Food and Chemical Toxicology 105 (2017) 407–428

Contents lists available at ScienceDirect

Food and Chemical Toxicology

journal homepage: www.elsevier.com/locate/foodchemtox

Quantifying dietary exposure to pesticide residues using spraying journal data

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A R T I C L E I N F O

Article history:
Received 2 January 2017
Received in revised form
27 April 2017
Accepted 7 May 2017
Available online 9 May 2017

Keywords:
Pesticides
Residues
Cumulative risk assessment
Exposure assessment
Consumer risk

A B S T R A C T

Relatively few studies are available on the combined risk of realistic dietary pesticide exposure. Despite available studies showing low risk, public concern remains. Recent methods used to estimate realistic exposure levels have a number of drawbacks, and better methods are needed. Using a novel approach, we estimated the combined exposure in the Danish population, resulting from pesticide usage in Danish agriculture. The complete Danish spraying journal data from 2014, and supervised trial residue levels reported by EFSA, were used in combination, generating residue estimates in 25 crops. Cumulative risk assessments were made for six typical Danish consumer diets. In terms of intake of cereals, sugar, fruits and vegetables, the 25 crops included accounted 70% of the diets of Danish consumers. The Hazard Index (HI) method was used to assess the consumer risk. Despite the conservative (cautious) approach, low HI values where obtained. Highest HI was 14% of the Acceptable Daily Intake (ADI) for Children. The main advantages of the new exposure estimation method are 1) comprehensive use data not relying on random samples, 2) coverage of all pesticides used, and 3) more precise estimates of residues that are below the standard reporting limits in the national monitoring program.

1. Introduction

Current regulation of pesticide residues in food focus mostly on single pesticide toxicity data, pre-approval residue measurements in harvested crops and post approval monitoring of compliance with maximum residue levels (MRLs) (Commission, 2016; EFSA, 2016). In reality however, the consumer is over the long term exposed to low amounts of hundreds of different pesticides. Hence, there is public concern that these residues might add up and jointly pose a risk for the consumer (Boobis et al., 2008). There is scientific consensus that the risk of multiple residues should be addressed by grouping pesticides into cumulative assessment groups (CAGs), grouping pesticides that share toxicological target/mode of action, has similar chemical structure, and similar mechanism of pesticidal action (CAG:s) (Boobis et al., 2008) but these groups are not yet defined in a regulatory context. There are reports in the literature on risk assessment of combined pesticide residue exposure, with varying approaches, like grouping insecticides (Boon et al., 2008; Jensen et al., 2009; Wong et al., 2014) or endocrine active pesticides (Jensen et al., 2013). There is one report in which the full dietary residue exposure was quantified, accompanied with a cumulative risk assessments grouping all pesticides together with no regard to mode of action, using the dose addition model (Jensen et al., 2015).

In quantifying the total mean exposure, previous studies all struggle with some basic methodological problems: 1) they are based on a limited number of food samples, originating from National Monitoring Programs (NMPs), or taken by researchers 2) the sampling programs usually do not analyze all pesticides possibly present in the foods 3) the quantification limits (LOQ) are usually in the 0.01–0.05 mg/kg range, and residues below this level cannot be quantified. These problems leave researchers unable to precisely define the exposure level, instead forcing them to report in terms of high and low bound exposure scenarios (Jensen et al., 2015; Nougadere et al., 2012). Thus, there is a need for alternative data

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http://dx.doi.org/10.1016/j.fct.2017.05.014
0278-6915/© 2017 Published by Elsevier Ltd.

sources that can overcome these limitations and provide more accurate and robust exposure estimates.

In Denmark, by law farmers have to record all their pesticide use in spraying journals. Since 2012, this reporting is done electronically and aggregated data is available from commercial data suppliers. The requirement concerns farmers with a cultivated area of more than 10 ha and greenhouse/horticultures, orchards, open field vegetable producers and plant nurseries having an annual turnover of 50.000 DKK (appr. 7.000 €) or more (EPA, 2017). These criteria effectively include all Danish food growers of relevance to the overall food supply. Producers below these limits are likely to be non-professional producers. Such producers are less likely to even use any pesticides at all, since usage of pesticides in Denmark requires a spraying certificate, that is granted by the authorities and requires formal training. The spraying journal has to contain information about crop, trade name of pesticide product, total amount used, number of hectares treated, and has to be reported to the authorities once per year. The authorities make around 600 farmer inspections annually where spraying journals are checked, and violations of rules are punishable by law, and can lead to heavy fines and reduced EU subsidiaries (EPA, 2017). Violations in this context means use of the products outside of the permitted use pattern (crop, dose and timing of application) as defined in the approval from the Danish Environmental Protection Agency (Danish EPA).

European pesticide regulation requires that a company seeking to register a pesticide for use in a certain crop has to perform at least 4–8 residue trials in that crop over two seasons, or one season if trials are widely enough spread climatically, in the climatic zone (EU north or EU south) where registration is sought (Commission, 2016). In such trials the pesticide has to be applied in worst case conditions with regards to residues formation in the harvested goods. That means the maximum dose rate needed to control the pest has to be used, applied at the latest crop growth stage for which registration is sought. These trials have to comply with Good Laboratory Practice (GLP), which ensures high data quality. Using validated analytical methods, the objective is to determine the residue level at harvest. Crop metabolism studies are conducted to establish the relevant residue definition. The European Food Safety Authority (EFSA) publishes the results of these residue trials as part of their review of Maximum Residue Levels (MRLs) according to article 12 of EU regulation 396/2005, or as part of evaluation of active substances according to EU regulation 1107/2009. Results are presented as so called “Supervised Trial Median Residue” (STMR), “Highest residue” (HR) resulting from use according to the so called “critical GAP” (GAP = Good Agricultural Practice), which equals use at worst case conditions with regards to residue formation. The STMR is the median residue level from the whole trial package, and the HR is the highest single value.

The purpose of this study was to develop and evaluate a novel method to more accurately estimate realistic pesticide residue exposure, by using spraying journal and residue trial data in combination. The goal was to estimate average residue levels that are appropriate for use in chronic cumulative risk assessments (Boobis et al., 2008). The potential advantages are higher accuracy in estimating residues below detection limit, and more comprehensive coverage of used pesticides. The purpose was also to estimate the cumulative risk to Danish consumers resulting from domestic agricultural pesticide use. We used six typical Danish diets (Pedersen et al., 2010) assuming 100% domestic produce consumption of 25 crops. The cumulative chronic health risk of the estimated exposure was assessed using the Hazard Index (HI) method, which is based on the dose addition model (Boobis et al., 2008; Kortenkamp et al., 2012; Reffstrup et al., 2010; Wilkinson et al., 2000).

2. Method

2.1. Selection of crops for typical diets

Six different diets were used, representing consumption pattern in the Danish population: Adult, Man, Woman, Child and Male + Female High Fruit & Vegetable (HFV) consumer (Table 1). The diets were based on consumption data reported by the National Food Institute, Technical University of Denmark (Petersen et al., 2013). The data originated from the Danish National Dietary Survey 2003–2008 (Pedersen et al., 2010). This cross-sectional survey included 2700 participants aged 4–75 years old drawn from the Danish Central Person Register. The participants were characterized as closely representative of the Danish population, and the data has been used in a previous pesticide residue exposure study (Jensen et al., 2015).

All crops that contributed at least 0.1% by weight of any of these diets were included in the analysis. (Table 2). No products of animal origin were included, since no pesticide residues have been detected in the 477 animal product samples taken in Denmark in 2013 and 2014(Fødevarestyrelsen, 2013; 2014). Aggregated monitoring data from entire EU published by EFSA does report pesticide findings also in products of animal origin (EFSA, 2016). However, a closer look shows that these findings are low levels of banned, persistent compounds like DDT, that due to their nature may be found almost ubiquitously. As the present project focused on current pesticide usage and due to the fact that spraying journals has no value in studying exposure to no-longer- in-use, persistent environmental pollutants, all products of animal origin were excluded.

The total crop area cultivated in 2014 in Denmark for the included crops where obtained from Danish Statistics web database (www.dst.dk). The consumption of sugar was estimated from the results of the national food survey 2011–2013, published by Danish Technical University (Pedersen et al., 2015). The consumption of beer was estimated from statistics published by Danish Statistics (www.dst.dk) and the Brewers Union (www.bryggerforeningen.dk). In terms of intake of cereals, sugar, fruits and vegetables, the 25 crops account for around 70% of the diets of Danish consumers.

2.2. Selection of pesticide treatments for inclusion

All pesticides were included, also the ones used at a crop growth stage where none or very little residue in the harvested crop is to be expected (e.g. early season herbicides). However, seed treatments were only included for potatoes, as information on treatment of imported seeds was lacking. Seed treatments are applied before a crop is sown and therefore give minimal or no residues in the harvested goods. Due to the very large number of different pesticide products used, a limitation was set that only products used on at least 5% of the total treated area were included. However, in practice many product uses occurring on less than 5% of the area where also included in the calculations. In total, 671 different pesticide/crop combinations and 93 different active substances

Table 1
Consumer groups from which crop consumption data was derived (Petersen et al., 2013). Detailed consumption data can be found in appendix 1.

	Adult	Male	Female	Child	Male HFV[a]	Female HFV[a]
Age	15–75	15–75	15–75	4–6	15–75	15–75
Bodyweight (kg)	75.1	83.5	68.2	21.8	84.4	69
Number	1599	721	878	106	118	258

[a] HFV = High Fruit & Vegetables, consuming higher than average amount of fruits and vegetables, e.g. vegetarians.

were included in the residue calculations for the 25 crops shown in Table 2. Post-harvest storage treatment occurs in Denmark for some crops, but these are not included in the spraying journal dataset. Other data sources would have to be used to estimate residues from post-harvest treatments, but that was out of the scope of this study.

2.3. Estimation of residues from spraying journal and EU residue trial data

The average residue resulting from each pesticide treatment was calculated according to equation (1):

$$Estimated\ Residue\left(\frac{mg}{kg}\right) = STMR\left(\frac{mg}{kg}\right) \times Dosage\ Factor \times Area\ Factor \quad (1)$$

Where STMR is the supervised trial median residue taken from the EU pre-registration residue trials. In cases where the STMR could not be retrieved, the EU maximum legal residue level (EU MRL) was used instead. STMRs and MRLs where retrieved from published reasoned opinions or conclusions in the EFSA journal, if not otherwise stated (Appendix 3). In certain cases (mancozeb, difenoconazole, alpha-cypermethrin) the STMR was retrieved from publicly available parts of Danish national registration dossier for the respective products. In cases where there were different residue definitions for risk assessment and monitoring, the STMR for the risk assessment residue definition was used. Conversion factors reported by EFSA were used if necessary to convert from residue definition for monitoring to residue definition for risk assessment. Many pesticide uses are not expected to generate any residues in the harvested goods, especially those that occur early in season before the edible part of the crop starts to form. In those cases the STMR often equals the LOQ, and the MRL. In these cases, the STMR used in the calculations was reduced by a factor of 0.5, similar in principle to what has been proposed earlier (Boobis et al., 2008). Processing factors for malting of spring barley for beer production was included (Appendix 5). No other processing factors were taken into account, as they were not generally applicable with the level of resolution of the available diet data.

Table 2
Crops grown in Denmark included in this study. Area data taken from Danish Statistics database, or aggregated spraying journals area, whichever was the highest.[a]

Crop	Total area cultivated in 2014 (hectares)
Wheat	668,443
Spring Barley[b]	490,533
Rye	104,093
Potato	42,617
Sugar Beet	35,859
Oat	34,830
Pea	4819
Carrot	2025
Apple & Pear	1792
Strawberry	1455
Onion	1180
Lettuce	1148
Head Cabbage	790
Cauliflower	315
Leek	315
Sweet Corn	300
Broccoli	284
Spinach	134
Celeriac	112
Plum	61
Cucumber (greenhouse)	50
Tomato (greenhouse)	34
Brussel sprouts	27
Gherkin (greenhouse)	2

[a] A substantial part of the Danish harvest for some crops (mainly cereals) is used for animal feed. We used the whole cultivated area in our calculation, including both food and feed. This is because the spray journal data does not reliably differentiate between food and feed production in the same crop, but states the total sprayed area.
[b] Spring barley is used for beer malt production.

The dosage factor is introduced to account for the fact that Danish farmers very rarely use the maximum dose rate according to the critical EU GAP, equation (2):

$$Dosage\ factor = \frac{Dosis\ used\ per\ hectare\ in\ 2014\left(\frac{L/Kg}{ha}\right)}{Maximum\ dose\ used\ in\ critical\ residue\ GAP\left(\frac{L/kg}{ha}\right)} \quad (2)$$

For example, the fungicide Rubric®, containing the active substance epoxiconazole, was used in wheat in 2014 at an average dose rate of 0.375 L/hectare. The EU residue trials for Rubric® were done with a dose rate of 2 L/hectare. The dosage factor for Rubric® in wheat thus becomes 0.375/2 = 0.188. The dosage factor is necessary to calculate realistic residue levels, because it accounts for how the products are used in reality. The dose rate of the EU critical GAP is often set assuming a scenario where only one product is relied upon to control disease. In reality, the farmer uses a combination of products applied in sequence that have been optimized in local trial research. The dose rates are adjusted to the disease pressure in that particular season. The full EU critical GAP dose rates often target full disease control. In Denmark however, farmers very much adjust the dose rate so that investment in spraying is only done to a level that can be justified from a net yield increase perspective, not always targeting full disease control. Furthermore, very often the dose rates in Denmark are restricted due to Danish specific environmental regulations. This means that the maximum dose rate tested according to the critical EU residue GAP is not allowed to use in Denmark, for environmental protection reasons. In cases where the EU critical GAP could not be retrieved, the maximum legal Danish dose-rate was used to calculate the dosage factor.

The area factor is introduced to account for the fact that almost none of the registered pesticides are used on the entire area of a crop grown in of Denmark, equation (3):

$$Area\ factor = \frac{Sum\ of\ hectares\ treated\ with\ product\ in\ 2014\ \ (ha)}{Total\ crop\ hectares\ in\ 2014\ (ha)} \quad (3)$$

Rubric® was used on 314.745 ha of wheat in 2014, while the total area of wheat was 668.441 ha. The area factor for Rubric® in wheat thus becomes 314.745/668.441 = 0.471.

Hence the average residue of epoxiconazole in wheat resulting from use of Rubric® was 0.035 mg/kg (STMR) x 0.188 (dosage factor) x 0.471 (area factor) = 0.0031 mg/kg.

The area factor is needed in order to calculate realistic residue levels. This is because especially in the more widely grown crops, the farmer has a wide range of products to choose from for the same type of treatment.

For example, in wheat our calculation includes 83 different pesticide applications, while in reality the farmer typically applies 10 or less in a field in a season. Without the area factor, the calculation would assume that all products used in a crop in a season were used all on the entire cultivated area. This is far from the use pattern in reality. As an example, calculating without area factor would mean that a product only used on 5% of the cultivated area, would be calculated as if it was used on the entire cultivated area, leading to a use overestimation of 95% that is directly reflected in the estimated residue values. To understand the calculation method we used, one should envision our calculation as representative for the entire pesticide use on the entire crop area grown in Denmark. To make that calculation realistic, dosage and area factors have to be used. One should *not* envision what is happening on the individual field, our calculations are not done on that level.

Another point to bear in mind is that our calculations were done on product use level. In order to get a total average for an individual *active substance*, one has to combine the results of all the product uses containing that active substance, in the crop. As an example, in total, seven products containing epoxiconazole were used in wheat in 2014. The sum of estimated residues for these seven product uses were 0.0087 mg/kg (calculated with the dosage and area factors corresponding to each product use according to the spraying journals).

Microsoft Excel was used for all calculations.

2.4. Risk assessment - the hazard index method

The hazard index (HI) method was used to make a simple cumulative health risk assessment of the calculated residue exposures in the 6 different population diets (Table 1). The latest published Acceptable Daily Intake (ADI) values from EFSA or EU was used as toxicity input (see appendix 3). The Hazard Index method is based on the dose addition model, which assumes that all compounds have the same mode of action and that they can be added up when taking their potency into account (Boobis et al., 2008; Wilkinson et al., 2000). The model has been shown to also predict cumulative toxicity quite well for compounds with different modes of action. It is considered a conservative (cautious) model since it assumes that the most sensitive toxicological target organ/system is the same for all compounds, which is in reality not the case (Kortenkamp et al., 2012; Reffstrup et al., 2010). The applicability of dose addition for cumulative risk assessment of pesticide residues is further supported by the lack of available evidence for significant deviation from dose or response additivity, e.g. synergistic action, for compounds present below their NOAEL (No Observed Adverse Effect Level) (Boobis et al., 2008). In reality, risk from combined exposure is only expected for compounds that share the same mode of action (Boobis et al., 2008), which is why EFSA is working on defining cumulative assessment groups (CAGs) (EFSA, 2013). However, dose addition of all pesticides was chosen as a simple first tier model in this project. Equation (4):

$$Cumulative\ \%\ ADI = \sum \frac{residue\ level \times crop\ consumption}{ADI} \times 100 \tag{4}$$

This is analog to the Hazard Index (HI) method published elsewhere (Boobis et al., 2008; Jensen et al., 2015; Wilkinson et al., 2000). It was chosen to express the results in terms of % ADI rather than HI, since we believe ADI is a more appropriate term to use in the context of describing exposures levels that are considered safe for the consumer over the long term.

Single pesticide risk assessments were also done; one for the pesticide with the highest cumulative risk, and one for the pesticide with the lowest ADI (diquat, ADI of 0.002 mg/kg bw/day).

3. Results

In total, 671 different pesticide/crop uses were analyzed, out of which 545 (82%) resulted in residue estimates below 0.01 mg/kg (0.01 mg/kg is the most common LOQ in monitoring programs).

The results of the residue estimations from the spraying journal data are presented in Table 3, as the total for each crop and the top 3 contributing pesticides. The full results can be seen in appendix 3. In general, the residue levels reflected the expected pattern, pesticides sprayed later in the season, closer to harvest, give higher residue levels (examples: glyphosate pre-harvest use in cereals, most insecticides, fungicides and growth regulators). Herbicides used early in the season generally did not give high residue levels in our calculations. For 59 pesticide uses we were not able to obtain an STMR value, In those cases the MRL was used instead, which gave most likely an overestimation of the average residue for these (e.g. cypermethrin in broccoli, cauliflower, sugarbeet and sweet corn).

3.1. Cumulative risk assessment

Residue levels reported as milligrams per kilo in crops do not say very much about potential risk to health. A risk assessment also has to take into account consumption levels of the various crops as well as the toxicities (reflected by the ADI) of the various pesticides. The results of a cumulative dietary risk assessment can be seen in Table 4. The risk assessment covers around 70% of the diet in terms of fruits, vegetables, cereals and sugar. The remaining 30% concerns crops that are not grown in Denmark. In the risk assessment 100% Danish produced consumption is assumed for all the 25 crops (see Fig. 1).

3.2. Cumulative risk assessment, highest crop % ADI

Apples & Pears gave the highest contribution to the overall % ADI (7.13% for child, 2,77% for adult). The details of the product uses, residue calculations and risk assessments for apple & pear can be seen in appendix 2, which includes also the details for the 2nd most consumed crop, potatoes.

3.3. Cumulative risk assessment, highest single pesticide % ADI

The active substance that contributed to the greatest extent to the cumulative % ADI was dithianon (fungicide used in apples, pears and plum). The % ADI for dithianon ranged from 4.7% (child) to 1.48% (male). This figure reflect the cumulative HI from three pesticide uses (two in apple&pear and one in plum).

3.4. Cumulative risk assessment, most toxic pesticide

The most toxic pesticide that was used in 2014 according to the spraying journal data, was diquat (herbicide and dessicant used in potatoes and a range of fruits and vegetables). Most toxic in this context means the pesticide with the lowest ADI. The ADI for diquat was 0.002 mg/kg bw/day. The cumulative % ADI of diquat ranged from 0.72% (child) to 0.36% (female).

4. Discussion

4.1. Method validation

We present in this study a new way to estimate dietary pesticide residue exposure, using spraying journal data and results from supervised residue trials in combination, as main input. Any new method should be discussed and validated to the greatest extent possible. The only other residue data from Denmark in 2014 was from the National Residue Monitoring Programme (NMP) (Fødevarestyrelsen, 2014). However, the NMP does not publish any average residue levels in their annual reports. Hence, there were no

Table 3
Estimated pesticide residues in 25 crops grown in Denmark during 2014, calculated using the spraying journal data model based on STMR (Supervised Trial Median Residue), area factor and dosage factor. STMR values taken from EFSA reports, unless otherwise noted. Full results can be found in appendix 3. The crops in Table 3 are sorted according to consumption level.

Crop	Top 3 Products (by residue level)	Active substance	Area factor	Dosage factor	STMR (mg/kg)	Residue estimate (mg/kg)
Apples & Pears	Merpan 80 WG	Captan	0.54	0.3	2.05	0.36413
	Delan WG	Dithianon	0.61	0.4	0.62	0.13548
	Scala	Pyrimethanil	0.49	0.2	0.77	0.08407
Potatoes	Dithane NT	Mancozeb	0.3	0.4	0.05	0.00528
	Tridex	Mancozeb	0.28	0.4	0.05	0.00501
	Reglone	Diquat	0.43	0.2	0.045[a]	0.00344
Wheat	Cycocel 750	Chlormequat	0.26	0.8	0.37	0.08048
	Glyfonova 450 Plus	Glyphosate	0.15	0.2	0.885	0.03241
	Glyfonova 360 SL	Glyphosate	0.12	0.2	0.885	0.02394
Sugar beet	Betanal Power	Desmedipham	0.54	0.8	0.05	0.02228
	Cyperb 100	Cypermethrin	0.02	0.7	1[b]	0.01274
	Matrigon 72 SG	Clopyralid	0.19	0.1	0.35	0.00947
Spring Barley (Beer)	Glyfonova 450 Plus	Glyphosate	0.15	1.3	5.85	1.16613
	Glyfonova 360 SL	Glyphosate	0.12	0.3	5.85	0.18242
	Glyfosate 360	Glyphosate	0.05	0.3	5.85	0.08465
Rye	Cycocel 750	Chlormequat	0.14	0.5	0.59	0.03811
	Glyfonova 360 SL	Glyphosate	0.05	0.3	0.885	0.01440
	Glyfonova 450 Plus	Glyphosate	0.06	0.26	0.885	0.01439
Carrots	Aramo	Tepraloxydim	0.37	0.5	0.13	0.02256
	Signum WG	Boscalid	0.23	0.5	0.09	0.01008
	DFF	Diflufenican	0.38	0.4	0.05[b]	0.00782
Tomatoes	Scala	Pyrimethanil	0.42	0.3	0.36	0.04744
	Warrant 700 WG	Imidacloprid	0.29	1.0	0.1	0.02907
	Floramite 240 SC	Bifenazate	0.29	0.300	0.14	0.01221
Cucumbers	Previcur Energy	Fosetyl	0.19	0.1	26	0.61276
	Previcur Energy	Propamocarb	0.19	0.4	1.6	0.11043
	Amistar	Azoxystrobin	0.09	1.3	0.19	0.02356
Onions	Antergon MH	Maleic Hydrazide	0.69	0.6	7.5	3.16192
	Acrobat New	Dimethimorph	0.83	0.5	0.2	0.08360
	Aramo	Tepraloxydim	0.93	0.7	0.1	0.06811
Lettuce	Fastac 50	Alpha-cypermethrin	0.95	0.5	2[b]	0.96408
	Revus	Mandipropamid	1.0	0.1	5.65	0.83542
	Cyperb 100	Cypermethrin	0.98	1.1	0.74	0.77612
Peas (without pods)	Cyperb 100	Cypermethrin	0.23	0.6	0.22[c]	0.03116
	Focus Ultra	Cycloxydim	0.03	0.1	7.89	0.01986
	Basagran M 75	MCPA	0.17	0.8	0.1[b]	0.01295
Oats	Glyfonova 360 SL	Glyphosate	0.08	0.3	5.85	0.12624
	Glyfonova 450 Plus	Glyphosate	0.06	0.4	5.85	0.12389
	Cycocel 750	Chlormequat	0.07	0.5	3.1	0.10398
Head Cabbage	Movento	Spirotetramat	0.19	0.4	0.11	0.00798
	Signum WG	Boscalid	0.43	0.3	0.05	0.00695
	Karate 2.5 WG	Lambda-cyhalotrin	0.65	0.2	0.04	0.00600
Strawberry	Teldor	Fenhexamid	0.49	0.2	1.4	0.16871
	Aliette 80 WG	Fosetyl	0.17	0.1	9.65	0.13248
	Signum WG	Boscalid	0.53	0.4	0.04	0.10903
Plum	Delan WG	Dithianon	0.24	0.7	0.5[b]	0.08794
	Signum WG	Boscalid	0.58	0.6	0.13	0.04293
	Signum WG	Pyraclostrobin	0.58	0.5	0.04	0.01185
Cauliflower	Cyperb 100	Cypermethrin	0.53	0.8	0.5[b]	0.21766
	Pirimor G	Pirimicarb	0.46	0.9	0.5[b]	0.19726
	Steward	Indoxacarb	0.81	0.2	0.07	0.01348
Broccoli	Cyperb 100	Cypermethrin	0.74	0.7	1[b]	0.48200
	Pirimor G	Pirimicarb	0.81	0.8	0.5[b]	0.30914
	Steward	Indoxacarb	0.99	0.6	0.07	0.15568
Leek	Totril	Ioxynil	0.84	0.2	0.87	0.13617
	Signum WG	Boscalid	0.67	0.2	0.93	0.12055
	Folicur 250 EC	Tebuconazole	0.74	0.4	0.21	0.06763
Gherkin	Aliette 80 WG	Fosetyl	1	0.58	26	15.00987
	Signum WG	Boscalid	0.57	0.08	0.68	0.03206
	Signum WG	Pyraclostrobin	0.57	0.08	0.17	0.00802
Brussel Sprouts	Fastac 50	Alpha cypermethrin	0.56	0.93	1[b]	0.52211
	Cyperb 100	Cypermethrin	0.48	1	1[b]	0.47938
	Movento SC100	spirotetramat	0.96	0.77	0.11	0.08017
Celeriac	Cyperb 100	cypermethrin	0.03	0.9	2[d]	0.04670
	Amistar	Azoxystrobin	0.6	0.7	0.08	0.03517
	Karate 2.5 WG	lambdacyhalotrin	0.61	0.5	0.03	0.00982
Spinach	Signum WG	Boscalid	1	0.5	1.1	0.59936
	Signum WG	Pyraclostrobin	1	0.5	0.05	0.02724
	Goltix SC 700	Metamitron	0.25	0.8	0.1[b]	0.01974
Sweet Corn	Cyperb 100	Cypermethrin	0.71	0.7	0.3[b]	0.15327

(continued on next page)

Table 3 (*continued*)

Crop	Top 3 Products (by residue level)	Active substance	Area factor	Dosage factor	STMR (mg/kg)	Residue estimate (mg/kg)
Peas with pods	Cythrin 500	Cypermethrin	0.38	0.8	0.3[b]	0.09484
	Roundup Bio	Glyphosate	0.28	0.3	1	0.07287
	Signum WG	boscalid	0.13	0.2	0.64	0.01333
	Basagran M 76	MCPA	0.17	0.8	0.1[b]	0.01295
	Agil 100 EC	propaquizafop	0.12	0.5	0.2[b]	0.01260

[a] STMR for diquat derived from EFSA Journal 2015; 13(1):3972, only one trial available for dessicant use in potatoes, residue = 0,03 mg/kg. Conversion factor not established for potatoes but worst case CF = 1,5 derived for other crops was used to derive a surrogate STMR = 0,03 × 1,5 = 0,045.
[b] No STMR found, MRL used instead.
[c] STMR value taken from JMPR 2008, legume vegetables.
[d] No STMR found and no MRL set, highest MRL set for any crop used as surrogate.

Table 4
The cumulative % of the acceptable daily intake (ADI), calculated using the dose addition model, resulting from pesticide usage reported in spraying journals of 2014 in Danish grown commodities. Calculated assuming consumption 100% domestically produced for the concerned crops. Consumption data originated from the Danish National Dietary Survey 2003–2008 (Pedersen et al., 2010).[a]

	Adult	Male	Female	Child	Male High Fruit & Veg Consumer	Female High Fruit & Veg Consumer
Age	15–75	15–75	15–75	4–6	15–75	15–75
Average bodyweight	75.1	83.5	68.2	21.8	84.4	69
Number	1599	721	878	106	118	258
Overall % ADI (HI)	**7.12**	**6.34**	**7.79**	**14.28**	**11.02**	**11.52**
Crop specific % ADI (HI)						
Apple & Pear	2.77	2.25	3.20	7.13	5.67	5.82
Lettuce	0.98	0.81	1.12	0.72	1.21	1.37
Wheat	0.64	0.64	0.63	1.78	0.63	0.60
Beer[b]	0.46	0.48	0.44	0.00	0.47	0.43
Onion	0.41	0.43	0.39	0.57	0.50	0.48
Potato	0.32	0.38	0.28	0.58	0.38	0.26
Carrot	0.23	0.16	0.29	0.69	0.26	0.48
Sugar[a]	0.21	0.22	0.20	0.65	0.22	0.20
Tomato	0.19	0.19	0.21	0.36	0.28	0.28
Broccoli	0.17	0.14	0.21	0.23	0.37	0.35
Leek	0.14	0.12	0.15	0.16	0.16	0.21
Rye	0.11	0.13	0.10	0.35	0.14	0.11
Strawberry	0.09	0.05	0.12	0.17	0.12	0.25
Brussel sprout	0.08	0.06	0.10	0.11	0.17	0.17
Cauliflower	0.06	0.05	0.06	0.05	0.09	0.09
Oats	0.06	0.07	0.06	0.19	0.08	0.06
Plum	0.05	0.03	0.06	0.10	0.09	0.10
Cucumber	0.04	0.03	0.05	0.23	0.06	0.07
Peas without pods	0.03	0.03	0.03	0.03	0.04	0.05
Head cabbage	0.03	0.03	0.04	0.04	0.04	0.05
Spinach	0.03	0.03	0.03	0.05	0.02	0.04
Gherkin	0.013	0.015	0.011	0.018	0.015	0.011
Corn	0.004	0.003	0.005	0.030	0.002	0.006
Celeriac	0.007	0.007	0.007	0.017	0.008	0.010
Peas with pods	0.0002	0.0001	0.0002	0.0023	0.0000	0.0004

The values in bold are the summarized hazard indexes of all the included commodities.
[a] The consumption of sugar was estimated from the results of "kostundersøgelsen 2011–2013, published by Danish Technical University (DTU).
[b] The consumption of beer was estimated from statistics published by Denmark Statistics (www.dst.dk) and Brewers Union (www.bryggerforeningen.dk).

published average residue levels that our levels could be compared with. The purpose of the NMP is primarily to monitor compliance with MRLs, and the data is not optimal for calculating average residue levels, which indeed was one of the main reasons we developed an alternative model.

Whereas quantitative direct comparison with NMP data for all residues was considered impossible, for reasons described above, some level of qualitative comparison could be done. As an example, NMP took 39 samples of Danish wheat kernels in 2014. The three pesticides most frequently detected above LOQ (boscalid, glyphosate and chlormequate) in NMP where the same three that our method predicted the highest average residue levels for. However, in apple and pear our data was not comparable with NMP since our top two in terms of average residue level (dithianon and captan) were not monitored in NMP. In potatoes, the only compound detected more than once in NMP was chlorpropam. This compound is used during storage in the food chain, and for such uses no spraying journal data exist, thus it was not covered by our data.

Facing a lack of monitoring data against which our data could be validated, we sought to further highlight some facts around the input data we used, showing why they were reliable and applicable in the context of predicting residues. The Danish spraying journal data exist in a comprehensive form mainly because of the legal requirement for Danish farmers to report all their spraying. Failure to comply leads to severe fines (20.000–100.000 DKK) and up to 5% reduction in the EU-subsidiaries. The authorities make around 600 farmer inspections per year, where compliance to the rules are assessed (EPA, 2017). Official statistics on findings at these

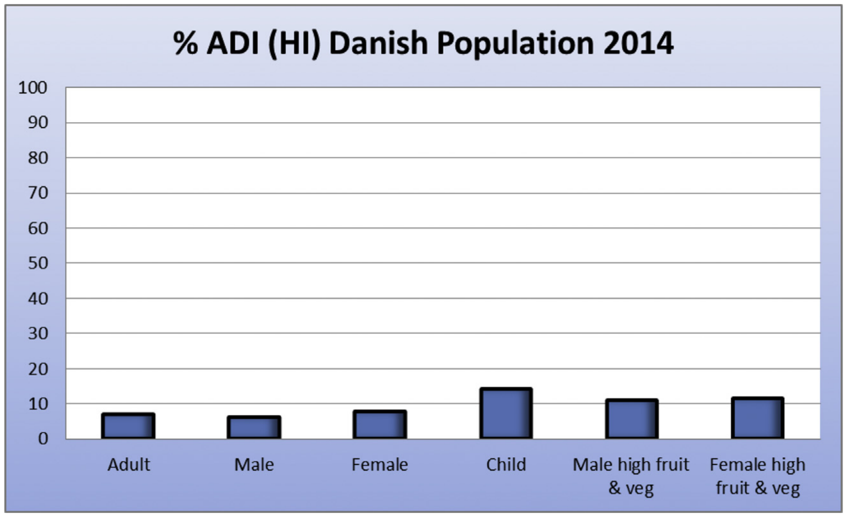

Fig. 1. The cumulative % of the Acceptable Daily Intake (ADI), calculated using the dose addition model, resulting from all pesticide usage reported in spraying journals of 2014 in Danish grown commodities. Calculated assuming consumption 100% domestically produced for the concerned crops.

inspections are not available. Many farmers use the professional advisory service to design their spraying programs and to fill in the electronic spraying journal for them. The electronically available data makes it easier for authorities to monitor how the farmers spray. Furthermore, the very rare occurrence of MRL-exceedances in Danish produced foods indicates that Danish farmers in general use pesticides as approved by the authorities (EFSA, 2015, 2016). In fact Denmark is one of the EU Member States with the lowest level of MRL exceedances. In 2014 MRL exceedances were found in 0.2% of the samples produced in Denmark (EFSA, 2016). This is low since the MRLs are set in such a way that a low level of MRL exceedances cannot be ruled out even if the pesticide is used according to label. In summary, we believe that the spraying journal data closely reflect the actual pesticide usage in Danish agriculture and can therefore be used to estimate residues, as was done in the present project.

The STMR data came from supervised residue trials conducted with the critical GAP, and according to Good Laboratory Practice (GLP). GLP renders the trial conducted subject to regular inspections by state accreditation agencies. GLP ensures very high level of data traceability and quality. GLP is the standard required for all studies used for regulatory decision making for pesticides in the health and environment risk assessments. The minimum requirement for a residue trial programme to support a critical GAP at EU level is usually, assuming all other variables are comparable, a minimum of eight trials representative of the proposed growing area for major crops, and four trials for minor or very minor crops (Commission, 2016). The quality of this data is therefore clearly good enough for the purpose it is used in this study.

The present method assumed that STMR residue levels from critical GAP dose rates could be linearly extrapolated downwards using dosage factors, accounting for a lower applied field dose rate. There is general scientific support for this kind of extrapolations although there is of course a difficulty in studying extrapolability to dose rates that leads to residues below the LOQ (OECD, 2016).

4.2. Factors that contributed to over- or underestimation of residues

In supervised trials, the worst case use pattern in terms of residue formation is applied, while in reality, use will often take place at earlier growth stages. In supervised residue trials, samples are taken right after harvest to determine the STMR. In reality, most crops are stored for varying periods of time before being consumed, during which degradation of residues often occur (Reiler et al., 2015). These factors make our residue estimate likely overestimating actual consumer exposure. Furthermore, various food processing procedures such as cooking, peeling, baking, brewing etc. most often leads to further degradation of residues (Reiler et al., 2015). In the present study the only processing factors taken into account were those published by EFSA for malting barley for beer production (appendix 5). Some pesticide uses that occur very early in season, like just around crop emergence, are likely to cause no residues in the harvested crops. These were still included in the present study, which gives some over-estimation of the cumulative exposure.

As mentioned above, post-harvest treatments were not included in the present data. This could in theory lead to underestimation of residues. However, to our knowledge there was no example of a pesticide that was used both before and post-harvest. We therefore do not consider post-harvest pesticide use to be a source of uncertainty in the present residue calculations. Post-harvest uses are in general not common in Denmark, and the above mentioned monitoring programme findings of chlorpropham in potatoes, comes from a limited use that is declining according to official statistics (Ørum, 2014). Potatoes are more often stored under cool conditions, removing the need to use chlorpropham against germination.

4.3. Method performance versus other methods

The methods previously used to estimate cumulative pesticide residue exposure are mostly based on data from NMPs (EFSA, 2015; Jensen et al., 2015). The present method has three main advantages over methods based on monitoring data:

1) The present method was based on data on the complete pesticide usage, rather than a limited number of random samples (typically up to 50 samples/commodity, or less, in the Danish programme)

2) The present method covered all pesticides that were used. For example, the single pesticide that gave the highest contribution to the overall % ADI (dithianon) in our study was not included in the Danish monitoring program to date. Also, the pesticide with the lowest ADI (diquat) was not included in the Danish monitoring programme.
3) The present method is likely to give more reliable and precise estimates of pesticides for which the true average lies below 0.01 mg/kg, which is the most common LOQ in monitoring programs. This was accomplished by extrapolating STMR values, obtained in trials with high doses, downwards using dosage- and area factors, to give average residue estimates resulting from realistic use dose-rates. Out of the 671 pesticide-crop uses we evaluated, 553 gave estimated residues below 0.01 mg/kg. Given the substantial number of residues in this low range, having reliable and precise methods to estimate their level is important in the context of making cumulative risk assessments.

The present study also included some high consumption commodities (beer and sugar) that were not included in the most recent other study done in Denmark (Jensen et al., 2015).

It is recognized that the food monitoring programs have a better chance to detect eventual illegal pesticide use, which our method likely would not detect. Illegal pesticide use is believed to be uncommon in Denmark, according to the Danish Crop Protection Association. But still, a comprehensive food monitoring program is from this perspective an essential component of a national food safety programme. Ideally, comprehensive risk assessments could be based on both methods in combination.

4.4. Discussion on the cumulative risk assessments

The highest cumulative HI calculated for the complete pesticide usage analyzed in this study was for the population group Child aged 4–6. The cumulative HI for this group was 14% of ADI. The previous study by Jensen et al. reported a HI of 44% for child aged 4–6, a figure that also includes imported foods (Jensen et al., 2015). Both of these studies lack risk assessment targeted specifically at the age groups children aged below 4 years, children/adolescents aged 7–14, or elderly aged above 75. Nevertheless, our results show that pesticide usage in Danish agriculture is very unlikely to pose a risk to the health of Danish consumers through dietary exposure of residues in domestically produced foods.

The present risk assessment had a clear limitation in lack of inclusion of imported foods. Work is ongoing to address this limitation, using another novel method based on monitoring data and agronomic use parameters in combination.

The model used in the present study is conservative (cautious) for several reasons. Firstly, the ADI values represent an exposure level that is considered safe from a regulatory perspective throughout the whole lifetime of a person. As such, the ADI value already has substantial safety margins built into it. The ADI value is normally derived by taking the lowest NOAEL from the whole registration toxicology study package for the pesticide active ingredient, and dividing by a safety factor of at least 100. That means the ADI is always at least 100 times lower than a level tested in animal studies, at which no adverse effects occurs. Secondly, ADI values for pesticides are based on the most sensitive toxicological endpoint. While the target organs/systems for pesticides differ, the dose addition model we used assumes that all pesticides have their most sensitive effect on the same target, which is in reality not the case. EFSA has recognized this and for that reason decided that dose addition across all pesticides is not the appropriate way to do a cumulative risk assessment for pesticides. Instead, the pesticides should be grouped in so called Cumulative Assessment Groups (CAGs) based on their common target organ/system. This work is ongoing in EFSA but to date the complete set of CAGs have not been published, although some of the preparatory work of RIVM, IPSC and ANSES for nervous system, liver, adrenal, eye, reproduction and development and thyroid system was recently published (Wolterink et al., 2016). It was out of the scope for the present study to prepare own cumulative assessment groups. And since it could be shown that there is no risk to the Danish population without cumulative assessment groups, from a risk assessment perspective it was not necessary to take it further to another tier level.

5. Conclusions

A novel method was developed for estimating realistic dietary pesticide exposure using spraying journal data and supervised trial residue measurements as main input. The advantages of this method over existing ones include more comprehensive and robust source data, more complete coverage of used pesticides and more reliable and precise estimates of below standard LOQ residues. More than 82% of the residues estimated in this study lie in the below standard LOQ range.

The highest cumulative ADI % calculated for the complete pesticide usage analyzed in this study was for the population group Child aged 4–6. The cumulative ADI % for this group was 14%. This finding adds to the existing body of evidence showing that pesticide usage in Danish agriculture poses no risk to the health of Danish consumers through dietary exposure of residues.

5.1. Perspectives

As shown in this study, the electronic spray journal data can be used as a complementary data source for surveillance of cumulative health risk of pesticide residues. Spraying journals are required for farmers in many other countries besides Denmark. Use of them for risk assessment purposes likely requires implementation of electronic reporting in these countries. But still, a comprehensive food monitoring program is from this perspective an essential component of a national food safety programme. Ideally, comprehensive risk assessments could be based on both methods in combination.

Conflict of interest and disclosure

Dr Frank Laporte declares: I am a member of the Residue Expert Group (ResEG) of the European Crop Protection Association (ECPA). The other authors have no conflicts of interest to disclose.

Transparency document

Transparency document related to this article can be found online at http://dx.doi.org/10.1016/j.fct.2017.05.014.

Appendix 1. Consumption data (g/kg bw/day)

	Adult	Male	Female	Child	Male HFV	Female HFV
Apple & Pear	1.28	1.04	1.48	3.3	2.623	2.694
Potato	1.27	1.49	1.09	2.27	1.51	1.04
Wheat	1.13	1.13	1.11	3.12	1.11	1.06
Sugar	0.69	0.71	0.66	2.11	0.70	0.65
Barley Malt (beer)	0.62	0.63	0.59	0.00	0.63	0.58
Rye	0.53	0.60	0.47	1.63	0.67	0.53
Tomato	0.52	0.46	0.56	0.97	0.74	0.76
Carrot	0.50	0.35	0.62	1.48	0.56	1.04
Cucumber	0.22	0.16	0.27	1.35	0.32	0.41
Onion	0.15	0.16	0.14	0.21	0.18	0.18
Peas without pods	0.12	0.11	0.13	0.14	0.19	0.19
Oats	0.11	0.12	0.10	0.34	0.14	0.10
Lettuce + Iceberg Lettuce	0.090	0.075	0.103	0.066	0.111	0.126
Head Cabbage	0.084	0.075	0.091	0.098	0.089	0.135
Strawberry	0.071	0.040	0.096	0.137	0.095	0.199
Plum	0.042	0.026	0.055	0.089	0.080	0.090
Cauliflower	0.037	0.033	0.041	0.031	0.059	0.059
Broccoli	0.034	0.027	0.041	0.047	0.073	0.070
Leek	0.027	0.023	0.030	0.032	0.031	0.042
Gherkin	0.021	0.025	0.018	0.030	0.024	0.019
Brussel sprout	0.014	0.011	0.017	0.019	0.030	0.029
Celeriac	0.014	0.013	0.015	0.034	0.015	0.019
Spinach	0.011	0.011	0.012	0.023	0.008	0.018
Corn	0.0063	0.0044	0.0079	0.0495	0.0029	0.0094
Peas with pods	0.00040	0.00016	0.00060	0.00587	0.00000	0.00104

Appendix 2. Apple & pear and potatoes: details of the product uses, residue calculations and risk assessments for pesticides used in Denmark 2014. Pheromones and sulphur were not included since ADI values are not defined for these compounds.

Tradename	Active substance	Area of use (ha)	Area factor	Maxdose critical GAP (L/ha)	Used dose (L/ha)	Dosage factor	ADI (mg/kg bw/day)	STMR or MRL (mg/kg)	Residue estimate (mg/kg)	% ADI Adult	% ADI Child
Apple & Pear											
Mospilan SG	Acetamiprid	781	0.44	0.8	0.3	0.38	0.07	0.03	0.0049	0.0090	0.0233
Teppeki	Flonicamid	529	0.30	0.4	0.1	0.28	0.025	0.06	0.0050	0.0254	0.0655
Steward	Indoxacarb	511	0.29	1.0	0.2	0.18	0.006	0.1	0.0053	0.1122	0.2894
Pirimor G	Pirimicarb	462	0.26	1.5	0.3	0.17	0.035	0.286	0.0126	0.0459	0.1184
Movento SC 100	Spirotetramat	251	0.14	4.3	1.0	0.24	0.05	0.1	0.0034	0.0086	0.0222
Karate 2.5 WG	Lambda- Cyhalotrin	173	0.10	1.2	0.7	0.61	0.0025	0.02	0.0012	0.0598	0.1541
Delan WG	Dithianon	1.099	0.61	9.0	3.2	0.36	0.01	0.62	0.1355	1.7342	4.4709
Merpan 80 WG	Captan	966	0.54	18.0	5.9	0.33	0.1	2.05	0.3641	0.4661	1.2016
Scala	Pyrimethanil	882	0.49	7.5	1.7	0.22	0.17	0.77	0.0841	0.0633	0.1632
Candit	Kresoxim-methyl	691	0.39	1.0	0.5	0.48	0.4	0.07	0.0131	0.0042	0.0108
Dithane NT	Mancozeb	531	0.30	38.4	4.0	0.10	0.05	0.75	0.0230	0.0590	0.1521
Signum WG	Boscalid	367	0.20	3.0	0.9	0.31	0.04	0.36	0.0225	0.0720	0.1855
Signum WG	Pyraclostrobin	367	0.20	7.2	0.9	0.13	0.03	0.1	0.0026	0.0112	0.0288
Switch 62.5 WG	Cyprodinil	122	0.07	3.6	0.6	0.17	0.03	0.49	0.0056	0.0239	0.0617
Switch 62.5 WG	Fludioxonil	122	0.07	3.6	0.6	0.17	0.37	0.19	0.0022	0.0008	0.0019
Delan 750 SC	Dithianon	44	0.02	8.4	2.6	0.31	0.01	0.62	0.0047	0.0596	0.1536
Roundup Bio	Glyphosate	320	0.18	12.0	3.6	0.30	0.3	0.025	0.0013	0.0006	0.0015
Glyfonova 450 Plus	Glyphosate	211	0.12	9.6	3.1	0.32	0.3	0.025	0.0010	0.0004	0.0011
Jablo Glyfosat	Glyphosate	204	0.11	12.0	3.3	0.28	0.3	0.025	0.0008	0.0003	0.0009
Glyphogan	Glyphosate	124	0.07	12.0	3.6	0.30	0.3	0.025	0.0005	0.0002	0.0006
Reglone	Diquat	55	0.03	2.0	0.9	0.44	0.002	0.01	0.0001	0.0086	0.0221
									Sum:	2.77	7.13
Potatoes											
Monceren DS	Pencycuron	3.618	0,08	4,0	3,0	0,8	0,2	0,01	0,00064	0,0004	0,0007
Monceren FS	Pencycuron	3.224	0,08	1,5	1,0	0,6	0,2	0,01	0,00048	0,0003	0,0005
Prestige FS 370	Pencycuron	6.807	0,16	1,2	0,9	0,7	0,2	0,01	0,00119	0,0008	0,0013
Prestige FS 370	imidacloprid	6.807	0,16	1,5	0,9	0,6	0,06	0,035	0,00342	0,0072	0,0129
Maxim 100 FS	fludioxonil	245	0,01	0,6	0,6	0,9	0,37	0,01	0,00005	0,0000	0,0000
Revus	Mandipropamid	25.448	0,60	3,6	1,2	0,3	0,15	0,01	0,00193	0,0016	0,0029
Amistar	azoxystrobin	20.543	0,48	1,5	0,5	0,4	0,2	0,005	0,00085	0,0005	0,0010
Ranman	Cyazofamid	22.092	0,52	2,0	0,5	0,2	0,17	0,005	0,00060	0,0004	0,0008
Dithane NT	Mancozeb	12.784	0,30	17,0	6,0	0,4	0,05	0,05	0,00528	0,0134	0,0240

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Tradename	Active substance	Area of use (ha)	Area factor	Maxdose critical GAP (L/ha)	Used dose (L/ha)	Dosage factor	ADI (mg/kg bw/day)	STMR or MRL (mg/kg)	Residue estimate (mg/kg)	% ADI Adult	% ADI Child
Tridex DG	Mancozeb	12.035	0,28	17,0	6,0	0,4	0,05	0,05	0,00501	0,0127	0,0228
Ranman Top	Cyazofamid	14.650	0,34	5,0	1,1	0,2	0,17	0,005	0,00039	0,0003	0,0005
Proxanil	Cymoxanil	7.710	0,18	15,6	1,8	0,1	0,013	0,01	0,00020	0,0020	0,0036
Proxanil	Propamocarb	7.710	0,18	10,0	1,8	0,2	0,244	0,01	0,00032	0,0002	0,0003
Revus Top	Mandipropamid	7.293	0,17	3,6	0,6	0,2	0,15	0,01	0,00030	0,0003	0,0005
Revus Top	difenoconazol	7.293	0,17	3,6	0,6	0,2	0,01	0,01	0,00030	0,0038	0,0069
Signum WG	Boscalid	7.052	0,17	4,0	0,3	0,1	0,04	0,05	0,00067	0,0021	0,0038
Signum WG	Pyraclostrobin	7.052	0,17	7,8	0,3	0,0	0,03	0,02	0,00014	0,0006	0,0010
Curzate M68 Wg	Cymoxanil	1.560	0,04	17,3	1,6	0,1	0,013	0,01	0,00003	0,0003	0,0006
Curzate M68 Wg	Mancozeb	1.560	0,04	18,8	1,6	0,1	0,05	0,05	0,00016	0,0004	0,0007
Rizolex 10D	Tolclofos-Methyl	2.847	0,07	3,5	1,8	0,5	0,064	0,02	0,00069	0,0014	0,0024
Consento/Tyfon	Fenamidon	1.279	0,03	6,0	1,0	0,2	0,03	0,01	0,00005	0,0002	0,0004
Consento/Tyfon	propamocarb	1.279	0,03	10,7	1,0	0,1	0,244	0,01	0,00003	0,0000	0,0000
Shirlan	Fluazinam	1.394	0,03	2,4	0,3	0,1	0,01	0,05	0,00023	0,0029	0,0052
Penncozeb DG	mancozeb	1.729	0,04	17,0	6,1	0,4	0,05	0,05	0,00073	0,0019	0,0033
Mirador 250 SC	azoxystrobin	1.159	0,03	1,6	0,3	0,2	0,2	0,005	0,00003	0,0000	0,0000
Rizolex 50 FW	Tolclofos-Methyl	1.144	0,03	1,1	0,6	0,5	0,064	0,02	0,00028	0,0006	0,0010
Cymbal 45	cymoxanil	670	0,02	1,7	0,4	0,3	0,013	0,01	0,00004	0,0004	0,0007
Reglone	diquat	18.294	0,43	10,0	1,8	0,2	0,002	0045	0,00344	0,2182	0,3900
Fenix	Aclonifen	22.825	0,54	4,0	0,8	0,2	0,07	0,02	0,00225	0,0041	0,0073
Titus WSB	Rimsulfuron	19.809	0,46	0,3	0,1	0,3	0,1	0,01	0,00139	0,0018	0,0031
Glyfonova 360 SL	glyphosate	7.814	0,18	12,0	1,8	0,2	0,3	0,025	0,00069	0,0003	0,0005
Boxer	Prosulfocarb	4.726	0,11	5,0	0,9	0,2	0,005	0005	0,00010	0,0026	0,0047
Roundup Bio	glyphosate	3.568	0,08	12,0	1,5	0,1	0,3	0,025	0,00026	0,0001	0,0002
Glyfosate 360	glyphosate	3.202	0,08	12,0	1,5	0,1	0,3	0,025	0,00023	0,0001	0,0002
Glyfonova 450 Plus	glyphosate	4.420	0,10	9,6	1,8	0,2	0,3	0,025	0,00049	0,0002	0,0004
Spotlight Plus	Carfentrazon ethyl	1.733	0,04	1,0	0,3	0,3	0,03	0,005	0,00007	0,0003	0,0005
Command CS	clomazone	1.000	0,02	0,3	0,1	0,4	0,133	0005	0,00004	0,0000	0,0001
IT-Diquat	diquat	1.224	0,03	10,0	1,1	0,1	0,002	0045	0,00015	0,0094	0,0168
Glyphogan	glyphosate	2.143	0,05	12,0	1,6	0,1	0,3	0,025	0,00016	0,0001	0,0001
Metaxon	MCPA	3.023	0,07	0,1	0,1	0,6	0,05	0,025	0,00104	0,0026	0,0047
Agil 100 EC	propaquizafop	1.138	0,03	0,8	0,3	0,3	0,015	0,1	0,00086	0,0073	0,0130
Jablo Glyfosat	glyphosate	1.365	0,03	12,0	1,0	0,1	0,3	0,025	0,00007	0,0000	0,0001
Karate 2,5 WG	lambda cyhalotrin	9.246	0,22	1,5	0,2	0,1	0,0025	0,01	0,00030	0,0154	0,0276
Mospilan SG	Acetamiprid	12.946	0,30	0,5	0,3	0,5	0,07	0,01	0,00155	0,0028	0,0050
Teppeki	Flonicamid	1.295	0,03	0,3	0,1	0,4	0,025	0,03	0,00035	0,0018	0,0032
Cyperb 100	Cypermethrin	982	0,02	0,3	0,1	0,5	0,05	0,05	0,00058	0,0015	0,0026
									Sum:	0,3234	0,5781

Appendix 3. Full results of residue calculations

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
Potato	Monceren DS	Pencycuron	3.618	0.08		4.0	3.0	0.8	0.01	0.1	0.00064
Seed	Monceren FS	Pencycuron	3.224	0.08		1.5	1.0	0.6	0.01	0.1	0.00048
Treatment	Prestige FS 370	Pencycuron	6.807	0.16		1.2	0.9	0.7	0.01	0.1	0.00119
	Prestige FS 370	Imidacloprid	6.807	0.16		1.2	0.9	0.7	0.05	0.5	0.00342
	Maxim 100 FS	Fludioxonil	245	0.01		0.6	0.6	0.9	0.01	0.04	0.00005
Potato	Revus	Mandipropamid	25.448	0.60	3.6	3.6	1.2	0.3	0.01	0.01	0.00193
Fungicides	Amistar	Azoxystrobin	20.543	0.48	1.5	1.0	0.5	0.4	0.005	1	0.00085
	Ranman	Cyazofamid	22.092	0.52	2.0	0.6	0.5	0.2	0.005	0.01	0.00060
	Dithane NT	Mancozeb	12.784	0.30	17.0	16.0	6.0	0.4	0.05	0.3	0.00528
	Tridex DG	Mancozeb	12.035	0.28	17.0	20.0	6.0	0.4	0.05	0.3	0.00501
	Ranman Top	Cyazofamid	14.650	0.34	5.0	3.0	1.1	0.2	0.005	0.01	0.00039
	Proxanil	Cymoxanil	7.710	0.18	15.6	15.0	1.8	0.1	0.01	0.05	0.00020
	Proxanil	Propamocarb	7.710	0.18	10.0	15.0	1.8	0.2	0.01	0.01	0.00032
	Revus Top	Mandipropamid	7.293	0.17	3.6	1.2	0.6	0.2	0.01	0.01	0.00030
	Revus Top	Difenoconazol	7.293	0.17	3.6	1.2	0.6	0.2	0.01	0.1	0.00030
	Signum WG	Boscalid	7.052	0.17	4.0	1.0	0.3	0.1	0.05	2	0.00067
	Signum WG	Pyraclostrobin	7.052	0.17	7.8	1.0	0.3	0.0	0.02	0.02	0.00014
	Curzate M68 Wg	Cymoxanil	1.560	0.04	17.3	7.2	1.6	0.1	0.01	0.05	0.00003
	Curzate M68 Wg	Mancozeb	1.560	0.04	18.8	7.2	1.6	0.1	0.05	0.3	0.00095
	Rizolex 10D	Tolclofos-methyl	2.847	0.07		3.5	1.8	0.5	0.02	0.2	0.00069
	Consento/Tyfon	Fenamidon	1.279	0.03		6.0	1.0	0.2	0.01	0.02	0.00005
	Consento/Tyfon	Propamocarb	1.279	0.03	10.7		1.0	0.1	0.01	0.01	0.00003
	Shirlan	Fluazinam	1.394	0.03		2.4	0.3	0.1		0.05	0.00023

(*continued*)

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Penncozeb DG	Mancozeb	1.729	0.04	17.0		6.1	0.4	0.05	0.3	0.00073
	Mirador 250 SC	Azoxystrobin	1.159	0.03	1.6	1.0	0.3	0.2	0.005	1	0.00003
	Rizolex 50 FW	Tolclofos-methyl	1.144	0.03		1.1	0.6	0.5	0.02	0.2	0.00028
	Cymbal 45	Cymoxanil	670	0.02	1.7		0.4	0.3	0.01	0.05	0.00004
Potato	Reglone	Diquat	18.294	0.43	10.0	5.0	1.8	0.2	0.045	0.1	0.00344
Herbicides	Fenix	Aclonifen	22.825	0.54	4.0	2.5	0.8	0.2	0.02	0.1	0.00225
	Titus WSB	Rimsulfuron	19.809	0.46		0.3	0.1	0.3		0.01	0.00139
	Glyfonova 360 SL	Glyphosate	7.814	0.18	12.0	4.0	1.8	0.2	0.025	0.05	0.00069
	Boxer	Prosulfocarb	4.726	0.11	5.0	5.0	0.9	0.2	0.005	0.01	0.00010
	Roundup Bio	Glyphosate	3.568	0.08	12.0	4.0	1.5	0.1	0.025	0.05	0.00026
	Glyfosate 360	Glyphosate	3.202	0.08	12.0	4.0	1.5	0.1	0.025	0.05	0.00023
	Glyfonova 450 Plus	Glyphosate	4.420	0.10	9.6	4.0	1.8	0.2	0.025	0.05	0.00049
	Spotlight Plus	Carfentrazon ethyl	1.733	0.04	1.0	1.0	0.3	0.3	0.005	0.01	0.00014
	Command CS	Clomazone	1.000	0.02	0.3	0.3	0.1	0.4	0.005	0.01	0.00004
	IT-Diquat	Diquat	1.224	0.03	10.0	5.0	1.1	0.1	0.045	0.1	0.00015
	Glyphogan	Glyphosate	2.143	0.05	12.0	4.0	1.6	0.1	0.025	0.05	0.00016
	Metaxon	Mcpa	3.023	0.07		0.1	0.1	0.6	0.025	0.05	0.00104
	Agil 100 EC	Propaquizafop	1.138	0.03		0.8	0.3	0.3	not found	0.1	0.00086
	Jablo Glyfosat	Glyphosate	1.365	0.03	12.0		1.0	0.1	0.025	0.05	0.00007
Potato	Karate 2.5 WG	Lambda cyhalotrin	9.246	0.22	1.5	1.0	0.2	0.1	0.01	0.02	0.00030
Insecticide	Mospilan SG	Acetamiprid	12.946	0.30	0.5	0.5	0.3	0.5	0.01	0.01	0.00155
	Teppeki	Flonicamid	1.295	0.03	0.3	0.3	0.1	0.4	0.03	0.07	0.00035
	Cyperb 100	Cypermethrin	982	0.02		0.3	0.1	0.5		0.05	0.00058
Wheat	Boxer	Prosulfocarb	496.347	0.74	5.0	5.0	1.1	0.2	0.005	0.01	0.00080
Herbicide	DFF	Diflufenican	432.804	0.65	0.5	0.1	0.0	0.1	0.01	0.02	0.00067
	Oxitril CM	Ioxynil	315.599	0.47	2.3	0.2	0.1	0.1	0.02	0.05	0.00059
	Oxitril CM	Bromoxynil	315.599	0.47	2.0	0.2	0.1	0.1	0.025	0.05	0.00083
	Starane XL	Fluroxypyr	221.696	0.33	4.0	1.2	0.3	0.1	0.05	0.1	0.00136
	Starane XL	Florasulam	221.696	0.33	3.0	1.2	0.3	0.1	0.005	0.01	0.00018
	Stomp Pentagon	Pendimethalin	165.092	0.25	4.8	1.5	0.6	0.1	0.01	0.05	0.00031
	Broadway	Florasulam	140.746	0.21	0.3	0.2	0.1	0.5	0.005	0.01	0.00048
	Broadway	Pyroxsulam	140.746	0.21	0.3	0.2	0.1	0.6	0.005	0.01	0.00058
	Hussar OD	Iodosulfuron	136.945	0.20	0.1	0.1	0.0	0.2	0.005	0.01	0.00024
	Glyfonova 450 Plus	Glyphosate	102.105	0.15	4.8	5.6	1.2	0.2	0.885	20	0.03241
	Atlantis OD	Iodosulfuron	93.091	0.14	5.0	0.9	0.2	0.0	0.005	0.01	0.00003
	Atlantis OD	Mesosulfuron	93.091	0.14	2.0	0.9	0.2	0.1	0.01	0.01	0.00014
	Cossack OD	Iodosulfuron	90.818	0.14	1.3	0.9	0.3	0.2	0.005	0.01	0.00015
	Cossack OD	Mesosulfuron	90.818	0.14	2.7	0.9	0.3	0.1	0.01	0.01	0.00015
	Glyfonova 360 SL	Glyphosate	80.914	0.12	6.0	7.0	1.3	0.2	0.885	20	0.02394
	Briotril 400 EC	Bromoxynil	78.829	0.12	1.7	0.2	0.2	0.1	0.025	0.05	0.00027
	Briotril 400 EC	Ioxynil	78.829	0.12	2.8	0.2	0.2	0.1	0.02	0.05	0.00013
	Monitor	Sulfosulfuron	67.186	0.10	0.0	0.0	0.0	0.3	0.01	0.01	0.00025
	Lexus 50 WG	Flupyrsulfuron-methyl-Na	62.509	0.09	0.0	0.0	0.0	0.3	0.02	0.02	0.00047
	Stomp	Pendimethalin	61.034	0.09	4.0	1.2	0.6	0.1	0.01	0.05	0.00013
	Mustang forte	Florasulam	60.644	0.09	1.5	1.0	0.3	0.2	0.005	0.01	0.00009
	Mustang forte	2.4d	60.644	0.09	6.9	1.0	0.3	0.0	0.025	0.05	0.00009
	Mustang forte	Aminopyralid	60.644	0.09		1.0	0.3	0.3	not found	0.1	0.00259
	Legacy 500 SC	Diflufenican	60.614	0.09	0.5	0.2	0.0	0.1	0.01	0.02	0.00009
	Lodin	Fluroxypyr	52.521	0.08	2.2		0.2	0.1	0.05	0.1	0.00036
	Accurate 20 WG	Metsulfuron-methyl	51.069	0.08	0.0		0.0	0.2	0.005	0.01	0.00006
	Broadway (Floramix Alpha)	Florasulam	45.570	0.07	0.3		0.1	0.2	0.005	0.01	0.00008
	Broadway (Floramix Alpha)	Pyroxsulam	45.570	0.07	0.3		0.1	0.3	0.005	0.01	0.00010
	Tomahawk 180 EC	Fluroxypyr	45.159	0.07	2.2		0.2	0.1	0.05	0.1	0.00034
	Nuance WG	Tribenuron-methyl	43.442	0.06	0.0		0.0	0.1	0.005	0.01	0.00004
	Primus XL	Florasulam	42.535	0.06	1.5		0.3	0.2	0.005	0.01	0.00006
	Primus XL	Fluroxypyr	42.535	0.06	4.0		0.3	0.1	0.05	0.1	0.00024
	Primera Super	Fenoxaprop-p ethyl	42.055	0.06	2.6		0.2	0.1	0.01	0.02	0.00005
	Metaxon	Mcpa	39.441	0.06		1.0	0.4	0.4	0.025	0.05	0.00054
	Nicanor 20 SG	Metsulfuron-methyl	38.241	0.06	0.0		0.0	0.2	0.005	0.01	0.00006
	Roxy EC	Prosulfocarb	37.229	0.06	5.0		1.1	0.2	0.005	0.01	0.00006
	Glyfosate 360	Glyphosate	33.865	0.05	6.0		1.6	0.3	0.885	20	0.01174
	Express SX	Tribenuron-methyl	32.496	0.05	0.1		0.0	0.1	0.005	0.01	0.00002
	Ally SX	Metsulfuron-methyl	30.598	0.05	0.0		0.0	0.2	0.005	0.01	0.00003
	Topik	Clodinafop-propargyl	29.730	0.04	0.6		0.1	0.1	0.02	0.1	0.00012
	MCPA 750	Mcpa	28.254	0.04		1.0	0.4	0.4	0.025	0.05	0.00042

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(*continued*)

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Foxtrot	Fenoxaprop-p ethyl	27.963	0.04	2.6		0.2	0.1	0.01	0.02	0.00003
	Ally ST	Metsulfuron-methyl	25.304	0.04	0.0		0.3	19.7	0.005	0.01	0.00374
	Saracen	Florasulam	25.134	0.04	0.2		0.0	0.2	0.005	0.01	0.00003
Wheat Fungicides	Proline EC 250	Prothioconazole	445.601	0.67	2.4	1.6	0.3	0.1	0.02	0.02	0.00164
	Bell	Epoxiconazole	391.985	0.59	3.7	1.5	0.5	0.1	0.035	0.6	0.00279
	Bell	Boscalid	391.985	0.59	3.0	1.5	0.5	0.2	0.12	0.5	0.01180
	Rubric	Epoxiconazole	314.745	0.47	2.0	1.0	0.4	0.2	0.035	0.6	0.00309
	Comet	Pyraclostrobin	263.053	0.39	2.0	2.0	0.1	0.1	0.02	0.2	0.00056
	Ceando	Epoxiconazole	228.756	0.34	3.0	1.5	0.3	0.1	0.035	0.6	0.00103
	Ceando	Metrafenon	228.756	0.34	3.0	1.5	0.3	0.1	0.01	0.07	0.00029
	Viverda	Epoxiconazole	139.553	0.21	5.0	2.5	0.6	0.1	0.035	0.6	0.00082
	Viverda	Pyraclostrobin	139.553	0.21	8.3	2.5	0.6	0.1	0.02	0.2	0.00028
	Viverda	Boscalid	139.553	0.21	5.0	2.5	0.6	0.2	0.12	0.5	0.00559
	Flexity	Metrafenon	129.981	0.19	1.0	0.5	0.1	0.1	0.01	0.07	0.00025
	Bumber 25 EC	Propiconazole	112.214	0.17	1.0	1.0	0.2	0.2	0.06	0.05	0.00152
	Folicur EC 250	Tebuconazole	60.866	0.09	2.5	2.0	0.2	0.1	0.05	0.1	0.00035
	Opus	Epoxiconazole	57.869	0.09	2.0	1.0	0.2	0.2	0.035	0.6	0.00071
	Prosaro 250 EC	Prothioconazole	55.994	0.08	4.8	2.0	0.3	0.2	0.02	0.02	0.00025
	Prosaro 250 EC	Tebuconazole	55.994	0.08	5.0	2.0	0.3	0.2	0.05	0.1	0.00063
	Tern	Fenpropidin	55.105	0.08	2.0	0.8	0.1	0.1	0.04	0.1	0.00023
	Maredo 125 SC	Epoxiconazole	41.573	0.06	2.0	1.0	0.3	0.1	0.035	0.6	0.00028
	Orius 200 EW	Tebuconazole	29.521	0.04	3.1	2.5	0.2	0.1	0.05	0.1	0.00012
	Zenit 575 EC	Propiconazole	25.312	0.04	2.0		0.2	0.1	0.06	0.05	0.00022
	Zenit 575 EC	Fenpropidin	25.312	0.04	3.3		0.2	0.1	0.04	0.1	0.00009
	Tilt 250 EC	Propiconazole	17.904	0.03	1.0		0.1	0.1	0.06	0.05	0.00019
	Opera	Epoxiconazole	10.331	0.02	5.0		0.2	0.0	0.035	0.6	0.00002
	Opera	Pyraclostrobin	10.331	0.02	3.8		0.2	0.0	0.02	0.2	0.00001
Wheat Insecticide	Mavrik 2F	Tau-fluvalinate	266.437	0.40	0.6	0.4	0.1	0.1	0.04	0.05	0.00185
	Cyperb 100	Cypermethrin	111.322	0.17		0.3	0.1	0.5	0.036	2	0.00280
	Fastac 50	Alpha-cypermethrin	86.874	0.13	0.4	0.3	0.1	0.3	0.01	2	0.00043
	Karate 2.5 WG	Lambda cyhalotrin	54.932	0.08	1.2	1.2	0.1	0.1	0.01	0.05	0.00008
	Pirimor G	Pirimicarb	31.123	0.05	0.5	0.2	0.1	0.1	0.01	0.01	0.00005
	Cythrin 500	Cypermethrin	22.661	0.03		0.1	0.0	0.6	0.036	2	0.00076
	Agros tau	Tau-fluvalinate	3.881	0.01	0.6		0.1	0.1	0.04	0.05	0.00003
Wheat Growth Regulator	Cycocel 750	Chlormequat	171.068	0.26	0.8		0.7	0.8	0.37	4	0.08048
	Moddus M	Trinexapac-ethyl	71.491	0.11	0.5		0.2	0.3	0.09	0.5	0.00289
	Cuadro 25 EC	Trinexapac-ethyl	30.643	0.05	0.5		0.2	0.3	0.09	0.5	0.00135
	Trece 750	Chlormequat	28.008	0.04	0.8		0.6	0.7	0.37	4	0.01128
	Medax Top	Mepiquat chloride	20.255	0.03	3.3		0.4	0.1	0.6		0.00203
	Medax Top	Prohexadione calcium	20.255	0.03	1.5		0.4	0.2	0.05	0.1	0.00037
	CCC 750	Chlormequat	18.180	0.03	0.8		0.7	0.8	0.37	4	0.00849
Rye Herbicides	Boxer	Prosulfocarb	61.148	0.59	5.0	5.0	1.1	0.2	0.005	0.01	0.00065
	DFF	Diflufenican	54.112	0.52	0.4	0.1	0.0	0.1	0.01	0.02	0.00063
	Oxitril CM	Ioxynil	36.947	0.35	2.0	0.2	0.2	0.1	0.02	0.05	0.00056
	Oxitril CM	Bromoxynil	36.947	0.35	2.0	0.2	0.2	0.1	0.025	0.05	0.00070
	Starane XL	Fluroxypyr	17.044	0.16	4.0	1.2	0.4	0.1	0.05	0.1	0.00078
	Starane XL	Florasulam	17.044	0.16	3.0	1.2	0.4	0.1	0.005	0.01	0.00010
	Stomp Pentagon	Pendimethalin	15.700	0.15	4.8	1.5	0.7	0.1	0.01	0.05	0.00021
	Briotril 400 EC	Ioxynil	13.284	0.13	2.5	0.2	0.2	0.1	0.02	0.05	0.00019
	Briotril 400 EC	Bromoxynil	13.284	0.13	1.7	0.2	0.2	0.1	0.025	0.05	0.00035
	Legacy 500 SC	Diflufenican	7.470	0.07	0.4	0.2	0.0	0.1	0.01	0.02	0.00008
	Stomp	Pendimethalin	7.003	0.07	4.0	1.0	0.6	0.2	0.01	0.05	0.00011
	Hussar OD	Iodosulfuron	6.953	0.07	0.1	0.1	0.0	0.3	0.005	0.01	0.00010
	Broadway	Florasulam	6.738	0.06	0.3	0.2	0.1	0.3	0.005	0.01	0.00010
	Broadway	Pyroxsulam	6.738	0.06	0.3	0.2	0.1	0.4	0.005	0.01	0.00012
	Glyfonova 450 Plus	Glyphosate	6.350	0.06	4.8	5.6	1.3	0.3	0.885	20	0.01439
	Cossack OD	Iodosulfuron	5.826	0.06	1.3	0.6	0.3	0.2	0.005	0.01	0.00007
	Cossack OD	Mesosulfuron	5.826	0.06	2.7	0.6	0.3	0.1	0.01	0.01	0.00007
	Roxy EC	Prosulfocarb	5.765	0.06	5.0	5.0	1.1	0.2	0.005	0.01	0.00006
	Mustang forte	Florasulam	5.621	0.05	1.5	1.0	0.3	0.2	0.005	0.01	0.00006
	Mustang forte	2.4d	5.621	0.05	6.9	1.0	0.3	0.1	0.025	0.05	0.00007
	Mustang forte	Aminopyralid	5.621	0.05		1.0	0.3	0.3	not found	0.1	0.00188
	Glyfonova 360 SL	Glyphosate	5.548	0.05	6.0	7.0	1.8	0.3	0.885	20	0.01440
	Accurate 20 WG	Metsulfuron-methyl	5.438	0.05	0.0	0.0	0.0	0.2	0.005	0.01	0.00006
	Lexus 50 WG	Flupyrsulfuron-methyl-Na	5.244	0.05	0.0		0.0	0.3	0.02	0.02	0.00030
	Atlantis OD	Iodosulfuron	5.053	0.05	5.0	0.9	0.2	0.0	0.005	0.01	0.00001
	Atlantis OD	Mesosulfuron	5.053	0.05	2.0	0.9	0.2	0.1	0.01	0.01	0.00005
	Nicanor 20 SG		4.493	0.04	0.0	0.0	0.0	0.2	0.005	0.01	0.00004

(*continued*)

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
		Metsulfuron-methyl									
	Primus XL	Florasulam	3.815	0.04	1.5		0.3	0.2	0.005	0.01	0.00004
	Primus XL	Fluroxypyr	3.815	0.04	4.0		0.3	0.1	0.05	0.1	0.00015
	Nuance WG	Tribenuron-methyl	3.763	0.04	0.0		0.0	0.1	0.005	0.01	0.00002
	Broadway (Floramix Alpha)	Florasulam	3.349	0.03	0.3		0.1	0.4	0.005	0.01	0.00006
	Broadway (Floramix Alpha)	Pyroxsulam	3.349	0.03	0.3		0.1	0.4	0.005	0.01	0.00007
	Express SX	Tribenuron-methyl	3.133	0.03	0.1		0.0	0.1	0.005	0.01	0.00002
	Ally SX	Metsulfuron-methyl	2.999	0.03	0.0		0.0	0.2	0.005	0.01	0.00003
	Ally ST	Metsulfuron-methyl	2.889	0.03	0.0		0.4	26.1	0.005	0.01	0.00362
Rye Growth Regulator	Cycocel 750	Chlormequat	14.279	0.14	2.0		0.9	0.5	0.59	4	0.03811
	Moddus M	Trinexapac-ethyl	7.826	0.08	0.5		0.3	0.6	0.09	0.5	0.00375
	Cerone	Etephon	4.809	0.05	1.5		0.4	0.2	0.05	0.5	0.00054
	Cuadro 25 EC	Trinexapac-ethyl	3.277	0.03	0.5		0.3	0.6	0.09	0.5	0.00181
	Trece 750	Chlormequat	2.068	0.02	2.0		0.7	0.4	0.59	4	0.00416
	Medax Top	Mepiquat chloride	1.715	0.02	3.3		0.5	0.1	0.6		0.00146
	Medax Top	Prohexadione calcium	1.715	0.02	1.5		0.5	0.3	0.05	0.1	0.00027
	Terpal	Mepiquat chloride	1.185	0.01	3.3		0.6	0.2	0.6		0.00119
	Terpal	Etephon	1.185	0.01	4.6		0.6	0.1	0.05	0.5	0.00007
	CCC 750	Chlormequat	1.042	0.01	2.0		0.6	0.3	0.59	4	0.00164
	Stabilan Extra	Chlormequat	701	0.01	2.0		0.8	0.4	0.59	4	0.00160
Rye Fungicides	Folicur EC 250	Tebuconazole	28.845	0.28	2.5		0.3	0.1	0.03	0.1	0.00099
	Proline EC 250	Prothioconazole	19.492	0.19	2.4		0.2	0.1	0.02	0.02	0.00027
	Rubric	Epoxiconazole	15.699	0.15	2.0		0.2	0.1	0.035	0.6	0.00058
	Prosaro 250 EC	Prothioconazole	15.613	0.15	4.8		0.3	0.1	0.02	0.02	0.00018
	Prosaro 250 EC	Tebuconazole	15.613	0.15	5.0		0.3	0.1	0.05	0.1	0.00042
	Comet	Pyraclostrobin	12.586	0.12	2.0		0.1	0.1	0.02	0.2	0.00017
	Orius 200 EW	Tebuconazole	10.169	0.10	3.1		0.3	0.1	0.03	0.1	0.00027
	Ceando	Epoxiconazole	9.481	0.09	3.0		0.2	0.1	0.035	0.6	0.00022
	Ceando	Metrafenon	9.481	0.09	3.0		0.2	0.1	0.01	0.07	0.00006
	Bell	Epoxiconazole	7.482	0.07	3.7		0.3	0.1	0.035	0.6	0.00018
	Bell	Boscalid	7.482	0.07	3.0		0.3	0.1	0.12	0.5	0.00084
	Flexity	Metrafenon	2.493	0.02	1.0		0.1	0.1	0.01	0.07	0.00002
	Opus	Epoxiconazole	2.488	0.02	2.0		0.2	0.1	0.035	0.6	0.00009
	Viverda	Epoxiconazole	1.677	0.02	5.0		0.7	0.1	0.035	0.6	0.00007
	Viverda	Pyraclostrobin	1.677	0.02	8.3		0.7	0.1	0.02	0.2	0.00003
	Viverda	Boscalid	1.677	0.02	5.0		0.7	0.1	0.12	0.5	0.00025
	Zenit 575 EC	Propiconazole	1.385	0.01	2.0		0.2	0.1	0.06	0.05	0.00008
	Zenit 575 EC	Fenpropidin	1.385	0.01	2.0		0.2	0.1	0.04	0.1	0.00006
Rye Insecticide	Cyperb 100	Cypermethrin	10.305	0.10		0.3	0.1	0.5	0.036	2	0.00184
	Fastac 50	Alpha-cypermethrin	9.492	0.09	0.4	0.3	0.1	0.4	0.01	2	0.00032
	Karate 2.5 WG	Lambda cyhalotrin	8.619	0.08	1.2		0.2	0.1	0.005	0.01	0.00005
	Cythrin 500	Cypermethrin	2.011	0.02		0.1	0.0	0.9	0.036	2	0.00061
	Mavrik 2F	Tau-fluvalinate	1.803	0.02	0.6		0.1	0.1	0.04	0.05	0.00007
	Cyperb 100 EW	Cypermethrin	979	0.01		0.3	0.1	0.5	0.036	2	0.00015
Apples & Pears Insecticide	Mospilan SG	Acetamiprid	781	0.44	0.8	0.5	0.3	0.4	0.03	0.8	0.00495
	Teppeki	Flonicamid	529	0.30	0.4	0.4	0.1	0.3	0.06	0.3	0.00496
	Steward	Indoxacarb	511	0.29	1.0	1.0	0.2	0.2	0.1	0.4	0.00526
	Pirimor G	Pirimicarb	462	0.26	1.5	0.2	0.3	0.2	0.286	0.5	0.01256
	Madex	Cydia pomonella granulosis virus (cpgv)	392	0.22		0.5	0.1	0.2	N.A.	N.A.	0.00000
	Movento SC 100	Spirotetramat	251	0.14	4.3	4.5	1.0	0.2	0.1	1	0.00337
	Karate 2.5 WG	Lambda cyhalotrin	173	0.10	1.2	0.8	0.7	0.6	0.02	0.08	0.00117
	DiPel DF	Bacillus thuringiensis	61	0.03			1.4		N.A.	N.A.	0.00000
Apples & Pears Fungicide	Delan WG	Dithianon	1.099	0.61	9.0		3.2	0.4	0.62	3	0.13548
	Merpan 80 WG	Captan	966	0.54	18.0		5.9	0.3	2.05	3	0.36413
	Scala	Pyrimethanil	882	0.49	7.5		1.7	0.2	0.77	15	0.08407
	Candit	Kresoxim-methyl	691	0.39	1.0		0.5	0.5	0.07	0.2	0.01306
	Dithane NT	Mancozeb	531	0.30	38.4		4.0	0.1	0.75	5	0.02304
	Signum WG	Boscalid	367	0.20	3.0		0.9	0.3	0.36	2	0.02249
	Signum WG	Pyraclostrobin	367	0.20	7.2		0.9	0.1	0.1	0.3	0.00262
	Kumulus S	Sulphur	220	0.12			12.7		N.A	N.A	0.00000
	Switch 62.5 WG	Cyprodinil	122	0.07	3.6		0.6	0.2	0.49	1.5	0.00561
	Switch 62.5 WG	Fludioxonil	122	0.07	3.6		0.6	0.2	0.19	5	0.00217

(*continued on next page*)

(*continued*)

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Delan 750 SC	Dithianon	44	0.02	8.4		2.6	0.3	0.62	3	0.00465
Apples & Pears Herbicide	Roundup Bio	Glyphosate	320	0.18	12.0		3.6	0.3	0.025	0.05	0.00134
	Glyfonova 450 Plus	Glyphosate	211	0.12	9.6		3.1	0.3	0.025	0.05	0.00096
	Jablo Glyfosat	Glyphosate	204	0.11	12.0		3.3	0.3	0.025	0.05	0.00079
	Glyphogan	Glyphosate	124	0.07	12.0		3.6	0.3	0.025	0.05	0.00053
	Reglone	Diquat	55	0.03	2.0		0.9	0.4	0.01	0.02	0.00013
* Pheromone traps used in Apples & Pears where not included since they are not sprayed on the crop.											
Carrot Herbicides	Fenix	Aclonifen	1.329	0.66	2.5		0.7	0.3	0.01	0.1	0.00182
	Command CS	Clomazone	837	0.41	0.3		0.2	0.5	0.005	0.01	0.00110
	Stomp	Pendimethalin	769	0.38	4.0		0.5	0.1	0.04	0.3	0.00196
	DFF	Diflufenican	764	0.38		0.3	0.1	0.4		0.05	0.00782
	Aramo	Tepraloxydim	742	0.37	2.0		0.9	0.5	0.13	0.4	0.02256
	Boxer	Prosulfocarb	427	0.21	5.0		0.4	0.1	0.19	1	0.00345
	Glyfonova 450 Plus	Glyphosate	378	0.19	9.6		2.4	0.2	0.025	0.05	0.00116
	Roundup Ultra	Glyphosate	312	0.15	12.0		0.2	0.0	0.025	0.05	0.00005
	Glyfonova 360 SL	Glyphosate	304	0.15	12.0		2.7	0.2	0.025	0.05	0.00083
	Reglone	Diquat	182	0.09		2.0	0.9	0.5		0.05	0.00210
	Stomp CS	Pendimethalin	100	0.05	3.5		0.1	0.0	0.04	0.3	0.00006
	Glyfosate 360	Glyphosate	100	0.05	12.0		0.6	0.0	0.025	0.05	0.00006
	Roundup Bio	Glyphosate	95	0.05	12.0		0.9	0.1	0.025	0.05	0.00009
Carrots Fungicide	Amistar	Azoxystrobin	827	0.41	4.0		0.5	0.1	0.05	1	0.00274
	Signum WG	Boscalid	459	0.23	2.0		1.0	0.5	0.09	2	0.01008
	Signum WG	Pyraclostrobin	459	0.23	2.0		1.0	0.5	0.03	0.1	0.00336
	Ortiva Top	Difenoconazol	428	0.21	3.0		1.0	0.3	0.05	0.2	0.00365
	Ortiva Top	Azoxystrobin	428	0.21	5.0		1.0	0.2	0.05	1	0.00219
Carrots Insecticide	Karate 2.5 WG	Lambda cyhalotrin	836	0.41	0.8		0.5	0.6	0.01	0.02	0.00243
	Pirimor G	Pirimicarb	362	0.18	1.5		0.2	0.2	0.01	0.05	0.00028
	Fastac 50	Alpha Cypermethrin*not approved for carrots in DK	100	0.05			0.0	1.0	not found	0.05	0.00248
Onions Herbicide	Totril	Ioxynil	1.140	0.97	7.1		1.3	0.2	0.02	0.2	0.00359
	Stomp	Pendimethalin	1.120	0.95	5.0		1.6	0.3	0.05	0.05	0.01473
	Aramo	Tepraloxydim	1.094	0.93	2.0		1.5	0.7	0.1		0.06811
	Fenix	Aclonifen	1.048	0.89	4.0		0.8	0.2	0.02	0.05	0.00364
	Boxer	Prosulfocarb	930	0.79	5.0		1.3	0.3	0.01	0.03	0.00197
	Reglone	Diquat	713	0.60		2.0	0.7	0.4		0.05	0.01079
	Glyfonova 450 Plus*	Glyphosate	392	0.33	9.6		1.6	0.2	0.025	0.05	0.00140
	Roundup Bio	Glyphosate	164	0.14	12.0		1.1	0.1	0.025	0.05	0.00031
	Glyfonova 360 SL	Glyphosate	110	0.09	12.0		0.8	0.1	0.025	0.05	0.00015
	LFS Glyphosat 360	Glyphosate	74	0.06	12.0		3.3	0.3	0.025	0.05	0.00043
	Glyfonova Plus	Glyphosate	67	0.06	12.0		1.4	0.1	0.025	0.05	0.00016
Onions Fungicides	Signum WG	Boscalid	1.115	0.94	4.5		1.2	0.3	0.05	5	0.01307
	Signum WG	Pyraclostrobin	1.115	0.94	3.0		1.2	0.4	0.02	0.05	0.00784
	Dithane NT	Mancozeb	1.098	0.93	12.3		4.6	0.4	0.17	1	0.05950
	Shirlan	Fluazinam	988	0.84	6.4		1.3	0.2	0.01	0.01	0.00174
	Acrobat New	Dimethomorph	974	0.83	9.0		4.6	0.5	0.2	0.6	0.08360
	Acrobat New	Mancozeb	974	0.83	13.9		4.6	0.3	0.17		0.04617
	Amistar	Azoxystrobin	865	0.73	4.0		0.7	0.2	0.005	0.01	0.00066
	ND Mastana SC	Mancozeb	54	0.05	20.3		2.0	0.1	0.17		0.00077
Onions Growth Regulator	Antergon MH	Maleinhydrazid	812	0.69	4.0		2.5	0.6	7.5		3.16192
Onions Insecticide	Karate 2.5 WG	Lambda cyhalotrin	593	0.50	0.6		0.2	0.3	0.01	0.06	0.00157
Tomato	Vertimec	Abamectin	15	0.42	10.8		1.7	0.1	0.031	0.02	0.00087
	Steward	Indoxacarb	15	0.42	0.8		0.6	0.3	0.03	0.5	0.00407
	Scala	Pyrimethanil	15	0.42	4.5		3.3	0.3	0.36	1	0.04744
	Conserve	Spinosad	10	0.29	19.3		7.0	0.2	0.25	1	0.01131
	Teldor WG 50	Fenhexamid	10	0.29	4.5		0.9	0.1	0.4	1	0.01034
	Switch 62.5 WG	Cyprodinil	10	0.29	3.0		0.7	0.1	0.17	1.5	0.00488
	Switch 62.5 WG	Fludioxonil	10	0.29	3.0		0.7	0.0	0.15	3	0.00145
	Floramite 240 SC	Bifenazate	10	0.29	1.5		0.2	0.3	0.14	0.5	0.01221
	Warrant 700 WG	Imidacloprid	10	0.29	0.7	0.4	1.1	1.0	0.1	0.5	0.02907
	Previcur Energy	Propamocarb	10	0.29	5.9		1.7	0.0	0.5	4	0.00612
	Previcur Energy	Fosetyl	10	0.29	51.0		1.7	0.0	11	100	0.00627
	Movento SC 100	Spirotetramat	5	0.13	5.8	5.8	1.3	0.0	0.44	2	0.00000
Cucumber	Vertimec	Abamectin	15	1.00	6.0		0.9	0.2	0.007	0.04	0.00032
	Plenum 50 WG	Pymetrozin	10	0.66	2.7		0.1	0.0	0.21		0.00185
	Scala	Pyrimethanil	10	0.66	6.0		0.2	0.0	0.24	0.6	0.00143
	Floramite 240 SC	Bifenazate	10	0.66	1.7		0.1	0.1	0.07	0.3	0.00094
	Previcur Energy	Propamocarb	10	0.66	14.0		5.0	0.4	1.6	5	0.11043

(*continued*)

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Previcur Energy	Fosetyl	10	0.66	41.0		5.0	0.1	26	75	0.61276
	Fungazil A	Imazalil	10	0.66		12.0	1.6	0.1	not found	0.2	0.00528
	Switch 62.5 WG	Cyprodinil	10	0.66	3.0		0.9	0.3	0.13	0.5	0.00723
	Switch 62.5 WG	Fludioxonil	10	0.66	3.0		0.9	0.3	0.1	1	0.00563
	Fungazil TM 100	Imazalil	5	0.33		6.0	1.5	0.2	not found	0.2	0.00496
	Amistar	Azoxystrobin	5	0.33	2.0		2.7	1.3	0.19	1	0.02356
Lettuce	Revus	Mandipropamid	1.148	1.00	1.2		0.2	0.1	5.65	25	0.83542
	Cyperb 100	Cypermethrin	1.126	0.98		0.3	0.3	1.1	0.74		0.77612
	Aliette 80 WG	Fosetyl	1.090	0.95	12.0		0.8	0.1	2.3	75	0.15113
	Fastac 50	Alpha-cypermethrin	1.090	0.95		0.4	0.2	0.5	not found	2	0.96408
	Signum WG	Boscalid	751	0.65	3.0		0.7	0.2	3.2	30	0.49158
	Signum WG	Pyraclostrobin	751	0.65	3.0		0.7	0.2	0.13	0.5	0.02010
	Amistar	Azoxystrobin	711	0.62	4.0		0.4	0.1	0.36	15	0.02187
	Mospilan SG	Acetamiprid	666	0.58	0.5		0.1	0.2	0.49	5	0.06915
	Movento SC 100	Spirotetramat	666	0.58	2.2	0.9	0.2	0.1	0.198		0.01044
	Roundup Bio	Glyphosate	446	0.39	12.0		1.2	0.1	0.025	0.05	0.00094
	Previcur Energy	Propamocarb	428	0.37	5.2		1.4	0.3	6.65	20	0.67956
	Previcur Energy	Fosetyl	428	0.37	31.0		1.4	0.0	2.3	75	0.03905
	Scala	Pyrimethanil	402	0.35	4.0		0.3	0.1	3.66		0.11159
	Pirimor G	Pirimicarb	402	0.35	1.5		0.0	0.0	0.056	0.15	0.00035
	Steward	Indoxacarb	402	0.35	0.2		0.1	0.4	0.27	2	0.03424
	Mirador 250 SC	Azoxystrobin	402	0.35	4.0		0.5	0.1	0.36	15	0.01689
	Spruzit Neu (frilandsgrønsager)	Pyrethrin I and II	153	0.13	26		3.9	0.1	0.1	0.3	0.00198
	Contans WG	Coniothyrium minitans	153	0.13			0.3		N.A.	N.A.	0.00000
	Confidor WG 70	Imidacloprid	27	0.02	0.2		0.1	0.8	0.05		0.00093
Peas With pods	Fighter 480	Bentazone	2.804	0.58	2.5		0.8	0.3	0.06	0.5	0.01116
	Stomp	Pendimethalin	2.270	0.47	2.3		1.1	0.5	0.05	0.05	0.01091
	Pirimor G	Pirimicarb	2.048	0.42	1.5		0.1	0.1	0.238	0.7	0.00939
	Karate 2.5 WG	Lambda cyhalotrin	1.810	0.38	0.6		0.2	0.4	0.01	0.2	0.00136
	Amistar	Azoxystrobin	1.352	0.28	2.0		0.3	0.2	0.12	3	0.00531
	Mavrik 2F	Tau-fluvalinate	1.195	0.25	0.6		0.1	0.3	0.09		0.00565
	Cyperb 100	Cypermethrin	1.102	0.23		0.3	0.2	0.6	0.04	0.7	0.00566
	Stomp CS	Pendimethalin	1.059	0.22	2.0		0.8	0.4	0.05	0.05	0.00443
	Glyfonova 450 Plus	Glyphosate	816	0.17		3.2	1.8	0.6	not found	0.1	0.00939
	Basagran M 75	Bentazone	805	0.17	4.9		1.2	0.2	0.06	0.5	0.00239
	Basagran M 76	Mcpa	805	0.17		1.5	1.2	0.8	not found	0.1	0.01295
	Fenix	Aclonifen	773	0.16	4.0		0.7	0.2	0.02	0.05	0.00054
	Fastac 50	Alpha-cypermethrin	710	0.15	0.3		0.2	0.7	0.01	0.1	0.00107
	Signum WG	Boscalid	605	0.13	3.0		0.5	0.2	0.64	3	0.01333
	Signum WG	Pyraclostrobin	605	0.13	2.1		0.5	0.2	not found	0.02	0.00060
	Agil 100 EC	Propaquizafop	579	0.12		0.9	0.5	0.5	not found	0.2	0.01260
	Command CS	Clomazone	451	0.09	0.3		0.2	0.5	0.005	0.01	0.00022
	Bentazone 480	Bentazone	409	0.08	2.5		0.9	0.3	0.06	0.5	0.00176
	Glyfonova 360 SL	Glyphosate	402	0.08		4.0	2.7	0.7	not found	0.1	0.00555
	Mirador 250 SC	Azoxystrobin	379	0.08	2.0		0.2	0.1	0.12	3	0.00082
	Roundup Bio	Glyphosate	229	0.05		4.0	2.7	0.7	not found	0.1	0.00321
	Glyphogan	Glyphosate	218	0.05		4.0	2.6	0.6	not found	0.1	0.00291
	Focus Ultra	Cycloxydim	164	0.03	9.0	5.0	0.7	0.1	0.3	2	0.00076
Peas without pods	Fighter 480	bentazone	2.804	0.58	2.5		0.8	0.3	0.03	0.2	0.00558
	Stomp	pendimethalin	2.270	0.47	2.3		1.1	0.5	0.01	0.03	0.00218
	Pirimor G	pirimicarb	2.048	0.42	1.5		0.1	0.1	0.01	0.01	0.00039
	Karate 2.5 WG	lambda cyhalotrin	1.810	0.38	0.6		0.2	0.4	0.01	0.2	0.00136
	Amistar	azoxystrobin	1.352	0.28	2.0		0.3	0.2	0.06	3	0.00266
	Mavrik 2F	tau-fluvalinate	1.195	0.25	0.6		0.1	0.3	0.01		0.00063
	Cyperb 100	cypermethrin	1.102	0.23		0.3	0.2	0.6	0.22	0.7	0.03116
	Stomp CS	pendimethalin	1.059	0.22	2.0		0.8	0.4	0.01	0.03	0.00089
	Glyfonova 450 Plus	glyphosate	816	0.17		3.2	1.8	0.6	not found	0.1	0.00939
	Basagran M 75	bentazone	805	0.17	4.9		1.2	0.2	0.03	0.2	0.00120
	Basagran M 76	MCPA	805	0.17		1.5	1.2	0.8	not found	0.1	0.01295
	Fenix	aclonifen	773	0.16	4.0		0.7	0.2	0.01	0.05	0.00027
	Fastac 50	alpha-cypermethrin	710	0.15	0.3		0.2	0.7	0.01		0.00107
	Signum WG	boscalid	605	0.13	3.0		0.5	0.2	0.05	3	0.00104
	Signum WG	pyraclostrobin	605	0.13	2.1		0.5	0.2	0.02	0.02	0.00060
	Agil 100 EC	propaquizafop	579	0.12		0.9	0.5	0.5	not found	0.05	0.00315
	Command CS	clomazone	451	0.09	0.3		0.2	0.5	0.005	0.01	0.00022
	Bentazone 480	bentazone	409	0.08	2.5		0.9	0.3	0.03	0.2	0.00088
	Glyfonova 360 SL	glyphosate	402	0.08		4.0	2.7	0.7	not found	0.1	0.00555

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Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Mirador 250 SC	azoxystrobin	379	0.08	2.0		0.2	0.1	0.06	3	0.00041
	Roundup Bio	glyphosate	229	0.05		4.0	2.7	0.7	not found	0.1	0.00321
	Glyphogan	glyphosate	218	0.05		4.0	2.6	0.6	not found	0.1	0.00291
	Focus Ultra	cycloxydim	164	0.03	9.0	5.0	0.7	0.1	7.89	20	0.01986
Leek	Totril	ioxynil	266	0.84	7.1		1.3	0.2	0.87	3	0.13617
	Aramo	tepraloxydim	246	0.78	2.0		1.2	0.6	0.1	0.3	0.04575
	Amistar	azoxystrobin	242	0.77	4.0		1.1	0.3	0.08	0.08	0.01694
	Folicur EC 250	tebuconazole	231	0.74	3.0		1.3	0.4	0.21	0.6	0.06763
	Karate 2.5 WG	lambda cyhalotrin	225	0.71	0.8		0.5	0.6	0.05	0.3	0.02261
	Signum WG	boscalid	212	0.67	4.5		0.9	0.2	0.93	5	0.12055
	Signum WG	pyraclostrobin	212	0.67	4.5		0.9	0.2	0.22	0.5	0.02852
	Boxer	Prosulfocarb	178	0.57	5.0		1.7	0.3	0.005	0.01	0.00095
	Stomp	pendimethalin	128	0.41	5.0		1.0	0.2	0.05	0.05	0.00419
	Vertimec	abamectin	118	0.38	1.5		0.8	0.6	0.006	0.01	0.00127
	Stomp CS	pendimethalin	118	0.38	4.4		1.6	0.4	0.05	0.05	0.00682
	Ortiva Top	difenoconazol	89	0.28		0.6	0.6	1.0	0.13	0.5	0.03794
	Ortiva Top	azoxystrobin	89	0.28	5.0		0.6	0.1	0.08	0.08	0.00280
	Jablo Glyfosat	glyphosate	29	0.09	12.0		0.5	0.0	0.025	0.05	0.00010
	Reglone	diquat	27	0.09		2.0	1.5	0.7		0.05	0.00312
Plum	Signum WG	boscalid	36	0.58	2.0		1.1	0.6	0.13	3	0.04293
	Signum WG	pyraclostrobin	36	0.58	2.2		1.1	0.5	0.04	0.2	0.01185
	Karate 2.5 WG	lambda cyhalotrin	29	0.47	1.2		0.6	0.5	0.01	0.2	0.00244
	Dithane NT	mancozeb	21	0.34	12.8		2.8	0.2	0.1		0.00737
	Delan WG	dithianon	14	0.24		2.0	1.5	0.7		0.5	0.08794
	Roundup Bio	glyphosate	13	0.21	12.0		2.5	0.2	0.025	0.05	0.00108
	Pirimor G	pirimicarb	8	0.13	2.2		0.2	0.1	0.418	1.5	0.00498
	Metaxon	MCPA	6	0.09		1.0	0.6	0.6	0.025	0.05	0.00130
	Mospilan SG	acetamiprid	5	0.08	0.5		0.2	0.5	0.01	0.02	0.00039
	Glyfonova 450 Plus	glyphosate	3	0.06	9.6		3.1	0.3	0.025	0.05	0.00045
	Jablo Glyfosat	glyphosate	3	0.05	12.0		4.5	0.4	0.025	0.05	0.00043
	SweDane MCPA 750	MCPA	2	0.04		1.0	0.9	0.9	0.025	0.05	0.00086
	Switch 62.5 WG	cyprodinil	2	0.03	3.6		0.6	0.2	0.11	0.4	0.00059
	Switch 62.5 WG	fludioxonil	2	0.03	3.0		0.6	0.2	0.11	0.3	0.00071
	Glyphogan	glyphosate	2	0.03	12.0		4.0	0.3	0.025	0.05	0.00022
Strawberry Herbicides	Boxer	Prosulfocarb	638	0.44		5.0	1.8	0.4	not found	0.05	0.00787
	Kerb 400 SC	propyzamid	559	0.38	3.5		0.7	0.2	0.01	0.01	0.00078
	Stomp	pendimethalin	447	0.31	5.0		1.1	0.2	0.05	0.05	0.00340
	Betanal	phenmedipham	431	0.30	8.0		1.9	0.2	0.02	0.16	0.00138
	Focus Ultra	cycloxydim	223	0.15		5.0	1.0	0.2		3	0.09079
	Reglone	diquat	209	0.14	4.0	2.5	2.1	0.5	0.01	0.05	0.00074
	Matrigon 72 SG	clopyralid	199	0.14		0.0	0.0	0.7		0.5	0.04933
	Goltix SC 700	metamitron	178	0.12		2.0	0.4	0.2		0.1	0.00246
	Stomp CS	pendimethalin	108	0.07	4.4		0.9	0.2	0.05	0.05	0.00073
	Roundup Bio	glyphosate	91	0.06		4.0	0.9	0.2	not found	0.1	0.00137
	Glyfonova 450 Plus	glyphosate	49	0.03		4.0	0.6	0.2	not found	0.1	0.00052
	Goliath	metamitron	48	0.03		2.0	0.3	0.2		0.1	0.00055
Strawberry Fungicides	Signum WG	boscalid	777	0.53	3.6		1.6	0.4	0.46	10	0.10903
	Signum WG	pyraclostrobin	777	0.53	3.7		1.6	0.4	0.1	0.5	0.02319
	Teldor WG 50	fenhexamid	708	0.49	4.5		1.1	0.2	1.4	5	0.16871
	Candit	kresoxim-methyl	521	0.36	0.9		0.2	0.2	0.07	0.2	0.00445
	Amistar	azoxystrobin	521	0.36	4.0		0.6	0.2	0.56	10	0.03184
	Frupica SC	mepanipyrim	461	0.32	1.8		0.5	0.3	0.4		0.03785
	Switch 62.5 WG	cyprodinil	393	0.27	3.0		0.5	0.2	0.44	5	0.02013
	Switch 62.5 WG	fludioxonil	393	0.27	3.0		0.5	0.2	0.27	3	0.01252
	Tilt 250 EC	propiconazole	367	0.25		1.0	0.6	0.6	not found	0.05	0.00752
	Scala	pyrimethanil	346	0.24	4.0		0.9	0.2	1.15	5	0.06012
	Aliette 80 WG	fosetyl AL	241	0.17	15.0		1.2	0.1	9.65	60	0.13248
	Kumulus S	sulphur	107	0.07			3.5		not found		0.00000
	Mirador 250 SC	azoxystrobin	67	0.05	4.0		0.4	0.1	0.56	10	0.00237
Strawberry Insecticides	Karate 2.5 WG	lambda cyhalotrin	668	0.46	1.0		0.2	0.2	0.01	0.5	0.00108
	Biscaya OD 240	thiacloprid	486	0.33	1.0		0.2	0.2	0.07	0.2	0.00453
	Fastac 50	alpha-cypermethrin	339	0.23	0.3		0.2	0.6	0.01	0.05	0.00149
	Pirimor G	pirimicarb	131	0.09	1.5		0.1	0.1	0.253		0.00223
	Milbeknock	milbemectin	110	0.08	2.5		1.3	0.5	0.02	0.02	0.00081
	Danitron 5 SC	fenpyroximat	84	0.06	1.9		0.6	0.3	0.06	1	0.00101
	Sluxx	iron III phosphate	72	0.05			5.8				0.00000
	Floramite 240 SC	bifenazate	45	0.03	1.7		0.0	0.0	0.18	3	0.00004
Celeriac	Fenix	aclonifen	69	0.62	2.5		0.4	0.2	0.01	0.1	0.00099
	Karate 2.5 WG	lambda cyhalotrin	69	0.61	0.6		0.3	0.5	0.03	0.1	0.00982
	Amistar	azoxystrobin	67	0.60	2.0		1.5	0.7	0.08	1	0.03517
	Boxer	Prosulfocarb	12	0.11	5.0		0.7	0.1	0.03	0.08	0.00041

(*continued*)

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Glyfonova 450 Plus	glyphosate	9	0.08	9.6		2.0	0.2	0.025	0.05	0.00042
	Cyperb 100	cypermethrin	3	0.03		0.3	0.3	0.9		2	0.04670
	Mirador 250 SC	azoxystrobin	3	0.02	2.0		1.0	0.5	0.08	1	0.00100
Broccoli	Karate 2.5 WG	lambda cyhalotrin	284	1.00	1.6		0.6	0.4	0.02	0.1	0.00744
	Steward	indoxacarb	281	0.99	0.3		0.6	2.2	0.07	0.3	0.15568
	Amistar	azoxystrobin	234	0.82	4.0		0.2	0.0	0.03	5	0.00117
	Pirimor G	pirimicarb	230	0.81		0.3	0.2	0.8	not found	0.5	0.30914
	Fastac 50	alpha-cypermethrin	230	0.81	0.3		0.4	1.6	0.016	0.5	0.02068
	Dithane NT	mancozeb	210	0.74	11.2		0.8	0.1	0.25		0.01371
	Cyperb 100	cypermethrin	210	0.74		0.3	0.2	0.7		1	0.48200
	Signum WG	boscalid	189	0.67	3.0		0.8	0.3	0.05	not found	0.00913
	Signum WG	pyraclostrobin	189	0.67	3.1		0.8	0.3	0.02	0.1	0.00350
	Stomp	pendimethalin	159	0.56	4.1		0.1	0.0	0.05	0.05	0.00086
	Reglone	diquat	159	0.56		2.0	0.1	0.0		0.05	0.00070
	Ortiva Top	difenoconazol	159	0.56	3.0		0.9	0.3	0.04	0.2	0.00657
	Ortiva Top	azoxystrobin	159	0.56	5.0		0.9	0.2	0.03	5	0.00296
	Movento SC 100	spirotetramat	41	0.14	1.4		0.0	0.0	0.31	0.6	0.00115
	Glyfonova 360 SL	glyphosate	30	0.11	12.0		0.3	0.0	0.025	0.05	0.00007
Cauliflower	Karate 2.5 WG	lambda cyhalotrin	308	0.98	1.6		0.6	0.3	0.02	0.2	0.00680
	Steward	indoxacarb	256	0.81	0.3		0.1	0.2	0.07	0.3	0.01348
	Fastac 50	alpha-cypermethrin	175	0.56	0.3		0.2	0.8	0.01	0.5	0.00453
	Cyperb 100	cypermethrin	166	0.53		0.3	0.2	0.8		0.5	0.21766
	Pirimor G	pirimicarb	146	0.46		0.3	0.3	0.9	not found	0.5	0.19726
	Amistar	azoxystrobin	146	0.46	4.0		0.4	0.1	0.03	5	0.00122
	Signum WG	boscalid	105	0.33	3.0		0.4	0.1	0.05		0.00217
	Signum WG	pyraclostrobin	105	0.33	3.1		0.4	0.1	0.02	0.1	0.00083
	Glyfonova 450 Plus	glyphosate	76	0.24	9.6		2.8	0.3	0.025	0.05	0.00174
	Ortiva Top	difenoconazol	70	0.22		1.0	0.2	0.2	0.03	0.2	0.00143
	Ortiva Top	azoxystrobin	70	0.22	5.0		0.2	0.0	0.03	5	0.00029
	Movento SC 100	spirotetramat	63	0.20	1.4		0.2	0.1	0.31	0.6	0.00743
	Confidor WG 70	imidacloprid	40	0.13	0.1		0.0	0.3	0.05		0.00171
Head Cabbage	Karate 2.5 WG	lambda cyhalotrin	517	0.65	1.6		0.4	0.2	0.04	0.2	0.00600
	Amistar	azoxystrobin	384	0.49	4.0		3.9	1.0	0.01	5	0.00469
	Signum WG	boscalid	338	0.43	3.0		1.0	0.3	0.05	5	0.00695
	Signum WG	pyraclostrobin	338	0.43	3.1		1.0	0.3	0.02	0.2	0.00266
	Fastac 50	alpha-cypermethrin	303	0.38	0.3		0.2	0.9	0.01	0.5	0.00328
	Pirimor G	pirimicarb	240	0.30	1.5		0.1	0.1	0.1	0.1	0.00297
	Steward	indoxacarb	222	0.28	0.3		0.1	0.4	0.02	3	0.00241
	Ortiva Top	difenoconazol	214	0.27		1.0	0.6	0.6	0.02	0.2	0.00345
	Ortiva Top	azoxystrobin	214	0.27	5.0		0.6	0.1	0.01	5	0.00035
	Cyperb 100	cypermethrin	168	0.21		0.3	0.2	0.9	0.02		0.00379
	Movento SC 100	spirotetramat	148	0.19	1.4		0.6	0.4	0.11	0.3	0.00798
	Command CS	clomazone	138	0.18	0.3		0.2	0.7	0.005	0.01	0.00062
	Cyperb 100 EW	cypermethrin	100	0.13		0.3	0.1	0.5	0.02		0.00121
	Roundup Bio	glyphosate	83	0.11	12.0		1.5	0.1	0.025	0.05	0.00033
	Stomp	pendimethalin	48	0.06	4.1		0.9	0.2	0.05	0.05	0.00065
	Glyfonova 450 Plus	glyphosate	47	0.06	9.6		3.2	0.3	0.025	0.05	0.00049
	Mirador 250 SC	azoxystrobin	40	0.05	4.0		0.9	0.2	0.01	5	0.00011
	Cythrin 500	cypermethrin	37	0.05		0.3	0.0	0.2	0.02		0.00018
	Matrigon 72 SG	clopyralid	37	0.05		0.1	0.0	0.3	0.23	0.5	0.00299
	Activus 40 WG	pendimethalin	30	0.04	4.1		0.9	0.2	0.05	0.05	0.00040
Oats	Oxitril CM	ioxynil	7.653	0.22	2.3		0.2	0.1	0.02	0.05	0.00035
Herbicides	Oxitril CM	bromoxynil	7.653	0.22	2.0		0.2	0.1	0.025	0.05	0.00050
	Starane XL	florasulam	5.806	0.17	3.0		0.3	0.1	0.005	0.01	0.00008
	Starane XL	fluroxypyr	5.806	0.17	4.0		0.3	0.1	0.05	0.1	0.00063
	Express SX	tribenuron-methyl	5.359	0.15	0.0		0.0	0.3	0.005	0.01	0.00020
	Nuance WG	tribenuron-methyl	5.093	0.15	0.0		0.0	0.8	0.005	0.01	0.00056
	Express ST	tribenuron-methyl	3.781	0.11	0.0		0.7	16.1	0.005	0.01	0.00873
	Tomahawk 180 EC	fluroxypyr	3.308	0.09	2.2		0.2	0.1	0.05	0.1	0.00047
	Briotril 400 EC	ioxynil	3.281	0.09	2.8		0.2	0.1	0.02	0.05	0.00013
	Briotril 400 EC	bromoxynil	3.281	0.09	1.7		0.2	0.1	0.025	0.05	0.00028
	Mustang forte	florasulam	2.743	0.08	1.5		0.4	0.2	0.005	0.01	0.00009
	Mustang forte	2.4D	2.743	0.08	5.6		0.4	0.1	0.025	0.05	0.00013
	Mustang forte	aminopyralid	2.743	0.08	5.6	0.8	0.4	0.5	not found	0.1	0.00376
	Glyfonova 360 SL	glyphosate	2.697	0.08	6.0		1.7	0.3	5.85	30	0.12624
	Glyfonova 450 Plus	glyphosate	2.008	0.06	4.8		1.8	0.4	5.85	30	0.12389
	Trimmer 50 SG	tribenuron-methyl	1.856	0.05	0.0		0.0	0.2	0.005	0.01	0.00004
	Lodin	fluroxypyr	1.772	0.05	2.2		0.2	0.1	0.05	0.1	0.00023
	Metaxon	MCPA	1.021	0.03		1.0	0.6	0.6	0.025	0.05	0.00045

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Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Glyphogan	glyphosate	998	0.03	6.0		1.7	0.3	5.85	30	0.04698
	Starane 180S	fluroxypyr	994	0.03	2.2		0.3	0.1	0.05	0.1	0.00016
	Accurate 20 WG	metsulfuron-methyl	964	0.03	0.0		0.0	0.2	0.005	0.01	0.00003
	Primus XL	florasulam	861	0.02	1.5		0.3	0.2	0.005	0.01	0.00002
	Primus XL	fluroxypyr	861	0.02	4.0		0.3	0.1	0.05	0.1	0.00009
	Express Gold SX	tribenuron-methyl	853	0.02	0.1		0.0	0.1	0.005	0.01	0.00001
	Express Gold SX	metsulfuron-methyl	853	0.02	0.1		0.0	0.1	0.005	0.01	0.00001
	Nicanor 20 SG	metsulfuron-methyl	733	0.02	0.0		0.0	0.2	0.005	0.01	0.00003
	Glyfosate 360	glyphosate	639	0.02	6.0		1.7	0.3	5.85	30	0.02975
	MCPA 750	MCPA	501	0.01		1.0	0.6	0.6	0.025	0.05	0.00020
	Harmony Plus ST	tribenuron-methyl	467	0.01	0.1		0.8	6.4	0.005	0.01	0.00043
	Harmony Plus ST	trifensulfuron-methyl	467	0.01	0.2		0.8	4.6	0.01	0.01	0.00062
	Ally ST	metsulfuron-methyl	443	0.01	0.0		0.5	30.7	0.005	0.01	0.00195
	Lodin 200 EC	fluroxypyr	435	0.01	2.0		0.2	0.1	0.05	0.1	0.00005
	Roundup Bio	glyphosate	424	0.01	6.0		1.8	0.3	5.85	30	0.02089
	SweDane MCPA 750	MCPA	407	0.01		1.0	0.5	0.5	0.025	0.05	0.00016
Oats	Folicur EC 250	tebuconazole	6.216	0.18	2.5		0.2	0.1	0.05	0.3	0.00078
Fungicides	Comet	pyraclostrobin	3.082	0.09	2.0		0.1	0.1	0.07	0.3	0.00037
	Prosaro 250 EC	prothioconazole	2.112	0.06	3.2		0.2	0.1	0.02	0.02	0.00009
	Prosaro 250 EC	tebuconazole	2.112	0.06	5.0		0.2	0.0	0.05	0.3	0.00015
	Rubric	epoxiconazole	2.013	0.06	2.0		0.2	0.1	0.03	0.2	0.00016
	Orius 200 EW	tebuconazole	1.964	0.06	3.1		0.2	0.1	0.05	0.3	0.00022
	Proline EC 250	prothioconazole	1.888	0.05	1.6		0.2	0.1	0.02	0.02	0.00011
	Bell	boscalid	1.603	0.05	3.0		0.2	0.1	1.07	3	0.00384
	Bell	epoxiconazole	1.603	0.05	3.7		0.2	0.1	0.03	0.2	0.00009
	Zenit 575 EC	propiconazole	1.215	0.03	2.0		0.2	0.1	0.09	0.2	0.00036
	Zenit 575 EC	fenpropidin	1.215	0.03	5.0		0.2	0.0	0.08	0.3	0.00013
	Ceando	epoxiconazole	990	0.03	3.0		0.2	0.1	0.03	0.2	0.00006
	Ceando	metrafenon	990	0.03	3.0		0.2	0.1	0.09	0.6	0.00019
	Flexity	metrafenon	632	0.02	1.0		0.1	0.1	0.09	0.6	0.00018
	Amistar	azoxystrobin	615	0.02	3.0		0.2	0.1	0.04	0.5	0.00004
	Tern	fenpropidin	546	0.02	3.0		0.2	0.1	0.08	0.3	0.00008
	Bumber 25 EC	propiconazole	433	0.01	1.0		0.1	0.1	0.09	0.2	0.00016
	Opus	epoxiconazole	431	0.01	2.0		0.2	0.1	0.03	0.2	0.00003
Oats Growth	Fastac 50	alpha-cypermethrin	2.693	0.08	0.4		0.1	0.4	0.02	2	0.00058
Regulators	Cyperb 100	cypermethrin	2.519	0.07		0.3	0.1	0.6	0.036		0.00147
	Karate 2.5 WG	lambda cyhalotrin	1.742	0.05	1.2		0.1	0.1	0.09	0.5	0.00055
	Pirimor G	pirimicarb	1.635	0.05	0.6		0.1	0.1	0.01	0.01	0.00005
	Mavrik 2F	tau-fluvalinate	1.338	0.04	0.4		0.1	0.2	0.1		0.00081
	Cythrin 500	cypermethrin	586	0.02		0.1	0.0	0.8	0.036		0.00049
Oats	Cycocel 750	Chlormequat	2.535	0.07	2.0		0.9	0.5	3.1	9	0.10398
Growth Regulator	Moddus M	trinexapac	452	0.01	0.5		0.2	0.3	0.09	0.5	0.00034
Spring Barley	Oxitril CM	ioxynil	190.016	0.39	2.3		0.2	0.1	0.02	0.05	0.00052
Herbicide	Oxitril CM	bromoxynil	190.016	0.39	2.0		0.2	0.1	0.025	0.05	0.00073
	DFF	diflufenican	129.786	0.26	0.5		0.0	0.1	0.01	0.05	0.00019
	Express SX	tribenuron-methyl	109.243	0.22	0.1		0.0	0.2	0.005	0.01	0.00020
	Nuance WG	tribenuron-methyl	104.467	0.21	0.0		0.0	0.2	0.005	0.01	0.00018
	Starane XL	florasulam	92.581	0.19	3.0		0.2	0.1	0.005	0.01	0.00008
	Starane XL	fluroxypyr	92.581	0.19	4.0		0.2	0.1	0.05	0.1	0.00059
	Hussar OD	iodosulfuron	88.218	0.18	0.1		0.0	0.2	0.005	0.01	0.00018
	Briotril 400 EC	ioxynil	83.418	0.17	2.8		0.2	0.1	0.02	0.05	0.00022
	Briotril 400 EC	bromoxynil	83.418	0.17	1.7		0.2	0.1	0.025	0.05	0.00046
	Glyfonova 450 Plus	glyphosate	75.958	0.15	4.8		6.2	1.3	5.85	30	1.16613
	Primera Super	fenoxaprop-p ethyl	69.131	0.14	2.6		0.3	0.1	0.01	0.02	0.00015
	Tomahawk 180 EC	fluroxypyr	66.838	0.14	2.2		0.2	0.1	0.05	0.1	0.00056
	Glyfonova 360 SL	glyphosate	58.486	0.12	6.0		1.6	0.3	5.85	30	0.18242
	Express ST	tribenuron-methyl	57.799	0.12	0.1		0.6	10.0	0.005	0.01	0.00588
	Lodin	fluroxypyr	54.504	0.11	2.2		0.2	0.1	0.05	0.1	0.00047
	Metaxon	MCPA	50.547	0.10		1.0	0.5	0.5	0.025	0.05	0.00117
	Mustang forte	florasulam	42.432	0.09	1.5		0.3	0.2	0.005	0.01	0.00008
	Mustang forte	2.4D	42.432	0.09	5.6		0.3	0.1	0.025	0.05	0.00011
	Mustang forte	aminopyralid	42.432	0.09		0.8	0.3	0.4	not found	0.1	0.00326
	Foxtrot	fenoxaprop-p ethyl	40.703	0.08	2.6		0.3	0.1	0.01	0.02	0.00009
	Trimmer 50 SG	tribenuron-methyl	36.540	0.07	0.1		0.0	0.1	0.005	0.01	0.00004
	Glyfosate 360	glyphosate	25.845	0.05	6.0		1.6	0.3	5.85	30	0.08465

(*continued*)

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Fighter 480	bentazone	24.925	0.05	3.1		0.3	0.1	0.06	0.1	0.00033
	Legacy 500 SC	diflufenican	23.494	0.05	0.5		0.0	0.1	0.01	0.05	0.00003
	MCPA 750	MCPA	22.040	0.04		1.0	0.4	0.4	0.025	0.05	0.00049
	Glyphogan	glyphosate	21.328	0.04	6.0		1.5	0.3	5.85	30	0.06528
	Starane 180S	fluroxypyr	20.442	0.04	2.2		0.2	0.1	0.05	0.1	0.00016
	SweDane MCPA 750	MCPA	18.712	0.04		1.0	0.6	0.6	0.025	0.05	0.00054
	Accurate 20 WG	metsulfuron-methyl	17.247	0.04	0.0		0.0	0.2	0.005	0.01	0.00003
	Roundup Bio	glyphosate	16.342	0.03	6.0		1.4	0.2	5.85	30	0.04695
	Express Gold SX	tribenuron-methyl	16.205	0.03	0.1		0.0	0.2	0.005	0.01	0.00004
	Express Gold SX	metsulfuron-methyl	16.205	0.03	0.1		0.0	0.4	0.005	0.01	0.00007
	Stomp	pendimethalin	14.913	0.03	4.0		0.3	0.1	0.01		0.00002
	Nicanor 20 SG	metsulfuron-methyl	14.442	0.03	0.0		0.0	0.2	0.005	0.01	0.00003
	Primus XL	florasulam	13.703	0.03	1.5		0.2	0.2	0.005	0.01	0.00002
	Primus XL	fluroxypyr	13.703	0.03	4.0		0.2	0.1	0.05	0.1	0.00009
	Fluxyr 200 EC	fluroxypyr	13.491	0.03	2.0		0.2	0.1	0.05	0.1	0.00013
	Jablo Glyfosat	glyphosate	13.096	0.03	6.0		1.6	0.3	5.85	30	0.04131
Spring Barley Fungicides	Proline EC 250	prothioconazole	198.162	0.40	1.6		0.2	0.1	0.02	0.02	0.00095
	Comet	pyraclostrobin	197.772	0.40	2.0		0.1	0.1	0,084	0.3	0,00217
	Prosaro 250 EC	prothioconazole	109.786	0.22	3.2		0.3	0.1	0.02	0.02	0.00043
	Prosaro 250 EC	tebuconazole	109.786	0.22	5.0		0.3	0.1	0,0255	0.3	0,00035
	Folicur EC 250	tebuconazole	106.031	0.22	2.5		0.2	0.1	0,0255	0.3	0,00039
	Rubric	epoxiconazole	90.797	0.19	2.0		0.2	0.1	0,04425	1	0,00077
	Bell	boscalid	72.315	0.15	3.0		0.2	0.1	0,5136	3	0,00604
	Bell	epoxiconazole	72.315	0.15	3.7		0.2	0.1	0,04425	1	0,00042
	Orius 200 EW	tebuconazole	62.832	0.13	3.1		0.2	0.1	0,0255	0.3	0,00021
	Opera	epoxiconazole	21.389	0.04	5.0		0.3	0.1	0,04425	1	0,00011
	Opera	pyraclostrobin	21.389	0.04	3.8		0.3	0.1	0,084	0.3	0,00028
	Bumber 25 EC	propiconazole	16.758	0.03	1.0		0.2	0.2	0,09	0.2	0,00048
	Amistar	azoxystrobin	14.677	0.03	3.0		0.1	0.0	0,0076	0.5	0,00001
	Opus	epoxiconazole	12.847	0.03	2.0		0.2	0.1	0,04425	1	0,00009
	Ceando	epoxiconazole	11.166	0.02	3.0		0.2	0.1	0,04425	1	0,00006
	Ceando	metrafenon	11.166	0.02	3.0		0.2	0.1	0,09	0.6	0,00012
	Viverda	epoxiconazole	11.022	0.02	5.0		0.3	0.1	0,04425	1	0,00006
	Viverda	boscalid	11.022	0.02	5.0		0.3	0.1	0,5136	3	0,00073
	Viverda	pyraclostrobin	11.022	0.02	8.3		0.3	0.0	0,084	0.3	0,00007
Spring Barley Insecticides	Fastac 50	alpha cypermethrin	63.886	0.13	0.3		0.1	0.4	0,0132	2	0,00063
	Cyperb 100	cypermethrin	62.260	0.13		0.3	0.1	0.5	0,02376		0,00148
	Karate 2.5 WG	lambda cyhalotrin	59.897	0.12	1.2		0.1	0.1	0.09	0.5	0.00115
	Pirimor G	pirimicarb	53.975	0.11	0.6		0.1	0.1	0,0007	0.01	0,00001
	Mavrik 2F	tau-fluvalinate	35.010	0.07	0.4		0.1	0.2	0.0025		0.00003
	Cythrin 500	cypermethrin	11.635	0.02		0.1	0.0	0.7	0,02376		0,00039
Spring Barley Growth Regulator	Moddus M	trinexapac	16.157	0.03	0.7		0.2	0.2	0,063	0.5	0,00046
Sugar Beet	Opera	pyraclostrobin	31.450	0.88	2.0		0.7	0.3	0.02	0.05	0.00599
	Opera	epoxiconazole	31.450	0.88	5.0		0.7	0.1	0.025	0.05	0.00300
	Rubric	epoxiconazole	6.201	0.17	2.0		0.3	0.2	0.025	0.05	0.00067
	Opus	epoxiconazole	1.135	0.03	2.0		0.3	0.2	0.025	0.05	0.00013
	Safari	triflusulfuron-methyl	33.643	0.94	0.1		0.0	0.2	0.01	0.02	0.00209
	Goltix SC 700	metamitron	22.285	0.62	5.0		2.4	0.5	0.05	0.05	0.01485
	Ethosan SC	ethofumesate	21.609	0.60	2.0		0.1	0.1	0.05	0.5	0.00192
	Betanal Power	desmedipham	19.259	0.54	3.0		2.5	0.8	0.05	0.1	0.02228
	Betanal Power	phenmedipham	19.259	0.54	6.0		2.5	0.4	0.02	0.15	0.00446
	Ethofol 500 SC	ethofumesate	13.656	0.38	2.0		0.1	0.1	0.05	0.5	0.00114
	Focus Ultra	cycloxydim	12.186	0.34	9.0		0.5	0.1	0.09	0.2	0.00157
	Betanal	phenmedipham	11.146	0.31	6.0		2.8	0.5	0.02	0.15	0.00292
	Kemifam Power	desmedipham	11.122	0.31	3.0		1.0	0.3	0.05	0.1	0.00508
	Kemifam Power	phenmedipham	11.122	0.31	6.0		1.0	0.2	0.02	0.15	0.00102
	SweDane Betasana 2000	phenmedipham	9.863	0.28	6.0		3.0	0.5	0.02	0.15	0.00271
	Command CS	clomazone	9.763	0.27	0.2		0.1	0.4	0.005	0.01	0.00059
	Betasana 2000	phenmedipham	7.545	0.21	6.0		3.2	0.5	0.02	0.15	0.00221
	Agil 100 EC	propaquizafop	7.385	0.21	2.0		0.2	0.1	0.02	0.05	0.00049
	Matrigon 72 SG	clopyralid	6.845	0.19		0.1	0.0	0.1	0.35	1	0.00947
	Metafol 700 SC	metamitron	5.637	0.16	5.0		2.1	0.4	0.05	0.05	0.00328
	Goliath	metamitron	3.996	0.11	5.0		2.0	0.4	0.05	0.05	0.00221
	Glyfonova 450 Plus	glyphosate	3.467	0.10	9.6		1.3	0.1	0.025	0.05	0.00033

(*continued on next page*)

(*continued*)

Crop + Indication	Product trade name	Active substance	Area of use (Hectares)	Area factor	cGAP dose L/Ha	DK max dose L/Ha	Used Dose L/Ha	Dosage factor	STMR mg/kg	MRL mg/kg	Residue estimate mg/kg
	Skater	metamitron	3.415	0.10	5.0		1.0	0.2	0.05	0.05	0.00097
	Herbasan	phenmedipham	3.044	0.08	6.0		3.5	0.6	0.02	0.15	0.00098
	SweDane Metafol 700 SC	metamitron	2.375	0.07	5.0		2.2	0.4	0.05	0.05	0.00144
	Kontakt 320 SC	phenmedipham	2.332	0.07	3.0		1.6	0.5	0.02	0.15	0.00068
	Glyfonova 360 SL	glyphosate	2.023	0.06	12.0		1.8	0.1	0.025	0.05	0.00021
	Cyperb 100	cypermethrin	619	0.02		0.3	0.2	0.7		1	0.01274
	Sluxx HP	iron III phosphate	614	0.02			2.8				
	Pirimor G	pirimicarb	343	0.01	1.0		0.2	0.2	0.01	0.01	0.00001
	Karate 2.5 WG	lambda cyhalotrin	211	0.01	1.2		0.2	0.1	0.01	0.02	0.00001
	Cythrin 500	cypermethrin	177	0.00		0.1	0.0	1.0		1	0.00485
	Sluxx	iron III phosphate	52	0.00			1.3				
Spinach	Signum WG	boscalid	134	1.00	3.0		1.6	0.5	1.1	5	0.59936
	Signum WG	pyraclostrobin	134	1.00	3.0		1.6	0.5	0.05	0.5	0.02724
	Betanal	phenmedipham	50	0.38	3.0		2.7	0.9	0.01	0.3	0.00342
	Command CS	clomazone	50	0.38	0.2		0.2	1.3	0.005	0.01	0.00244
	Goltix SC 700	metamitron	33	0.25		1.0	0.8	0.8		0.1	0.01974
	Reglone	diquat	33	0.25		2.0	1.5	0.7		0.05	0.00912
	Asulox	asulam	33	0.25		2.0	1.6	0.8	not found	0.05	0.00971
	Pirimor G	pirimicarb	32	0.24	1.5		0.3	0.2	0.056	0.06	0.00238
	Dithane NT	mancozeb	20	0.15			2.0	1.0		0.05	0.00744
	Glyfonova 360 SL	glyphosate	20	0.15	12.0		4.0	0.3	0.025	0.05	0.00124
	Opera	epoxiconazole	18	0.13		1.0	0.5	0.5	0.025	0.05	0.00169
	Opera	pyraclostrobin	18	0.13	1.5		0.5	0.3	0.05	0.5	0.00225
	Karate 2.5 WG	lambda cyhalotrin	13	0.10	0.8		0.6	0.8	0.05	0.5	0.00364
	Goliath	metamitron	5	0.04		1.0	0.5	0.5		0.1	0.00187
Sweet Corn	Callisto	mesotrion	296	0.99	1.5		0.9	0.6	0.005	0.01	0.00300
	Plenum 50 WG	pymetrozin	234	0.78	0.8		0.1	0.1	0.01	0.02	0.00086
	Cyperb 100	cypermethrin	213	0.71		0.2	0.2	0.7	not found	0.3	0.15327
	Harmony SX	thifensulfuron-methyl	163	0.54	0.0		0.0	0.2	0.005	0.01	0.00055
	Stomp	pendimethalin	137	0.46	5.0		0.6	0.1	0.05	0.05	0.00285
	Cythrin 500	cypermethrin	115	0.38		0.1	0.0	0.8	not found	0.3	0.09484
	Roundup Bio	glyphosate	85	0.28		4.0	1.0	0.3	not found	1	0.07287
	Fighter 480	bentazone	85	0.28	3.1		0.2	0.1	0.03	0.08	0.00047
	Jablo Glyfosat	glyphosate	30	0.10		4.0	0.7	0.2	not found	1	0.01830
	Glyfonova 450 Plus	glyphosate	28	0.09		3.2	1.6	0.5	not found	1	0.04530
	Opera	epoxiconazole	9	0.03		1.5	1.3	0.9		0.1	0.00269
	Opera	pyraclostrobin	9	0.03		1.5	1.3	0.9		0.02	0.00054
Brussel sprouts	Karate 2.5 WG	lambda cyhalotrin	27	1	0.8		0.4	0.5	0.02		0.01017
	Movento SC 100	spirotetramat	25	0.95	1.44		1.1	0.8	0.11		0.08017
	Fastac 50	alpha cypermethrin	15	0.56		0.45	0.4	0.9	not found	1	0.52211
	Amistar	azoxystrobin	15	0.56	2		1.0	0.5	0.04		0.01123
	Command CS	clomazone	13	0.50	0.25		0.3	1.0	0.005	0.01	0.00248
	Cyperb 100	cypermethrin	13	0.48		0.2	0.2	1.0	not found	1	0.47938
	Ortiva Top	difenoconazole	12	0.46		1	0.6	0.6	not found	0.2	0.05359
	Ortiva Top	azoxystrobin	12	0.46	2.5		0.6	0.2	0.04		0.00429
	Steward	indoxacarb	10	0.39	0.25		0.2	1.0	0.02	0.06	0.00735
	Pirimor G	pirimicarb	3	0.11	0.76		0.3	0.4	0.17	0.6	0.00665
	Signum WG	pyraclostrobin	2	0.06	3.1		1.1	0.3	0.04	0.3	0.00080
	Signum WG	boscalid	2	0.06	3		1.1	0.4	0.3		0.00621
	Stomp	pendimethalin	1	0.05	4.1		1.5	0.4	0.025		0.00042
Gherkin	Aliette 80 WG	fosetyl	2	1	16		9.2	0.6	26		15.00987
	Signum WG	pyraclostrobin	1	0.57	3		0.3	0.1	0.17	0.5	0.00802
	Signum WG	boscalid	1	0.57	3		0.3	0.1	0.68		0.03206

Appendix 4. ADI values

Active substance	Acceptable Daily Intake (ADI) mg/kg bw/day	Source
2.4 D	0.05	Reg. (EU) 2015/2033
Abamectin	0.0025	Dir 08/107
Acetamiprid	0.07	04/99/EC
Aclonifen	0.07	Dir 08/116
Alpha-Cypermethrin	0.015	Dir 04/58
Aminopyralid	0.26	EFSA 2013
Asulam	0.36	EFSA 10
Azoxystrobin	0.2	EFSA 2010
Bentazone	0.1	Dir 00/68
Bifenazate	0.01	05/58/EC

(*continued*)

Active substance	Acceptable Daily Intake (ADI) mg/kg bw/day	Source
Boscalid	0.04	08/44/EC
Bromoxynil	0.01	Dir 04/58
Captan	0.1	Dir 07/5
Carfentrazon-ethyl	0.03	03/68/EC
Chlormequat	0.04	EFSA 2008
Clodinafop	0.003	Dir 06/39
Clomazone	0.133	Dir 07/76
Clopyralid	0.15	Dir 06/64
Cyazofamid	0.17	03/23/EC
Cycloxydim	0.07	EFSA 10
Cymoxanil	0.013	EFSA 08
Cypermethrin	0.05	Dir 05/53
Cyprodinil	0.03	Dir 06/64
Desmedipham	0.03	Dir 04/58
Difenoconazole	0.01	Dir 08/69
Diflufenican	0.2	Dir 08/66
Dimethomorph	0.05	Dir 07/25
Diquat	0.002	Dir 01/21
Dithianon	0.01	11/41/EU
Epoxiconazole	0.008	Dir 08/107
Ethephone	0.03	Dir 06/85
Ethofumesate	1.0	Reg. (EU) 2016/1426
Fenamidone	0.03	03/68/EC
Fenhexamide	0.2	Reg. (EU) 2015/1201
Fenoxaprop-p	0.01	Dir 08/66
Fenpropidin	0.02	Dir 08/66
Fenpyroximate	0.01	EFSA 2013
Flonicamid	0.025	2010/29/EU
Florasulam	0.05	Reg. (EU) 2015/1397
Fluazinam	0.01	Dir 08/108
Fludioxonil	0.37	Dir 07/76
Flupyrsulfuron-methyl	0.035	01/49/EC
Fluroxypyr	0.8	Dir 00/10
Fosetyl	3	Dir 06/64
Glyphosate	0.3	Dir 01/99
Imazalil	0.025	EFSA 2010
Imidacloprid	0.06	Dir 08/116
Indoxacarb	0.006	06/10/EC
Iodosulfuron	0.03	03/84/EC
Ioxynil	0.005	Dir 04/58
Kresoxim-methyl	0.4	Commission 2011
Lambda-cyhalotrin	0.0025	Reg. (EU) 2016/146
Maleic-Hydrazide	0.25	Dir 03/31
Mancozeb	0.05	Dir 05/72
Mandipropamid	0.15	EFSA 2012
MCPA	0.05	SCoFCAH July 08
Mepanipyrim	0.02	04/62/EC
Mepiquat	0.2	Dir 08/108
Mesosulfuron	1	03/119/EC
Mesotrion	0.01	03/68/EC
Metamitron	0.01	03/68/EC
Metrafenone	0.25	07/6/EC
Metsulfuron-Methyl	0.22	Reg. (EU) 2016/139
Milbemectin	0.03	05/58/EC
Pencycuron	0.2	11/49/EU
Pendimethalin	0.125	EFSA 2016
Phenmedipham	0.03	Dir 04/58
Pirimicarb	0.035	Dir 06/39
Prohexadione	0.2	EFSA 2010
Propamocarb	0.24	EFSA 2013
Propaquizafop	0.015	EFSA 2008
Propiconazole	0.04	Dir 03/70
Propyzamid	0.02	Dir 03/39
Prosulfocarb	0.005	Dir 07/76
Prothioconazole	0.01	08/44/EC
Pymetrozine	0.03	01/87/EC
Pyraclostrobin	0.03	04/30/EC
Pyrethrins	0.04	EFSA 2013
Pyrimethanil	0.17	Dir 06/74
Pyroxylam	0.9	EFSA 2013
Rimsulfuron	0.1	Dir 06/39
Spinosad	0.024	07/6/EC
Spirotetramat	0.05	EFSA 2013
Sulfosulfuron	0.24	EFSA 2014

(*continued on next page*)

(*continued*)

Active substance	Acceptable Daily Intake (ADI) mg/kg bw/day	Source
Sulphur	N.A.	EFSA 2008
Tau-fluvalinate	0.005	EFSA 2010
Tebuconazole	0.03	EFSA 2008
Tepraloxydim	0.025	05/34/EC
Thiacloprid	0.01	04/99/EC
Thifensulfuron	0.01	Reg. (EU) 2016/1424
Tolclophos-Methyl	0.064	Dir 06/39
Tribenuron	0.01	Dir 05/54
Thifensulfuron-Methyl	0.01	Reg. (EU) 2016/1424
Triflusulfuron-Methyl	0.04	Dir 09/77
Trinexapac	0.32	Dir 06/64

Appendix 5. Processing factors for barley malt

Active Substance	Processing Factor	Source
Epoxiconazole	0.59	EFSA Scientific Report (2008) 138. 1–80. Conclusion on the peer review of epoxiconazole
Tebuconazole	0.51	EFSA Journal 2011; 9(8):2339
Trinexapac	0.7	EFSA Journal 2012; 10(1):2511
Azoxystrobin	0.19	EFSA Journal 2013; 11(12):3497
Boscalid	0.48	EFSA Journal 2014; 12(7):3799
Pyraclostrobin	1.2	EFSA Journal 2011; 9(8):2344
Tebuconazole	0.51	JMPR 2011
Cypermethrins	0.66	JMPR 2009

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