Evaluating the Presence of Pesticide Residues in Organic Rice Production in An Giang Province, Vietnam

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Abstract
The presence of pesticide residues was investigated in the organic rice production model in An Giang province, Vietnam. A total number of sixteen pesticide residues were recorded during the investigation. Based on their contamination rate, they are classified as follows. The high-risk group includes tricyclazole (80%). The medium-risk group includes chlorpyrifos (47%), isoprothiolane (47%), difenoconazole (40%), propiconazole (40%), hexaconazole (40%), chlorfenapyr (33%), azoxystrobin (20%), and cypermethrin (20%). The low-risk group includes metalaxyl & metalaxyl-M, paclobutazol, niclosamide, chlorfenapyr, fipronil, fipronil-desulfinyl, and fenoxanil, which were detected with a contamination rate of 7%. There were seven insecticides, seven fungicides, one snail killer, and one growth regulator.

Keywords: pesticide residues, tricyclazole, prohibited pesticides, organic rice farming, organic production, An Giang province

1. Introduction
Pesticides in controlling rice diseases have increased in recent years due to the higher incidence of insects and pests. However, pesticide residues in food are a major public health concern and harm producers and consumers (Hou et al., 2013). Identifying the presence of such residues in all types of food (both fresh and industrialized) is important to guarantee food safety (Wang et al., 2012). At the same time, the use of pesticides on rice fields can affect the quality of environmental resources such as groundwater and surface water.

Under the European Union (EU) legislation (Article 32, Regulation (EC) No 396/2005), the European Food Safety Authority (EFSA) (2020) provides an annual report which analyses pesticide residue levels in foods in the EU market. According to the report, for 2018, 95.5% of the overall 91,015 analyzed samples fell below the maximum residue level (MRL), 4.5% exceeded MRL, of which 2.7% was non-compliant, i.e. samples exceeding the MRL after taking into account the measurement uncertainty. For the subset of 11,679 analyzed samples as part of the EU-coordinated control program, 1.4% exceeded the MRL, and 0.9% was non-compliant. Dietary exposure to pesticide residues was estimated and compared with health-based guidance values to assess acute and chronic risk to consumer health. The findings suggest that the assessed levels for the analyzed food commodities are unlikely to pose a concern for consumers’ health. However, many recommendations are proposed to increase the efficiency of European control systems (e.g. optimizing traceability), thereby ensuring a high level of consumer protection (EFSA, 2020).

Since then, organic agriculture has helped farmers apply new farming techniques, replacing harmful chemical inputs with biological and organic derived substances. At the same time, it helps to improve the skills of producers to apply the smart methods "high-tech" like using good variety, smart agronomy techniques, machines, biology and organic products to replace traditional methods in non-organic agricultural production. The biggest challenge in organic agriculture is changing farmers’ mindsets and farming practices that favor the application of toxic
According to the Farming Reader (2021) (www.farmingreader.com), organic farming is a farming method using crop, animal, aquatic wastes, and other biological materials. This method is completely safe for the soil and the environment as it does not use any toxic chemicals. The soil remains alive and in good condition. Martin (2009) reported that organic farming is a method, which crop and livestock production involves choosing not to use pesticides, fertilizers, genetically modified organisms, antibiotics, and growth hormones. Organic production is a holistic system designed to optimize the productivity and fitness of diverse communities within the agro-ecosystem, including soil organisms, plants, livestock, and people (Martin, 2009). Supporting the organic production program, the United States Department of Agriculture (USDA) has listed the substances, including pesticides that allow and prohibit organic production (USDA, 2021). EU provided the information on permitted substances in organic production (European Commission, 2021). Japan has released the guideline for organic production according to its standards called organic JAS (MAFF, 2021). According to these standards and regulations, synthetic pesticides are prohibited for crop production unless specifically allowed, and non-synthetic pesticides are allowed for crop production unless specifically prohibited.

Since 2015, researchers from the Asian Organic Agriculture Research and Development Institute (AOI) and the Institute of Agricultural Sciences for Southern Vietnam (IAS) have contributed to successfully building the internationally certified organic rice production models in rice-shrimp farming areas of the Mekong River delta. However, building a rice production model to convert from non-organic to fully organic in rice-intensive farming fields (2-3 crops per year) is challenging (Nguyen and Van, 2021). Organic production in intensive farming areas is not as favorable as in rice-shrimp farming areas (i.e. only one rice crop is rotated with one shrimp crop) because there is no reciprocity to help limit the pest and disease pressure (Nguyen et al., 2019). So it is tough to be certified according to EU, USDA, and JAS organic standards. Another challenge is changing farmers' farming practices that favor the application of pesticides. In some cases, the farmers did not follow organic production procedures to use the prohibited pesticides for their farms. This had led to failing the organic rice models, affecting the entire project and causing financial damage to the invested enterprises (Nguyen and Van, 2021). So, assessing the presence of prohibited residual pesticides in organic production is necessary to build the organic rice production model in rice-intensive farming areas.

The study evaluates the presence of residual pesticides, which are prohibited from being used in organic production, as part of the project “building an organic rice model according to organic standards (EU, USDA, JAS) in An Giang province, Vietnam”. The study's aims were (i) to investigate the presence of nearly a thousand residual pesticides, which are prohibited from being used in organic production, in soil, water, and rice crop (ii) to document the common pesticides used in rice-intensive farming systems.

2. Material and Methods

2.1 Study Sites

An Giang is a border province in the Mekong River delta with a natural area of 3,536,83 km² (GSO, 2021) and a rice cultivation area of 637,200 ha (GSO, 2020). This is the province with the country's largest rice production and aquaculture. Since the 1990s, the province has actively built an irrigation system to exploit the potential of the available local land. Besides the achieved achievements, the province faces the risk of soil pollution, such as the heavy use of chemical fertilizers and pesticides in agricultural production, waste from probiotics and feed in aquaculture, and wastes from production facilities and residential areas (DoENR An Giang, 2020). Minimizing the risk of pesticide pollution is an urgent requirement to protect agriculture, which is the advantage of this province.

In this study, study sites were located in Tri Ton and Thoai Son districts of An Giang province (Fig. 1). These districts are the province's two largest cultivated paddy areas, with 115,065 ha and 114,629 ha (NIAPP, 2020). Similarly to other areas of the province, three crops are permanently cultivated per year. It could be said that rice production in this area represents the rice-intensive farming system in An Giang province.
2.2 Studied Pesticides and Rice Cultivation

The study pesticides were selected according to the audit program of the organic certification body, ControlUnion (CU). The total number of investigated pesticides was 854 substrates (Appendix 1). Rice varieties grown in these studied areas were Hong Ngoc Oc Eo and ST 25, having a growing duration of 95 days and 114 days, respectively. Both varieties belong to the *Oryza sativa* species. In the organic production model, farmers were trained in organic rice cultivation that as described by Hay et al. (2018). Paddy was sowed and then constantly flooded with 5–7 cm depth from soil surface still 1 month before harvesting.

2.3 Sampling

Irrigation water, soil, and plants were sampled at the drought stage (around 20 days before harvest). Water samples were collected in 1 L plastic bottles, soil samples were collected at a depth of 0–10 cm, and plant samples were collected by chopping the above ground portion of the plants. The collection of soil, water, and rice samples should accurately represent the entire production batch and target to detect residual chemicals thoroughly at high-risk areas (different from random sampling). The number of samples depends on the farming conditions of each household group and risk capacity. If farming conditions of the household is not good with high-risk possibility, samples need to be taken more. If the number of households is too large, take at least 10% (Singh and Masuku, 2014). Each sample was collected from neighboring households and then mixed as 1 sample for analysis. A total number of 15 samples was sampled and analyzed during three years (2019 - 2021).

2.4 Pesticide Analysis

The samples were sent for analysis at the labs designated by CU. Without washing, the samples were then extracted and analyzed using GC-MS/MS, which was described by Braun et al. (2018) and LC-MS/MS described by Shah et al. (2015). The results from the analyses were reported in parts per million (ppm) or milligram per kilogram (mg kg\(^{-1}\)).

2.5 Evaluating Criteria and Statistical Analysis

In this study, we use the criteria to evaluate the presence of pesticides as follows. Limit of detection (LOD) is the lowest quantity of an active ingredient that can be distinguished from the absence of active ingredients. Pesticide concentration (PC) (mg kg\(^{-1}\)) is an amount of pesticide's active ingredient per total weight of the sample. Progressive presence (PP) is the cumulative number of impressions from previous times. Frequency of occurrence (FOO) is the number of times that pesticide detected with a concentration higher than LOD. Contamination rate (CR) (%) is determined by the percentage of frequency of occurrence per the total number of samples. Microsoft Excel was used for data analysis and graphing.
3. Results and Discussion

3.1 Pesticide Residues Were Present in Soil and Rice Samples in Organic Rice Fields of An Giang Province

A total number of 15 samples, including 13 rice samples, 1 soil sample, and 1 water sample, was analyzed during three years of project implementation. The results showed that 16 pesticide types were found in the samples, including tricyclazole, chlorpyrifos, isoprothiolane, difenoconazole, propiconazole, hexaconazole, chlorfenapyr, azoxystrobin, and cypermethrin, metalaxyl & metalaxyl-M, paclotrazol, niclosamide, chlorfenoson, fipronil, fipronil-desulfynyl, and fenoxanil with concentrations from 0.005 mg kg⁻¹ to 0.71 mg kg⁻¹ (Table 1). Among the analyzed samples, sample No. 7 was the most contaminated, with 11 detected substances, while samples No. 2 and No. 15 were free of pesticide residues, and sample No. 9 only detected chlorpyrifos. This result indicates that different samples from different households found various contaminants in the same organic production model (i.e. leakage from neighboring fields were being controlled). We can infer that the contaminated pesticides came from two sources. The first, the pesticides came from a passive way, in which pesticides have been used in previous crops and are still remained up to the time of sampling. This correlates with several studies, which reported that pesticide persistence in the environment was determined by a measure known as the half-life or time for starting material to be reduced by 50%, where the half-life of pesticides can range from several hours up to 4-5 years (Hanson, 2015). Therefore, pesticides with high half-lives in soil (above 60 days), such as tricyclazole (305 days) (Thai et al., 2009), propiconazole (315 days) (Garrison et al., 2009, 2011), hexaconazole (69.3 and 86.6 days) (Maznah et al., 2015), and isoprothiolane (9.4 months) (Suzuki et al., 1998) can come in passive ways, such as pesticide residues detected in sample No. 1, No. 5, and No. 11. The second, pesticides with short soil half-lives such as fenoxanil (3.3–4.4 days) (Fu et al., 2016), azoxystrobin (7.5 days) (Gajbhiye et al., 2011), cypermethrin (0.5–8 weeks) (Paul, 2005) and chlorpyrifos (18.7 and 13.9) (Hwang et al., 2018) might actively be applied by farmers.

Table 1. Results of analysis of pesticide residues in rice fields of the organic rice production model in An Giang province during 2019 - 2021

| Sample No. | Sampling sites | Sowing time | Sampling time | Detected pesticide substances LOD (mg kg⁻¹) PC PP |
|------------|---------------|-------------|---------------|-------------------------------------------------|
| 1 Tri Ton  | 20/01/2019    | 07/03/2019  | Tricyclazole  0.005 0.71 1 |
|            |               |             | Propiconazole 0.007 0.6 1 |
| 2 Tri Ton  | 20/01/2019    | 07/03/2019  | Isoprothiolane 0.007 0.02 1 |
|            |               |             | Tricyclazole 0.005 0.07 2 |
| 3 Tri Ton  | 20/01/2019    | 07/03/2019  | Chlorpyrifos 0.002 0.01 1 |
|            |               |             | Difenoconazole 0.007 0.015 1 |
|            |               |             | Tricyclazole 0.004 0.01 2 |
|            |               |             | Chlorfenapyr 0.003 0.063 1 |
| 4 Tri Ton  | 22/06/2019    | 04/09/2019  | Chlorpyrifos 0.002 0.022 2 |
|            |               |             | Hexaconazole 0.003 0.021 2 |
|            |               |             | Tricyclazole 0.005 0.022 4 |
| 5 Tri Ton  | 25/10/2019    | 23/12/2019  | Chlorpyrifos 0.002 0.011 3 |
|            |               |             | Isoprothiolane 0.003 0.03 3 |
|            |               |             | Tricyclazole 0.005 0.031 5 |
| 6 Tri Ton  | 25/10/2019    | 23/12/2019  | Chlorpyrifos 0.002 0.011 3 |
|            |               |             | Hexaconazole 0.007 0.011 2 |
| 7 Thoai Son| 03/01/2020    | 31/03/2020  | Chlorpyrifos 0.002 0.01 4 |
|            |               |             | Difenoconazole 0.003 0.038 1 |
|            |               |             | Hexaconazole 0.007 <0.02 3 |
|            |               |             | Isoprothiolane 0.003 0.01 4 |
|            |               |             | Metalaxyl & metalaxyl-M 0.003 2.1 1 |
|            |               |             | Propiconazole 0.007 0.036 2 |
### 3.2 Summarizing the Presence of Pesticide Residues in Organic Rice Fields in An Giang Province

The contaminated pesticides in this study can be classified according to their contamination rate into 3 groups. The
The high-risk group has pesticides with a contamination rate greater than 50%, including only tricyclazole (80%). The medium-risk group is those with contamination rate ranged from 10% to 50%, including chlorpyrifos (47%), isoprothiolane (47%), difenoconazole (40%), propiconazole (40%), hexaconazole (40%), chlorfenapyr (33%), azoxystrobin (20%), and cypermethrin (20%). The low-risk group is those with a contamination rate of less than 10%, including metalaxyl & metalaxyl-M, paclobutrazol, niclosamide, chlorfenson, fipronil, fipronil-desulfinyl, and fenoxanil, detected with a contamination rate of 7% (Fig. 2). Among them, tricyclazole was the most prominent with a contamination rate of 80%. This is reasonable because tricyclazole (5-methyl-1,2,4-triazolo[3,4-b]benzothiazole) is a unique fungicide to control rice blast disease caused by the fungus *Pyricularia oryzae* (Peterson, 1990). It is worth noting that among these 16 active substances, there are substances such as chlorpyrifos and fipronil that have been prohibited from use by the Ministry of Agriculture and Rural Development (MARD, 2019). Abroad, the use of some fipronil-based products in domestic animals has not been recommended for a long time (Colin et al., 2003).

Figure 2. Frequency of occurrence and contamination rate (%) of pesticide residues in rice fields of the organic rice production model in An Giang province during 2019 – 2021

Compared to other research on pesticides assessment in Mekong Delta, Berg (2001) reported that 64 different pesticides were used in rice and rice-fish farms of the Mekong River delta. Therein, five pesticides, including propiconazole, hexaconazole, isoprothiolane, cypermethrin, and fipronil, are matched with the result of this study. A decade after that, another study by Berg and Tam (2012) reported that twenty pesticides used most in rice-fish farms by farmers in Tien Giang and Can Tho provinces in 2007, in which seven of them are matched with this discussing result, including propiconazole, hexaconazole, isoprothiolane, tricyclazole, cypermethrin, fipronil, and chlorpyrifos. Along with that, the study on pesticides and antibiotics in permanent rice, alternating rice-shrimp and permanent shrimp systems of the coastal Mekong Delta, Vietnam by Braun et al., (2019) reported that analyzed chemicals comprised 12 pesticides most commonly used in rice paddies, among them seven pesticides are found in this study, including chlorpyrifos, fipronil, difenoconazole, propiconazole, hexaconazole, isoprothiolane, and azoxystrobin. Summarizing the previous researches and this study we can infer that propiconazole, hexaconazole, isoprothiolane, and fipronil were the main contaminated pesticides in rice production in An Giang province in detail and Mekong River delta in general for more than two decades.

In this study, among 16 detected substances, there were 7 insecticides, 7 fungicides, 1 snail killer, and 1 growth regulator (Table 2). We can realize that various types of pesticides were detected in organic rice fields. This is more evidence to prove that farmers had broken the rules in organic production to apply pesticides in their fields, which agrees with Nguyen and Van's report (2021).
Table 2. Summarizing the presence of pesticide residues in rice fields of the organic rice production model in An Giang province during 2019 - 2021

| No. | Pesticide substances     | Main usages | CR (%) |
|-----|-------------------------|-------------|--------|
| 1   | Tricyclazole            | Fungicide   | 80     |
| 2   | Chlorpyrifos            | Fungicide   | 47     |
| 3   | Isoprothiolane          | Fungicide   | 40     |
| 4   | Difenoconazole          | Fungicide   | 40     |
| 5   | Propiconazole           | Insecticide | 40     |
| 6   | Hexaconazole            | Fungicide   | 40     |
| 7   | Chlorfenapyr            | Fungicide   | 33     |
| 8   | Azoxystrobin            | Insecticide | 20     |
| 9   | Cypermethrin            | Insecticide | 20     |
| 10  | Metalaxyl & metalaxyl-M | Fungicide   | 13     |
| 11  | Fenoxanil               | Insecticide | 7      |
| 12  | Fipronil                | Insecticide | 7      |
| 13  | Fipronil-desulfinyl     | Insecticide | 7      |
| 14  | Chlorfenson             | Insecticide | 7      |
| 15  | Niclorsamide            | Snail killer| 7      |
| 16  | Paclobutrazol           | Growth regulator | 7      |

4. Conclusion and Recommendation

The study of evaluating the presence of pesticide residues, which are prohibited from being used in organic production in An Giang province, Vietnam, has been summarized. Thereby, 16 pesticide residues have been recorded with the contamination rate compared to the total number of samples tested from 2019 to 2021 as follows: the high-risk group includes tricyclazole (80%); The medium-risk group includes chlorpyrifos (47%), isoprothiolane (47%), difenoconazole (40%), propiconazole (40%), hexaconazole (40%), chlorfenapyr (33%), azoxystrobin (20%), and cypermethrin (20%); The low-risk group includes metalaxyl & metalaxyl-M, paclobutrazol, niclorsamide, chlorfenson, fipronil, fipronil-desulfinyl, and fenoxanil, all were detected with a contamination rate of 7%. There were 7 insecticides, 7 fungicides, 1 snail killer, and 1 growth regulator.

Research results serve as the basis for pre-inspecting raw material areas for organic rice production to reduce risks, analysis, and evaluation costs. We recommend that the provincial, national, and international organizations increase funding support for AOI researchers to organize and build the linkage models in rice value chains according to organic standards in the rice-intensive farming areas to minimize the application of harmful pesticides in the environment.

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Conflicts of interest

The authors declare that they have no conflict of interest.

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### Appendix 1

**List of pesticides under audit program of Control Union tested in SGS Laboratory (SGS Vietnam Co. Ltd.)**

| LC-MS/MS (LOD* mg/kg) | LOD* mg/kg |
|------------------------|-----------|
| 1-Naphthylacetamide    | 0.003     |
| Daimuron               | 0.003     |
| Imazalil               | 0.005     |
| Phosfolan-methyl       | 0.003     |
| Thifluzamide           | 0.01      |
| 4-(Trifluoromethyl)nicotamide | 0.002     |
| DEET                   | 0.005     |
| Imibenconazole         | 0.007     |
| Phosmet                | 0.01      |
| Thiobencarb            | 0.003     |
| Ahahemectin (sum)      | (a)       |
| Demeton (sum of Demeton-O and Demeton-S) | (a)     |
| Imidacloprid           | 0.005     |
| Phosmet (phosmet and phosmet oxon expressed as phosmet) | 0.01 |
| Thiodicarb             | 0.01      |
| Ahahemectin B1a        | 0.02      |
| Demeton-S-methyl sulfone | 0.003  |
| Imidacloprid           | 0.003     |
| Phosmet-oxon           | 0.01      |
| Thiophanate-methyl     | 0.003     |
| Ahahemectin B1b        | 0.02      |
| Demeton-S-methyl sulfone (Oxydemeton-methyl) | 0.003  |
| Indanoxin              | 0.005     |
| Phoshamidon            | 0.003     |
| Thiram                 | 0.01      |
| Acephate               | 0.002     |
| Desmedipham            | 0.007     |
| Indaciflam             | 0.002     |
| Phoxim                 | 0.003     |
| Tiadioiil              | 0.01      |
| Acequinocyl            | 0.01      |
| Diflubenzuron          | 0.002     |
| Indoxacarbazepine (sum) | 0.005  |
| Fenoxadene             | 0.01      |
| Tolfenpyrad            | 0.003     |
| Acetamiprid            | 0.003     |
| Dichlorvos             | 0.007     |
| Iodosulfuron-methyl (sum) | 0.008  |
| Piperonyl butoxide     | 0.003     |
| Tolufilfluand          | 0.01      |
| Acibenzolar-S-methyl   | 0.007     |
| Dichlorfotin           | 0.01      |
| Iosotianid             | 0.002     |
| Prinomicarb            | 0.003     |
| Tolufilfluand (sum)    | (a)      |
| Actinonif              | 0.007     |
| Dichlorhydrin          | 0.002     |
| Isocloruron            | 0.005     |
| Prinomicarb-desmethyl  | 0.002     |
| Topramezone            | 0.003     |
| Albendazole            | 0.003     |
| Diflubenzuron          | 0.01      |
| Isoprocarb             | 0.005     |
| Prochloraz             | 0.005     |
| Tralkoxydim (sum of isomers) | 0.008 |
| Aldicarb          | 0.007 | Dimethametryn   | 0.005 | Isoproturon | 0.003 | Profoxydim (sum of R- and S-isomers) | 0.003 | Triadimefon | 0.003 |
|------------------|-------|-----------------|-------|-------------|-------|------------------------------------|-------|-------------|-------|
| Aldicarb (sum)   | (a)   | Dimethoate      | 0.002 | Isopryrazam | 0.003 | Propamocarb (sum)                   | 0.002 | Tribenuron methyl | 0.01 |
| Aldicarb sulfone | 0.002 | Isoprothiolane  | 0.003 | Propanil    | 0.003 | Trichlorfon                         | 0.007 |             |       |
| Aldicarb sulfoxide | 0.003 | Dimethomorph (sum of isomers) | 0.003 | Triadimefon | 0.003 | Triflumuron                         | 0.007 |             |       |
| Allethrin        | 0.007 | Dimethyliniline, 2,4- | 0.007 | Isopyrazam | 0.005 | Triacyclole                         | 0.005 |             |       |
| Allidochlor      | 0.003 | Dinofuran       | 0.003 | Isopropamid | 0.003 | Triazophos                          | 0.008 |             |       |
| Alloxydim        | 0.007 | Dimethylaniline, 2,4- | 0.007 | Ivermectin (22,23-dihydroavermectin B1a) | 0.01 | Propoxy carbazone                    | 0.01 | Triflumuron-methyl | 0.007 |
| Amidosulfuron    | 0.008 | Diuron          | 0.005 | Isoxamifen-ethyl | 0.008 | Propoxy carbazone-2-OH             | 0.007 | Triflumuron-methyl | 0.007 |
| Amisulbrom       | 0.008 | DMSA (Dimethylaminosulfanilide) | 0.01 | Jasminol I | 0.03 | Propoxy carbazone-2-OH              |       | Triflumuron-methyl | 0.007 |
| Anilazine        | 0.01  | DMBT (Dimethylaminosulfotoluidide) | 0.01 | Jasminol II | 0.03 | Propyrisulfuron                    | 0.007 | Triflorine     | 0.01 |
| Anirnate         | 0.003 | Dowedemorph     | 0.008 | Lenacil     | 0.003 | Tricarboxamide                     | 0.003 | Tritosulfuron       | 0.01 |
| Asulam           | 0.007 | Dodiine         | 0.007 | Linuron    | 0.007 | Trisulfuron                        | 0.005 |             |       |
| Atrazine-desisopropyl | 0.002 | Edifenphos      | 0.005 | Lufemaron (any ratio of constituent isomers) | 0.01 | Trisulfuron                        | 0.005 | Vanidithion       | 0.005 |
| Azadirachtin     | 0.02  | Enemectin benzoxate B1a, expressed as enemectin | 0.007 | Malathion | 0.005 | Trichlorfon (any ratio of constituent isomers) | 0.005 | Vernolate        | 0.003 |
| Azamethiphos     | 0.005 | EPTC            | 0.008 | Malathion | 0.005 | Pyracarbolid                       | 0.005 | XMC               | 0.003 |
| Azimsulfuron     | 0.005 | Ethabucar       | 0.01  | Malathion (sum) | (a) | Pyracarbolid (a) | 0.005 | XMC               | 0.003 |
| Azinphos-methyl  | 0.007 | Ethametsulfuron-methyl | 0.003 | Mandipropamid | 0.005 | Pyraclostrobin                    | 0.005 | Ziram             | 0.005 |
| Azoxytosbin      | 0.005 | Ethiflucarbl-methyl | 0.04 | Mesobenzazide | 0.002 | Pyraclostrobin                    | 0.005 | Ziram             | 0.005 |
| Barban           | 0.007 | Ethiflucarbl (sum) | (a) | Mepanipyrim | 0.005 | Pyraclostrobin                    | 0.005 | Acequinocycyl-      | 0.01 |
| Benacar           | 0.003 | Ethiflucarbl-sulfone | 0.003 | Mephosulfuran | 0.005 | Pyraclostrobin                    | 0.003 | Atrazine, 2-      | 0.01 |
| Bensodanil       | 0.003 | Ethiflucarbl-sulfide | 0.003 | Mesopropamid | 0.003 | Pyrazolylate                       | 0.01 | Benzoxylopyrone    | 0.003 |
| Bensulfuron-methyl | 0.003 | Ethion           | 0.008 | Mephos | 0.003 | Pyrazosulfuron-ethyl               | 0.003 | Bicyclopyrone       | 0.003 |
| Benzalide        | 0.008 | Ethiofuran       | 0.005 | Mesosulfuron-methyl | 0.01 | Pyrazoxifen                       | 0.003 | Bromadiolone       | 0.01 |
| Benfazone        | 0.005 | Ethirimol        | 0.003 | Mesotrione | 0.007 | Pyrethrin I                       | 0.02 | Bufencarb         | 0.003 |

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| Chemical                          | Amount | Description                                      | Amount | Description                                      | Amount | Description                                      |
|----------------------------------|--------|--------------------------------------------------|--------|--------------------------------------------------|--------|--------------------------------------------------|
| Benthiavalicarb                  | 0.003  | Ethoprophos                                      | 0.007  | Metaflumizone (sum of E- and Z-isomers)          | 0.005  | Pyrethrin II                                     | 0.02   | Cafenstrole                                      | 0.003  |
| Benthiazole (TCMTB)              | 0.01   | Ethoxysulfuron                                    | 0.007  | Metalaxyl & Metalaxyl-M and Metalaxyl-M-M (sum of isomers) | 0.003  | Pyrethrins (sum) (a)                            | 0.01   | Coumatetralyl                                    | 0.01   |
| Benzoavindiflapyr                | 0.01   | Endrin                                          | 0.007  | Metamiprop                                      | 0.007  | Pirabenoxim                                      | 0.01   | Cyanopyrafen                                     | 0.01   |
| Benzoxydimate                    | 0.007  | Fenoxadone                                       | 0.01   | Metamitron                                      | 0.003  | Permethiphos                                     | 0.003  | Deltamethion                                     | 0.003  |
| Benzyladenine, 6-                | 0.007  | Fenamiphos                                       | 0.01   | Methabenzthiazuron                               | 0.003  | Pirimicin                                        | 0.01   | Diclosulate                                       | 0.003  |
| Bifurcate (sum)                  | 0.007  | Fenamiphos (sum)                                 | 0.008  | Methomyl and Thiodicarb (sum)                   | 0.003  | Quinalphos                                       | 0.003  | Floccumafen                                      | 0.01   |
| Bifenthrin                       | 0.01   | Fenamiphos sulfone                               | 0.005  | Methiocarb                                      | 0.005  | Pyriphaquazone                                   | 0.003  | Diphacinone                                      | 0.01   |
| Boscalid                         | 0.005  | Fenamiphos sulfone                               | 0.005  | Methiocarb sulfide                              | 0.01   | Pyroquilon                                      | 0.005  | Fenpicontoxin                                    | 0.003  |
| Bromacil                         | 0.007  | Fenfuralan                                       | 0.003  | Methiocarb sulfide                              | 0.01   | Pyroquilon                                       | 0.005  | Fenpicontoxin                                    | 0.003  |
| Bromfeninfos-methyl              | 0.003  | Fenhexamid                                       | 0.005  | Methomyl                                        | 0.01   | Pyroxalam                                        | 0.005  | Fensulfothion-oxon                               | 0.003  |
| Buproprizin                      | 0.003  | Fenbucarb                                        | 0.008  | Methomyl and Thiodicarb (sum)                   | 0.003  | Quinalphos                                       | 0.003  | Floccumafen                                      | 0.01   |
| Butocarboxim                     | 0.003  | Fenithiocarb                                      | 0.003  | Methoprolate                                    | 0.005  | Quinoclamine                                     | 0.007  | Fluetsulfuron                                     | 0.003  |
| Cabaryl                          | 0.003  | Fenoxamid                                        | 0.003  | Methoxyfenoxide                                 | 0.01   | Quinoxyl                                        | 0.005  | haloxifenin-methyl                               | 0.003  |
| Carbendazim and benomyl (sum)    | 0.003  | Fenoxycarb                                       | 0.003  | Metobromuron                                    | 0.003  | Rimsulfuron                                      | 0.007  | Imicyafos                                        | 0.003  |
| Carbamid (sum)                   | 0.003  | Fenpicontol                                   | 0.007  | Metolcarb                                       | 0.003  | Rotenone                                        | 0.005  | Metazachlor Metabolite 479M6                     | 0.002  |
| Carbofuran                       | 0.002  | Fenspyramine                                    | 0.007  | Metominostrobin                                 | 0.007  | Safflamacil                                      | 0.01   | Metazosulfuron                                   | 0.003  |
| Carbofuran (sum)                 | 0.003  | Fenspyroximate                                  | 0.003  | Metosulam                                       | 0.002  | Sedafox                                   | 0.003  | Neburon                                          | 0.003  |
| Carbofuran-3-OH                  | 0.002  | Fensulfosfion                                    | 0.003  | Metoxuron                                       | 0.003  | Sethoxydim                                       | 0.007  | Niclosamide                                      | 0.003  |
| Carbophenothion                   | 0.007  | Fensulfosfion-oxon-sulfone                      | 0.005  | Metasufluron methyl                             | 0.003  | Sidoran                                           | 0.002  | Norar (nororon)                                  | 0.003  |
| Carbosulfan                      | 0.01   | Fensulfosfion-sulfone                           | 0.008  | Mevinphos (sum of E- and Z-isomers)             | 0.002  | Simazine                                         | 0.007  | Oroxolin acid                                   | 0.003  |
| Carboxin                         | 0.003  | Fenhimin                                         | 0.005  | Milbemectin (sum)                               | 0.01   | Simetryn                                        | 0.003  | Pyrothoate                                      | 0.003  |
| Carprofenam                      | 0.003  | Fenhimin sulfone                                | 0.007  | Molinate                                        | 0.007  | Spinocor (175-J + 175-L)                         | 0.008  | Piriflubac                                       | 0.003  |
| Chlorantraniliprole              | 0.005  | Fenthion sulfone                                | 0.003  | Monocrotoxoph                                   | 0.003  | Spinocor 175-J                                  | 0.008  | Piriflubac                                       | 0.003  |
| Chlorbuzuron                     | 0.02   | Fenbamidine                                     | 0.007  | Monocrotoxoph                                   | 0.005  | Spinocor 175-L                                  | 0.008  | Ronidazole                                       | 0.003  |
| Chlorbromuron                    | 0.005  | Fensuron                                        | 0.003  | Monuron                                         | 0.003  | Spinosad (sum of spinosyn.A + D)                 | 0.003  | Temephos                                         | 0.003  |
| Chlorfluazaruron                  | 0.008  | Ferimzone                                       | 0.005  | MPMC (Xylcarb)                                  | 0.003  | Spinosyn A                                       | 0.01   | Tiafenacil                                       | 0.003  |
| Chloridazon                      | 0.003  | Fipronil                                        | 0.002  | Naphthoam                                        | 0.005  | Spinosyn D                                       | 0.01   | Tritosulfuron                                    | 0.003  |
| Metabolite AMTT                                                                 | Concentration (%) | Metabolite AMTT                                                                 | Concentration (%) |
|--------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------|-------------------|
| Chlorimuron-ethyl                                                              | 0.007             | Fipronil (sum)                                                                  | (a)               |
|                                                                                |                   | Niclosamide                                                                    | 0.005             |
|                                                                                |                   | Spirodiclofen                                                                   | 0.008             |
|                                                                                |                   | Alabamectin B1a, 8,9-                                                          | 0.01              |
|                                                                                |                   | Z (Avermectin B1a, 8,9-Z-)                                                   |                   |
| Chlorsulfuron                                                                  | 0.005             | Fipronil desulfanyl                                                             | 0.002             |
|                                                                                |                   | Nicotine                                                                       | 0.003             |
|                                                                                |                   | Spiromesifen                                                                   | 0.01              |
|                                                                                |                   | Alanycarb                                                                      | 0.01              |
| Chlorothalidate                                                                | 0.003             | Fipronil sulfide                                                                | 0.002             |
|                                                                                |                   | Nitenpyram                                                                     | 0.005             |
|                                                                                |                   | Spirotetramat                                                                  | 0.01              |
|                                                                                |                   | Amitraz                                                                        | 0.005             |
| Chlopyriphos-methyl                                                            | 0.003             | Fipronil Sulfone                                                                | 0.002             |
|                                                                                |                   | Nitratin                                                                       | 0.01              |
|                                                                                |                   | Spirotetramat (sum)                                                            | (a)               |
|                                                                                |                   | Amitraz (sum)                                                                  | (a)               |
| Chlorsulfuron                                                                  | 0.005             | Fluazifop-P-butyl                                                               | 0.007             |
|                                                                                |                   | Novaluron                                                                       | 0.007             |
|                                                                                |                   | Spirotetramat-cis-keto-hydroxy                                                 | 0.01              |
|                                                                                |                   | Chloridazon-desphenyl                                                          | 0.003             |
| Chloprothrin                                                                   | 0.003             | Fluazinam                                                                      | 0.007             |
|                                                                                |                   | Ofirace                                                                        | 0.003             |
|                                                                                |                   | Spirotetramat-enol-glucoside                                                   | 0.003             |
|                                                                                |                   | Dikegulac                                                                      | 0.01              |
| Chromafenozide                                                                 | 0.007             | Flubendazole                                                                    | 0.002             |
|                                                                                |                   | Omethoate                                                                      | 0.002             |
|                                                                                |                   | Spirotetramat-mono-hydroxy                                                     | 0.003             |
|                                                                                |                   | DNOC                                                                           | 0.003             |
| Cinerin I                                                                       | 0.05              | Flubendiamide                                                                   | 0.007             |
|                                                                                |                   | Orthosulfamuron                                                                | 0.01              |
|                                                                                |                   | Spiroxamine (sum of isomers)                                                   | 0.01              |
|                                                                                |                   | Fenthion (a)                                                                    |                   |
| Cinerin II                                                                      | 0.05              | Flucyclonoxuron                                                                | 0.007             |
|                                                                                |                   | Oryzalin                                                                       | 0.01              |
|                                                                                |                   | Sulcotrione                                                                    | 0.007             |
|                                                                                |                   | Fenthion-oxon                                                                  | 0.003             |
| Cinosulfuron                                                                    | 0.005             | Flufenoxuron                                                                   | 0.01              |
|                                                                                |                   | Oxadiangyl                                                                    | 0.007             |
|                                                                                |                   | Sulfaniquinoxalise                                                             | 0.003             |
|                                                                                |                   | Fenthion-oxon-sulfone                                                          | 0.003             |
| Clethodim                                                                       | 0.003             | Flumethrin                                                                     | 0.01              |
|                                                                                |                   | Oxamyl                                                                         | 0.003             |
|                                                                                |                   | Sulfentrazone                                                                  | 0.007             |
|                                                                                |                   | Fenthion-oxon-sulfoxide                                                       | 0.003             |
| Clethodim (sum)                                                                 | (a)               | Fluometuron                                                                    | 0.008             |
|                                                                                |                   | Oxasulfuron                                                                    | 0.005             |
|                                                                                |                   | Sulfosulfuron                                                                  | 0.007             |
|                                                                                |                   | Flazasulfuron                                                                  | 0.007             |
| Clofentezine                                                                    | 0.007             | Flupyradiflurone                                                               | 0.002             |
|                                                                                |                   | Oxathiapiprolin                                                                 | 0.002             |
|                                                                                |                   | Sulfoxaflor (sum of isomers)                                                   | 0.005             |
|                                                                                |                   | Imazosulfuron                                                                  | 0.01              |
| Cloneprop                                                                       | 0.003             | Flupysulfuron-methyl                                                            | 0.003             |
|                                                                                |                   | Oxaziclibrole                                                                  | 0.007             |
|                                                                                |                   | Sulprofos                                                                      | 0.008             |
|                                                                                |                   | Isoxaflutole (sum)                                                             | (a)               |
| Clothianidin                                                                    | 0.003             | Fluthione                                                                      | 0.007             |
|                                                                                |                   | Oxybendazole                                                                   | 0.002             |
|                                                                                |                   | Tebufenozide                                                                   | 0.01              |
|                                                                                |                   | Isoxaflutole                                                                   |                   |
|                                                                                |                   | diketonitrile                                                                  | RPA               |
|                                                                                |                   | 202248                                                                         | 0.01              |
| Coumaphos                                                                       | 0.005             | Flusulfamide                                                                   | 0.003             |
|                                                                                |                   | Oxycarboxin                                                                    | 0.003             |
|                                                                                |                   | Tebutham                                                                       | 0.002             |
|                                                                                |                   | Naled                                                                           | 0.01              |
| CPMC (Etrofol)                                                                 | 0.007             | Fluthiacet-methyl                                                               | 0.007             |
|                                                                                |                   | Oxydenesos-methyl (sum)                                                        | (a)               |
|                                                                                |                   | Tebuthiuron                                                                    | 0.005             |
|                                                                                |                   | Phorate-oxon                                                                   | 0.01              |
| Cyanazine                                                                       | 0.002             | Fluxapyroxad                                                                   | 0.003             |
|                                                                                |                   | Oxamtrine                                                                       | 0.003             |
|                                                                                |                   | Tebufenozarot                                                                  | 0.01              |
|                                                                                |                   | Phorate-oxon-sulfone                                                           | 0.002             |
| Cyantraniliprole                                                                | 0.007             | Foramsulfuron                                                                  | 0.01              |
|                                                                                |                   | Packobutrazol                                                                  | 0.03              |
|                                                                                |                   | Tembotrione                                                                    | 0.01              |
|                                                                                |                   | Phorate-oxon-sulfoxide                                                         | 0.002             |
| Cyazofamid                                                                      | 0.003             | Forchlorfenuron                                                                | 0.005             |
|                                                                                |                   | Paraoxon (ethyl)                                                                | 0.005             |
|                                                                                |                   | Tepraloxydim                                                                   | 0.008             |
|                                                                                |                   | Pirimicarb (sum)                                                               | (a)               |
| Cyclaniliprole                                                                  | 0.003             | Formetanate (Sum)                                                               | 0.005             |
|                                                                                |                   | Paraoxon-methyl                                                                | 0.007             |
|                                                                                |                   | Terbufos-sulfone                                                               | 0.01              |
|                                                                                |                   | Pirimicarb-desmethyl-                                                         |                   |
|                                                                                |                   | formamido                                                                       | 0.003             |
| Cyclonoprin                                                                     | 0.02              | Flubendazole                                                                    | 0.002             |
|                                                                                |                   | Penycuron                                                                      | 0.003             |
|                                                                                |                   | Terbufos-sulfoxide                                                             | 0.007             |
|                                                                                |                   | Prothiocoumaroyle and                                                          | (a)               |
|                                                                                |                   | prothiocoumaroyle-desifos (sum)                                                |                   |

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| Pesticide                          | Concentration | Note                  |
|-----------------------------------|---------------|-----------------------|
| Cyclosulfuron                     | 0.01          |                       |
| Halosulfuron-methyl               | 0.007         |                       |
| Penflufen                         | 0.002         |                       |
| Tetcroazonole                     | 0.005         |                       |
| Pyraclostrobin                    | (a)           | Refer to LOD/LOQ of the individual pesticides that were used to calculate the sum item |
| Cycloxydim                        | 0.007         |                       |
| Hexasulfuron                      | 0.01          |                       |
| Penoxsulam                        | 0.007         |                       |
| Thiabendazole                     | 0.003         |                       |
| Pyraclostrobin metabolite         | 0.01          |                       |
| Cyflametofin                      | 0.02          |                       |
| Hexazinone                        | 0.005         |                       |
| Pentiopyrad                       | 0.005         |                       |
| Thiaclopid                        | 0.003         |                       |
| Sulfenacil (sum of sulfenacil)    | (a)           |                       |
| Cymoxanil                         | 0.007         |                       |
| Hexythiazox                       | 0.003         |                       |
| Phenmedipham                      | 0.003         |                       |
| Thiamethoxam                      | 0.003         |                       |
| Sulfenacil Metabolite             | M800H11       |                       |
| Cyprazine                         | 0.007         |                       |
| Hydroxyquinoline, 8- (sum)        | 0.01          |                       |
| Phorate sulfoxide                 | 0.002         |                       |
| Thidiazuron                       | 0.003         |                       |
| Sulfenacil Metabolite             | M800H35       |                       |
| Cyromazine                        | 0.007         |                       |
| Hymexazol                         | 0.008         |                       |
| Phosfolan -ethyl                  | 0.003         |                       |
| Thiensulfuron-methyl              | 0.005         |                       |
| Saflufenacil Metabolite           | (a)           |                       |
| Dichlofluanid (sum)               | (a)           |                       |
| Disulfoton (sum)                  | (a)           |                       |
| Phorate (sum)                     | (a)           |                       |
| Prochloraz (sum)                  | (a)           |                       |

**GC-MS/MS (LOD mg/kg)**

| Compound                          | LOD (μg/kg) |
|-----------------------------------|-------------|
| 2,6-Diisopropyl-naphthalene       | 0.003       |
| Cyanophos                         | 0.008       |
| Fenamidone                        | 0.005       |
| Leptophos                         | 0.003       |
| Pyriminobac-methyl (sum)          | 0.003       |
| 2-Naphthol                        | 0.02        |
| Cynolphos                         | 0.005       |
| Fenamisol                         | 0.003       |
| Mecarbam                          | 0.007       |
| Pyriproxyfen                      | 0.003       |
| Acetochlor                        | 0.005       |
| Cyloate                           | 0.003       |
| Fenazaquin                        | 0.003       |
| Mefenacet                         | 0.003       |
| Quintozene                        | 0.005       |
| Acrinathrin                       | 0.003       |
| Cyflufenamide (sum)               | 0.007       |
| Fenchloryphos                     | 0.003       |
| Mefenpyr-diethyl                  | 0.007       |
| Quintozene and Pentachloroaniline (sum) | (a)      |
| Alachlor                          | 0.003       |
| Cyfluthrine (sum of isomers)      | 0.003       |
| Fenchloryphos (sum)               | (a)         |
| Metazachlor                       | 0.005       |
| Quinalofop-ethyl                  | 0.005       |
| Aldrin                            | 0.003       |
| Cyhalofop-buty1                   | 0.008       |
| Fenchloryphos oxon                | 0.005       |
| Metconazole (sum of isomers)      | 0.005       |
| Resmethrin (sum)                  | 0.008       |
| Aldrin and Dieldrin (sum, expressed as dieldrin) | (a)        |
| Cyhalothrin-lambda + Cyhalothrin-gamma (sum) | 0.003 |
| Fenchloryphos                     | 0.005       |
| Methacrilos                       | 0.007       |
| S421                              | 0.02        |
| Anilofos                          | 0.007       |
| Cyminazole                        | 0.007       |
| Fenithion                         | 0.003       |
| Methidithion                      | 0.003       |
| Sibumeton                         | 0.003       |
| Anthraquinone                     | 0.003       |
| Cypermethrin (sum of isomers)     | 0.003       |
| Fenoxaprop-ethyl (sum)            | 0.008       |
| Methoprene                        | 0.003       |
| Silafluofen                       | 0.003       |
| Aspon                             | 0.002       |
| Cyphenothrin (sum)                | 0.005       |
| Fenpropethrin                     | 0.005       |
| Methoxychlor                      | 0.003       |
| Silthioriam                       | 0.007       |
| Atraton                           | 0.003       |
| Cyproconazole                     | 0.005       |
| Fenpropidin (sum)                 | 0.003       |
| Metolachlor and S-metolachlor (sum of isomers) | 0.003 |
| Simeconazole                      | 0.008       |
| Atrazine                          | 0.008       |
| Cyprodinil                        | 0.005       |
| Fenpropimorph (sum of isomers)    | 0.003       |
| Metrafenone                       | 0.007       |
| Sulfoprop                        | 0.007       |

Note: (a) Refer to LOD/LOQ of the individual pesticides that were used to calculate the sum item.
| Chemical Name         | Concentration | Dose Form | Formulation | Activeingredient | Symbol | Conversionfactor | Notes |
|----------------------|---------------|-----------|-------------|------------------|--------|------------------|-------|
| Atrazine-desethyl    | 0.003         | Dazomet   | 0.01        | Fenvalerate      | 0.005  | MGK 326          | 0.003 |
| Azacarboxide         | 0.007         | DBCP      | 0.005       | MGK-264          | 0.007  | TEBACONAZOLE     | 0.005 |
| Azinphos-ethyl       | 0.008         | DDD-o,p'- | 0.005       | Mirex            | 0.003  | TEBUFENPYRAD     | 0.003 |
| Beflubutanid         | 0.007         | DDE-o,p'  | 0.003       | Mirex            | 0.003  | TEBUSIMFOS       | 0.005 |
| Benalaxyl-M (sum)    | 0.005         | DDE-p,p'  | 0.005       | MYCLOBUTANIL     | 0.005  | TECAZENE         | 0.005 |
| Benfluralin          | 0.003         | DDT (sum | 0.005       | Flucrypyrin      | 0.003  | TEFICHLORIDE     | 0.003 |
| Benoxacor            | 0.008         | p,p'-DDE  | 0.007       | NITROFEN         | 0.003  | TEBIFLONAT       | 0.01  |
| Benzoylprop-ethyl    | 0.005         | DDT-o,p'- | 0.005       | NITROTHIAN ISOPROPYL | 0.005 | TEBACOLI         | 0.007 |
| Bifenox              | 0.005         | DDT-p,p'- | 0.008       | Nonaclor, cis-   | 0.003  | TEBUFOS          | 0.003 |
| Bifenthrin (sum of isomers) | 0.007 | Deltamethrin and Tralomethrin (sum) | 0.008 | TEBUMETON | 0.003 |
| Binapacryl           | 0.01          | Demeton-S- methyl | 0.01 | TEBUTHYLAZINE | 0.005 |
| Bioresmethrin (cis-trans) | 0.008 | Desmethyln | 0.007 | TEBUTRYS | 0.007 |
| Biphenyl             | 0.01          | D-Iallate (sum of isomers) | 0.005 | TETRACHLOROANILINE | 0.005 |
| Bitertanol (sum of isomers) | 0.005 | Diazinon | 0.003 | TETRACHLORVINPHOS | 0.007 |
| Bixafen              | 0.007         | Dichlobenil | 0.01 | TETRATRIOD | 0.007 |
| Bromobutide          | 0.003         | Dichlorofenthion | 0.002 | TETRAMETHIN (SUM OF ISOMERS) | 0.003 |
| Bromocyclen          | 0.003         | Dichlofluorid | 0.01 | TETRASUL | 0.007 |
| Bromophos (methyl)   | 0.003         | Dichloromid | 0.005 | THENYLETHYLCHLOR | 0.005 |
| Bromophos-ethyl      | 0.007         | Dichloroaniline, 3,5- | 0.003 | THIAZOPYR | 0.005 |
| Bromopropylate       | 0.003         | Dichlorophenol, 2,4- | 0.007 | THIOCYCLAM | 0.01 |
| Bromosulfin-octanoate | 0.002  | Dichlorobenzol | 0.007 | THIOFANOX | 0.007 |
| Name of Chemical                        | Concentration | Name of Chemical                        | Concentration | Name of Chemical                        | Concentration | Name of Chemical                        | Concentration | Name of Chemical                        | Concentration |
|----------------------------------------|---------------|-----------------------------------------|---------------|-----------------------------------------|---------------|-----------------------------------------|---------------|-----------------------------------------|---------------|
| Bromuconazole (sum of diasteroisomers) | 0.003         | Diclofop-methyl                         | 0.003         | Fluazoxopyr-mephiyl                     | 0.003         | Pentachloroaniline                      | 0.003         | Thiometon                               | 0.008         |
| Bupirimate                             | 0.005         | Dicloran                                | 0.008         | Fluprimidol                             | 0.003         | Pentachloroanisole                      | 0.003         | Thiozalin                               | 0.003         |
| Butachlor                              | 0.003         | Dicofol (<a>o,p</a>)                    | 0.007         | Flurtamone                              | 0.003         | Pentachlorobenzene                      | 0.003         | Tiocarbazil                             | 0.005         |
| Butafenacil                            | 0.003         | Dicofol (<p,p'>)                         | 0.003         | Flusilazole                             | 0.007         | Pentachlorophenol                      | 0.007         | Tolclofos-methyl                        | 0.007         |
| Butamifos                              | 0.003         | Dicofol (sum)                           | (a)           | Flutolanil                              | 0.005         | Pentachlorothioanisole                  | 0.003         | Transfluthrin                           | 0.005         |
| Butralin                               | 0.005         | Dieldrin                                | 0.005         | Flutriafol                              | 0.003         | Pentoxazone                            | 0.005         | Triadimenol (sum of isomers)            | 0.007         |
| Butylate                               | 0.003         | Diethyryl-ethyl                         | 0.003         | Fluvalinate (sum)                       | 0.003         | Permethrin (sum)                       | 0.007         | Triadimenol (sum)                       | 0.007         |
| Cadusafos                              | 0.005         | Dithofencarb                            | 0.007         | Fonofos                                 | 0.003         | Perthane                               | 0.007         | Triallate                              | 0.005         |
| Carbortiran-3- keto                    | 0.005         | Difenoconazole                          | 0.003         | Formothion                              | 0.007         | Perthoxamide                           | 0.005         | Triazophos                             | 0.003         |
| Carbophenothan Methyl                  | 0.007         | Diflupridazin                           | 0.01          | Fosuthiazate                            | 0.01          | Phenothrin (sum of isomers)             | 0.008         | Tribulos (DEF)                         | 0.003         |
| Carfentrazone-ethyl                    | 0.003         | Dimapiperate                            | 0.007         | Furacalyl                               | 0.007         | Phenothoate                            | 0.003         | Trichlorobenzene,1,2,3,-               | 0.003         |
| Carvacoel                              | 0.01          | Dimethachlor                            | 0.003         | Furametryr                              | 0.007         | Phenylpheno 2,-                         | 0.005         | Trichlorobenzene,1,2,4,-              | 0.003         |
| Chinosmethionat                        | 0.007         | Dimethenamid (sum)                      | 0.003         | Halifenpos                              | 0.003         | Phorate                                | 0.003         | Trichlorobenzene,1,3,5,-             | 0.003         |
| Chlorbenside                           | 0.003         | Dimethipin                              | 0.01          | Haloxyfip-methyl                        | 0.007         | Phorate sulphone                       | 0.007         | Trichloroanate                         | 0.003         |
| Chlorbutan                             | 0.007         | Dimethylvinphos                         | 0.002         | HCH-alpha                               | 0.003         | Phosalone                              | 0.003         | Trichlorophenol,2,4,6,-             | 0.01          |
| Chlordane (sum of cis- and trans- chlordane) | (a)       | Dinoxystrobin                           | 0.008         | HCH-beta                                | 0.005         | Phthalide                              | 0.007         | Triclosan                              | 0.01          |
| Chlordane, cis- (sum of isomers)      | 0.003         | Diniconazole                            | 0.007         | HCH-delta                               | 0.005         | Picolinic acid                         | 0.005         | Tridiphane                             | 0.01          |
| Chlordane, oxy-                       | 0.003         | Dinotramine                             | 0.005         | HCH-epsilon                             | 0.005         | Pioxystrobin                           | 0.005         | Triflumazone                           | 0.003         |
| Chlordane, trans-                      | 0.003         | Dicofoslan                              | 0.005         | HCH-gamma (Lindane)                     | 0.003         | Piperoxphos                            | 0.003         | Trifluralin                            | 0.003         |
| Chlordecone                           | 0.005         | Dioxabenzoaloxid                        | 0.003         | Heptachlor                              | 0.003         | Pirimiphos-etyl                        | 0.003         | Trimethacarb,2,3,5,-                | 0.007         |
| Chlorimineform                         | 0.003         | Diphenamid                              | 0.007         | Heptachlor (sum)                        | (a)           | Pirimiphos-methyl                      | 0.005         | Trimethacarb,3,4,5,-               | 0.007         |
| Chlorothoxylos                        | 0.008         | Diphenylamine                           | 0.005         | Heptachlor endo-epoxide (isomer A)      | 0.005         | Pfredinate                              | 0.01          | Triticazonol                           | 0.007         |
| Chlorfenapyr                          | 0.008         | Ditalimfos                              | 0.01          | Heptachlor ero-epoxide (isomer B)       | 0.003         | Prallethrin (sum of (R)- and (S)- stereoisomers) | 0.01 | Uniconazol                             | 0.003         |
| Chlorfenon                            | 0.005         | Dithiopyr                               | 0.003         | Heptanophos                             | 0.005         | Pretialachlor                          | 0.007         | Vinclozolin                            | 0.003         |
| Chlorfenovinphos                  | 0.003         | Endosulfan (sum)                        | (a)           | Hexachlorobenzene (HCB)                 | 0.005         | Procyximide                             | 0.005         | 2,6-Dichlorobenzamide                  | 0.003         |
| Chlorflurenol-Methyl                  | 0.007         | Endosulfan I                            | 0.003         | Hexachlorocyclohexane (HCB), (sum)      | (a)           | Profenofos                             | 0.005         | 3-decen-2-one                          | 0.003         |
| Chlorflurin                           | 0.007         | Endosulfan II                           | 0.003         | Hexaconazole                            | 0.007         | Profuralin                             | 0.007         | Benozolin-ethyl                        | 0.003         |
| Chlorobenzilate                      | 0.002         | Endosulfan sulfate                      | 0.003         | Hydropropene (sum)                     | 0.003         | Prometon                               | 0.003         | Chloronitrofen                         | 0.003         |
| Chemical          | LOD (mg/kg) | Chemical          | LOD (mg/kg) | Chemical          | LOD (mg/kg) | Chemical          | LOD (mg/kg) |
|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| Chloroneb         | 0.003       | Endrin            | 0.003       | Imazamethabenzyl  | 0.01        | Prometryn         | 0.003       |
| Chloropropylate   | 0.007       | Endrin aldehyde   | 0.003       | Ipomazolazo      | 0.003       | Propachlor        | 0.003       |
| Chlorpropham      | 0.007       | Endrin ketone     | 0.003       | Iprobenfos       | 0.008       | Propazine         | 0.005       |
| Chlorpyrifos (-ethyl) | 0.002    | EPN               | 0.003       | Ipsozalne        | 0.01        | Propentamphos     | 0.007       |
| Chlothral-dimethyl| 0.007       | Epoxiconazole     | 0.002       | Iprovalicarb     | 0.003       | Propamphos        | 0.007       |
| Chlorothion       | 0.007       | Epsecarb          | 0.003       | Isazalne         | 0.002       | Propiconazole (sum of isomers) | 0.007 |
| Cloroalphos       | 0.007       | Etacozole (sum)   | 0.002       | Isobenzan        | 0.007       | Propisochlor      | 0.005       |
| Chloroazinate     | 0.003       | Ethhalfluralin    | 0.005       | Isocarbophos     | 0.003       | Propyramide       | 0.003       |
| Cinclidon-ethyl (sum) | 0.007    | Ethofumesate      | 0.003       | Isoxaline        | 0.007       | Prothioconazole   | 0.005       |
| Cinmethylin (sum of isomers) | 0.007 | Ethofumesate (sum) | (a)         | Isofenphos       | 0.005       | Pentachlorobenzonitrile 2,3,4,5,6- | 0.003 |
| Cloflinafop-propargyl | 0.003 | Ethofumesate, 2-keto- | 0.002 | Isofenphos-methyl | 0.005 | Pyraflufen-ethyl | 0.007 |
| Clomazone         | 0.003       | Etosirnprox       | 0.003       | Isopropalin      | 0.005       | Pyrazophos        | 0.007       |
| Cloquintocet-mexyl | 0.003    | Etosazole         | 0.007       | Jodfenphos       | 0.005       | Pyributicarb      | 0.005       |
| Crimidine         | 0.005       | Etridiazole       | 0.007       | Kresoxim-methyl  | 0.003       | Pyridaben         | 0.007       |
| Crotosyphos       | 0.002       | Famphur           | 0.003       | Lactofen         | 0.003       | Pyridalyl         | 0.003       |

Note: (a) Refer to LOD of the individual pesticides that were used to calculate the sum item

**LC-MS/MS + GC-MS/MS (LOD* mg/kg)**

| Chemical          | LOD (mg/kg) | Chemical          | LOD (mg/kg) | Chemical          | LOD (mg/kg) | Chemical          | LOD (mg/kg) |
|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| Dichlofluanid (sum) | (a)         | Diadiflum (sum)   | (a)         | Phorate (sum)     | (a)         | Prochloraz (sum)  | (a)         |
| Disulfoton (sum)  | (a)         | Phorate (sum)     | (a)         | Prochloraz (sum)  | (a)         | Phorate (sum)     | (a)         |

Note: (a) Refer to LOD/LOQ of the individual pesticides that were used to calculate the sum item

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