Cooperation Centre for Scientific Research Relative to Tobacco

CORESTA GUIDE N° 1

The Concept and Implementation of CPA Guidance Residue Levels

October 2021

Agro-Chemical Advisory Committee

CORESTA TECHNICAL GUIDE N° 1

Title:

The Concept and Implementation of CPA Guidance Residue Levels

Status: Valid

Note: This document will be periodically reviewed by CORESTA

Document history:

Date of review	**Information**
July 2003	**Version 1**
December 2003	GRL for Pyrethrins (Σ) and Terbufos corrected. CPA terminology corrected.
June 2008	**Version 2** – GRLs revised and residue definitions added.
June 2010	Provisional GRL of 2.00 ppm for Cyfluthrin to replace previous GRL of 0.50 ppm.
July 2013	**Version 3** – GRLs revised.
October 2013	Note for Maleic Hydrazide revised.
July 2016	**Version 4** – GRLs revised + clarification that scope of GRLs applies predominantly to the production of traditional cigarette tobaccos and GAP associated with their cultivation.
June 2018	Fluopyram GRL of 5 ppm added to GRL list.
November 2019	**Version 5** – Nine new CPAs with GRLs added to list. Revision of GRLs for Chlorantraniliprole and Indoxacarb. Updated web links.
October 2020	**Version 6** – Flupyradifurone GRL of 21 ppm added to GRL list.
October 2021	**Version 7** – Paragraph on HHPs added to text

THE CONCEPT AND IMPLEMENTATION OF CPA GUIDANCE RESIDUE LEVELS

Executive Summary

- Guidance Residue Levels (GRLs) are in the remit of the Agro-Chemical Advisory Committee (ACAC) of CORESTA. Their development is a joint activity of all ACAC members, who represent the leaf production, processing and manufacturing sectors of the Tobacco Industry. The concept of GRLs and their implementation are described in this guide.
- GRLs provide guidance to tobacco growers and assist with interpretation and evaluation of results from analyses of residues of Crop Protection Agents (CPAs*). They therefore serve as an indicator that Good Agricultural Practice (GAP) with respect to CPA use is being implemented. The principles of GAP and CPAs for tobacco are given in "Section V. Agrochemical Management" of CORESTA Guide No. 3 – "Good Agricultural Practices (GAP) Guidelines" [https://www.coresta.org/good-agricultural-practices-gap-guidelines-29207.html].
- The GRLs are applicable to cured tobacco leaf while focusing on processed tobacco leaf which is predominantly used for the production of traditional cigarette tobaccos and the GAPs associated with the cultivation of these tobacco types.
- Compliance with the statutory conditions of use of each CPA as shown in its product "label" is central to using GRLs as a means for monitoring GAP. The relevant information in this context is:
  - Trade and common names of the product;
  - Active ingredient(s);
  - Type of CPA (herbicide, insecticide, suckericide, etc.);
  - Local registration for use on tobacco;
  - Target pests;
  - Timing of application (growth stage) and maximum number of applications;
  - Rate(s) of application;
  - Pre-harvest interval;
  - Mixing and method(s) of application.
- The GRL list is comprised of compounds banned for use in agriculture by International Conventions, those not registered for tobacco but that may occasionally be present in the crop and those registered for tobacco and in common use. It is important to note that:
  - **It is not a list of recommended CPAs for tobacco. That is the case for official and/or industry bodies in each country;**
  - **GRLs have not yet been set for all CPAs registered for tobacco. Setting GRLs is an ongoing process based on a list of priorities decided by frequency of use and importance to leaf production;**
  - **The presence of a compound does not imply endorsement by CORESTA;**
  - **The entries in the list do not replace Maximum Residue Levels (MRLs) set by the authorities. Compliance with MRLs is a legal requirement for countries that have set them for tobacco.**
- The list is reviewed periodically in the light of new information on regulations, analytical capabilities and registration status.
- The following sources of information are referred to when setting GRLs:
  - Results from supervised field trials, where available;
  - Legislation on MRLs for tobacco and other crops;
  - ACAC CPA residue database (CARD);
  - Limits of Quantification (provided by CORESTA Agrochemicals Analysis Sub-Group); and
  - Information provided by CPA manufacturers and tobacco agronomists.
- Reference material and criteria adopted for the setting of each GRL are documented and stored by CORESTA.

** CPAs are agrochemicals used to protect crops from pests and diseases, control unwanted plants (weeds) and regulate growth.*

Abstract

Guidance Residue Levels (GRLs) have been developed by the CORESTA Agro-Chemical Advisory Committee (ACAC), to provide guidance to tobacco growers and those in the tobacco industry interested in Crop Protection Agents (CPAs) application and the implementation of Good Agricultural Practice (GAP) in tobacco production.

GRLs are intended to assist with the interpretation and evaluation of CPA residue testing results and serve as an indicator that GAP is being implemented. In 2003 GRLs were developed for 99 CPAs, which may be included in the range of CPA residue analysis routinely offered by the major testing laboratories. The list is revised periodically as needs demand and now covers 116 CPAs. As a result, it contains additional compounds and changes to some of those in the original list following full reviews of all compounds in the light of continuing changes in CPA registrations, labels, regulations and agricultural practices, and based also on improvements in analytical methods, knowledge of degradation patterns and information about residues.

GRLs do not replace requirements to comply with regulations, neither on the use of CPAs, nor with regard to residue levels that may be detected. GRLs are designed to emphasise the importance of GAP for growing quality tobacco.

Introduction

Tobacco cultivation, like the production of nearly all other crops, requires appropriate measures to protect the growing plant in order to secure desired quality and acceptable yield, as well as to preserve the crop after harvesting. Responsible and considerate use of CPAs may, in some cases, lead to unavoidable residues remaining on the crop. Consequently, just as is the case with other crops, CPA residues may be detectable on commercial tobacco and in finished tobacco products.

International and national authorities regulate the residues of CPAs in food and feed crops, but there is no universal consensus with regards to tobacco. CORESTA members have identified the need to provide information to the tobacco growers and tobacco industry based on the best available technical and scientific knowledge and historical residue data on tobacco. This guidance should be based on the levels of residues that may be present after applications of CPAs using GAP.

In some countries both growers and companies have legal obligations to address the use of CPAs in tobacco cultivation and the presence of residues on tobacco. They should also act in a socially responsible manner ensuring that CPAs are used responsibly in accordance with GAP. Legal obligations can include compliance with all applicable statutory Maximum Residue Levels (MRLs).

GAP in the Use of Pesticides, as defined by Codex Alimentarius[1], includes the nationally authorised safe uses of pesticides under actual conditions necessary for effective and reliable pest control. It encompasses a range of levels of pesticide applications up to the highest authorised use, applied in a manner which leaves a residue which is the smallest amount practicable.

Authorised safe uses are determined at the national level and include nationally registered or recommended uses, which take into consideration public and occupational health and environmental safety. Actual conditions include any stage in the production, storage, transport, distribution and processing of food commodities and animal feed.

The authorised safe use forms a section of the "Product Label" and in many countries handlers and users who do not comply in detail with these instructions may be prosecuted. The usual information on the Label includes the crops to which the product can be applied, the timings and maximum number of applications per season, the application rate, the interval between the last application and harvest and considerable information on safety aspects. Compliance with the Product Label is, therefore, one of the key elements of GAP. CORESTA and its ACAC strongly support the use of GAP in tobacco production and have used this as the main principle for this proposal on guidance residue levels.

The international oversight guidance for CPAs residues in food is through Codex Alimentarius. Codex MRLs, which are primarily intended to apply in international trade, are used to assist national governments in setting their MRLs and are based on GAP.

Development of Guidance Residue Levels

In order to provide guidance to tobacco growers and the tobacco industry with regard to CPA residues on cured tobacco leaf, ACAC has developed over the past years the concept of

Guidance Residue Levels. GRLs embrace the same concepts used by Codex, but to avoid any confusion over terminology the term "Guidance Residue Levels" is proposed thereby distinguishing these levels from regulatory MRLs. The purpose of GRLs is to provide a benchmark for comparing results obtained from CPA residue testing of leaf samples. They attempt to answer the questions:

- What residue should one expect when the label recommendations are being followed and GAP is being implemented?
- How can one distinguish between residues that result from authorised use, unauthorised use or another environmental source of a CPA?

CPAs were categorised into four groups:

1. CPAs that are authorised for use on tobacco;
2. Obsolete or unauthorised CPAs that may still be available to farmers in some countries;
3. Obsolete CPAs that may persist in the growing environment;
4. Certain CPAs with well-established statutory MRLs.

Category of CPA	***Basis for Guidance Residue Level***
Important CPAs authorised for use on tobacco	Applicable legislated levels, or the highest acceptable residue that might be expected from GAP
CPAs that should not be used on tobacco or are not known to be authorised for use on tobacco	The Limits of Quantification with the current analytical methods
CPAs that are no longer used but remain in the environment	Internationally accepted residue levels or legal / regulatory MRLs
CPAs that are covered by specific tobacco laws and regulations but not covered in any of the above categories	The legal / regulatory MRLs

As is the case with setting MRLs, which are set "by an experienced expert after he has consulted all the available documentation and information on the residue situation of the envisaged application of the product"[2], the GRLs were developed from many different sources of information. A commercial database[3] and information about registration in several countries (Homologa database[11]) were used for determining the most important CPAs that are being sold for use on tobacco. Cognisance was made of those CPAs that are being severely restricted through the different international conventions[4,5] and the CPA residues commonly tested for in national residue monitoring programmes[6,7]. Those CPA residues that arise as contaminants from environmental sources (including former agricultural uses) and are given in Codex as Extraneous Maximum Residue Limit[8] (EMRL) were also used as an information source.

The current list does not necessarily include every CPA authorised for use on tobacco in some places in the world. Exclusion of particular CPAs from the list of GRLs would *not* mean that their use was unacceptable, as long as their use complied with all relevant laws and regulations. At the same time, inclusion of particular CPAs in the list of GRLs does not mean that their use is specifically endorsed.

The GRLs have also been broadly compared with acceptable intake levels established for food evaluation by the U.S. EPA[9] and JMPR[10] where they were available.

Limited residue data are available from specific field experiments conducted by manufacturers and research institutes. In addition, for many years CPA residues have been examined on tobacco leaf to confirm compliance with relevant standards. Over time, these measurements have given a good indication of CPA residue levels that can be expected even when GAP is followed. ACAC has reviewed these data and examined relevant laws and regulations to develop a list of GRLs for a number of commonly tested CPAs.

In determining the GRLs for individual residues, account was also taken of the chemical and physical properties of the compound and the precision at which the residue can be measured.

Some CPAs that are known to be widely authorised for use on tobacco tend to have higher GRLs but for some non-persistent, or non-systemic

soil applied active ingredients, such as some of the organophosphates, the GRLs are lower. Some of the differences between the GRLs for the unauthorised active ingredients are the capability of the major tobacco residue testing laboratories to detect the residue. In order to ensure that the GRLs can be reliably detected by most laboratories, the Limits of Detection (LOD) and Limits of Quantification (LOQ) of several laboratories were examined and a consensus value arrived at for these residues.

GRLs are now defined, using the information detailed above, for 116 individual, or groups of, CPA active ingredients (Table 1). In two exceptional cases, dithio-carbamates (EBDCs) and maleic hydrazide (MH), it was recognised that the proper use of the CPA is determined by a number of complex factors that may be quite variable from area to area. Rather than suggesting multiple GRLs for different situations, ACAC decided to specify only one GRL for each CPA and amend it by clearly worded admonitory commentaries offering advice and warning.

Use of Guidance Residue Levels

The main purpose of providing this guidance is to assist the sectors of the tobacco industry, most closely associated with tobacco leaf producers, in the evaluation of results from CPA residue testing. Companies determine for themselves the analysis to be conducted in order to identify specific CPA residues. This may depend on where tobaccos are grown or purchased, the necessity to comply with statutory MRLs, or their own product (leaf or finished product) stewardship programmes. The introduction of the GRL concept should allow the same information to also be used for monitoring compliance to GAP.

The list of GRL values is neither a regulatory requirement nor mandatory - but is designed to emphasise the importance of GAP for growing good quality tobacco. In some cases, results for individual CPAs will be obtained that exceed the GRL. This, along with other evidence, could be taken as a preliminary indication that GAP might not have been observed and that remedial action may be required to ensure that, in the future, farmers have followed proper procedures. In a small number of exceptional cases, perhaps arising from local environmental and practical considerations, there may be valid reasons, even under strict compliance with GAP, why residues of a few active ingredients exceed a specified GRL. An illustration of this is the residues of the two CPAs mentioned above – the dithiocarbamates and maleic hydrazide (MH).

In countries with severe blue mould epidemics and where only dithiocarbamates are available for combating this disease, residues above the stated 5 ppm might arise. Where effective systemic fungicides, such as metalaxyl and dimethomorph, are authorised and insensitive strains do not occur, the problem is much smaller and the specified level more easily achievable. In countries where blue mould does not occur regularly in the field it should not be necessary to apply these fungicides. For late season leaf diseases alternative fungicides should, if possible, be found or the dithiocarbamates used with care with strict adherence to the label on the harvest interval.

With maleic hydrazide, the residues are highly dependent on the amount of rainfall following application. Small amounts of rain can substantially reduce the level of residues but in dry years even when it has been applied according to the current label conditions there could be difficulties achieving the 80 ppm limit. There is considerable research into finding agronomic practices to reduce residue levels. For example, examining different rates of application in conjunction with fatty alcohols, sprayer and spray nozzle designs, changes to fertiliser applications and new sucker control chemicals.

Following this approach, potential elevated residues can be addressed. In this context, the GRL concept should be viewed as a way of establishing targets for improvement aimed at a further reduction of CPA residue levels and as roadmaps to improve GAP. It is intended that GRLs should become an integral part in the pragmatic management of CPA residues on tobacco along with appropriate approaches for sampling, residue testing, the assessment of analytical results and an action plan from the results.

If the information from the residue analysis can be fed back to the extension services and farmers in the areas where issues have been highlighted, real progress can be made to address any problems.

Based on history, the main reasons for a residue exceeding a GRL of a CPA authorised for use are often: applications of a CPA too close to harvesting; too many applications in one crop year and exceeding the recommended application rate. Information pertaining to application rate, timing and harvest interval should be on the

Product Label, and if the CPA has been appropriately scrutinised during the authorisation procedures, few issues with residues exceeding the GRLs should arise.

Guidance Residue Levels and Highly Hazardous Pesticides (HHPs)

WHO-FAO describes HHPs as the "Pesticides that are acknowledged to present particularly high levels of acute or chronic hazards to health or environment…". The WHO-FAO encourages the identification of HHPs in use, an assessment of their associated risks, and decisions made on appropriate measures to mitigate these risks.

The CPA list in this Guide is neither all-encompassing nor exhaustive of all CPAs used in tobacco leaf production. Rather, it is comprised of the predominant compounds that are registered for use in tobacco, those that are banned by International Conventions and those that are not registered for use in tobacco but are occasionally detected. Therefore, the list also contains some CPAs classed as HHPs.

CORESTA Guide No. 27 on the Identification and Elimination of Highly Hazardous Pesticides (HHPs) in Leaf Tobacco Production, facilitates the access to key basic information on HHPs, such as: identification; risk assessment and risk mitigation; and elimination.

Guide No. 27, produced by ACAC, promotes specific awareness on HHPs use in tobacco leaf production and provides an indicative reference list of HHPs, irrespective of their GRL status. Guide No. 27 adds to existing CORESTA Guides that address responsible agrochemical management.

Future Developments

The GRL concept continues to be a major part of ACAC's work in the future. The list of GRLs will be periodically reviewed to reflect changes in CPA registrations and labels, laws and regulations, agricultural practices, information and data from residue trials and/or other scientific knowledge. There are also discussions on how this objective assessment of residue information can facilitate sharing of information so that areas of general concern can be more openly identified. Once issues have been identified, CORESTA and ACAC may be able to give appropriate guidance and assistance to the leaf production sector on residue issues. In connection with this proposal on GRLs, ACAC is working with the CORESTA Agrochemical Analysis Sub-Group on a proficiency testing programme, whereby individual laboratories involved in tobacco residue testing can benchmark their methods with other companies undertaking the same test. This is facilitating harmonisation on limits of quantification and gives CORESTA members increased confidence that their samples are being tested with appropriate methods.

The development of the concept and details of GRLs is a joint activity of all ACAC members, comprised of representatives of the leaf growing, processing and manufacturing sectors of the Tobacco Industry. Although implementation is an individual matter for companies, the members of ACAC envisage industry-wide acceptance of GRLs as a useful measure for ensuring adherence to GAP in the production of predominantly traditional cigarette tobaccos.

References

1. Codex Alimentarius General Requirements Volume 1A (1995). Food and Agriculture Organization Rome
2. Commission of the European Communities (1995). Calculation of maximum residue levels and safety intervals. 7039/VI/95 En 22/7/1997 Appendix 1
3. Sigma Database Agrochemical Use on Tobacco (1999). Produce Studies Research, Newbury Berks. UK
4. Rotterdam Convention on the Prior Informed Consent procedure for certain hazardous chemicals and pesticides in international trade. Rotterdam, Netherlands 10th September 1998 http://treaties.un.org/doc/publication/mtdsg/volume%20ii/chapter%20xxvii/xxvii-14.en.pdf
5. Stockholm Convention on Persistent Organic Pollutants. Stockholm, Sweden 22nd May 2001 http://www.pops.int/
6. European Commission (2003). Monitoring of Pesticide Residues in products of plant origin in the European Union, Norway, Iceland and Liechtenstein 2001 Report. Sanco/20/03 Final. http://ec.europa.eu/food/fvo/specialreports/pesticide_residues/report_2001_en.pdf
7. Food and Drug Administration (2002). Food and Drug Administration pesticide program - residue monitoring – 2001. https://wayback.archive-it.org/7993/20170722164648/https://www.fda.gov/Food/FoodborneIllnessContaminants/Pesticides/ucm126141.htm

8. Codex maximum residue limits for pesticides.
http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/

9. US Environmental Protection Agency, Pesticide Reregistration Status.
https://iaspub.epa.gov/apex/pesticides/f?p=CHEMICALSEARCH:1:::NO:::

10. Inventory of IPCS and other WHO pesticide evaluations and summary of toxicological evaluations performed by the Joint Meeting on Pesticide Residues (JMPR) through 2010, and subsequent annual updates from summary reports of the Joint FAO/WHO Meeting on Pesticide Residues (issued October 2011, October 2012, October 2013 and October 2014). Evaluations through 2002. WHO/PCS/02.3
http://www.who.int/pcs/jmpr/inventory.htm

11. Homologa™, The Global Crop Protection Database. https://v5.homologa.com/en/

12. CORESTA Guide No. 27 - Identification and Elimination of Highly Hazardous Pesticides (HHPs) in Leaf Tobacco Production
https://www.coresta.org/identification-and-elimination-highly-hazardous-pesticides-hhps-leaf-tobacco-production-33021.html

Table 1. **CPA Guidance Residue Levels (GRLs)**

- **This is not a list of recommended Crop Protection Agents (CPAs) for tobacco. That is the case for official and/or industry bodies in each country.**
- **GRLs have not yet been set for all CPAs registered for tobacco. Setting GRLs is an ongoing process based on a list of priorities decided by frequency of use and importance to leaf production.**
- **The presence of a compound does not imply endorsement by CORESTA.**
- **The entries in the list do not replace Maximum Residue Levels (MRLs) set by the authorities. Compliance with MRLs is a legal requirement for countries that have set them for tobacco.**

No.	CPA	GRL (ppm)	Residue definition	Notes
1	2,4,5-T	0.05	2,4,5-T	
2	2,4-D	0.2	2,4-D	
3	Acephate	0.1	Acephate	
4	Acetamiprid	3	Acetamiprid	
5	Acibenzolar-S-methyl	5	Acibenzolar-S-methyl	
6	Alachlor	0.1	Alachlor	
7	Aldicarb (Σ)	0.5	sum of Aldicarb, Aldicarb sulfoxide and Aldicarb sulfone, expressed as Aldicarb	
8	Aldrin + Dieldrin	0.02	Aldrin + Dieldrin	
9	Azinphos-ethyl	0.1	Azinphos-ethyl	
10	Azinphos-methyl	0.3	Azinphos-methyl	
11	Azoxystrobin [(h)]	16	Azoxystrobin	
12	Benalaxyl	2	Benalaxyl	
13	Benfluralin	0.06	Benfluralin	
14	Benomyl [(a)]		sum of Benomyl, Carbendazim, and Thiophanate-methyl expressed as Carbendazim	see Carbendazim
15	Bifenthrin	3	Bifenthrin	
16	Bromophos	0.04	Bromophos	
17	Butralin	5	Butralin	
18	Camphechlor (Σ) (Toxaphene)	0.3	Camphechlor (mixture of chlorinated camphenes)	
19	Captan	0.7	Captan	
20	Carbaryl	0.5	Carbaryl	
21	Carbendazim [(a)]	2	sum of Benomyl, Carbendazim, and Thiophanate-methyl expressed as Carbendazim	
22	Carbofuran (Σ)	0.5	sum of Carbofuran and 3-Hydroxycarbofuran expressed as Carbofuran	
23	Chinomethionat	0.1	Chinomethionat	
24	Chlorantraniliprole	14	Chlorantraniliprole	Revised GRL
25	Chlordane (Σ)	0.1	sum of cis-Chlordane and trans-Chlordane	
26	Chlorfenvinphos (Σ)	0.04	sum of (E)-Chlorfenvinphos and (Z)-Chlorfenvinphos	
27	Chlorothalonil	1	Chlorothalonil	
28	Chlorpyrifos	0.5	Chlorpyrifos	
29	Chlorpyrifos-methyl	0.2	Chlorpyrifos-methyl	

No.	CPA	GRL (ppm)	Residue definition	Notes
30	Chlorthal-dimethyl	0.5	Chlorthal-dimethyl	
31	Clomazone	0.2	Clomazone	
32	Cyantraniliprole [(h)]	18	Cyantraniliprole	
33	Cyfluthrin (Σ)	2	Cyfluthrin (sum of all isomers)	
34	Cyhalothrin (Σ)	0.5	Cyhalothrin (sum of all isomers)	
35	Cymoxanil	0.1	Cymoxanil	
36	Cypermethrin (Σ)	1	Cypermethrin (sum of all isomers)	
37	DDT (Σ)	0.2	sum of o,p'- and p,p'-DDT, o,p'- and p,p'-DDD (TDE), o,p'- and p,p'-DDE expressed as DDT	
38	Deltamethrin [(b)]	1	sum of Deltamethrin and Tralomethrin expressed as Deltamethrin	
39	Demeton-S-methyl (Σ)	0.1	sum of Demeton-S-methyl, Oxydemeton-methyl (Demeton-S-methyl sulfoxide) and Demeton-S-methyl sulfone expressed as Demeton-S-methyl	
40	Diazinon	0.1	Diazinon	
41	Dicamba	0.2	Dicamba	
42	Dichlorvos [(c)]	0.1	sum of Dichlorvos, Naled and Trichlorfon expressed as Dichlorvos	
43	Dicloran	0.1	Dicloran	
44	Difenoconazole [(h)]	12	Difenoconazole	
45	Diflubenzuron	0.1	Diflubenzuron	
46	Dimethoate [(d)]	0.5	sum of Dimethoate and Omethoate expressed as Dimethoate	
47	Dimethomorph (Σ)	2	sum of (E)-Dimethomorph and (Z)-Dimethomorph	
48	Disulfoton (Σ)	0.1	sum of Disulfoton, Disulfoton sulfoxide, and Disulfoton sulfone expressed as Disulfoton	
49	Dithiocarbamates (as CS_2) [(e)]	5	Dithiocarbamates expressed as CS_2	In countries where fungal diseases such as blue mould are a persistent problem in the field throughout the growing season, the use of dithio-carbamates (DTC) fungicides may be an essential part of the season-long disease management strategy and in keeping with GAP as a means of ensuring crop quality and economic viability for the producer. Under high disease pressure residues of dithio-carbamates (DTC) fungicides slightly in excess of the specified GRL may be observed. In countries where there is not a field fungal disease problem the use of fungicides is not necessary, and there should be no residues detected. Consistent with GAP, dithiocarbamate (DTC) fungicides must be used only according to label instructions to combat fungal diseases in the seedbed and in the field.
50	Endosulfans (Σ)	1	sum of alpha- and beta-isomers and Endosulfan-sulphate expressed as Endosulfan	

No.	CPA	GRL (ppm)	Residue definition	Notes
51	Endrin	0.05	Endrin	
52	Ethoprophos	0.1	Ethoprophos	
53	Famoxadone	5	Famoxadone	
54	Fenamidone *(h)*	3	Fenamidone	
55	Fenamiphos (Σ)	0.5	sum of Fenamiphos, Fenamiphos sulfoxide and Fenamiphos sulfone expressed as Fenamiphos	
56	Fenitrothion	0.1	Fenitrothion	
57	Fenthion (Σ)	0.1	sum of Fenthion, Fenthion sulfoxide and Fenthion sulfone expressed as Fenthion	
58	Fenvalerate (Σ)	1	Fenvalerate (sum of all isomers including Esfenvalerate)	
59	Fluazifop-butyl (Σ)	1	Fluazifop-butyl (sum of all isomers)	
60	Flubendiamide *(h)*	18	Flubendiamide	
61	Flumetralin	5	Flumetralin	
62	Fluopyram *(g)*	5	Fluopyram	
63	Flupyradifurone *(i)*	21	Flupyradifurone	
64	Folpet	0.2	Folpet	
65	HCH (α-, β-, δ-)	0.05	HCH (α-, β-, δ-)	
66	HCH (γ-) (Lindane)	0.05	HCH (γ-) (Lindane)	
67	Heptachlor (Σ)	0.02	sum of Heptachlor and two Heptachlor epoxides (cis- and trans-) expressed as Heptachlor	
68	Hexachlorobenzene	0.02	Hexachlorobenzene	
69	Imidacloprid	5	Imidacloprid	
70	Indoxacarb (Σ)	6	Sum of S isomer + R isomer	Revised GRL
71	Iprodione (Σ)	0.5	sum of Iprodione and N-3,5-dichlorophenyl-3-isopropyl-2,4-dioxoimidazolyzin-1-carboxamide expressed as Iprodione	
72	Malathion	0.5	Malathion	
73	Maleic hydrazide	80	Maleic hydrazide (free and bounded form)	In some instances, where GAP is implemented and label recom-mendations with regard to application rates and timing are strictly adhered to, residue levels may exceed the current GRL of 80 ppm as a result of extreme weather conditions and the current technology available for application. However, as with all CPAs, all efforts should be made to strictly follow label application rates, and use should be no more than necessary to achieve the desired effect.
74	Metalaxyl (Σ)	2	sum of all isomers including Metalaxyl-M / Mefenoxam	
75	Methamidophos	1	Methamidophos	
76	Methidathion	0.1	Methidathion	
77	Methiocarb (Σ)	0.2	sum of Methiocarb, Methiocarb sulfoxide, and Methiocarb sulfone expressed as Methiocarb	

No.	CPA	GRL (ppm)	Residue definition	Notes
78	Methomyl [(f)]	1	sum of Methomyl, Methomyl-oxim, and Thiodicarb expressed as Methomyl	
79	Methoxychlor	0.05	Methoxychlor	
80	Mevinphos (Σ)	0.04	Mevinphos (sum E and Z isomers)	
81	Mirex	0.08	Mirex	
82	Monocrotophos	0.3	Monocrotophos	
83	Naled [(c)]		sum of Dichlorvos, Naled, and Trichlorfon expressed as Dichlorvos	see Dichlorvos
84	Nitrofen	0.02	Nitrofen	
85	Omethoate [(d)]		sum of Dimethoate and Omethoate expressed as Dimethoate	see Dimethoate
86	Oxadixyl	0.1	Oxadixyl	
87	Oxamyl	0.5	Oxamyl	
88	Parathion (-ethyl)	0.06	Parathion	
89	Parathion-methyl	0.1	Parathion-methyl	
90	Pebulate	0.5	Pebulate	
91	Penconazole	1	Penconazole	
92	Pendimethalin	5	Pendimethalin	
93	Permethrin (Σ)	0.5	Permethrin (sum of all isomers)	
94	Phorate	0.05	Phorate	
95	Phosalone	0.1	Phosalone	
96	Phosphamidon (Σ)	0.05	Phosphamidon (sum of E and Z isomers)	
97	Phoxim	0.5	Phoxim	
98	Piperonyl butoxide	3	Piperonyl butoxide	
99	Pirimicarb	0.5	Pirimicarb	
100	Pirimiphos-methyl	0.1	Pirimiphos-methyl	
101	Profenofos	0.1	Profenofos	
102	Propamocarb [(h)]	13	Propamocarb	
103	Propoxur	0.1	Propoxur	
104	Pymetrozine	1	Pymetrozine	
105	Pyrethrins (Σ)	0.5	sum of Pyrethrins 1, Pyrethrins 2, Cinerins 1, Cinerins 2, Jasmolins 1 and Jasmolins 2	
106	Tebuconazole [(h)]	18	Tebuconazole	
107	Teflubenzuron [(h)]	3	Teflubenzuron	
108	Tefluthrin	0.1	Tefluthrin	
109	Terbufos (Σ)	0.05	sum of Terbufos, Terbufos sulfoxide and Terbufos sulfone expressed as Terbufos	
110	Thiamethoxam	5	Thiamethoxam	
111	Thiodicarb [(f)]		sum of Methomyl, Methomyl-oxim, and Thiodicarb expressed as Methomyl	see Methomyl
112	Thionazin	0.04	Thionazin	

No.	CPA	GRL (ppm)	Residue definition	Notes
113	Thiophanate-methyl [(a)]		sum of Benomyl, Carbendazim, and Thiophanate-methyl expressed as Carbendazim	see Carbendazim
114	Tralomethrin [(b)]		sum of Deltamethrin and Tralomethrin expressed as Deltamethrin	see Deltamethrin
115	Trichlorfon [(c)]		sum of Dichlorvos, Naled, and Trichlorfon expressed as Dichlorvos	see Dichlorvos
116	Triflumuron [(h)]	4	Triflumuron	
117	Trifluralin	0.1	Trifluralin	

(a) Carbendazim is the degradation product of Benomyl and Thiophanate-methyl. In case the same sample contains residues of both Carbendazim and/or Benomyl/Thiophanate-methyl, the sum of the residues should not exceed 2 ppm.

(b) Deltamethrin is the degradation product of Tralomethrin. In case the same sample contains residues of both Deltamethrin and Tralomethrin, the sum of the two residues should not exceed 1 ppm.

(c) Dichlorvos is the degradation product of Naled and Trichlorfon. In case the same sample contains residues of both Dichlorvos and/or Naled/Trichlorfon, the sum of the residues should not exceed 0.1 ppm.

(d) Omethoate is the degradation product of Dimethoate. In case the same sample contains residues of both Dimethoate and Omethoate, the sum of the two residues should not exceed 0.5 ppm.

(e) The Dithiocarbamates Group includes the EBDCs: Mancozeb, Maneb, Metiram, Nabam and Zineb – as well as Amobam, Ferbam, Policarbamate, Propineb, Thiram and Ziram.

(f) Methomyl is the degradation product of Thiodicarb. In case the same sample contains residues of both Methomyl and Thiodicarb, the sum of the two residues should not exceed 1 ppm.

(g) Fluopyram added to GRL list June 2018.

(h) New CPA with GRL (November 2019).

(i) Flupyradifurone added to GRL list October 2020.

NOTE 1:

July 2016: The following CPAs were removed from the GRL list as sources consulted show no detections over the last 10 years, they are not registered for tobacco in any country and they are no longer used:

DBCP, Dimefox, Dinocap (Σ), Diphenamid, Ethylene dibromide, Fenchlorphos, Fensulfothion, Flucythrinate (Σ), Fonofos (Σ), Formothion, Isopropaline, Methoprene, Tetrachlorvinphos, Vamidothion (Σ)

NOTE 2:

July 2016: GRL values were rounded according to the following guidelines.

- OECD: ENV/JM/MONO (2011)2. OECD MRL CALCULATOR: USER GUIDE; Series on Pesticides No. 56, P.15 "Rounding: http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2011)2&doclanguage=en
- FAO: FAO PPP* Paper 197, SUBMISSION AND EVALUATION OF PESTICIDE RESIDUES DATA FOR THE ESTIMATION OF MAXIMUM RESIDUE LEVELS IN FOOD AND FEED, P.119, "6.13 EXPRESSION OF MAXIMUM RESIDUE LIMITS (MRLs)" http://www.fao.org/docrep/012/i1216e/i1216e00.htm