



## **APIStrip storage**

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## Summary

Degradation of pesticides is mainly affected by light and moisture. This is generally true and it also occurs for pesticides accumulated in the APIStrip. In preliminary studies of INSIGNIA in 2019, it was shown that APIStrip storage under frozen conditions and at room temperature (under dry and dark conditions in both cases) had virtually the same impact on the pesticide stability, i.e. when adsorbed onto the APIStrip surface, the pesticide residues remained stable under both conditions.

Because of practicality and uniformity with pollen storage, in year 2 of the INSIGNIA study (2020), the APIStrips were stored in the freezer after exposure. Notwithstanding storage in the freezer is good, defrosting during transport and refreezing prior to analysis adds extra steps and variables (when the sample is frozen, how long it remains at room temperature) that could anyhow affect the pesticide residues prior to the sample analysis.

Therefore, a new study was conducted to compare degradation of pesticides in the APIStrip as a function of storage under frozen- and under dry dark room temperature conditions. The results of this study demonstrated there was no difference after the 60 days test period.

In the light of the above-mentioned results, the final recommendations in the apicultural citizen science protocols for biomonitoring the environment with honeybee colonies include this dark, dry, room temperature storage.

Almeria, January 2020

## The test

Seven APISrips were spiked simultaneously with a mix containing a total of 359 pesticide residues (including pesticides analysed by the routine multiresidue methods in the University of Almería laboratory but that are not included in the INSIGNIA list), at a concentration of 100 ppb.

One of the APISrips (day 0) was extracted and analysed right away. The remaining samples were separated in two groups:

- Three of them were stored in aluminium foil and inside the shipment bags, at room temperature (about 20° C in the laboratory).
- The other three were also stored in aluminium foil + bags, and placed inside a freezer at -20 °C.

These samples were subsequently extracted and analysed after different periods of time up to 60 days.

The test period lasted from 20 November 2020 until 19 January 2020.

## Results

The following table shows the concentrations found in all pesticides included in the study, both for APISrips stored at room temperature (green color) and freezer (blue color).

		Day 0	Room temperature				Freezer (- 18 °C)			
			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
2,4-D	LC	81	109	89	120	18	80	90	120	20
2,4-DDE	GC	90	110	113	112	10	84	95	85	6
4,4-DDD	GC	98	116	117	117	8	120	97	113	11
4,4-DDE	GC	109	83	114	98	14	103	111	100	5
4,4-DDT	GC	80	95	85	97	9	85	102	84	11
Abamectin	LC	93	104	101	82	10	86	81	84	6
Acephate	LC	121	118	108	106	7	111	104	81	16
Acetamiprid	LC	91	103	100	104	6	91	109	84	11
Acrinathrin	LGC	93	86	103	82	10	82	116	116	17
Alachlor	LGC	87	107	121	118	14	90	101	93	6
Albendazole	LC	108	85	105	113	12	116	98	87	12
Aldicarb	LC	103	119	80	91	17	87	83	122	18
Ametoctradin	LC	101	101	89	121	13	94	88	97	6
Ametryn	GC	94	103	97	118	10	110	82	121	17
Anilofos	LC	79	80	115	87	19	83	95	103	12
Antraquinone	GC	112	112	100	116	6	114	120	114	3
Atrazine	LGC	100	110	111	97	7	87	95	104	8
Azinphos-ethyl	LC	120	86	100	85	17	87	115	107	14
Azinphos-methyl	LC	90	109	101	90	9	111	111	117	11



			Room temperature				Freezer (- 18 ° C)			
Day 0			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
Azoxystrobin	LGC	105	83	90	102	11	84	88	122	17
BAC10	LC	80	84	90	87	5	87	85	90	5
BAC8	LC	88	108	84	121	17	85	80	103	11
Benalaxyl	LGC	100	80	85	82	10	89	111	82	13
Bendiocarb	LC	85	100	86	118	16	94	94	83	7
Benzovindiflupyr	LC	98	120	109	97	10	100	109	89	8
Bifenazate	LC	104	112	93	113	9	83	109	117	14
Bifenox	GC	85	116	98	83	16	92	107	101	10
Bifenthrin	LGC	94	111	80	102	14	81	83	99	10
Biphenyl	GC	87	89	99	91	6	97	121	107	14
Bitertanol	LC	112	85	112	88	15	82	94	101	13
Bixafen	LGC	116	82	120	122	17	115	110	98	8
Boscalid	LGC	81	101	88	119	17	90	88	87	4
Bromacil	LC	110	99	106	93	7	98	121	83	16
Bromopropylate	GC	85	115	116	106	14	120	119	90	18
Bromuconazole	LC	84	115	121	96	16	85	121	91	18
Bupirimate	LGC	107	103	84	116	13	87	110	109	11
Buprofezin	LGC	119	100	83	82	18	80	118	110	17
Butoxycarboxim	LC	103	89	90	85	9	107	90	91	9
Butralin	GC	83	121	85	104	18	98	101	118	14
Butylate	GC	86	80	105	104	14	87	88	80	4
Cadusafos	GC	105	89	98	103	7	87	105	98	9
Carbaryl	LC	103	91	81	114	15	80	120	111	17
Carbendazim	LC	101	85	92	88	8	85	93	96	7
Carbophenothion	GC	87	91	116	117	16	81	80	79	4
Carbosulfan	LGC	112	121	109	80	17	121	109	83	15
Chinomethionat	GC	115	87	108	92	13	121	112	110	4
Chlorantraniliprole	LC	110	100	80	79	17	109	93	81	14
Chlorbromuron	LGC	118	93	120	85	17	84	121	111	16
Chlorbufam	LC	120	112	115	111	4	118	87	95	16
Chlordane	GC	107	116	111	105	4	114	107	108	3
Chlorfenapyr	GC	86	112	88	117	16	86	110	97	12
Chlorfenvinphos	LGC	95	86	92	109	10	96	94	121	13
Chlorfluazuron	LGC	115	96	112	118	9	105	83	110	14
Chloridazon	LC	93	90	86	92	3	99	81	87	9
Chlorobenzilate	GC	111	115	122	110	5	114	86	92	14
Chlorothalonil	GC	109	118	118	109	5	103	118	82	15
Chlorotoluron	LC	112	80	113	119	17	91	83	107	14
Chloroxuron	LC	84	91	90	97	6	81	90	99	9
Chlorpropham	LGC	115	93	88	83	15	82	101	93	14
Chlorpyrifos	LGC	88	121	90	83	18	96	117	120	15
Chlorpyrifos-methyl	LGC	98	109	91	105	8	108	98	121	10
Chlozolinate	GC	113	82	118	121	17	106	117	112	4



		Day 0	Room temperature				Freezer (- 18 ° C)			
			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
			Chromafenozide	LC	114	116	92	101	11	108
Clofentezine	LC	113	116	95	114	9	83	84	85	16
Clomazone	LC	94	116	105	102	9	94	99	83	7
Clopyralid	LC	79	81	94	114	18	96	118	90	17
Clorthal-dimethyl	GC	106	105	112	95	7	112	100	109	5
Coumaphos	LGC	84	83	100	104	12	87	85	82	2
Cyazofamid	LC	111	93	100	80	14	86	116	80	18
Cyflufenamid	LGC	83	109	106	116	14	84	101	85	10
Cyfluthrin	GC	113	87	96	83	14	86	80	113	18
Cyhalofop-butyl	LC	94	80	80	112	17	100	87	97	6
Cymoxanil	LC	101	93	96	85	7	115	84	122	16
Cypermethrin	LGC	93	80	104	98	11	86	105	112	12
Cyproconazole	LGC	92	115	93	100	11	86	100	115	13
Cyprodinil	LGC	82	86	120	122	21	108	109	99	13
Cyromazine	LC	87	96	85	108	11	88	117	117	17
Dazomet	LC	119	118	80	122	18	121	111	87	14
DEET	LC	85	112	103	83	15	90	108	93	11
Deltamethrin	LGC	103	88	84	80	11	81	99	109	12
Demeton-S-methyl	LC	98	84	96	87	7	89	98	87	6
Demeton-S-methylsulfone	LC	99	93	120	113	12	95	117	83	14
Demeton-S-methylsulfoxide	LC	116	96	95	86	13	121	116	95	10
Desethylterbuthylazine	LC	107	86	93	104	10	88	106	90	10
Diazinon	LGC	101	89	112	104	9	94	103	109	6
Dichlofluanid	GC	93	97	118	115	12	110	80	82	15
Dichlorvos	LGC	102	82	109	93	12	96	112	93	8
Diclobutrazole	GC	79	84	121	81	22	114	119	88	20
Dicloran	LGC	94	115	87	118	15	83	99	102	9
Dicofol	GC	80	109	103	81	16	111	108	114	15
Dicrotophos	LC	119	108	91	119	12	88	84	98	16
Dieldrin	GC	80	120	113	105	17	112	83	120	20
Diethofencarb	LGC	98	92	105	102	6	87	92	84	7
Difenoconazole	LC	95	92	112	103	9	81	113	86	15
Difenoxuron	LC	82	82	83	115	18	110	94	121	17
Diflubenzuron	LC	122	102	97	101	11	115	112	90	13
Dimethenamid	GC	97	115	85	99	12	81	109	103	12
Dimethipin	GC	89	100	85	118	15	81	112	84	15
Dimethoate	LC	86	103	85	86	10	95	82	85	6
Dimethomorph	LC	100	104	121	79	17	119	81	117	17
Dimethylvinphos	LC	84	101	107	118	14	88	106	118	16
Diniconazole	LC	79	116	100	86	17	86	122	80	22
Dinotefuran	LC	89	120	122	115	14	98	105	91	8
Disulfoton	GC	115	109	85	64	25	92	81	76	19
Dithianon	LC	85	116	85	104	16	80	115	89	17
Diuron	LC	80	94	93	110	13	122	87	105	19



			Room temperature				Freezer (- 18 ° C)			
Day 0			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
Dodemorph	GC	109	97	63	48	36	95	84	75	16
Dodine	LC	120	92	82	86	18	88	116	117	14
Edifenphos	LC	94	117	99	122	13	105	113	98	8
Emamectin benzoate	LC	88	87	88	104	9	104	109	86	12
Endosulfan alpha	GC	86	101	104	109	10	88	106	101	10
Endosulfan beta	GC	102	114	108	92	9	118	113	111	6
Endosulfan Sulfate	GC	82	104	109	91	13	109	86	113	16
Endrin	GC	117	88	95	88	14	115	107	122	5
EPN	LGC	100	87	93	83	8	98	108	81	12
Epoconazole	LGC	114	113	104	110	4	87	122	102	14
Ethiofencarb	LC	110	96	97	96	7	117	111	90	11
Ethion	LGC	114	107	86	83	16	110	86	85	16
Ethiprole	LC	119	81	112	85	19	105	93	110	10
Ethirimol	LC	88	118	106	82	17	100	82	91	8
Ethofumesate	GC	85	83	114	86	16	110	107	91	12
Ethoprophos	LGC	79	113	112	108	16	90	91	94	7
Etofenprox	LGC	103	81	99	122	17	112	117	95	9
Etoazole	LC	94	103	110	96	7	111	115	113	9
Etoxiquina	GC	87	89	104	105	10	115	95	98	12
Etrimfos	GC	89	109	88	111	13	86	86	79	5
Famoxadone	LC	116	81	108	87	17	99	118	112	8
Fenamidone	LGC	113	113	83	100	14	100	80	101	14
Fenamiphos	LC	87	113	115	102	12	90	109	101	10
Fenamiphos-sulfone	LC	79	104	118	82	19	111	101	110	15
Fenamiphos-sulfoxide	LC	96	93	101	104	5	121	85	113	16
Fenarimol	LGC	84	91	81	106	12	112	97	115	14
Fenazaquin	LGC	116	91	78	93	17	110	90	88	14
Fenbendazole	LC	94	88	112	118	14	108	98	85	10
Fenbuconazole	LGC	102	83	91	82	10	97	99	121	11
Fenclorphos	GC	106	117	108	103	6	114	93	90	11
Fenhexamid	LGC	85	96	83	111	14	114	106	111	13
Fenitrothion	LGC	83	81	94	103	11	79	84	81	3
Fenobucarb	LC	103	93	113	100	8	100	113	107	5
Fenoxycarb	LC	89	102	114	117	12	98	92	119	14
Fenpicoxamid	LC	85	92	83	96	7	101	87	87	8
Fenpropathrin	LGC	96	92	117	89	13	105	95	97	5
Fenpropidin	LGC	99	106	79	55	27	83	80	61	19
Fenpropimorph	LGC	122	96	84	75	22	83	101	91	17
Fenpyrazamine	LC	115	118	110	111	3	121	100	84	16
Fenpyroximate (E)	LC	93	88	99	95	5	82	121	114	18
Fenpyroximate (Z)	LC	109	122	85	109	15	122	96	92	13
Fensulfothion	LC	119	81	119	94	18	106	86	114	14
Fenthion	LGC	104	99	84	76	14	84	91	96	9
Fenthion-sulfone	LC	89	86	111	96	12	110	87	109	13



		Day 0	Room temperature				Freezer (- 18 ° C)			
			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
			Fenthion-sulfoxide	LC	87	109	109	104	10	97
Fenuron	LC	89	90	81	82	5	85	96	99	7
Fenvalerate	LGC	98	102	122	90	13	107	104	96	5
Fipronil	LGC	105	105	103	93	6	113	119	99	8
Flamprop-isopropyl	GC	111	87	94	114	13	89	114	110	11
Flamprop-Methyl	GC	113	116	107	114	3	85	97	80	16
Flazasulfuron	LC	122	96	91	95	14	108	115	115	5
Flonicamid	LC	83	109	110	80	17	93	86	120	18
Fluacrypyrim	LGC	91	93	93	117	13	97	94	109	8
Fluazifop	LC	93	103	93	91	6	79	84	80	8
Fluazifop-p-butyl	GC	119	108	99	114	8	87	86	102	16
Flubendiamide	LC	88	106	119	122	14	121	104	107	13
Flucythrinate	LGC	94	87	92	110	10	111	116	99	10
Fludioxonil	LGC	100	94	85	110	11	110	92	112	9
Fluensulfone	LGC	116	115	118	120	2	91	117	93	14
Flufenacet	LC	105	93	93	86	8	115	111	99	7
Flufenoxuron	LC	89	107	83	116	16	83	83	107	13
Fluometuron	LC	99	81	95	115	14	94	119	98	11
Fluopicolide	LGC	90	100	100	108	7	111	121	108	12
Fluopyram	LGC	108	120	120	112	5	96	88	106	9
Fluquinconazole	LGC	80	93	81	94	9	81	108	122	21
Flusilazole	LGC	121	98	121	95	13	86	94	90	16
Flutolanil	GC	108	100	115	95	8	104	108	99	4
Flutriafol	LGC	118	104	84	95	14	118	121	92	12
Fluxapyroxad	LC	89	96	110	118	13	94	88	81	6
Fonofos	GC	90	92	115	97	12	89	110	110	12
Formetanate Hydrochloride	LC	122	81	120	118	18	87	105	108	14
Formothion	GC	112	101	90	83	13	105	111	87	11
Fosthiazate	LGC	103	106	120	118	8	105	122	118	8
Haloxifop	LC	100	94	81	101	10	80	91	93	9
HCB	GC	103	95	85	101	8	115	93	106	9
Heptachlor	GC	85	113	82	116	18	89	113	102	13
Heptenophos	GC	113	101	94	119	11	115	90	81	17
Hexaconazole	LGC	85	80	81	93	7	89	88	80	5
Hexaflumuron	LC	94	95	100	107	6	99	121	95	12
Hexythiazox	LC	101	107	96	99	5	118	101	116	9
Imazalil	LC	83	109	116	107	14	81	86	91	5
Imidacloprid	LC	102	92	85	86	9	111	102	116	6
Indoxacarb	LGC	115	91	84	90	14	80	80	82	19
loxynil	LC	86	87	86	109	12	114	92	105	13
lprodione	LGC	85	94	107	88	10	110	116	109	13
lprovalicarb	LGC	105	103	91	100	6	114	113	122	6
Isazofos	GC	80	82	84	118	20	85	80	117	20
Isocarbofos	LGC	103	91	96	80	10	88	96	85	9



			Room temperature				Freezer (- 18 ° C)			
Day 0			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
Isofenfos-methyl	LGC	101	100	101	82	10	107	115	80	15
Isofenphos Ethyl	GC	94	91	103	98	5	105	117	99	10
Isoprocarb	LC	94	92	113	98	10	108	93	99	7
Isoprothiolane	LGC	87	111	101	119	13	89	115	120	17
Isoproturon	LC	112	120	110	121	5	108	103	103	4
Isopyrazam	GC	79	110	113	122	18	82	86	114	18
Isoxaflutole	LC	99	117	94	91	12	103	113	110	6
Kresoxim-methyl	LGC	108	104	109	103	3	112	88	98	11
Lambda-cyhalothrin	LGC	108	105	89	86	11	91	83	90	11
Lenacil	LC	112	87	92	80	15	91	83	104	13
Lindane	GC	99	98	113	104	7	118	83	100	14
Linuron	LC	107	110	92	97	8	90	119	111	11
Lufenuron	LC	94	85	121	84	18	107	98	107	6
Malathion	LGC	122	91	115	82	19	82	102	95	17
Mandipropamid	LC	104	85	82	95	11	104	112	85	11
MCPB	LC	85	117	96	116	15	99	104	112	11
Mebendazole	LC	100	94	107	114	8	110	94	102	7
Mecarbam	GC	120	94	88	93	15	121	114	119	3
Mepanipyrim	LGC	92	80	101	95	10	112	91	109	11
Meptyldinocap	LC	88	81	92	81	6	102	117	91	13
Merphos	GC	91	95	103	86	8	90	121	107	14
Metaflumizone	LC	116	117	100	107	7	116	111	110	3
Metalaxyl	LGC	94	85	76	82	9	81	83	78	8
Metamitron	LC	117	82	122	105	17	80	81	109	20
Metazachlor	GC	99	100	115	98	8	115	81	80	18
Metconazole	LGC	119	90	118	86	17	93	117	83	17
Methamidophos	LC	118	83	89	97	16	105	90	94	12
Methidathion	LGC	87	109	85	81	14	100	103	107	9
Methiocarb	LGC	84	91	94	83	6	98	115	93	13
Methiocarb-sulfone	LC	106	117	120	107	6	101	99	103	3
Methiocarb-sulfoxide	LC	107	81	108	103	13	92	121	117	12
Methomyl	LC	102	85	84	86	10	85	118	87	16
Methoxyfenozide	LC	107	118	88	93	13	110	105	91	8
Metobromuron	LC	100	105	82	70	18	86	102	77	13
Metolachlor	LGC	112	88	119	103	13	96	99	112	8
Metolcarb	LC	103	88	92	92	7	117	116	120	7
Metoxychlor	GC	106	121	112	119	6	85	117	99	13
Metrafenone	LC	95	105	111	120	10	120	91	89	15
Mevinphos	GC	105	115	115	84	14	111	106	111	3
Molinate	GC	119	96	114	89	14	84	116	90	17
Monocrotophos	LC	93	121	87	109	15	100	90	85	7
Monolinuron	LC	111	112	109	112	1	103	80	119	16
Monuron	LC	82	108	89	88	12	120	97	80	19
Myclobutanil	LGC	119	101	113	118	7	116	84	84	19





			Room temperature				Freezer (- 18 ° C)			
Day 0			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
Napropamide	GC	121	88	98	90	15	121	78	98	20
Neburon	LC	102	89	115	80	16	116	112	91	11
Nitenpyram	LC	111	88	121	111	13	87	101	85	13
Nitrofen	LC	82	113	112	122	16	119	100	102	15
Novaluron	LGC	87	88	79	96	8	85	111	80	15
Nuarimol	GC	95	102	89	110	9	98	120	92	13
Ofurace	GC	102	109	89	96	9	103	105	104	1
Omethoate	LC	82	121	104	93	17	108	108	103	12
Orthosulfamuron	LC	121	116	111	82	16	94	100	117	12
Oxadiargyl	LC	112	92	122	98	13	81	110	97	14
Oxadixyl	LGC	120	116	90	109	12	85	108	112	14
Oxamyl	LC	116	109	84	97	14	101	94	120	11
Oxasulfuron	LC	113	119	94	121	11	93	100	97	9
Oxathiapipronil	LC	120	95	83	92	16	92	106	97	12
Oxfendazole	LC	100	82	107	98	11	106	117	102	7
Oxyfluorfen	LC	121	117	84	115	16	122	117	97	10
Paclobutrazol	LGC	113	116	90	108	11	116	113	112	2
Parathion ethyl	GC	109	81	88	83	14	100	82	119	15
Parathion methyl	GC	110	99	86	81	14	89	117	96	12
Pebulate	GC	111	99	96	93	8	91	90	107	11
Penconazole	LGC	115	107	113	103	5	84	112	110	14
Pencycuron	LC	112	96	90	96	10	120	87	122	15
Pendimethalin	LGC	89	99	88	77	10	120	85	92	17
Penflufen	LC	110	106	93	114	9	96	98	95	7
Penthiopyrad	LGC	92	88	117	86	15	81	95	111	13
Permethrin	LGC	98	113	105	116	8	91	120	102	12
Phenothrin	LGC	102	92	83	81	11	101	86	99	8
Phenthoate	LGC	79	116	81	91	19	81	84	86	4
Phorate	GC	96	108	111	97	7	89	101	102	6
Phosalone	LC	106	120	98	99	10	121	112	112	5
Phosmet	LGC	98	98	108	119	9	91	111	112	10
Phoxim	LC	111	100	83	98	12	103	80	112	15
Picolinafen	GC	114	88	108	103	11	108	98	113	7
Picoxistrobin	GC	101	94	97	84	8	104	116	84	13
Pirimicarb	LGC	87	84	107	106	13	97	84	118	16
Pirimiphos-methyl	LGC	94	122	107	108	11	81	112	102	13
Prochloraz	LC	104	96	122	118	11	80	111	94	14
Procymidone	LGC	120	83	95	120	18	96	93	104	12
Profenofos	LGC	110	83	86	93	13	115	100	101	7
Promecarb	LC	94	107	80	99	12	122	80	111	18
Prometon	GC	119	87	84	87	18	122	94	114	11
Prometryn	LGC	92	107	97	113	9	82	102	80	11
Propamocarb	LC	86	83	119	81	19	109	91	117	15
Propaquizafop	LC	105	86	74	78	16	94	79	81	14



		Day 0	Room temperature				Freezer (- 18 ° C)			
			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
Propargite	LGC	85	105	94	112	12	114	114	89	16
Propazine	LGC	93	91	81	118	16	80	97	86	8
Propiconazole	LGC	107	113	89	97	10	103	105	111	3
Propoxur	LC	87	86	105	98	10	115	113	119	13
Propyzamide	LGC	103	83	96	99	9	88	96	91	7
Proquinazid	LC	119	110	117	89	13	86	92	112	15
Prosulfocarb	LGC	117	122	121	121	2	119	93	93	14
Prothioconazole	LC	100	110	110	100	5	82	83	112	15
Prothiofos	LGC	81	94	114	113	16	116	83	100	17
Pymetrozine	LC	113	104	108	106	4	84	99	104	12
Pyraclostrobin	LGC	84	106	84	84	12	92	120	89	17
Pyrazofos	GC	83	122	101	86	18	111	90	113	15
Pyrethrin	LC	119	104	120	122	7	101	115	80	17
Pyridaben	LGC	83	107	111	92	13	95	97	118	15
Pyridalyl	LC	103	115	112	80	15	90	84	83	10
Pyridaphenthion	LC	109	100	81	96	12	112	121	109	5
Pyridate	LC	104	114	83	119	15	113	80	107	14
Pyrifenox	GC	80	99	111	87	14	98	119	98	16
Pyrimethanil	LGC	102	117	98	89	12	82	107	96	11
Pyriofenone	LGC	89	89	87	111	12	83	107	85	12
Pyriproxyfen	LGC	105	95	82	101	10	102	93	87	9
Quinalphos	LGC	115	110	119	86	14	104	96	97	9
Quinoclamine	LC	94	82	115	110	15	82	100	100	9
Quinoxifen	LGC	80	82	119	80	21	110	118	119	17
Quintozene	GC	97	107	101	91	7	92	116	88	13
Quizalofop	LC	118	90	109	100	12	97	107	83	15
Quizalofop-ethyl	LC	112	103	104	115	5	86	105	83	15
Rotenone	LC	120	83	105	80	20	90	104	89	14
Secbumeton	GC	85	89	114	121	18	106	94	95	9
Simazine	LC	96	112	90	116	12	90	118	121	15
Spinetoram	LC	81	99	109	100	12	88	99	108	13
Spinosad	LC	121	82	98	113	17	120	86	81	21
Spirodiclofen	LGC	102	118	91	111	11	101	116	110	7
Spiromesifen	LGC	114	104	80	104	14	118	97	112	8
Spirotetramat	LC	105	85	94	107	10	86	115	87	14
Spiroxamine	LC	118	83	90	96	16	109	82	96	15
Sulfotep	GC	119	83	118	81	21	83	101	90	16
Sulfoxaflor	LC	115	96	89	91	12	97	90	88	13
Tau-fluvalinate	LGC	120	110	95	101	10	108	86	108	13
Tebuconazole	LGC	115	106	91	97	10	91	92	122	15
Tebufenozide	LC	97	113	114	79	16	93	81	103	10
Tebufenpyrad	LGC	120	106	114	81	16	106	84	99	15
Tecnazene	GC	92	119	121	100	13	89	112	117	14
Teflubenzuron	LC	109	97	101	97	6	85	91	106	12



			Room temperature				Freezer (- 18 ° C)			
Day 0			Day 14	Day 31	Day 60	RSD (%)	Day 14	Day 31	Day 60	RSD (%)
Teflutrin	GC	98	115	84	102	13	91	84	117	15
Terbufos	GC	81	72	68	61	12	86	74	58	16
Terbumeton	GC	109	84	115	110	13	99	115	115	7
Terbutryn	LGC	101	80	87	112	15	87	86	91	8
Terbutylazine	LC	79	80	86	81	4	108	114	113	16
Tetraclorvinfos	GC	119	82	89	81	19	94	101	86	14
Tetraconazole	LGC	86	86	99	86	7	116	120	102	15
Tetradifon	GC	90	110	118	113	11	122	107	96	14
Tetramethrin	LGC	117	113	118	89	13	96	119	102	10
TFNA	LC	119	106	87	99	13	98	115	99	10
TFNG	LC	91	86	87	102	8	120	83	109	17
Thiabendazol	LC	114	94	121	85	16	121	106	103	7
Thiacloprid	LC	100	115	94	110	9	93	109	111	8
Thiamethoxam	LC	115	109	106	90	10	108	99	99	7
Thiobencarb	LGC	98	121	120	107	10	80	89	108	13
Thymol	GC	110	120	99	109	8	117	89	92	13
Tolclofos-methyl	LGC	89	103	82	85	10	107	80	87	13
Tolfenpyrad	LC	101	81	119	116	17	86	104	91	9
Tolyfluanid	GC	103	85	107	113	12	92	89	89	7
Triadimefon	LGC	88	89	116	110	14	83	86	122	19
Triallate	LGC	101	105	87	103	8	103	113	89	10
Triazophos	LGC	95	116	106	98	9	87	82	93	7
Trichlorfon	LC	106	83	100	107	11	87	83	107	13
Triclorcarban	LC	117	118	86	89	17	88	98	114	13
Tricyclazole	LC	90	86	94	96	5	100	92	122	15
Trifloxystrobin	LGC	87	94	91	115	13	93	96	86	5
Triflumizole	LC	91	118	119	80	19	120	116	86	17
Triflumuron	LC	96	94	120	98	12	81	94	90	7
Trifluralin	GC	92	99	82	97	8	83	95	90	6
Triticonazole	LC	118	109	101	116	7	107	116	97	9
Tritosulfuron	LC	98	115	111	100	8	110	104	106	5
Vinclozolin	LGC	105	114	86	103	11	91	83	118	16
Zoxamide	LC	115	107	94	116	9	87	98	93	12
<b>Average RSD (Room T°)</b>						<b>12</b>	<b>Average RSD (Freezer)</b>			<b>12</b>



## Discussion

The recovery values lower than 80 % (usually, recoveries between 80 -120 % are accepted in Analytical Chemistry) are highlighted in red. Additionally, in some cases, punctual values very close to 80 % were obtained; these data should not be considered as degradation, as for instance in the case of carbophenothion. However, there are a few cases in which the degradation is indeed evident, such as dodemorph, fenpropidin and terbufos.

The relative standard deviation (RSD) is applied for comparing the uncertainty between different measurements of varying absolute magnitude. The RSD is calculated from the standard deviation,  $s$ , and expressed as percentage (%). In the present study, the average RSD of both storage methods was 12 %, thus showing no significant impact on the pesticide degradation process as function of the two storage methods.