PPE	z PPE	brak PPE	z PPE
	Uprawy średnio- wysokie				
Sparta 250 EW [tebukonazol]	0,03	160	6	400	15
Ammo Super 100 EW [z-cypermetryna]	0,02	30	2	75	4
Bumper 250 EC [propikonazol]	0,1	6	0	15	1
Captan 80 WG [kaptan]	0,1	120	18	300	45
Mospilan 20 SP [acetamipryd]	0,124	9	1	23	2

Wniosek:
Narażenie operatora po zastosowaniu uszkodzonego ręcznego opryskiwacza plecakowego (zawór i rozpylacz) w uprawach średnio-wysokich przekracza wartość limitującą AOEL przy braku PPE dla środków zawierających tebukonazol i kaptan.

Załącznik do Tabeli 4.1.2-1 i 4.1.2-2

Podsumowanie oczekiwanego i potencjalnego narażenia operatora dla różnych poziomów zabezpieczenia PPE, Model BBA (Uprawy średnio - wysokie)

1) tebukonazol – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method		Hand-held sprayer: hydraulic nozzles. Outdoor, high level target					
Product		**Sparta 250 EW**			Active substance		**tebukonazol**
Formulation type		Liquid			a.s. concentration		**250** g/l
Dermal absorption from product		**13** %			Dermal absorption from spray		**13** %
RPE during mix/loading		None			RPE during application		None
PPE during mix/loading		None					
PPE during application:	Head	None	Hands		None	Body	None
Dose		**0,75** l product/ha			Work rate/day		**1** ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	38,4375	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	38,4375	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,009375	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,009375	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	0,9	1,9875	4,6875	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	7,575	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,05625	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,05625	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	38,4375	mg/day	7,575	mg/day
Percent absorbed	13	%	13	%
Absorbed dose (dermal route)	4,996875	mg/day	0,98475	mg/day
Inhalation exposure to a.s.	0,009375	mg/day	0,05625	mg/day
Total systemic exposure	5,00625	mg/day	1,041	mg/day

PREDICTED EXPOSURE

Total systemic exposure	6,04725	mg/day
Operator body weight	70	kg
Operator exposure	0,086389286	mg/kg bw/day

2) tebukonazol – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Sparta 250 EW**			Active substance		**tebukonazol**	
Formulation type	Liquid			a.s. concentration		**250**	g/l
Dermal absorption from product	**13**	%		Dermal absorption from spray		**13**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**0,75**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	38,4375	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	0,384375	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,009375	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,009375	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	0,9	1,9875	4,6875	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	1,15425	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,05625	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,05625	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,384375	mg/day	1,15425	mg/day
Percent absorbed	13	%	13	%
Absorbed dose (dermal route)	0,04996875	mg/day	0,1500525	mg/day
Inhalation exposure to a.s.	0,009375	mg/day	0,05625	mg/day
Total systemic exposure	0,05934375	mg/day	0,2063025	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,26564625	mg/day
Operator body weight	70	kg
Operator exposure	0,003794946	mg/kg bw/day

3) z-cypermetryna – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Ammo Super 100 EW**			Active substance		**zeta-cypermetryna**	
Formulation type	Liquid			a.s. concentration		**100**	g/l
Dermal absorption from product	**10**	%		Dermal absorption from spray		**10**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	None						
PPE during application: Head	None		Hands	None	Body	None	
Dose	**0,3**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	6,15	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	6,15	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,0015	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0015	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	0,144	0,318	0,75	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	1,212	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,009	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,009	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	6,15	mg/day	1,212	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	0,615	mg/day	0,1212	mg/day
Inhalation exposure to a.s.	0,0015	mg/day	0,009	mg/day
Total systemic exposure	0,6165	mg/day	0,1302	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,7467	mg/day
Operator body weight	70	kg
Operator exposure	0,010667143	mg/kg bw/day

4) z-cypermetryna – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Ammo Super 100 EW**			Active substance		**zeta-cypermetryna**	
Formulation type	Liquid			a.s. concentration		**100**	g/l
Dermal absorption from product	**10**	%		Dermal absorption from spray		**10**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**0,3**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	6,15	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	0,0615	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,0015	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0015	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	0,144	0,318	0,75	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	0,18468	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,009	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,009	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,0615	mg/day	0,18468	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	0,00615	mg/day	0,018468	mg/day
Inhalation exposure to a.s.	0,0015	mg/day	0,009	mg/day
Total systemic exposure	0,00765	mg/day	0,027468	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,035118	mg/day
Operator body weight	70	kg
Operator exposure	0,000501686	mg/kg bw/day

5) propikonazol – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Bumper 250 EC**			Active substance		**propikonazol**	
Formulation type	Liquid			a.s. concentration		**250**	g/l
Dermal absorption from product	**2,4**	%		Dermal absorption from spray		**2,4**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	None						
PPE during application: Head	None		Hands	None	Body	None	
Dose	**0,45**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	23,0625	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	23,0625	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,005625	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,005625	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	0,54	1,1925	2,8125	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	4,545	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,03375	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,03375	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	23,0625	mg/day	4,545	mg/day
Percent absorbed	2,4	%	2,4	%
Absorbed dose (dermal route)	0,5535	mg/day	0,10908	mg/day
Inhalation exposure to a.s.	0,005625	mg/day	0,03375	mg/day
Total systemic exposure	0,559125	mg/day	0,14283	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,701955	mg/day
Operator body weight	70	kg
Operator exposure	0,010027929	mg/kg bw/day

6) propikonazol – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Bumper 250 EC**			Active substance		**propikonazol**	
Formulation type	Liquid			a.s. concentration		**250**	g/l
Dermal absorption from product	**2,4**	%		Dermal absorption from spray		**2,4**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**0,45**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	23,0625	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	0,230625	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,005625	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,005625	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	0,54	1,1925	2,8125	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	0,69255	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,03375	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,03375	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,230625	mg/day	0,69255	mg/day
Percent absorbed	2,4	%	2,4	%
Absorbed dose (dermal route)	0,005535	mg/day	0,0166212	mg/day
Inhalation exposure to a.s.	0,005625	mg/day	0,03375	mg/day
Total systemic exposure	0,01116	mg/day	0,0503712	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,0615312	mg/day
Operator body weight	70	kg
Operator exposure	0,000879017	mg/kg bw/day

7) kaptan – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target					
Product	**Captan 80 WG**		Active substance		**kaptan**	
Formulation type	WG		a.s. concentration		**800**	g/kg
Dermal absorption from product	**10**	%	Dermal absorption from spray		**10**	%
RPE during mix/loading	None		RPE during application		None	
PPE during mix/loading	None					
PPE during application: Head	None	Hands	None	Body	None	
Dose	**2,8**	kg product/ha	Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	21	mg/kg a.s.
Hand contamination/day	47,04	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	47,04	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,02	mg/kg a.s.
Inhalation exposure/day	0,0448	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0448	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	10,752	23,744	56	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	90,496	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,672	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,672	mg/day

ABSORBED DOSE

	Mix/load		Application		
Dermal exposure to a.s.	47,04	mg/day	90,496	mg/day	
Percent absorbed	10	%	10	%	
Absorbed dose (dermal route)	4,704	mg/day	9,0496	mg/day	
Inhalation exposure to a.s.	0,0448	mg/day	0,672	mg/day	
Total systemic exposure	4,7488	mg/day	9,7216	mg/day	

PREDICTED EXPOSURE

Total systemic exposure	14,4704	mg/day
Operator body weight	70	kg
Operator exposure	0,20672	mg/kg bw/day

8) kaptan – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Captan 80 WG**			Active substance		**kaptan**	
Formulation type	WG			a.s. concentration		**800**	g/kg
Dermal absorption from product	**10**	%		Dermal absorption from spray		**10**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None	Hands		Gloves	Body	Coverall and sturdy footwear	
Dose	**2,8**	kg product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	21	mg/kg a.s.
Hand contamination/day	47,04	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	0,4704	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,02	mg/kg a.s.
Inhalation exposure/day	0,0448	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0448	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	10,752	23,744	56	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	13,78944	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,672	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,672	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,4704	mg/day	13,78944	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	0,04704	mg/day	1,378944	mg/day
Inhalation exposure to a.s.	0,0448	mg/day	0,672	mg/day
Total systemic exposure	0,09184	mg/day	2,050944	mg/day

PREDICTED EXPOSURE

Total systemic exposure	2,142784	mg/day
Operator body weight	70	kg
Operator exposure	0,0306112	mg/kg bw/day

9) acetamipryd – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target				
Product	**Mospilan 20 SP**		Active substance	**acetamipryd**	
Formulation type	WP		a.s. concentration	**200**	g/kg
Dermal absorption from product	**15,9**	%	Dermal absorption from spray	**33**	%
RPE during mix/loading	None		RPE during application	None	
PPE during mix/loading	None				
PPE during application: Head	None	Hands	None	Body	None
Dose	**0,3**	kg product/ha	Work rate/day	**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	50	mg/kg a.s.	WARNING: Value not based on data
Hand contamination/day	3	mg/day	
Protective clothing	none		
Transmission to skin	100	%	
Dermal exposure to a.s.	3	mg/day	

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,8	mg/kg a.s.
Inhalation exposure/day	0,048	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,048	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	0,288	0,636	1,5	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	2,424	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,018	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,018	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	3	mg/day	2,424	mg/day
Percent absorbed	15,9	%	33	%
Absorbed dose (dermal route)	0,477	mg/day	0,79992	mg/day
Inhalation exposure to a.s.	0,048	mg/day	0,018	mg/day
Total systemic exposure	0,525	mg/day	0,81792	mg/day

PREDICTED EXPOSURE

Total systemic exposure	1,34292	mg/day	
Operator body weight	70	kg	
Operator exposure	0,019184571	mg/kg bw/day	WARNING: Assumed value for hand contamination when mixing

10) acetamipryd – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target				
Product	**Mospilan 20 SP**		Active substance	**acetamipryd**	
Formulation type	WP		a.s. concentration	**200**	g/kg
Dermal absorption from product	**15,9**	%	Dermal absorption from spray	**33**	%
RPE during mix/loading	None		RPE during application	None	
PPE during mix/loading	Gloves				
PPE during application: Head	None	Hands	Gloves	Body	Coverall and sturdy footwear
Dose	**0,3**	kg product/ha	Work rate/day	**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	50	mg/kg a.s.	WARNING: Value not based on data
Hand contamination/day	3	mg/day	
Protective clothing	gloves		
Transmission to skin	1	%	
Dermal exposure to a.s.	0,03	mg/day	

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,8	mg/kg a.s.
Inhalation exposure/day	0,048	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,048	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	0,288	0,636	1,5	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	0,36936	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,018	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,018	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,03	mg/day	0,36936	mg/day
Percent absorbed	15,9	%	33	%
Absorbed dose (dermal route)	0,00477	mg/day	0,1218888	mg/day
Inhalation exposure to a.s.	0,048	mg/day	0,018	mg/day
Total systemic exposure	0,05277	mg/day	0,1398888	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,1926588	mg/day	
Operator body weight	70	kg	
Operator exposure	0,002752269	mg/kg bw/day	WARNING: Assumed value for hand contamination when mixing

4.1.3 Uprawa niska

Tabela 4.1.3-1) Wielkość ekspozycji operatora po zastosowaniu sprawnego opryskiwacza w uprawach niskich

Model BBA / Środki ochrony roslin	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień
	brak PPE	z PPE
	Uprawy niskie	
Roundup Max 680 SG [glifosat]	0,05	0,01
Starane 250 EC [fluroksypyr]	0,17	0,008
Chwastox 750 SL [MCPA-DMA]	0,08	0,007
Amistar 250 SC [azoksystrobina]	0,04	0,0027
Mythos 300 SC [pirymetanil]	0,11	0,017

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.1.3-2) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach niskich

	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień
Model BBA	brak PPE	z PPE	brak PPE	z PPE
	Uprawy niskie			
Roundup Max 680 SG [glifosat]	0,050	0,010	0,096	0,019
Starane 250 EC [fluroksypyr]	0,168	0,008	0,325	0,015
Chwastox 750 SL [MCPA-DMA]	0,079	0,007	0,153	0,013
Amistar 250 SC [azoksystrobina]	0,040	0,003	0,076	0,005
Mythos 300 SC [pirymetanil]	0,109	0,017	0,210	0,032

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.1.3-3) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach niskich wyrażone w % AOEL

	wartość AOEL dla s.cz. [mg/kg m.c./dzień]	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **zawór**	% AOEL uszkodzony **zawór**
Model BBA		brak PPE	z PPE	brak PPE	z PPE
	Uprawy niskie				
Roundup Max 680 SG [glifosat]	0,2	25	5	48	10
Starane 250 EC [fluroksypyr]	0,8	21	1	41	2
Chwastox 750 SL [MCPA-DMA]	0,04	198	17	382	33
Amistar 250 SC [azoksystrobina]	0,1	40	3	76	5
Mythos 300 SC [pirymetanil]	0,12	91	14	175	27

Wniosek:
Narażenie operatora po zastosowaniu uszkodzonego ręcznego opryskiwacza plecakowego w uprawach niskich przekracza wartość limitującą AOEL przy braku PPE dla środka zawierającego MCPA-DMA (rozpylacz) oraz dla środków zawierających MCPA-DMA i pirymetanil (zawór).

Załącznik do Tabeli 4.1.3-1 i 4.1.3-2

Podsumowanie oczekiwanego i potencjalnego narażenia operatora dla różnych poziomów zabezpieczenia PPE, Model BBA (Uprawy niskie)

1) glifosat – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Roundup Max 680 SG**			Active substance		**glifosat**	
Formulation type	WG			a.s. concentration		**680**	g/kg
Dermal absorption from product	**3**	%		Dermal absorption from spray		**3**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	None						
PPE during application: Head	None		Hands	None	Body	None	
Dose	**2,5**	kg product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	21	mg/kg a.s.
Hand contamination/day	35,7	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	35,7	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,02	mg/kg a.s.
Inhalation exposure/day	0,034	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,034	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	8,16	18,02	42,5	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	68,68	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,51	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,51	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	35,7	mg/day	68,68	mg/day
Percent absorbed	3	%	3	%
Absorbed dose (dermal route)	1,071	mg/day	2,0604	mg/day
Inhalation exposure to a.s.	0,034	mg/day	0,51	mg/day
Total systemic exposure	1,105	mg/day	2,5704	mg/day

PREDICTED EXPOSURE

Total systemic exposure	3,6754	mg/day
Operator body weight	70	kg
Operator exposure	0,052505714	mg/kg bw/day

2) glifosat – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Roundup Max 680 SG**			Active substance		**glifosat**	
Formulation type	WG			a.s. concentration		**680**	g/kg
Dermal absorption from product	**3**	%		Dermal absorption from spray		**3**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**2,5**	kg product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	21	mg/kg a.s.
Hand contamination/day	35,7	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	0,357	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,02	mg/kg a.s.
Inhalation exposure/day	0,034	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,034	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	8,16	18,02	42,5	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	10,4652	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,51	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,51	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,357	mg/day	10,4652	mg/day
Percent absorbed	3	%	3	%
Absorbed dose (dermal route)	0,01071	mg/day	0,313956	mg/day
Inhalation exposure to a.s.	0,034	mg/day	0,51	mg/day
Total systemic exposure	0,04471	mg/day	0,823956	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,868666	mg/day
Operator body weight	70	kg
Operator exposure	0,012409514	mg/kg bw/day

3) fluroksypyr – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target					
Product	**Starane 250 EC**		Active substance		**fluroksypyr**	
Formulation type	Liquid		a.s. concentration		**250**	g/l
Dermal absorption from product	**10**	%	Dermal absorption from spray		**10**	%
RPE during mix/loading	None		RPE during application		None	
PPE during mix/loading	None					
PPE during application: Head	None	Hands	None	Body	None	
Dose	**2**	l product/ha	Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	102,5	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	102,5	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,025	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,025	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	2,4	5,3	12,5	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	20,2	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,15	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,15	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	102,5	mg/day	20,2	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	10,25	mg/day	2,02	mg/day
Inhalation exposure to a.s.	0,025	mg/day	0,15	mg/day
Total systemic exposure	10,275	mg/day	2,17	mg/day

PREDICTED EXPOSURE

Total systemic exposure	12,445	mg/day
Operator body weight	70	kg
Operator exposure	0,177785714	mg/kg bw/day

4) fluroksypyr – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Starane 250 EC**			Active substance		**fluroksypyr**	
Formulation type	Liquid			a.s. concentration		**250**	g/l
Dermal absorption from product	**10**	%		Dermal absorption from spray		**10**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**2**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	102,5	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	1,025	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,025	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,025	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	2,4	5,3	12,5	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	3,078	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,15	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,15	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	1,025	mg/day	3,078	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	0,1025	mg/day	0,3078	mg/day
Inhalation exposure to a.s.	0,025	mg/day	0,15	mg/day
Total systemic exposure	0,1275	mg/day	0,4578	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,5853	mg/day
Operator body weight	70	kg
Operator exposure	0,008361429	mg/kg bw/day

5) MCPA-DMA – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Chwastox 750 SL**			Active substance		**MCPA**	
Formulation type	Liquid			a.s. concentration		**750**	g/l
Dermal absorption from product	**2,2**	%		Dermal absorption from spray		**2,5**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	None						
PPE during application: Head	None		Hands	None	Body	None	
Dose	**1,3**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	199,875	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	199,875	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,04875	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,04875	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	4,68	10,335	24,375	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	39,39	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,2925	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,2925	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	199,875	mg/day	39,39	mg/day
Percent absorbed	2,2	%	2,5	%
Absorbed dose (dermal route)	4,39725	mg/day	0,98475	mg/day
Inhalation exposure to a.s.	0,04875	mg/day	0,2925	mg/day
Total systemic exposure	4,446	mg/day	1,27725	mg/day

PREDICTED EXPOSURE

Total systemic exposure	5,72325	mg/day
Operator body weight	70	kg
Operator exposure	0,081760714	mg/kg bw/day

6) MCPA-DMA – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Chwastox 750 SL**			Active substance		**MCPA**	
Formulation type	Liquid			a.s. concentration		**750**	g/l
Dermal absorption from product	**2,2**	%		Dermal absorption from spray		**2,5**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**1,3**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	199,875	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	1,99875	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,04875	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,04875	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	4,68	10,335	24,375	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	6,0021	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,2925	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,2925	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	1,99875	mg/day	6,0021	mg/day
Percent absorbed	2,2	%	2,5	%
Absorbed dose (dermal route)	0,0439725	mg/day	0,1500525	mg/day
Inhalation exposure to a.s.	0,04875	mg/day	0,2925	mg/day
Total systemic exposure	0,0927225	mg/day	0,4425525	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,535275	mg/day
Operator body weight	70	kg
Operator exposure	0,007646786	mg/kg bw/day

7) azoksystrobina – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target					
Product	**Amistar 250 S.C.**		Active substance		**azoksystrobina**	
Formulation type	Liquid		a.s. concentration		**250**	g/l
Dermal absorption from product	**5**	%	Dermal absorption from spray		**5**	%
RPE during mix/loading	None		RPE during application		None	
PPE during mix/loading	None					
PPE during application: Head	None	Hands	None	Body	None	
Dose	**1**	l product/ha	Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	51,25	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	51,25	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,0125	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0125	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	1,2	2,65	6,25	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	10,1	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,075	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,075	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	51,25	mg/day	10,1	mg/day
Percent absorbed	5	%	5	%
Absorbed dose (dermal route)	2,5625	mg/day	0,505	mg/day
Inhalation exposure to a.s.	0,0125	mg/day	0,075	mg/day
Total systemic exposure	2,575	mg/day	0,58	mg/day

PREDICTED EXPOSURE

Total systemic exposure	3,155	mg/day
Operator body weight	70	kg
Operator exposure	0,045071429	mg/kg bw/day

8) azoksystrobina – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Amistar 250 S.C.**			Active substance		**azoksystrobina**	
Formulation type	Liquid			a.s. concentration		**250**	g/l
Dermal absorption from product	**5**	%		Dermal absorption from spray		**5**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**1**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	51,25	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	0,5125	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,0125	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0125	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	1,2	2,65	6,25	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	1,539	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,075	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,075	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,5125	mg/day	1,539	mg/day
Percent absorbed	5	%	5	%
Absorbed dose (dermal route)	0,025625	mg/day	0,07695	mg/day
Inhalation exposure to a.s.	0,0125	mg/day	0,075	mg/day
Total systemic exposure	0,038125	mg/day	0,15195	mg/day

PREDICTED EXPOSURE

Total systemic exposure	0,190075	mg/day
Operator body weight	70	kg
Operator exposure	0,002715357	mg/kg bw/day

9) pirymetanil – brak PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target				
Product	**Mythos 300 S.C.**		Active substance	**pirymetanil**	
Formulation type	Liquid		a.s. concentration	**300**	g/l
Dermal absorption from product	**1**	%	Dermal absorption from spray	**20**	%
RPE during mix/loading	None		RPE during application	None	
PPE during mix/loading	None				
PPE during application: Head	None	Hands	None	Body	None
Dose	**2,5**	l product/ha	Work rate/day	**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	153,75	mg/day
Protective clothing	none	
Transmission to skin	100	%
Dermal exposure to a.s.	153,75	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,0375	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0375	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	3,6	7,95	18,75	
Protective clothing	none	none	none	
Transmission to skin	100	100	100	%
Total dermal exposure to a.s.	30,3	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,225	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,225	mg/day

ABSORBED DOSE

	Mix/load		Application		
Dermal exposure to a.s.	153,75	mg/day		30,3	mg/day
Percent absorbed	1	%		20	%
Absorbed dose (dermal route)	1,5375	mg/day		6,06	mg/day
Inhalation exposure to a.s.	0,0375	mg/day		0,225	mg/day
Total systemic exposure	1,575	mg/day		6,285	mg/day

PREDICTED EXPOSURE

Total systemic exposure	7,86	mg/day
Operator body weight	70	kg
Operator exposure	0,112285714	mg/kg bw/day

10) pirymetanil – z PPE

THE GERMAN MODEL (GEOMETRIC MEAN VALUES)

Application method	Hand-held sprayer: hydraulic nozzles. Outdoor, high level target						
Product	**Mythos 300 S.C.**			Active substance		**pirymetanil**	
Formulation type	Liquid			a.s. concentration		**300**	g/l
Dermal absorption from product	**1**	%		Dermal absorption from spray		**20**	%
RPE during mix/loading	None			RPE during application		None	
PPE during mix/loading	Gloves						
PPE during application: Head	None		Hands	Gloves	Body	Coverall and sturdy footwear	
Dose	**2,5**	l product/ha		Work rate/day		**1**	ha

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	205	mg/kg a.s.
Hand contamination/day	153,75	mg/day
Protective clothing	gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	1,5375	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,05	mg/kg a.s.
Inhalation exposure/day	0,0375	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,0375	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique: Hand-held sprayer: hydraulic nozzles. Outdoor, high level target

	Head	Hands	Rest of body	
Dermal contamination/kg a.s.	4,8	10,6	25	
Dermal contamination/day	3,6	7,95	18,75	
Protective clothing	none	gloves	coverall and sturdy footwear	
Transmission to skin	100	1	5	%
Total dermal exposure to a.s.	4,617	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure/kg a.s.	0,3	mg/kg a.s.
Inhalation exposure/day	0,225	mg/day
RPE	none	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,225	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	1,5375	mg/day	4,617	mg/day
Percent absorbed	1	%	20	%
Absorbed dose (dermal route)	0,015375	mg/day	0,9234	mg/day
Inhalation exposure to a.s.	0,0375	mg/day	0,225	mg/day
Total systemic exposure	0,052875	mg/day	1,1484	mg/day

PREDICTED EXPOSURE

Total systemic exposure	1,201275	mg/day
Operator body weight	70	kg
Operator exposure	0,017161071	mg/kg bw/day

4.2 Modelowanie ekspozycji operatora po zastosowaniu ręcznego opryskiwacza plecakowego wg. Model UK-POEM

4.2.1 Uprawa wysoka

Tabela 4.2.1-1) Wielkość ekspozycji operatora po zastosowaniu sprawnego opryskiwacza w uprawach wysokich

Model UK-POEM / Środki ochrony roślin	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień
	brak PPE	z PPE
	Uprawy wysokie	
Pirimor 500 WG [pirymikarb]	0,4	0,09
Sadoplon 75 WP [tiuram]	3,15	0,48
Reldan 400 EC [chlorpiryfos metylowy]	0,09	0,016
Pennfluid 420 SC [mankozeb]	0,04	0,014
Owadofos Extra 480 EC [chloropiryfos]	0,2	0,14

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.2.1-2) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach wysokich

	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień
Model UK-POEM	brak PPE	z PPE	brak PPE	z PPE
	Uprawy wysokie			
Pirimor 500 WG [pirymikarb]	1,78	0,40	5,92	1,33
Sadoplon 75 WP [tiuram]	13,99	2,13	46,62	7,10
Reldan 400 EC [chlorpiryfos metylowy]	0,40	0,07	1,33	0,24
Pennfluid 420 SC [mankozeb]	0,18	0,06	0,59	0,21
Owadofos Extra 480 EC [chloropiryfos]	0,89	0,62	2,96	2,07

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.2.1-3) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach wysokich wyrażone w % AOEL

	wartość AOEL dla s.cz. [mg/kg m.c./dzień]	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **zawór**	% AOEL uszkodzony **zawór**
Model UK-POEM		brak PPE	z PPE	brak PPE	z PPE
	Uprawy wysokie				
Pirimor 500 WG [pirymikarb]	0,035	5074,29	1141,71	16914,3	3805,7
Sadoplon 75 WP [tiuram]	0,02	69930,00	10656,00	233100,0	35520,0
Reldan 400 EC [chlorpiryfos metylowy]	0,01	3996,00	710,40	13320,0	2368,0
Pennfluid 420 SC [mankozeb]	0,035	507,43	177,60	1691,4	592,0
Owadofos Extra 480 EC [chloropiryfos]	0,01	8880,00	6216,00	29600,0	20720,0

Wniosek:
Narażenie operatora po zastosowaniu uszkodzonego opryskiwacza ręcznym plecakowym (zawór i rozpylacz) w uprawach wysokich przekracza wartość limitującą AOEL, dla wszystkich ocenianych środków ochrony roślin, zarówno przy braku jak i po zastosowaniu PPE.

Załącznik do Tabeli 4.2.1-1 i 4.2.1-2

Podsumowanie oczekiwanego i potencjalnego narażenia operatora dla różnych poziomów zabezpieczenia PPE, Model UK-POEM (Uprawy wysokie)

1) pirimikarb – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Pirimor 500 WG**		Active substance	**pirimikarb**	
Formulation type	WG or SG		a.s. concentration	**500**	mg/g
Dermal absorption from product	**0,1**	%	Dermal absorption from spray	**13**	%
PPE during mix/loading	None		PPE during application	None	
Dose	**0,75**	kg product/ha	Work rate/day	**1**	ha
Application volume	**150**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.
Hand contamination/day	64,275	mg/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to a.s.	64,275	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,0628	mg/kg a.s.
Inhalation exposure/day	0,02355	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,02355	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	150	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		
Concentration of a.s. in spray solut	2,5	mg/ml		
Dermal exposure to a.s.	185,625	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	2,5	mg/ml
Inhalation exposure to a.s.	0,15	mg/day
Percent absorbed	100	%
Absorbed dose	0,15	mg/day

ABSORBED DOSE

	Mix/load		Application		
Dermal exposure to a.s.	64,275	mg/day		185,625	mg/day
Percent absorbed	0,1	%		13	%
Absorbed dose (dermal route)	0,064275	mg/day		24,13125	mg/day
Inhalation exposure to a.s.	0,02355	mg/day		0,15	mg/day
Absorbed dose	0,087825	mg/day		24,28125	mg/day

PREDICTED EXPOSURE

Total absorbed dose	24,369075	mg/day
Operator body weight	60	kg
Operator exposure	0,40615125	mg/kg bw/day

2) pirimikarb – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Pirimor 500 WG**		Active substance	**pirimikarb**	
Formulation type	WG or SG		a.s. concentration	**500**	mg/g
Dermal absorption from product	**0,1**	%	Dermal absorption from spray	**13**	%
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**0,75**	kg product/ha	Work rate/day	**1**	ha
Application volume	**150**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.
Hand contamination/day	64,275	mg/day
Protective clothing	Gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	0,64275	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,0628	mg/kg a.s.
Inhalation exposure/day	0,02355	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,02355	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	150	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	0,5	1,625	0,625	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	16,5	ml/day		
Concentration of a.s. in spray solut	2,5	mg/ml		
Dermal exposure to a.s.	41,25	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	2,5	mg/ml
Inhalation exposure to a.s.	0,15	mg/day
Percent absorbed	100	%
Absorbed dose	0,15	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,64275	mg/day	41,25	mg/day
Percent absorbed	0,1	%	13	%
Absorbed dose (dermal route)	0,00064275	mg/day	5,3625	mg/day
Inhalation exposure to a.s.	0,02355	mg/day	0,15	mg/day
Absorbed dose	0,02419275	mg/day	5,5125	mg/day

PREDICTED EXPOSURE

Total absorbed dose	5,53669275	mg/day
Operator body weight	60	kg
Operator exposure	0,092278213	mg/kg bw/day

3) tiuram– brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Sadoplon 75 WP**		Active substance	**tiuram**	
Formulation type	WP or SP		a.s. concentration	**750**	mg/g
Dermal absorption from product	**10**	%	Dermal absorption from spray	**10**	%
PPE during mix/loading	None		PPE during application	None	
Dose	**7,5**	kg product/ha	Work rate/day	**1**	ha
Application volume	**500**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.	WARNING: Extrapolated value from WG data
Hand contamination/day	964,125	mg/day	
Protective clothing	None		
Transmission to skin	100	%	
Dermal exposure to a.s.	964,125	mg/day	

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	1,534	mg/kg a.s.
Inhalation exposure/day	8,62875	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	8,62875	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	500	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		
Concentration of a.s. in spray solut	11,25	mg/ml		
Dermal exposure to a.s.	835,3125	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	11,25	mg/ml
Inhalation exposure to a.s.	0,675	mg/day
Percent absorbed	100	%
Absorbed dose	0,675	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	964,125	mg/day	835,3125	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	96,4125	mg/day	83,53125	mg/day
Inhalation exposure to a.s.	8,62875	mg/day	0,675	mg/day
Absorbed dose	105,04125	mg/day	84,20625	mg/day

PREDICTED EXPOSURE

Total absorbed dose	189,2475	mg/day	
Operator body weight	60	kg	
Operator exposure	3,154125	mg/kg bw/day	WARNING: Extrapolated value from WG data

4) tiuram– z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Sadoplon 75 WP**		Active substance	**tiuram**	
Formulation type	WP or SP		a.s. concentration	**750**	mg/g
Dermal absorption from product	**10**	%	Dermal absorption from spray	**10**	%
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**7,5**	kg product/ha	Work rate/day	**1**	ha
Application volume	**500**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.	WARNING: Extrapolated value from WG data
Hand contamination/day	964,125	mg/day	
Protective clothing	Gloves		
Transmission to skin	1	%	
Dermal exposure to a.s.	9,64125	mg/day	

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	1,534	mg/kg a.s.
Inhalation exposure/day	8,62875	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	8,62875	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	500	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	0,5	1,625	0,625	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	16,5	ml/day		
Concentration of a.s. in spray solut	11,25	mg/ml		
Dermal exposure to a.s.	185,625	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	11,25	mg/ml
Inhalation exposure to a.s.	0,675	mg/day
Percent absorbed	100	%
Absorbed dose	0,675	mg/day

ABSORBED DOSE

	Mix/load		Application		
Dermal exposure to a.s.	9,64125	mg/day		185,625	mg/day
Percent absorbed	10	%		10	%
Absorbed dose (dermal route)	0,964125	mg/day		18,5625	mg/day
Inhalation exposure to a.s.	8,62875	mg/day		0,675	mg/day
Absorbed dose	9,592875	mg/day		19,2375	mg/day

PREDICTED EXPOSURE

Total absorbed dose	28,830375	mg/day	
Operator body weight	60	kg	
Operator exposure	0,48050625	mg/kg bw/day	WARNING: Extrapolated value from WG data

5) Chlorpiryfos metylowy– brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Reldan 400 EC**		Active substance	**chloropiryfos metylowy**	
Formulation type	organic solvent-based		a.s. concentration	**400**	mg/ml
Dermal absorption from product	**1**	%	Dermal absorption from spray	**1**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	None		PPE during application	None	
Dose	**1,5**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	1,5	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,8	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,8	ml/day	74,25	ml/day
Concen. of a.s. product or spray	400	mg/ml	3	mg/ml
Dermal exposure to a.s.	320	mg/day	222,75	mg/day
Percent absorbed	1	%	1	%
Absorbed dose	3,2	mg/day	2,2275	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	3	mg/ml
Inhalation exposure to a.s.	0,18	mg/day
Percent absorbed	100	%
Absorbed dose	0,18	mg/day

PREDICTED EXPOSURE

Total absorbed dose	5,6075	mg/day
Operator body weight	60	kg
Operator exposure	0,093458333	mg/kg bw/day

6) Chlorpiryfos metylowy– z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Reldan 400 EC**		Active substance	**chloropiryfos metylowy**	
Formulation type	organic solvent-based		a.s. concentration	**400**	mg/ml
Dermal absorption from product	**1**	%	Dermal absorption from spray	**1**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**1,5**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	1,5	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	Gloves	
Transmission to skin	10	%
Dermal exposure to formulation	0,08	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	0,5	1,625	0,625	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	16,5	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,08	ml/day	16,5	ml/day
Concen. of a.s. product or spray	400	mg/ml	3	mg/ml
Dermal exposure to a.s.	32	mg/day	49,5	mg/day
Percent absorbed	1	%	1	%
Absorbed dose	0,32	mg/day	0,495	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	3	mg/ml
Inhalation exposure to a.s.	0,18	mg/day
Percent absorbed	100	%
Absorbed dose	0,18	mg/day

PREDICTED EXPOSURE

Total absorbed dose	0,995	mg/day
Operator body weight	60	kg
Operator exposure	0,016583333	mg/kg bw/day

7) mankozeb– brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Pennfluifd 420 S.C.**		Active substance	**mankozeb**	
Formulation type	organic solvent-based		a.s. concentration	**420**	mg/ml
Dermal absorption from product	**0,11**	%	Dermal absorption from spray	**0,25**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	None		PPE during application	None	
Dose	**4**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	4	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,8	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,8	ml/day	74,25	ml/day
Concen. of a.s. product or spray	420	mg/ml	8,4	mg/ml
Dermal exposure to a.s.	336	mg/day	623,7	mg/day
Percent absorbed	0,11	%	0,25	%
Absorbed dose	0,3696	mg/day	1,55925	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	8,4	mg/ml
Inhalation exposure to a.s.	0,504	mg/day
Percent absorbed	100	%
Absorbed dose	0,504	mg/day

PREDICTED EXPOSURE

Total absorbed dose	2,43285	mg/day
Operator body weight	60	kg
Operator exposure	0,0405475	mg/kg bw/day

8) mankozeb– z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Pennfluifd 420 S.C.**		Active substance	**mankozeb**	
Formulation type	organic solvent-based		a.s. concentration	**420**	mg/ml
Dermal absorption from product	**0,11**	%	Dermal absorption from spray	**0,25**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**4**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	4	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	Gloves	
Transmission to skin	10	%
Dermal exposure to formulation	0,08	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	0,5	1,625	0,625	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	16,5	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,08	ml/day	16,5	ml/day
Concen. of a.s. product or spray	420	mg/ml	8,4	mg/ml
Dermal exposure to a.s.	33,6	mg/day	138,6	mg/day
Percent absorbed	0,11	%	0,25	%
Absorbed dose	0,03696	mg/day	0,3465	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	8,4	mg/ml
Inhalation exposure to a.s.	0,504	mg/day
Percent absorbed	100	%
Absorbed dose	0,504	mg/day

PREDICTED EXPOSURE

Total absorbed dose	0,88746	mg/day
Operator body weight	60	kg
Operator exposure	0,014791	mg/kg bw/day

9) Chlorpiryfos– brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Owadofos Extra 480 EC**		Active substance	**chloropiryfos**	
Formulation type	organic solvent-based		a.s. concentration	**480**	mg/ml
Dermal absorption from product	**1**	%	Dermal absorption from spray	**1**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	None		PPE during application	None	
Dose	**5**	l/ha	Work rate/day	**1**	ha
Application volume	**150**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	5	litres product/ha
Work rate	1	ha/day
Number of operations	60	/day
Hand contamination	0,6	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,6	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	150	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,6	ml/day	74,25	ml/day
Concen. of a.s. product or spray	480	mg/ml	16	mg/ml
Dermal exposure to a.s.	288	mg/day	1188	mg/day
Percent absorbed	1	%	1	%
Absorbed dose	2,88	mg/day	11,88	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	16	mg/ml
Inhalation exposure to a.s.	0,96	mg/day
Percent absorbed	100	%
Absorbed dose	0,96	mg/day

PREDICTED EXPOSURE

Total absorbed dose	15,72	mg/day
Operator body weight	60	kg
Operator exposure	0,262	mg/kg bw/day

10) Chlorpiryfos– z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Owadofos Extra 480 EC**		Active substance	**chloropiryfos**	
Formulation type	organic solvent-based		a.s. concentration	**480**	mg/ml
Dermal absorption from product	**1**	%	Dermal absorption from spray	**1**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	Gloves		PPE during application	Gloves	
Dose	**5**	l/ha	Work rate/day	**1**	ha
Application volume	**150**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	5	litres product/ha
Work rate	1	ha/day
Number of operations	60	/day
Hand contamination	0,6	ml/day
Protective clothing	Gloves	
Transmission to skin	10	%
Dermal exposure to formulation	0,06	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	150	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Permeable	Permeable	
Penetration	10%	15%	20%	
Dermal exposure	0,5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	47,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,06	ml/day	47,25	ml/day
Concen. of a.s. product or spray	480	mg/ml	16	mg/ml
Dermal exposure to a.s.	28,8	mg/day	756	mg/day
Percent absorbed	1	%	1	%
Absorbed dose	0,288	mg/day	7,56	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	16	mg/ml
Inhalation exposure to a.s.	0,96	mg/day
Percent absorbed	100	%
Absorbed dose	0,96	mg/day

PREDICTED EXPOSURE

Total absorbed dose	8,808	mg/day
Operator body weight	60	kg
Operator exposure	0,1468	mg/kg bw/day

4.2.2 Uprawa średnio-wysoka

Tabela 4.2.2-1) Wielkość ekspozycji operatora po zastosowaniu sprawnego opryskiwacza w uprawach średnio- wysokich

Model UK-POEM / Środki ochrony roslin	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień
	brak PPE	z PPE
	Uprawy średnio - wysokie	
Sparta 250 EW [tebukonazol]	0,58	0,05
Ammo Super 100 EW [z-cypermetryna]	0,7	0,08
Bumper 250 EC [propikonazol]	0,09	0,01
Captan 80 WG [kaptan]	1,2	0,13
Mospilan 20 SP [acetamipryd]	0,15	0,08

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.2.2-2) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach średnio-wysokich

	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień
Model UK-POEM	brak PPE	z PPE	brak PPE	z PPE
	Uprawy średnio- wysokie			
Sparta 250 EW [tebukonazol]	0,35	0,03	0,87	0,08
Ammo Super 100 EW [z-cypermetryna]	0,42	0,05	1,05	0,12
Bumper 250 EC [propikonazol]	0,05	0,01	0,14	0,02
Captan 80 WG [kaptan]	0,72	0,08	1,80	0,20
Mospilan 20 SP [acetamipryd]	0,09	0,05	0,23	0,12

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.2.1-3) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach średnio-wysokich wyrażone w % AOEL

	wartość AOEL dla s.cz. [mg/kg m.c./dzień]	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **zawór**	% AOEL uszkodzony **zawór**
Model UK-POEM		brak PPE	z PPE	brak PPE	z PPE
	Uprawy średnio- wysokie				
Sparta 250 EW [tebukonazol]	0,03	1160,00	100,00	2900,0	250,0
Ammo Super 100 EW [z-cypermetryna]	0,02	2100,00	240,00	5250,0	600,0
Bumper 250 EC [propikonazol]	0,1	54,00	6,00	135,0	15,0
Captan 80 WG [kaptan]	0,1	720,00	78,00	1800,0	195,0
Mospilan 20 SP [acetamipryd]	0,124	72,58	38,71	181,5	96,8

Wniosek:
Narażenie operatora po zastosowaniu uszkodzonego opryskiwacza ręcznego plecakowego (zawór i rozpylacz) w uprawach wysokich przekracza wartość limitującą AOEL przy braku PPE we wszystkich przypadkach. Natomiast przy zastosowaniu PPE wartość AOEL została przekroczona dla trzech środków.

Załącznik do Tabeli 4.2.2-1 i 4.2.2-2

Podsumowanie oczekiwanego i potencjalnego narażenia operatora dla różnych poziomów zabezpieczenia PPE, Model UK-POEM (Uprawy średnio - wysokie)

1) tebukonazol – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Product	**Sparta 250 EW**	Active substance	**tebukonazol**	
Formulation type	water-based	a.s. concentration	**250**	mg/ml
Dermal absorption from product	**13** %	Dermal absorption from spray	**13**	%
Container	5 litres 45 or 63 mm closure			
PPE during mix/loading	None	PPE during application	None	
Dose	**0,75** l/ha	Work rate/day	**1**	ha
Application volume	**200** l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	0,75	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,8	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,8	ml/day	74,25	ml/day
Concen. of a.s. product or spray	250	mg/ml	0,9375	mg/ml
Dermal exposure to a.s.	200	mg/day	69,609375	mg/day
Percent absorbed	13	%	13	%
Absorbed dose	26	mg/day	9,04921875	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	0,9375	mg/ml
Inhalation exposure to a.s.	0,05625	mg/day
Percent absorbed	100	%
Absorbed dose	0,05625	mg/day

PREDICTED EXPOSURE

Total absorbed dose	35,10546875	mg/day
Operator body weight	60	kg
Operator exposure	0,585091146	mg/kg bw/day

2) tebukonazol – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Product	**Sparta 250 EW**	Active substance	**tebukonazol**	
Formulation type	water-based	a.s. concentration	**250**	mg/ml
Dermal absorption from product	**13** %	Dermal absorption from spray	**13**	%
Container	5 litres 45 or 63 mm closure			
PPE during mix/loading	Gloves	PPE during application	Gloves and impermeable coveralls	
Dose	**0,75** l/ha	Work rate/day	**1**	ha
Application volume	**200** l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	0,75	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	Gloves	
Transmission to skin	5	%
Dermal exposure to formulation	0,04	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	0,5	1,625	0,625	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	16,5	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,04	ml/day	16,5	ml/day
Concen. of a.s. product or spray	250	mg/ml	0,9375	mg/ml
Dermal exposure to a.s.	10	mg/day	15,46875	mg/day
Percent absorbed	13	%	13	%
Absorbed dose	1,3	mg/day	2,0109375	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	0,9375	mg/ml
Inhalation exposure to a.s.	0,05625	mg/day
Percent absorbed	100	%
Absorbed dose	0,05625	mg/day

PREDICTED EXPOSURE

Total absorbed dose	3,3671875	mg/day
Operator body weight	60	kg
Operator exposure	0,056119792	mg/kg bw/day

3) z-cypermetryna – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Ammo Super 100 EW**		Active substance	**zeta-cypermetryna**	
Formulation type	organic solvent-based		a.s. concentration	**480**	mg/ml
Dermal absorption from product	**10**	%	Dermal absorption from spray	**10**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	None		PPE during application	None	
Dose	**0,3**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	0,3	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,8	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,8	ml/day	74,25	ml/day
Concen. of a.s. product or spray	480	mg/ml	0,72	mg/ml
Dermal exposure to a.s.	384	mg/day	53,46	mg/day
Percent absorbed	10	%	10	%
Absorbed dose	38,4	mg/day	5,346	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	0,72	mg/ml
Inhalation exposure to a.s.	0,0432	mg/day
Percent absorbed	100	%
Absorbed dose	0,0432	mg/day

PREDICTED EXPOSURE

Total absorbed dose	43,7892	mg/day
Operator body weight	60	kg
Operator exposure	0,72982	mg/kg bw/day

4) z-cypermetryna – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Product	**Ammo Super 100 EW**	Active substance	**zeta-cypermetryna**	
Formulation type	organic solvent-based	a.s. concentration	**480**	mg/ml
Dermal absorption from product	**10** %	Dermal absorption from spray	**10**	%
Container	5 litres 45 or 63 mm closure			
PPE during mix/loading	Gloves	PPE during application	Gloves and impermeable coveralls	
Dose	**0,3** l/ha	Work rate/day	**1**	ha
Application volume	**200** l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	0,3	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	Gloves	
Transmission to skin	10	%
Dermal exposure to formulation	0,08	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	0,5	1,625	0,625	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	16,5	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,08	ml/day	16,5	ml/day
Concen. of a.s. product or spray	480	mg/ml	0,72	mg/ml
Dermal exposure to a.s.	38,4	mg/day	11,88	mg/day
Percent absorbed	10	%	10	%
Absorbed dose	3,84	mg/day	1,188	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	0,72	mg/ml
Inhalation exposure to a.s.	0,0432	mg/day
Percent absorbed	100	%
Absorbed dose	0,0432	mg/day

PREDICTED EXPOSURE

Total absorbed dose	5,0712	mg/day
Operator body weight	60	kg
Operator exposure	0,08452	mg/kg bw/day

5) propikonazol – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Bumper 250 EC**		Active substance	**propikonazol**	
Formulation type	organic solvent-based		a.s. concentration	**250**	mg/ml
Dermal absorption from product	**2,4**	%	Dermal absorption from spray	**2,4**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	None		PPE during application	None	
Dose	**0,45**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	0,45	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,8	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,8	ml/day	74,25	ml/day
Concen. of a.s. product or spray	250	mg/ml	0,5625	mg/ml
Dermal exposure to a.s.	200	mg/day	41,765625	mg/day
Percent absorbed	2,4	%	2,4	%
Absorbed dose	4,8	mg/day	1,002375	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	0,5625	mg/ml
Inhalation exposure to a.s.	0,03375	mg/day
Percent absorbed	100	%
Absorbed dose	0,03375	mg/day

PREDICTED EXPOSURE

Total absorbed dose	5,836125	mg/day
Operator body weight	60	kg
Operator exposure	0,09726875	mg/kg bw/day

6) propikonazol – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Bumper 250 EC**		Active substance	**propikonazol**	
Formulation type	organic solvent-based		a.s. concentration	**250**	mg/ml
Dermal absorption from product	**2,4**	%	Dermal absorption from spray	**2,4**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	Gloves		PPE during application	Gloves	
Dose	**0,45**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	0,45	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	Gloves	
Transmission to skin	10	%
Dermal exposure to formulation	0,08	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Permeable	Permeable	
Penetration	10%	15%	20%	
Dermal exposure	0,5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	47,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,08	ml/day	47,25	ml/day
Concen. of a.s. product or spray	250	mg/ml	0,5625	mg/ml
Dermal exposure to a.s.	20	mg/day	26,578125	mg/day
Percent absorbed	2,4	%	2,4	%
Absorbed dose	0,48	mg/day	0,637875	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	0,5625	mg/ml
Inhalation exposure to a.s.	0,03375	mg/day
Percent absorbed	100	%
Absorbed dose	0,03375	mg/day

PREDICTED EXPOSURE

Total absorbed dose	1,151625	mg/day
Operator body weight	60	kg
Operator exposure	0,01919375	mg/kg bw/day

7) kaptan – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Captan 80 WG**		Active substance	**kaptan**	
Formulation type	WG or SG		a.s. concentration	**800**	mg/g
Dermal absorption from product	**10**	%	Dermal absorption from spray	**10**	%
PPE during mix/loading	None		PPE during application	None	
Dose	**2,8**	kg product/ha	Work rate/day	**1**	ha
Application volume	**500**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.
Hand contamination/day	383,936	mg/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to a.s.	383,936	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,0628	mg/kg a.s.
Inhalation exposure/day	0,140672	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,140672	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	500	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		
Concentration of a.s. in spray solut	4,48	mg/ml		
Dermal exposure to a.s.	332,64	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	4,48	mg/ml
Inhalation exposure to a.s.	0,2688	mg/day
Percent absorbed	100	%
Absorbed dose	0,2688	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	383,936	mg/day	332,64	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	38,3936	mg/day	33,264	mg/day
Inhalation exposure to a.s.	0,140672	mg/day	0,2688	mg/day
Absorbed dose	38,534272	mg/day	33,5328	mg/day

PREDICTED EXPOSURE

Total absorbed dose	72,067072	mg/day
Operator body weight	60	kg
Operator exposure	1,201117867	mg/kg bw/day

8) kaptan – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Captan 80 WG**		Active substance	**kaptan**	
Formulation type	WG or SG		a.s. concentration	**800**	mg/g
Dermal absorption from product	**10**	%	Dermal absorption from spray	**10**	%
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**2,8**	kg product/ha	Work rate/day	**1**	ha
Application volume	**500**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.
Hand contamination/day	383,936	mg/day
Protective clothing	Gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	3,83936	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,0628	mg/kg a.s.
Inhalation exposure/day	0,140672	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,140672	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	500	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	0,5	1,625	0,625	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	16,5	ml/day		
Concentration of a.s. in spray solut	4,48	mg/ml		
Dermal exposure to a.s.	73,92	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	4,48	mg/ml
Inhalation exposure to a.s.	0,2688	mg/day
Percent absorbed	100	%
Absorbed dose	0,2688	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	3,83936	mg/day	73,92	mg/day
Percent absorbed	10	%	10	%
Absorbed dose (dermal route)	0,383936	mg/day	7,392	mg/day
Inhalation exposure to a.s.	0,140672	mg/day	0,2688	mg/day
Absorbed dose	0,524608	mg/day	7,6608	mg/day

PREDICTED EXPOSURE

Total absorbed dose	8,185408	mg/day
Operator body weight	60	kg
Operator exposure	0,136423467	mg/kg bw/day

9) acetamipryd – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Mospilan 20 SP**		Active substance	**acetamipryd**	
Formulation type	WP or SP		a.s. concentration	**200**	mg/g
Dermal absorption from product	**15,9**	%	Dermal absorption from spray	**33,7**	%
PPE during mix/loading	None		PPE during application	None	
Dose	**0,3**	kg product/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.	WARNING: Extrapolated value from WG data
Hand contamination/day	10,284	mg/day	
Protective clothing	None		
Transmission to skin	100	%	
Dermal exposure to a.s.	10,284	mg/day	

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	1,534	mg/kg a.s.
Inhalation exposure/day	0,09204	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,09204	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		
Concentration of a.s. in spray solut	0,3	mg/ml		
Dermal exposure to a.s.	22,275	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	0,3	mg/ml
Inhalation exposure to a.s.	0,018	mg/day
Percent absorbed	100	%
Absorbed dose	0,018	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	10,284	mg/day	22,275	mg/day
Percent absorbed	15,9	%	33,7	%
Absorbed dose (dermal route)	1,635156	mg/day	7,506675	mg/day
Inhalation exposure to a.s.	0,09204	mg/day	0,018	mg/day
Absorbed dose	1,727196	mg/day	7,524675	mg/day

PREDICTED EXPOSURE

Total absorbed dose	9,251871	mg/day	
Operator body weight	60	kg	
Operator exposure	0,15419785	mg/kg bw/day	WARNING: Extrapolated value from WG data

10) acetamipryd – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Mospilan 20 SP**		Active substance	**acetamipryd**	
Formulation type	WP or SP		a.s. concentration	**200**	mg/g
Dermal absorption from product	**15,9**	%	Dermal absorption from spray	**33,7**	%
PPE during mix/loading	Gloves		PPE during application	Gloves	
Dose	**0,3**	kg product/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.	WARNING: Extrapolated value from WG data
Hand contamination/day	10,284	mg/day	
Protective clothing	Gloves		
Transmission to skin	1	%	
Dermal exposure to a.s.	0,10284	mg/day	

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	1,534	mg/kg a.s.
Inhalation exposure/day	0,09204	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,09204	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Permeable	Permeable	
Penetration	10%	15%	20%	
Dermal exposure	0,5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	47,25	ml/day		
Concentration of a.s. in spray solut	0,3	mg/ml		
Dermal exposure to a.s.	14,175	mg/day		

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	0,3	mg/ml
Inhalation exposure to a.s.	0,018	mg/day
Percent absorbed	100	%
Absorbed dose	0,018	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	0,10284	mg/day	14,175	mg/day
Percent absorbed	15,9	%	33,7	%
Absorbed dose (dermal route)	0,01635156	mg/day	4,776975	mg/day
Inhalation exposure to a.s.	0,09204	mg/day	0,018	mg/day
Absorbed dose	0,10839156	mg/day	4,794975	mg/day

PREDICTED EXPOSURE

Total absorbed dose	4,90336656	mg/day	
Operator body weight	60	kg	
Operator exposure	0,081722776	mg/kg bw/day	WARNING: Extrapolated value from WG data

4.2.3 Uprawa niska

Tabela 4.2.3-1) Wielkość ekspozycji operatora po zastosowaniu sprawnego opryskiwacza w uprawach niskich

Model UK-POEM / Środki ochrony roslin	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień	Narażenie operatora sprawny opryskiwacz mg/kg m.c./dzień
	brak PPE	z PPE
	Uprawy niskie	
Roundup Max 680 SG [glifosat]	0,59	0,09
Starane 250 EC [fluroksypyr]	0,9	0,17
Chwastox 750 SL [MCPA-DMA]	1,01	0,17
Amistar 250 SC [azoksystrobina]	0,24	0,02
Mythos 300 SC [pirymetanil 300]	0,5	0,09

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.2.3-2) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach niskich

	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **rozpylacz** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień	Narażenie operatora uszkodzony **zawór** mg/kg m.c./dzień
Model UK-POEM	brak PPE	z PPE	brak PPE	z PPE
	Uprawy niskie			
Roundup Max 680 SG [glifosat]	0,58	0,09	1,13	0,17
Starane 250 EC [fluroksypyr]	0,89	0,17	1,72	0,32
Chwastox 750 SL [MCPA-DMA]	1,00	0,17	1,93	0,32
Amistar 250 SC [azoksystrobina]	0,24	0,02	0,46	0,04
Mythos 300 SC [pirymetanil 300]	0,50	0,09	0,96	0,17

Szczegółowe wyniki modelowania komputerowego w załączniku

Tabela 4.2.1-3) Wielkość ekspozycji operatora po zastosowaniu uszkodzonego opryskiwacza w uprawach niskich wyrażone w % AOEL

	wartość AOEL dla s.cz. [mg/kg m.c./dzień]	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **rozpylacz**	% AOEL uszkodzony **zawór**	% AOEL uszkodzony **zawór**
Model UK-POEM		brak PPE	z PPE	brak PPE	z PPE
	Uprawy niskie				
Roundup Max 680 SG [glifosat]	0,2	292,05	44,55	563,5	86,0
Starane 250 EC [fluroksypyr]	0,8	111,38	21,04	214,9	40,6
Chwastox 750 SL [MCPA-DMA]	0,04	2499,75	420,75	4822,8	811,8
Amistar 250 SC [azoksystrobina]	0,1	237,60	19,80	458,4	38,2
Mythos 300 SC [pirymetanil 300]	0,12	412,50	74,25	795,8	143,3

Wniosek:
Narażenie operatora po zastosowaniu uszkodzonego opryskiwacza ręcznym plecakowym (zawór i rozpylacz) w uprawach wysokich przekracza wartość limitującą AOEL przy braku PPE we wszystkich przypadkach. Natomiast przy zastosowaniu PPE wartość AOEL została przekroczona dla uszkodzonego rozpylacza dla jednego środka a dla uszkodzonego zaworu dla dwóch środków.

Załącznik do Tabeli 4.2.2-1 i 4.2.2-2

Podsumowanie oczekiwanego i potencjalnego narażenia operatora dla różnych poziomów zabezpieczenia PPE, Model UK-POEM (Uprawy niskie)

1) glifosat – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target				
Product	**Roundup Max 680 SG**		Active substance	**glifosat**	
Formulation type	WG or SG		a.s. concentration	**680**	mg/g
Dermal absorption from product	**3**	%	Dermal absorption from spray	**3**	%
PPE during mix/loading	None		PPE during application	None	
Dose	**2,5**	kg product/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.
Hand contamination/day	291,38	mg/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to a.s.	291,38	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,0628	mg/kg a.s.
Inhalation exposure/day	0,10676	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,10676	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target				
Application volume	200	spray/ha			
Volume of surface contamination	50	ml/h			
Distribution	Hands		Trunk	Legs	
	25%		25%	50%	
Clothing	None		Permeable	Permeable	
Penetration	100%		20%	18%	
Dermal exposure	10		2,5	4,5	ml/h
Duration of exposure	6	h			
Total dermal exposure to spray	102	ml/day			
Concentration of a.s. in spray solut	8,5	mg/ml			
Dermal exposure to a.s.	867	mg/day			

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,02	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	8,5	mg/ml
Inhalation exposure to a.s.	1,02	mg/day
Percent absorbed	100	%
Absorbed dose	1,02	mg/day

ABSORBED DOSE

	Mix/load		Application		
Dermal exposure to a.s.	291,38	mg/day		867	mg/day
Percent absorbed	3	%		3	%
Absorbed dose (dermal route)	8,7414	mg/day		26,01	mg/day
Inhalation exposure to a.s.	0,10676	mg/day		1,02	mg/day
Absorbed dose	8,84816	mg/day		27,03	mg/day

PREDICTED EXPOSURE

Total absorbed dose	35,87816	mg/day
Operator body weight	60	kg
Operator exposure	0,597969333	mg/kg bw/day

2) glifosat – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM) WITH GERMAN MODEL MIX/LOAD DATA (75th PERCENTILE)

Application method	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target				
Product	**Roundup Max 680 SG**		Active substance	**glifosat**	
Formulation type	WG or SG		a.s. concentration	**680**	mg/g
Dermal absorption from product	**3**	%	Dermal absorption from spray	**3**	%
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**2,5**	kg product/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

DERMAL EXPOSURE DURING MIXING AND LOADING

Hand contamination/kg a.s.	171,4	mg/kg a.s.
Hand contamination/day	291,38	mg/day
Protective clothing	Gloves	
Transmission to skin	1	%
Dermal exposure to a.s.	2,9138	mg/day

INHALATION EXPOSURE DURING MIXING AND LOADING

Inhalation exposure/kg a.s.	0,0628	mg/kg a.s.
Inhalation exposure/day	0,10676	mg/day
RPE	None	
Transmission through RPE	100	%
Inhalation exposure to a.s.	0,10676	mg/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target				
Application volume	200	spray/ha			
Volume of surface contamination	50	ml/h			
Distribution	Hands	Trunk	Legs		
	25%	25%	50%		
Clothing	Gloves	Impermeable	Impermeable		
Penetration	10%	5%	5%		
Dermal exposure	1,25	0,625	1,25	ml/h	
Duration of exposure	6	h			
Total dermal exposure to spray	18,75	ml/day			
Concentration of a.s. in spray solut	8,5	mg/ml			
Dermal exposure to a.s.	159,375	mg/day			

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure to spray	0,02	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	8,5	mg/ml
Inhalation exposure to a.s.	1,02	mg/day
Percent absorbed	100	%
Absorbed dose	1,02	mg/day

ABSORBED DOSE

	Mix/load		Application	
Dermal exposure to a.s.	2,9138	mg/day	159,375	mg/day
Percent absorbed	3	%	3	%
Absorbed dose (dermal route)	0,087414	mg/day	4,78125	mg/day
Inhalation exposure to a.s.	0,10676	mg/day	1,02	mg/day
Absorbed dose	0,194174	mg/day	5,80125	mg/day

PREDICTED EXPOSURE

Total absorbed dose	5,995424	mg/day
Operator body weight	60	kg
Operator exposure	0,099923733	mg/kg bw/day

3) fluroksypyr – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Product	**Starane 250 EC**		Active substance	**fluroksypyr**
Formulation type	organic solvent-based		a.s. concentration	**480** mg/ml
Dermal absorption from product	**10** %		Dermal absorption from spray	**10** %
Container	5 litres 45 or 63 mm closure			
PPE during mix/loading	None		PPE during application	None
Dose	**2** l/ha		Work rate/day	**1** ha
Application volume	**200** l/ha		Duration of spraying	**6** h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	2	litres product/ha
Work rate	1	ha/day
Number of operations	14	/day
Hand contamination	0,14	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,14	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	25%	25%	50%	
Clothing	None	Permeable	Permeable	
Penetration	100%	20%	18%	
Dermal exposure	10	2,5	4,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	102	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,14	ml/day	102	ml/day
Concen. of a.s. product or spray	480	mg/ml	4,8	mg/ml
Dermal exposure to a.s.	67,2	mg/day	489,6	mg/day
Percent absorbed	10	%	10	%
Absorbed dose	6,72	mg/day	48,96	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,02	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	4,8	mg/ml
Inhalation exposure to a.s.	0,576	mg/day
Percent absorbed	100	%
Absorbed dose	0,576	mg/day

PREDICTED EXPOSURE

Total absorbed dose	56,256	mg/day
Operator body weight	60	kg
Operator exposure	0,9376	mg/kg bw/day

4) fluroksypyr – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target				
Product	**Starane 250 EC**		Active substance	**fluroksypyr**	
Formulation type	organic solvent-based		a.s. concentration	**480**	mg/ml
Dermal absorption from product	**10**	%	Dermal absorption from spray	**10**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**2**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	2	litres product/ha
Work rate	1	ha/day
Number of operations	14	/day
Hand contamination	0,14	ml/day
Protective clothing	Gloves	
Transmission to skin	10	%
Dermal exposure to formulation	0,014	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	25%	25%	50%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	1,25	0,625	1,25	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	18,75	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,014	ml/day	18,75	ml/day
Concen. of a.s. product or spray	480	mg/ml	4,8	mg/ml
Dermal exposure to a.s.	6,72	mg/day	90	mg/day
Percent absorbed	10	%	10	%
Absorbed dose	0,672	mg/day	9	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,02	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	4,8	mg/ml
Inhalation exposure to a.s.	0,576	mg/day
Percent absorbed	100	%
Absorbed dose	0,576	mg/day

PREDICTED EXPOSURE

Total absorbed dose	10,248	mg/day
Operator body weight	60	kg
Operator exposure	0,1708	mg/kg bw/day

5) MCPA-DMA – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Product	**Chwastox 750 SL**		Active substance	**MCPA**
Formulation type	organic solvent-based		a.s. concentration	**750** mg/ml
Dermal absorption from product	**10** %		Dermal absorption from spray	**10** %
Container	5 litres 45 or 63 mm closure			
PPE during mix/loading	None		PPE during application	None
Dose	**1,3** l/ha		Work rate/day	**1** ha
Application volume	**200** l/ha		Duration of spraying	**6** h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	1,3	litres product/ha
Work rate	1	ha/day
Number of operations	14	/day
Hand contamination	0,14	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,14	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	25%	25%	50%	
Clothing	None	Permeable	Permeable	
Penetration	100%	20%	18%	
Dermal exposure	10	2,5	4,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	102	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,14	ml/day	102	ml/day
Concen. of a.s. product or spray	750	mg/ml	4,875	mg/ml
Dermal exposure to a.s.	105	mg/day	497,25	mg/day
Percent absorbed	10	%	10	%
Absorbed dose	10,5	mg/day	49,725	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,02	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	4,875	mg/ml
Inhalation exposure to a.s.	0,585	mg/day
Percent absorbed	100	%
Absorbed dose	0,585	mg/day

PREDICTED EXPOSURE

Total absorbed dose	60,81	mg/day
Operator body weight	60	kg
Operator exposure	1,0135	mg/kg bw/day

6) MCPA-DMA – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Product	**Chwastox 750 SL**		Active substance	**MCPA**
Formulation type	organic solvent-based		a.s. concentration	**750** mg/ml
Dermal absorption from product	**10** %		Dermal absorption from spray	**10** %
Container	5 litres 45 or 63 mm closure			
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls
Dose	**1,3** l/ha		Work rate/day	**1** ha
Application volume	**200** l/ha		Duration of spraying	**6** h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	1,3	litres product/ha
Work rate	1	ha/day
Number of operations	14	/day
Hand contamination	0,14	ml/day
Protective clothing	Gloves	
Transmission to skin	10	%
Dermal exposure to formulation	0,014	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	25%	25%	50%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	1,25	0,625	1,25	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	18,75	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,014	ml/day	18,75	ml/day
Concen. of a.s. product or spray	750	mg/ml	4,875	mg/ml
Dermal exposure to a.s.	10,5	mg/day	91,40625	mg/day
Percent absorbed	10	%	10	%
Absorbed dose	1,05	mg/day	9,140625	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,02	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	4,875	mg/ml
Inhalation exposure to a.s.	0,585	mg/day
Percent absorbed	100	%
Absorbed dose	0,585	mg/day

PREDICTED EXPOSURE

Total absorbed dose	10,775625	mg/day
Operator body weight	60	kg
Operator exposure	0,17959375	mg/kg bw/day

7) azoksystrobina – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Amistar 250 S.C.**		Active substance	**azoksystrobina**	
Formulation type	water-based		a.s. concentration	**250**	mg/ml
Dermal absorption from product	**5**	%	Dermal absorption from spray	**5**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	None		PPE during application	None	
Dose	**1**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	1	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,8	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	None	Permeable	Permeable	
Penetration	100%	15%	20%	
Dermal exposure	5	4,875	2,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	74,25	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,8	ml/day	74,25	ml/day
Concen. of a.s. product or spray	250	mg/ml	1,25	mg/ml
Dermal exposure to a.s.	200	mg/day	92,8125	mg/day
Percent absorbed	5	%	5	%
Absorbed dose	10	mg/day	4,640625	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	1,25	mg/ml
Inhalation exposure to a.s.	0,075	mg/day
Percent absorbed	100	%
Absorbed dose	0,075	mg/day

PREDICTED EXPOSURE

Total absorbed dose	14,715625	mg/day
Operator body weight	60	kg
Operator exposure	0,245260417	mg/kg bw/day

8) azoksystrobina – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target				
Product	**Amistar 250 S.C.**		Active substance	**azoksystrobina**	
Formulation type	water-based		a.s. concentration	**250**	mg/ml
Dermal absorption from product	**5**	%	Dermal absorption from spray	**5**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**1**	l/ha	Work rate/day	**1**	ha
Application volume	**200**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	1	litres product/ha
Work rate	1	ha/day
Number of operations	80	/day
Hand contamination	0,8	ml/day
Protective clothing	Gloves	
Transmission to skin	5	%
Dermal exposure to formulation	0,04	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held rotary atomiser equipment (2.5 l tank). Outdoor, high level target			
Application volume	200	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	10%	65%	25%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	0,5	1,625	0,625	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	16,5	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,04	ml/day	16,5	ml/day
Concen. of a.s. product or spray	250	mg/ml	1,25	mg/ml
Dermal exposure to a.s.	10	mg/day	20,625	mg/day
Percent absorbed	5	%	5	%
Absorbed dose	0,5	mg/day	1,03125	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,01	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	1,25	mg/ml
Inhalation exposure to a.s.	0,075	mg/day
Percent absorbed	100	%
Absorbed dose	0,075	mg/day

PREDICTED EXPOSURE

Total absorbed dose	1,60625	mg/day
Operator body weight	60	kg
Operator exposure	0,026770833	mg/kg bw/day

9) pirymetanil – brak PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target				
Product	**Mythos 300 S.C.**		Active substance	**pirimetanil**	
Formulation type	organic solvent-based		a.s. concentration	**300**	mg/ml
Dermal absorption from product	**1**	%	Dermal absorption from spray	**20**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	None		PPE during application	None	
Dose	**2,5**	l/ha	Work rate/day	**0,8**	ha
Application volume	**500**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	2,5	litres product/ha
Work rate	0,8	ha/day
Number of operations	27	/day
Hand contamination	0,27	ml/day
Protective clothing	None	
Transmission to skin	100	%
Dermal exposure to formulation	0,27	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Application volume	500	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	25%	25%	50%	
Clothing	None	Permeable	Permeable	
Penetration	100%	20%	18%	
Dermal exposure	10	2,5	4,5	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	102	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,27	ml/day	102	ml/day
Concen. of a.s. product or spray	300	mg/ml	1,5	mg/ml
Dermal exposure to a.s.	81	mg/day	153	mg/day
Percent absorbed	1	%	20	%
Absorbed dose	0,81	mg/day	30,6	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,02	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	1,5	mg/ml
Inhalation exposure to a.s.	0,18	mg/day
Percent absorbed	100	%
Absorbed dose	0,18	mg/day

PREDICTED EXPOSURE

Total absorbed dose	31,59	mg/day
Operator body weight	60	kg
Operator exposure	0,5265	mg/kg bw/day

10) pirymetanil – z PPE

THE UK PREDICTIVE OPERATOR EXPOSURE MODEL (POEM)

Application method	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target				
Product	**Mythos 300 S.C.**		Active substance	**pirimetanil**	
Formulation type	organic solvent-based		a.s. concentration	**300**	mg/ml
Dermal absorption from product	**1**	%	Dermal absorption from spray	**20**	%
Container	5 litres 45 or 63 mm closure				
PPE during mix/loading	Gloves		PPE during application	Gloves and impermeable coveralls	
Dose	**2,5**	l/ha	Work rate/day	**0,8**	ha
Application volume	**500**	l/ha	Duration of spraying	**6**	h

EXPOSURE DURING MIXING AND LOADING

Container size	5	litres
Hand contamination/operation	0,01	ml
Application dose	2,5	litres product/ha
Work rate	0,8	ha/day
Number of operations	27	/day
Hand contamination	0,27	ml/day
Protective clothing	Gloves	
Transmission to skin	10	%
Dermal exposure to formulation	0,027	ml/day

DERMAL EXPOSURE DURING SPRAY APPLICATION

Application technique	Hand-held sprayer (15 l tank): hydraulic nozzles. Outdoor, low level target			
Application volume	500	spray/ha		
Volume of surface contamination	50	ml/h		
Distribution	Hands	Trunk	Legs	
	25%	25%	50%	
Clothing	Gloves	Impermeable	Impermeable	
Penetration	10%	5%	5%	
Dermal exposure	1,25	0,625	1,25	ml/h
Duration of exposure	6	h		
Total dermal exposure to spray	18,75	ml/day		

ABSORBED DERMAL DOSE

	Mix/load		Application	
Dermal exposure	0,027	ml/day	18,75	ml/day
Concen. of a.s. product or spray	300	mg/ml	1,5	mg/ml
Dermal exposure to a.s.	8,1	mg/day	28,125	mg/day
Percent absorbed	1	%	20	%
Absorbed dose	0,081	mg/day	5,625	mg/day

INHALATION EXPOSURE DURING SPRAYING

Inhalation exposure	0,02	ml/h
Duration of exposure	6	h
Concentration of a.s. in spray	1,5	mg/ml
Inhalation exposure to a.s.	0,18	mg/day
Percent absorbed	100	%
Absorbed dose	0,18	mg/day

PREDICTED EXPOSURE

Total absorbed dose	5,886	mg/day
Operator body weight	60	kg
Operator exposure	0,0981	mg/kg bw/day

5. Analiza statystyczna wyników

Poniżej przedstawiono zestawienie wyników ekspozycji operatora dla 15 środków ochrony roślin uwzględniające typ uszkodzenia opryskiwacza (zawór i rozpylacz)

Tabela 5.1) Odsetek śor z wartością ekspozycji powyżej AOEL

Rodzaj uprawy	**Odsetek śor z wartością ekspozycji powyżej AOEL ↑**							
	Uszkodzenie-zawór Model BBA		Uszkodzenie-rozpylacz Model BBA		Uszkodzenie-zawór UK-POEM		Uszkodzenie-rozpylacz UK-POEM	
	bez PPE	z PPE	bez PPE	z PPE	bez PPE	z PPE	bez PPE	z PPE
Wysokie (n=5)*	100%	100%	100%	80%	100%	100%	100%	100%
Średnio-wysokie (n=5)*	40%	0%	40%	0%	100%	60%	60%	20%
Niskie (n=5)*	40%	0%	20%	0%	100%	40%	100%	20%

* n – liczba śor.

6. Podsumowanie

Przeprowadzono oszacowanie ekspozycji operatora na wybrane środki ochrony roślin z uwzględnieniem stanu technicznego ręcznych opryskiwaczy plecakowych (usterka zaworu lub rozpylacza). Przeanalizowano 15 środków ochrony roślin z zastosowaniem dwóch modeli matematycznych Model BBA i Model UK-POEM. Szacowanie przeprowadzono zgodnie z zaproponowanym przez ISiK w Skierniewicach schematem dozymetrycznego badania narażenia operatora w warunkach polowych dla upraw wysokich, średnio-wysokich i niskich.

1) Wyniki modelowania narażenia przeprowadzonego zarówno z zastosowaniem modelu BBA jak i UK-POEM wskazują , że ochrona upraw wysokich powodowała przekroczenie akceptowanego poziomu narażenia operatora (AOEL) w niemal 100% przypadków środków ochrony roślin wykorzystanych do modelowania. Przekroczenie bezpiecznej wartości narażenia obserwowano niezależnie od typu uszkodzenia jak i stosowania bądź niestosowania indywidualnych środków ochrony osobistej.
2) W przypadku zabiegów dokonywanych w uprawach średnio-wysokich i niskich narażenie poniżej bezpiecznej wartości odnotowano w 60% do 100% wg. Modelu BBA i 40% do 80% wg. Modelu UK-POEM.

7. Wnioski:

1. W przypadku upraw wysokich przy stosowaniu niesprawnych ręcznych opryskiwaczy plecakowych wyniki oszacowania jednoznacznie wskazują na potrzebę kontrolowania stanu technicznego ręcznych opryskiwaczy plecakowych. Wartość ekspozycji szacowana w obu modelach (BBA i UK-POEM) przy braku jak i przy zastosowaniu środków ochrony indywidualnej (PPE-ŚOR) przekraczają bezpieczne wartości AOEL.
2. W przypadku upraw średnio-wysokich i niskich przy stosowaniu niesprawnych ręcznych opryskiwaczy plecakowych odpowiedni margines bezpieczeństwa (ekspozycja zbliżona lub poniżej wartości AOEL) zapewni nałożenie obowiązku stosowania środków ochrony indywidualnej (PPE-ŚOR).
3. Jeżeli wnioskodawca w procesie rejestracji śor zaproponuje w opisie Dobrej Praktyki Rolniczej (GAP) zastosowanie opryskiwaczy ręcznych plecakowych należałoby przeprowadzić odpowiednią ocenę ekspozycji-narażenia operatora dla tego sposobu wykonania zabiegu agrochemicznego.
4. Model UK-POEM jest znacznie bardziej restrykcyjny z uwagi na zastosowanie innego podejścia przy ocenie ryzyka, które wykorzystuje 75 percentyl rozkładu badanego parametru, podczas gdy model BBA wykorzystuje do tego celu średnia geometryczną.
5. Wykorzystanie wyników modelowania wg. BBA w odniesieniu do zabiegów wyłącznie w uprawach średnio-wysokich i niskich i niskich przeprowadzonych przez operatorów wyposażonych w indywidualne środki ochrony osobistej ma racjonalne podstawy.
6. Z opisu technologii zabiegów doświadczalnych wykonanych dla celu niniejszej oceny ryzyka ISiK w Skierniewicach, ze część zabiegów była wykonywana niedoświadczonych operatorów w celu zbadania najmniej korzystnego scenariusza. Wyniki nie były jednoznaczne, a niekiedy narażenie „doświadczonych" operatorów było większe niż „niedoświadczonych", co można wyjaśnić rutynowością podejścia operatorów z większym doświadczeniem i związanym z tym osłabieniem czujności podczas zabiegu, w przeciwieństwie do operatorów „niedoświadczony", którzy prawdopodobnie bardzie literalnie przestrzegali zasad wymaganych przy zabiegach agrochemicznych. W niniejszej ekspertyzie przyjęto założenie, że wszystkie zabiegi agrochemiczne powinny być wykonywane zgodnie z obowiązującymi zaleceniami bezpieczeństwa i w związku z tym nie przeprowadzono oddzielnych ocen ryzyka „doświadczony" i „niedoświadczonych" operatorów.

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