Residue trials were available from Germany, France, Austria, Italy, the USA, Brazil and Australia. A number of German trials were submitted of which six (2 with replicates) were according to German GAP (0.0234 kg ai/ha, 35-day PHI). The residues in these were 0.01-0.15 mg/kg in samples taken 35 days after the final treatment. Seven of the German trials (two with replicates) were at or within the UK GAP (0.04 kg ai/ha, PHI of 14 days) with residues of 0.02-0.24 mg/kg in samples taken 14 days after the final treatment. In a single French trial conducted in accordance with GAP in France (0.018 kg ai/ha, PHI 7 days) a residue of 0.02 mg/kg was found after 9 days.

Residues in trials according to US GAP (0.051 kg ai/ha, 30-day PHI) were low (0.003-0.06 mg/kg) in 17 US trials, several of which were replicated, in samples taken 28-32 days after the final treatment. Australian GAP (0.024 kg ai/ha or 0.0024 kg ai/hl, 14-day PHI) was also supported by 5 trials with either the maximum spray concentration or application rate per hectare (both are stated on the product label). Residues were 0.01-0.08 mg/kg 13 or 14 days after the final treatment.

None of the Southern European trials according to GAP conformed to Italian (0.06kg ai/ha or 0.0036 kg ai/hl, 14-day PHI) or Portuguese GAP (0.03kg ai/ha or 0.003 kg ai/hl, 7-day PHI) which have the highest dose rate and the shortest PHI respectively.

Table 29. European supervised residue trials on grapes.

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Ref.
	Form	No.	kg ai/ha	kg ai/hl				
Rohrendorf, Austria, 1977[1,2,5,6]	EC	4	0.036	0.0036	58	fruit	<0.01	NH 05
Rohrendorf, Austria, 1977[1,2,5,6]	WP	4	0.036	0.0036	58	fruit	0.01	NH 05
Grosshofflein, Austria, 1977[1,2,5,6]	EC	4	0.024	not reported	66	fruit	0.02	NH 06
		4	0.036	0.0036	66	fruit	<0.01	
Pau, France, 1981[5]	SC	4	0.024	0.024 Low vol.	0	fruit	0.18	NH 12
					7	fruit	0.12	
					14	fruit	0.05	
		4	0.036	0.036 Low vol.	0	fruit	0.27	
					7	fruit	0.18	
					14	fruit	0.04	
Sistels, France, 1993[3]	SC	3	0.018	0.075 Low vol.	0	fruit	0.04	NH 04
					4	fruit	0.03	
					9	fruit	0.02	
					15	fruit	0.02	
Godramstein, Germany, 1992[3]	SC	6	0.003+ 0.005+ 0.014+ 0.018+ 0.020+ 0.025	0.0008+ 0.0008+ 0.0026+ 0.0031+ 0.0036+ 0.0042	28	fruit	0.02	NH 11
					35	fruit	0.03	
					42	fruit	0.01	
					35	must	<0.01	
					35	wine	<0.01	
Londau, Germany, 1992[3]	SC	6	0.003+ 0.005+ 0.014+ 0.018+ 0.020+ 0.025	0.0008+ 0.0008+ 0.0026+ 0.0031+ 0.0036+ 0.0042	28	fruit	0.04	NH 11

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Ref.
	Form	No.	kg ai/ha	kg ai/hl				
					35	fruit	0.04	
					42	fruit	0.02	
					35	must	<0.01	
					35	wine	<0.01	
Neustadt, Germany, 1993[3]	SC	6	0.003+ 0.005+ 0.014+ 0.018+ 0.020+ 0.025	0.0008+ 0.0008+ 0.0026+ 0.0031+ 0.0036+ 0.0042	28	fruit	0.02	NH 11
					35	fruit	0.01	
					42	fruit	0.02	
					35	must	<0.01	
					35	wine	<0.01	
Neustadt, Germany, 1993[3]	SC	6	0.003+ 0.005+ 0.014+ 0.018+ 0.020+ 0.025	0.0008+ 0.0008+ 0.0026+ 0.0031+ 0.0036+ 0.0042	28	fruit	0.02	NH 11
					35	fruit	0.02	
					42	fruit	0.01	
					35	must	<0.01	
					35	wine	<0.01	
Bad Kreuznach, Germany, 1982 [5]	SC	8	0.005-0.033	2X0.0016 6X0.0031	0	fruit	0.23	NH 12
					7	fruit	0.14	
					14	fruit	0.14*	
					21	fruit	0.10	
					28	fruit	0.11	
					35	fruit	0.07	
					42	fruit	0.08	
Ortsweil Wolf, Germany, 1982 [5]	EC	6	0.014-0.04	2X0.0008 4X0.0016	0	fruit	0.56	NH 12
					7	fruit	0.22	
					14	fruit	0.20*	
					21	fruit	0.10	
					28	fruit	0.07	
					35	fruit	0.06	
					42	fruit	0.05	
Ortsweil Wolf, Germany, 1982 [5]	SC	6	0.014-0.04	2X0.0008 4X0.0016	0	fruit	0.44	NH 12
					7	fruit	0.28	
					14	fruit	0.18*	
					21	fruit	0.10	
					28	fruit	0.07	
					35	fruit	0.05	
					42	fruit	0.05	
Trier, Germany, 1982 [5]	SC	6	2X0.012 4X0.024	2X0.0008 4X0.0016	0	fruit	0.02	NH 12

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Ref.
	Form	No.	kg ai/ha	kg ai/hl				
					7	fruit	0.03	
					14	fruit	0.02*	
					21	fruit	0.01	
					28	fruit	0.01	
					35	fruit	0.01	
					42	fruit	0.01	
		8	1X0.014 7X0.028	1X0.0008 7X0.0016	0	fruit	0.33	
					7	fruit	0.24	
					14	fruit	0.24*	
					21	fruit	0.23	
					28	fruit	0.19	
					35	fruit	0.15	
					42	fruit	0.14	
Trier, Germany, 1982 [5]	EC	6	2X0.012 4X0.024	2X0.0008 4X0.0016	0	fruit	0.03	NH 12
					7	fruit	0.02	
					14	fruit	0.02*	
					21	fruit	0.01	
					28	fruit	0.01	
					35	fruit	0.01	
					42	fruit	0.01	
		8	1X0.014 7X0.028	1X0.0008 7X0.0016	0	fruit	0.17	
					7	fruit	0.16	
					14	fruit	0.10*	
					21	fruit	0.09	
					28	fruit	0.09	
					35	fruit	0.10	
					42	fruit	0.11	
Thringen, Germany, 1982[5]		8	2X0.015 6X0.039	1X0.0008 7X0.0020	0	fruit	0.20	NH 12
					7	fruit	0.14	
					14	fruit	0.18*	
					21	fruit	0.11	
					28	fruit	0.08	
					35	fruit	0.08	
					42	fruit	0.08	
Bad Kreuznach, Germany, 1982[5]	EC	8	2X0.015 6X0.039	1X0.0008 7X0.0020	0	fruit	0.08	NH 12
					7	fruit	0.06	
					14	fruit	0.07*	
					21	fruit	0.05	
					28	fruit	0.03	
					42	fruit	0.05	
					35	fruit	0.03	
Calderara, Italy, 1977[1,2,4-6]	WP	7	0.024	not reported	22	fruit	0.02	NH 09

Underlined residues are from treatments according to GAP in Germany; the residue underlined twice was from treatment according to GAP in France
* according to UK GAP.
[1] No weather data submitted
[2] Method of analysis unspecified
[3] Crops stored for more than 6 months before analysis (8-9 months except wine samples)
[4] Low associated recoveries (63%)
[5] No example chromatograms submitted
[6] Duration of sample storage unspecified

Table 30. Non-European supervised residue trials on grapes (including US processing trials).

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
Sungarden, Australia, 1976[1,2]	EC	2	0.015	0.003	71	fruit	--	NH 22 AUS 76-237
		2	0.01	0.002	71	fruit	0.001	
		2	0.02	0.004	71	fruit	0.005	
Victoria, Australia, 1976[1,2,4]	EC	2	0.01	0.002	89	fruit	0.001	NH 22 AUS 76-238
		2	0.015	0.003	89	fruit	0.001	
		3	0.03	0.02	66	fruit	0.001	
		3	0.045	0.003	66	fruit	0.001	
		3	0.06	0.004	66	fruit	0.002	
Mclaren Vale, S. Australia, 1978[1,2]	EC	4	0.09	0.0036	90	fruit	0.009	NH 22 AUS 78-263
Pokolbin, NSW, Australia, 1980[1,2]	EC	7	0.01	0.001	8	fruit	0.05	NH 22 AUS 79-339
		7	0.024		8	fruit	0.06	
Mclaren Vale, S. Australia, 1981 (1,7)	EC	4		0.0024	0	fruit	0.34	NH 23 AUS 80-223
					1	fruit	0.19	
					5	fruit	0.09	
					29	fruit	0.02	
		4		0.0036	0	fruit	0.72	
					1	fruit	0.43	
					5	fruit	0.27	
					29	fruit	0.10	
Lyndoch, S. Australia, 1981[1,2]	EC	4	0.047	0.0024	0	fruit	0.28	NH 22 AUS 83-201
					7	fruit	0.22	
					14	fruit	<u>0.06</u>	
					28	fruit	0.02	
		4	0.094	0.0048	0	fruit	0.45	
					7	fruit	0.37	
					14	fruit	0.19	
					28	fruit	0.10	
Pokolbin, NSW, Australia, 1985[1,3]	EC	4		0.0024	7	fruit	0.02	NH 23 F/H01/85
					13	fruit	<u>0.01</u>	
					20	fruit	0.001	
					27	fruit	0.01	

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
		4		0.0048	7	fruit	0.06	
Irymple, Australia, 1992[1,2,4]	EC	1	0.037	0.0024	0	fruit	1.01	NH 24 S93 FEN1
					1		0.84	
					3		0.46	
					7		0.11	
					14		0.06	
					22		0.03	
					35		<0.2	
Irymple, Australia, 1993[1,2,4]	EC	1	0.037	0.0024	0	fruit	0.23	NH 24 S93 FEN3
					1		0.2	
					3		0.16	
					7		0.08	
					14		0.05	
					21		0.03	
					14	wine	0.008	
					14	dried fruit	0.03	
Nuriootpa, Australia, 1993[1,2,4]	EC	1	0.024	0.040-0.074	0		0.06	NH 24 A93 FEN2
					1		0.06	
					3		0.18	
					5		0.05	
					7		0.05	
					14		0.08	
					21		0.05	
					28		0.04	
					28	wine	0.008	
Nuriootpa, Australia, 1993[1,2,4]	EC	6	0.048	0.080- 0.148	28	fruit	0.57	NH 24 A93 FEN4
Brazil, 1985[1,2,4,7]	EC	11	0.024	0.0024	28	fruit	0.03	NB 29
Fresno, CA, USA, 1981[1,2]	EC	4	0.019 0.028 0.037 0.037		62	fruit	0.008	NH 21 DHF81-3
Fresno, CA, USA, 1981[1,2]	EC	3	0.025 0.025 0.025		70	fruit	<0.002	NH 21 DHF81-4
		4	0.037 0.056 0.074		70	fruit	0.006	
		3	0.025 0.025 0.025		70	fruit	0.002	
		3	0.012 0.025 0.037		70	fruit	0.003	
Fresno, CA, USA, 1981[1,2]	SC	3	0.019 0.028 0.037		70	fruit	0.005	NH 21 DHF81-4
		3	0.037		70	fruit	0.005	

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
			0.037 0.037					
		3	0.037 0.037 0.037		70	fruit	0.002	
			0.012 0.025 0.037		70	fruit		
Fresno, CA, USA, 1981[1,2]	SC	3	0.074 0.111 0.148		70	fruit	0.02	NH 21 DHF81-5
	EC	3	0.037 0.056 0.074		70	fruit	0.007	
Fresno, CA, USA, 1981[1,2]	EC	3	0.025 0.025 0.025		15	fruit	<0.002	NH 21 DHF81-6
	SC	3	0.05 0.05 0.05		15	fruit	0.008	
Fresno, CA, USA, 1981[1,2]	SC	3	0.05 0.05 0.05		119	fruit	<0.002	NH 21 LGT81-7
	EC	3	0.05 0.05 0.05		119	fruit	0.03	
Grandview, WA, USA, 1982[1,2]	EC	3	0.026		106	fruit	0.002	NH 17 82WA3
						juice/wine	<0.002	
						wet pomace	0.008	
						dried pomace	0.030	
Grandview, WA, USA, 1982[1,2]	EC	3	0.035		106	fruit	0.004	NH 17 82WA3
						juice/wine	<0.002	
						wet pomace	0.012	
						dried pomace	0.047	
Paw Paw, MI, USA, 1982[1,2]	EC	3	0.018 0.026 0.035		50	fruit	<0.002	NH 17 DE-082-31
						juice/wine	<0.002	
						wet pomace	0.003	
						dried pomace	0.012	
Paicines, CA, USA, 1983[1,2,5]	EC	2	0.044		94	fruit	0.006	NH 17 DF-83-62
						juice/wine	<0.002	
						wet pomace	0.011	
					94	fruit	0.005	
						juice/wine	<0.002	
						wet pomace	0.006	
					96	fruit	0.005	
						juice/wine	<0.002	
						wet pomace	0.005	

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
					96	fruit	0.006	
						juice/wine	<0.002	
						wet pomace	0.007	
Thermal, CA, USA, 1983[1,2,5]	EC	3	0.026 0.035 0.052		40	fruit	0.005	
						juice/wine	<0.002	
Thermal, CA, USA, 1983[1,2]	EC	3	0.026 0.035 0.052		40	fruit	0.005	NH 17 DHF-83-16
						juice/wine	<0.002	
						fruit	0.008	
		2	0.035 0.044		40	fruit	0.001	
Thermal, CA, USA, 1983[1,2]	EC	3	0.026 0.035 0.052		32	fruit	0.006	NH 17 DHF-83-17
	EC	3	0.026 0.035 0.052		32	fruit	0.007	
	SC	3	0.035 0.044 0.061		32	fruit	0.009	
Thermal, CA, USA, 1983[1,2]	EC	3	0.026 0.035 0.052		32	fruit	0.007	NH 17 DHF-83-18
	EC	3	0.026 0.035 0.052		32	fruit	0.003	
	SC	3	0.035 0.044 0.061		32	fruit	0.010	
Thermal, CA, USA, 1984	EC	3	0.025+ 0.033+ 0.05		47	fruit	<0.001	NH 02
		3	0.025+ 0.033+ 0.05		27	fruit	0.001	
		3	0.025+ 0.033+ 0.05		0	fruit	0.33	
					3	fruit	0.18	
					7	fruit	0.072	
					15	fruit	0.033	
					30	fruit	0.005	
Biola, CA, USA, 1984[1]	EC	2	0.033 0.05		82	fruit	0.004	NH 02 845-A
						juice	0.006	
						pomace	0.47	
						raisins	0.005	
						raisin waste	0.34	
Biola, CA, USA, 1984[1]	EC	3	0.025 0.033		82	fruit	0.004	NH 02 845-B

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
			0.05					
						juice	0.006	
						pomace	0.071	
						raisins	0.005	
						raisin waste	0.31	
Sanger, CA, USA, 1984[1]	EC	2	0.033 0.05	0.007 0.0107	86	fruit	0.006	NH 02 846-A
						juice	0.022	
						pomace	0.042	
						raisins	0.011	
						raisin waste	0.29	
Sanger, CA, USA, 1984[1,5]	EC	3	0.025 0.033 0.05	0.0053 0.007 0.0107	86	fruit	0.004	NH 02 846-B
						juice	0.008	
						pomace	0.035	
						raisins	0.004	
						raisin waste	0.52	
Biola, CA, USA, 1984[1]	EC	2	0.033 0.05	0.007 0.0107	92	fruit	0.004	NH 02 847-A
						juice	0.003	
						pomace	0.052	
Biola, CA, USA, 1984[1]	EC	3	0.025 0.033 0.05	0.0053 0.007 0.0107	92	fruit	0.003	NH 02 847-B
						juice	0.001	
						pomace	0.026	
Fresno, CA, USA, 1987	EC	4	0.025+ 0.033+ 0.05+ 0.05	0.0053+ 0.0071+ 0.0106+ 0.0106	30	fruit	<u>0.03</u>	NH 01
						juice	0.08	
						pomace	0.21	
		4	0.025+ 0.033+ 0.05+ 0.05	0.0053+ 0.0071+ 0.0106+ 0.0106	30	fruit	<u>0.02</u>	NH 01
						juice	0.07	
						pomace	0.19	
						raisin waste	0.48	
						raisins	0.04	
Biola, CA, USA, 1987[1]	EC	4	0.025 0.033 0.05 0.05	0.0053 0.0071 0.0106 0.0106	30	fruit	<u>0.026</u>	NH 01 87-13
						raisins	0.04	
						raisin waste	0.30	
Kerman, CA, USA, 1987[1]	EC	4	0.025 0.033 0.05 0.05		30	fruit	<u>0.019</u>	NH 01 87-14

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
						juice	0.047	
						pomace	0.09	
						raisins	0.04	
						raisin waste	0.26	
Bethlehem, PA, USA, 1988	EC	4	0.025 0.033 0.05 0.05		30	fruit	0.042	NH 20 8804R
Phelps, NY, USA, 1988	EC	4	0.025 0.033 0.05 0.05		30	fruit	0.006	NH 20 88060
Dundee, NY, USA, 1988	EC	4	0.025 0.033 0.05 0.05		30	fruit	0.010	NH 20 88061
Sunnyside, WA, USA, 1988	EC	4	0.025 0.033 0.05 0.05		30	fruit	0.033	NH 20 BJB88-05
Sunnyside, WA, USA, 1988	EC	4	0.025 0.033 0.05 0.05		30	fruit	0.017	NH 20 BJB88-06
Fresno, CA, USA, 1988	EC	3	0.025 0.033 0.050		30	fruit	0.007	NH 20 LE388-17
Biola, CA, USA, 1993[1,2]	EC	3	0.026 0.035 0.052		13	fruit	0.04	NH 17 DHF-83-56
					21	fruit	0.03	
					28	fruit	0.016	
					45	fruit	0.009	
					61	fruit	0.01	
					13	juice	0.018	
					21	juice	0.011	
					28	juice	0.014	
					45	juice	0.012	
					61	juice	0.008	
					13	wet pomace	0.037	
					21	wet pomace	0.021	
					28	wet pomace	0.028	
					45	wet pomace	0.015	
					61	wet pomace	0.016	
		4	0.026 0.035 0.052 0.052		13	fruit	0.005	
					21	fruit	0.039	
					28	fruit	0.032	
					45	fruit	0.015	
					61	fruit	0.017	

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
					13	juice	0.023	
					21	juice	0.013	
					28	juice	0.023	
					45	juice	0.016	
					61	juice	0.013	
					13	wet pomace	0.036	
					21	wet pomace	0.032	
					28	wet pomace	0.029	
					45	wet pomace	0.027	
					61	wet pomace	0.029	
Biola, CA, USA, 1993[1,2,5]	EC	3	0.026 0.035 0.052		14	fruit	0.023	NH 17 DHF-83-57
					21	fruit	0.024	
					28	fruit	0.019	
					45	fruit	0.021	
					59	fruit	0.009	
					14	juice	0.008	
					21	juice	0.012	
					28	juice	0.005	
					45	juice	0.003	
					59	juice	0.006	
					14	wet pomace	0.031	
					21	wet pomace	0.018	
					28	wet pomace	0.016	
					45	wet pomace	0.016	
					59	wet pomace	0.018	
					14	raisins	0.011	
					21	raisins	0.015	
					28	raisins	0.010	
					45	raisins	0.009	
					59	raisins	0.005	
					14	raisin waste	0.105	
					21	raisin waste	0.105	
					28	raisin waste	0.099	
					45	raisin waste	0.101	
					59	raisin waste	0.095	
		4	0.026 0.035 0.052 0.052		14	fruit	0.046	
					21	fruit	0.029	
					28	fruit	0.025	
					45	fruit	0.026	
					59	fruit	0.029	
					14	juice	0.008	
					21	juice	0.019	
					28	juice	0.008	

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
					45	juice	0.007	
					59	juice	0.009	
					14	wet pomace	0.027	
					21	wet pomace	0.026	
					28	wet pomace	0.027	
					45	wet pomace	0.019	
					59	wet pomace	0.019	
					14	raisins	0.017	
					21	raisins	0.019	
					28	raisins	0.014	
					45	raisins	0.010	
					59	raisins	0.012	
					14	raisin waste	0.171	
					21	raisin waste	0.191	
					28	raisin waste	0.179	
					45	raisin waste	0.131	
					59	raisin waste	0.206	
Sanger, CA, USA, 1993[1,2]	EC	4	0.026 0.035 0.052 0.052		16	fruit	0.053	NH 17 DHF-83-58
					21	fruit	0.053	
					30	fruit	0.043	
					48	fruit	0.081	
					63	fruit	0.032	
					16	raisin waste	0.347	
					21	raisin waste	0.401	
					30	raisin waste	0.216	
					48	raisin waste	0.332	
					63	raisin waste	0.271	
					16	juice	0.022	
					21	juice	0.025	
					30	juice	0.009	
					48	juice	0.017	
					63	juice	0.014	
					16	wet pomace	0.04	
					21	wet pomace	0.04	
					30	wet pomace	0.037	
					48	wet pomace	0.06	
					63	wet pomace	0.044	
					16	raisins	0.026	
					21	raisins	0.021	
					30	raisins	0.016	
					48	raisins	0.020	
					63	raisins	0.014	
Sanger, CA, USA, 1993[1,2]	EC	3	0.026 0.035 0.052		16	fruit	0.023	NH 17 DHF-83-58

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
					21	fruit	0.024	
					30	fruit	0.016	
					48	fruit	0.024	
					63	fruit	0.024	
					16	raisin waste	0.178	
					21	raisin waste	0.157	
					30	raisin waste	0.111	
					48	raisin waste	0.177	
					63	raisin waste	0.124	
					16	juice	0.021	
					21	juice	0.019	
					30	juice	0.016	
					48	juice	0.015	
					63	juice	0.006	
					16	wet pomace	0.067	
					21	wet pomace	0.023	
					30	wet pomace	0.052	
					48	wet pomace	0.045	
					63	wet pomace	0.024	
					16	raisins	0.009	
					21	raisins	0.007	
					30	raisins	0.011	
					48	raisins	0.007	
					63	raisins	0.009	
Biola, CA, USA, 1993[1,2,5]	SC	3	0.035 0.052 0.061		14	fruit	0.024	NH 17 DHF-83-57
					21	fruit	0.028	
					28	fruit	0.040	
					45	fruit	0.020	
					59	fruit	0.009	
					14	juice	0.036	
					21	juice	0.023	
					28	juice	0.027	
					45	juice	0.014	
					59	juice	0.014	
					14	wet pomace	0.042	
					21	wet pomace	0.023	
					28	wet pomace	0.035	
					45	wet pomace	0.023	
					59	wet pomace	0.035	
					14	raisins	0.020	
					21	raisins	0.019	
					28	raisins	0.013	
					45	raisins	0.012	
					59	raisins	0.012	
					14	raisin waste	0.242	

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
					21	raisin waste	0.195	
					28	raisin waste	0.174	
					45	raisin waste	0.152	
					59	raisin waste	0.163	
Biola, CA, USA, 1993[1,2,5]	SC	4	0.035 0.052 0.061 0.070		14	fruit	0.068	NH 17
					21	fruit	0.052	
					28	fruit	0.044	
					45	fruit	0.040	
					59	fruit	0.044	
					14	juice	0.037	
					21	juice	0.038	
					28	juice	0.050	
					45	juice	0.021	
					59	juice	0.021	
					14	wet pomace	0.050	
					21	wet pomace	0.033	
					28	wet pomace	0.067	
					45	wet pomace	0.047	
					59	wet pomace	0.038	
					14	raisins	0.042	
					21	raisins	0.050	
					28	raisins	0.026	
					45	raisins	0.023	
					59	raisins	0.022	
					14	raisin waste	0.330	
					21	raisin waste	0.406	
					28	raisin waste	0.361	
					45	raisin waste	0.284	
					59	raisin waste	0.290	
Biola, CA, USA, 1993[1,2]	SC	3	0.035 0.052 0.061		13	fruit	0.061	NH 17 DHF-83-56
					21	fruit	0.024	
					28	fruit	0.029	
					45	fruit	0.041	
					61	fruit	0.019	
					13	juice	0.044	
					21	juice	0.015	
					28	juice	0.027	
					45	juice	0.028	
					61	juice	0.023	
					13	wet pomace	0.039	
					21	wet pomace	0.033	
					28	wet pomace	0.031	
					45	wet pomace	0.030	

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
					61	wet pomace	0.028	
Biola, CA, USA, 1993[1,2]	SC	4	0.035 0.052 0.061 0.070		13	fruit	0.061	NH 17 DHF-83-56
					21	fruit	0.038	
					28	fruit	0.053	
					45	fruit	0.060	
					61	fruit	0.039	
					13	juice	0.043	
					21	juice	0.032	
					28	juice	0.094	
					45	juice	0.064	
					61	juice	0.053	
					13	wet pomace	0.052	
					21	wet pomace	0.037	
					28	wet pomace	0.053	
					45	wet pomace	0.055	
					61	wet pomace	0.057	
Sanger, CA, USA, 1993[1,2]	SC	3	0.035 0.052 0.061		16	fruit	0.067	NH 17 DHF-83-58
					21	fruit	0.032	
					30	fruit	0.061	
					48	fruit	0.061	
					63	fruit	0.021	
					16	juice	0.040	
					21	juice	0.039	
					30	juice	0.032	
					48	juice	0.031	
					63	juice	0.016	
					16	wet pomace	0.048	
					21	wet pomace	0.042	
					30	wet pomace	0.030	
					48	wet pomace	0.036	
					63	wet pomace	0.041	
					16	raisins	0.024	
					21	raisins	0.050	
					30	raisins	0.019	
					48	raisins	0.015	
					63	raisins	0.012	
					16	raisin waste	0.384	
					21	raisin waste	0.492	
					30	raisin waste	0.337	
					48	raisin waste	0.362	
					63	raisin waste	0.312	
Sanger, CA, USA, 1993[1,2]	SC	4	0.035 0.052		16	fruit	0.100	NH 17 DHF-83-58

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
			0.061 0.070					
					21	fruit	0.053	
					30	fruit	0.085	
					48	fruit	0.060	
					63	fruit	0.034	
					16	juice	0.076	
					21	juice	0.034	
					30	juice	0.045	
					48	juice	0.044	
					63	juice	0.034	
					16	wet pomace	0.053	
					21	wet pomace	0.039	
					30	wet pomace	0.049	
					48	wet pomace	0.051	
					63	wet pomace	0.046	
					16	raisins	0.064	
					21	raisins	0.059	
					30	raisins	0.034	
					48	raisins	0.036	
					63	raisins	0.042	
					16	raisin waste	1.18	
					21	raisin waste	0.88	
					30	raisin waste	0.74	
					48	raisin waste	1.07	
					63	raisin waste	0.62	

Underlined residues are from treatments according to GAP in the USA; those underlined twice from treatments according to GAP in Australia

[1] No weather data submitted

[2] Duration of sample storage unspecified (Californian trials: 11 months maximum by calculation)

[3] NH23 F/H01/85 samples stored for 15 months

[4] No example chromatograms submitted

[5] Some high associated recoveries (NH 02 fruit, 122%; DHF 83-57 pomace, 123%, 136%; DHF 83-62 pomace 125%), but mean recoveries acceptable

[6] No detailed report submitted

[7] No English translation provided

Strawberries. GAP was reported for Denmark, Ireland, Italy, Japan (indoor and outdoor), The Netherlands, Spain and the UK. The maximum application rates are 0.03-0.084 kg ai/ha with PHIs of 1-14 days.

Data were available from Italy, Japan, Spain and The Netherlands. Two Italian trials and one Spanish trial were according to Italian GAP (0.048 kg ai/hl, 7-day PHI), with residues of 0.12-0.18 mg/kg. Spanish GAP has a PHI of 3 days (0.0048 kg ai/hl) and was only represented by the single Spanish trial with a residue of 0.25 mg/kg. at 3 days. Three Dutch trials were according to GAP (0.084 kg ai/ha, treatment before flowering) with residues of <0.01-0.02 mg/kg, but all the Dutch trials were submitted in summary form only. Japanese indoor GAP (0.003 kg ai/hl, 1-day PHI) was represented by 7 trials in which the crops were all protected by what was described as "vinyl housing cultivation with plastic mulch on bed". Residue levels in the trials were 0.04-0.56 mg/kg in samples taken 1 day after the final treatment.

Raspberries. Information on GAP was reported for Ireland and the UK. The application rate is 0.04 kg ai/ha with a PHI of 14 days. Only one trial was available from the UK, and this was at an exaggerated application rate.

Table 31. Supervised residue trials on strawberries and raspberries.

Location, year	Application					PHI, days	Residues, mg/kg	Ref.
	Sample	Form	No.	kg ai/ha	kg ai/hl			
STRAWBERRY								
Grosseto, Italy, 1979[1,2,3,5]	Field	WP	3	0.042	0.0042	7	0.12	NC 11
						16	0.09	
						22	0.07	
Grosseto, Italy, 1979[1,2,3,5]	Field	WP	3	0.042	0.0042	7	0.14	NC 12
						16	0.10	
						22	0.05	
Nara Pref., Japan, 1984[1,3]	Protected	WP	3	0.045	0.003	1	0.32**	NC16
						3	0.17	
						8	0.29	
Chiba Pref., Japan, 1984[1,3]	Protected	WP	3	0.045	0.003	1	0.43**	NC 16
						3	0.48	
						6	0.44	
Saitama Pref, Japan, 1987[1,3]	Protected	WP	3	0.06	0.003	1	0.04**	NC 16
Wakayama, Japan, 1988[1,3]	Protected	WP	3	0.045	0.003	1	0.13**	NC 16
Hyogo, Japan, 1988[1,3]	Protected	WP	3	0.045	0.003	1	0.56**	NC 16
Osaka, Japan, 1988[1,3]	Protected	WP	3	0.045	0.003	1	0.20**	NC 16
Shiga Pref, Japan, 1988[1,3]	Protected	WP	3	0.045	0.003	1	0.21**	NC 16
Ophensden, Netherlands, 1979[6]	Field	EC	1	0.084		238	0.02	6
Zaltbommel, Netherlands, 1979[6]	Field	EC	1	0.084		239	<0.01	6
Zundert, Netherlands, 1979[6]	Field	EC	1	0.084		238	<0.01	6
Breda, Netherlands, 1982[6]	Field	EC	1	0.07		15	<0.01	6
Vilanova de Castello, Spain, 1986[1,3,4,7]	Field	EC	3	0.096	0.0048	0	0.3	13
						3	0.25*	
						7	0.18	
						14	0.1	
						21	0.07	
RASPBERRY								
Earl Wood, Windlesham, UK, 1994[1,2,4]	Field	SC	3	0.075	0.0036	11	0.05	ND 01

Underlined residues are from treatments according to GAP in Italy; those underlined twice from treatments according to GAP in The Netherlands

* According to GAP in Spain
** According to Japanese indoor GAP
[1] No weather data submitted
[2] Method of analysis unspecified
[3] No example chromatograms submitted
[4] Duration of sample storage unspecified
[5] Crop variety unspecified
[6] No detailed report submitted
[7] No English translation provided

Bananas. GAP was reported for Honduras and Nicaragua. The application rates in both countries are 0.08-0.12 kg ai/ha with a PHI of 0 days.

Data were available from Ecuador, Costa Rica, Honduras and the Philippines. In all trials a low-volume application (20-48 l/ha) was made using a motorized backpack sprayer. Six trials reflected the use in Honduras and Nicaragua with residues 0 or 1 day after the final treatment of <0.01-0.19 mg/kg in unbagged bananas and <0.01-0.12 mg/kg in bagged bananas. Six further trials at twice the maximum application rate (i.e. 0.24 kg ai/ha) were also available with residues of 0.03-0.3 mg/kg in unbagged bananas and <0.01-0.12 mg/kg in bagged bananas.

Table 32. Supervised residue trials on bananas in 1992. All with 7 applications of EC.

Location, year	Application		Sample	Bagged/Un-bagged	PHI, days	Residues, mg/kg	Ref.
	kg ai/ha	kg ai/hl					
Limon, Costa Rica -East	0.12	0.55	whole	unbagged	0	0.02	NL 02
			pulp	unbagged	0	0.02	
			whole	unbagged	1	0.02	
			pulp	unbagged	1	0.01	
			whole	bagged	0	<0.01	
			pulp	bagged	0	<0.01	
			whole	bagged	1	<0.01	
			pulp	bagged	1	<0.01	
Limon, Costa Rica -East	0.24	1.1	whole	unbagged	0	0.03	NL 02
			pulp	unbagged	0	0.03	
			whole	unbagged	1	0.03	
			pulp	unbagged	1	0.05	
			whole	bagged	0	<0.01	
			pulp	bagged	0	<0.01	
			whole	bagged	1	0.01	
			pulp	bagged	1	<0.01	
Limon, Costa Rica -West	control		whole	bagged	-	<0.01 0.01	NL 02
	0.12	0.55	whole	unbagged	0	0.03	
			pulp	unbagged	0	0.01	
			whole	unbagged	1	0.03	
			pulp	unbagged	1	<0.01	
			whole	bagged	0	<0.01	
			pulp	bagged	0	<0.01	
			whole	bagged	1	<0.01	
			pulp	bagged	1	<0.01	
Limon, Costa Rica -West	control	control	whole	bagged	-	<0.01 0.01	NL 02

Location, year	Application		Sample	Bagged/Un-bagged	PHI, days	Residues, mg/kg	Ref.
	kg ai/ha	kg ai/hl					
	0.24	1.1	whole	unbagged	0	0.05	
			pulp	unbagged	0	-	
			whole	unbagged	1	0.05	
			pulp	unbagged	1	0.01	
			whole	bagged	0	0.01	
			pulp	bagged	0	<0.01	
			whole	bagged	1	<0.01	
			pulp	bagged	1	<0.01	
Guayas, Ecuador Site 1	0.12	0.6	whole	unbagged	0	0.09	NL 02
			pulp	unbagged	0	0.05	
			whole	unbagged	1	0.19	
			pulp	unbagged	1	0.02	
			whole	bagged	0	0.12	
			pulp	bagged	0	0.01	
			whole	bagged	1	0.02	
			pulp	bagged	1	0.12	
Guayas, Ecuador Site 1	0.24	1.2	whole	unbagged	0	0.25	NL 02
			pulp	unbagged	0	0.12	
			whole	unbagged	1	0.22	
			pulp	unbagged	1	0.11	
			whole	bagged	0	0.02	
			pulp	bagged	0	0.01	
			whole	bagged	1	0.03	
			pulp	bagged	1	0.01	
Guayas, Ecuador Site 2	0.12	0.6	whole	unbagged	0	0.12	NL 02
			pulp	unbagged	0	0.11	
			whole	unbagged	1	0.16	
			pulp	unbagged	1	0.04	
			whole	bagged	0	<0.01	
			pulp	bagged	0	<0.01	
			whole	bagged	1	0.01	
			pulp	bagged	1	0.02	
Guayas, Ecuador Site 2	0.24	1.2	whole	unbagged	0	0.05	NL 02
			pulp	unbagged	0	0.07	
			whole	unbagged	1	0.3	
			pulp	unbagged	1	0.12	
			whole	bagged	0	0.04	
			pulp	bagged	0	0.03	
			whole	bagged	1	0.04	
			pulp	bagged	1	0.04	
La Lima, Honduras Site 1	0.12	0.00025	whole	unbagged	0	0.01	NL 02
			pulp	unbagged	0	<0.01	
			whole	unbagged	1	<0.01	
			pulp	unbagged	1	<0.01	
			whole	bagged	0	<0.01	
			pulp	bagged	0	<0.01	
			whole	bagged	1	<0.01	

Location, year	Application		Sample	Bagged/Un-bagged	PHI, days	Residues, mg/kg	Ref.
	kg ai/ha	kg ai/hl					
			pulp	bagged	1	<0.01	
La Lima, Honduras Site 1	0.24	0.5	whole	unbagged	0	0.02	NL 02
			pulp	unbagged	0	0.02	
			whole	unbagged	1	0.02	
			pulp	unbagged	1	0.02	
			whole	bagged	0	<0.01	
			pulp	bagged	0	<0.01	
			whole	bagged	1	<0.01	
			pulp	bagged	1	<0.01	
La Lima, Honduras Site 2	0.12	0.25	whole	unbagged	0	<0.01	NL 02
			pulp	unbagged	0	<0.01	
			whole	unbagged	1	0.01	
			pulp	unbagged	1	0.01	
			whole	bagged	0	<0.01	
			pulp	bagged	0	ND	
			whole	bagged	1	<0.01	
			pulp	bagged	1	ND	
La Lima, Honduras -Site 2	0.24	0.5	whole	unbagged	0	0.02	NL 02
			pulp	unbagged	0	<0.01	
			whole	unbagged	1	0.02	
			pulp	unbagged	1	0.02	
			whole	bagged	0	<0.01	
			pulp	bagged	0	0.02	
			whole	bagged	1	<0.01	
			pulp	bagged	1	<0.01	
Philippines[1]	0.15	0.11	pulp	NR	8	0.02	NL 03
			peel	NR	8	0.07	
			whole	NR	8	0.04	

Underlined residues are from treatments according to GAP in Honduras and Nicaragua
ND none detected
NR not recorded
[1] 1991

Cucumbers. GAP was reported for Brazil, Denmark, Ireland, Japan, The Netherlands, Uruguay and the UK. Several other countries reported GAP for the group "cucurbits". The maximum application rates are 0.019-0.072 kg ai/ha or 0.0012-0.0072 kg ai/hl with PHIs of 1-7 days.

Residue trials data were available from Austria, Italy, Brazil and the UK. One trial with a residue of 0.03 mg /kg was according to UK and Irish GAP (0.002 kg ai/hl, 2-day PHI) and a Brazilian trial with a residue at 4 days of 0.003 mg/kg complied with GAP in Uruguay. Residues in the Italian trials were at PHIs of 10-15 days, although this is longer than any reported GAP. There were no results at the Japanese GAP PHI of 1 day.

Gherkins. GAP was reported for The Netherlands (0.0024 kg ai/hl, 3-day PHI) for both protected and field use. Other countries had GAP for the group "cucurbits".

Two replicated Dutch trials were submitted in summary form in which a high application concentration of 0.24 kg ai/hl was reported, with the rate per hectare unspecified. Residues in samples taken 3 days after the final treatment were 0.02-0.06 mg/kg.

Table 33. Supervised residue trials on cucumbers and gherkins.

Location, year	Field protected	Application				PHI, days	Residues, mg/kg	Ref.
		Form	No.	kg ai/ha	kg ai/hl			
CUCUMBER								
Tadten, Austria, 1976[1,2,3,5]	Field	EC	1	0.012	0.0006	2	0.03	NB 01
		EC	1	0.024	0.0012	2	0.02	
Campinas, Brazil, 1986[1,3-5]	Field	EC	3	0.018		4	0.003	NB 29
			3	0.036		4	0.01	
Bellaria, Italy, 1977 [1-5]	Field	WP	8		0.003 high vol.	10	<0.01	NB 08
Borghesi, Italy, 1977 [1-5]	Field	WP	7		0.003 high vol.	22	<0.01	NB 09
Parma, Italy, 1981[1-3]	Field	SC	1	0.024	0.0024	15	<0.01	NB 15
Windlesham, Surrey, UK, 1976[1-3]	Protected	EC	6	250 ml/plant	0.002	2	0.03	NB 04
						4	0.05	
			6	250 ml/plant	0.004	2	0.09	
						4	0.07	
			6	250 ml/plant	0.008	2	0.03	
						4	0.16	
GHERKINS								
Denne, Netherlands, 1977[7]	Field?	EC	1		0.24	1	0.1	6
						3	0.03	
			1		0.24	1	0.07	
							0.05	
							0.1	
							0.08	
						3	0.06	
							0.03	

fenarimol

Location, year	Field protected	Application				PHI, days	Residues, mg/kg	Ref.
		Form	No.	kg ai/ha	kg ai/hl			
							0.05	
							0.02	
Wernhout, Netherlands, 1977[7]	Field?	EC	1		0.24	1	0.08	6
							0.06	
							0.1	
							0.05	
						3	0.06	
							0.04	
							0.03	
							0.02	

Underlined residues are from treatments according to GAP in UK and Ireland; those underlined twice from treatments according to GAP in Uruguay
[1] No weather data provided
[2] Method of analysis unspecified
[3] No example chromatograms submitted
[4] Duration of sample storage unspecified
[5] Crop variety unspecified
[6] No English translation provided
[7] No detailed report submitted

Melons (including cantaloupes) and watermelons. Indoor GAP for melons was reported for The Netherlands (0.0024 kg ai/hl, 3-day PHI), and outdoor GAP for melons for Japan, Portugal and Brazil and for watermelons for Japan, Brazil and Uruguay, as well as GAP for "cucurbits" in other countries. The maximum application rates are 0.012-0.036 kg ai/ha with PHIs of 1-7 days.

The only relevant indoor data were from two Spanish trials on melons but these were with a higher spray concentration than in Dutch GAP.

Outdoor trials were carried out on melons in France, Italy, Brazil and Spain, on watermelons in Italy and Brazil and on cantaloupes in Italy. In four French trials according to Greek GAP for cucurbits (0.024 kg ai/ha, 1-day PHI) residues were <0.01 and <0.01-0.11 mg/kg in the pulp and peel, respectively, 2 days after the final treatment. Residues at 4 days were <0.01 and 0.01-0.07 mg/kg in the pulp and peel respectively. When a double rate was applied (0.048 kg ai/ha) residues were only <0.01-0.02 and 0.04-0.09 mg/kg in the pulp and peel at 2 days. In these French trials the actual weights of pulp and peel were not recorded.

A number of other trials on melons in Brazil, Italy and Spain were at higher application rates than GAP at 0.036-0.048 kg ai/ha but residues were low (0.01-0.04 mg/kg) at 3-4 days. In a further three outdoor trials on watermelons in Italy and Brazil and two Italian trials on cantaloupes residues were all below the LOD (<0.01 mg/kg or ND) 4-14 days after the final treatment. Brazilian GAP (0.024 kg ai/ha, 4-day PHI) was represented by two trials; residues were 0.005 mg/kg in melons and "not detected" in watermelons, but in both trials the duration of sample storage was unspecified.

Table 34. Supervised residue trials on melons, watermelons and canteloupe melons.

Location, year	Field/ protected	Application				PHI, days	Sample	Residues, mg/kg	Ref.
		Form	No.	kg ai/ha	kg ai/hl				

Location, year	Field/ protected	Application				PHI, days	Sample	Res-idues, mg/kg	Ref.
		Form	No.	kg ai/ha	kg ai/hl				
MELON									
Campinas, Brazil, 1986[1,4-6]	Field	EC	3	0.018		4	whole	0.005	NB 29
			3	0.036		4	whole	0.04	
Savonieries, France, 1976[1,2,4]	Field	EC	3	0.01	0.0017	10	whole	<0.01	NB 02
			3	0.015	0.0025	10	whole	<0.01	
St Nicholas, France, 1980[1,2,4]		EC	1	0.024	0.0024	0	pulp	<0.01	NB 20
						0	pulp	<0.01	
						2	peel	0.03	
						2	peel	0.11	
						4	peel	0.06	
						4	peel	0.04	
Moissac, France, 1980 [1,2,4]	Field	EC	1	0.024	0.0025	0	pulp	<0.01	NB 21
						0	peel	0.09	
						2	pulp	<0.01	
						2	peel	0.03	
						4	pulp	<0.01	
						4	peel	0.01	
			1	0.048	0.0048	0	pulp	<0.01	
						0	peel	0.08	
						2	pulp	<0.01	
						2	peel	0.04	
						4	pulp	<0.01	
						4	peel	0.04	
St Nicola de la Grave, France, 1980[1,2,4]	Field	EC	1	0.024	0.0024	0	pulp	<0.01	NB 22
						0	peel	0.19	
						2	pulp	<0.01	
						2	peel	0.09	
						4	pulp	<0.01	
						4	peel	0.07	
			1	0.048	0.0048	0	pulp	0.01	
						0	peel	0.22	
						2	pulp	<0.01	
						2	peel	0.09	
						4	pulp	0.01	
						4	peel	0.08	
Moissac, France, 1980[1,2,4]	Field	EC	1	0.024	0.0022	0	pulp	<0.01	NB 23
						0	peel	<0.01	
						2	pulp	<0.01	
						2	peel	<0.01	
						4	pulp	<0.01	
						4	peel	0.04	
			1	0.048	0.0048	0	pulp	0.02	
						0	peel	013	
						2	pulp	0.02	
						2	peel	0.07	

Location, year	Field/ protected	Application				PHI, days	Sample	Res-idues, mg/kg	Ref.
		Form	No.	kg ai/ha	kg ai/hl				
						4	pulp	<0.01	
						4	peel	0.04	
Volania, Ferrara, Italy, 1994	Field	SC	3	0.018+ 0.018+ 0.036	0.0036	7	peel	0.01	NB 32
						7	pulp	ND	
						7	whole	<0.01	
			3	0.024+ 0.024+ 0.048	0.0048	7	peel	0.01	
						7	pulp	ND	
						7	whole	<0.01	
Gavello, Italy, 1994	Field	SC	3	0.018+ 0.018+ 0.036	0.0036	7	peel	0.03	NB 32
						7	pulp	ND	
						7	whole	0.01	
			3	0.024+ 0.024+ 0.048	0.0048	7	peel	0.02	
						7	pulp	ND	
						7	whole	<0.01	
Los Alcazares, Spain, 1994	Protected	SC	3	0.037	0.0048	-1	whole	<0.01	NB 31
						0	whole	0.02	
						3	whole	0.02	
						5	whole	0.02	
						7	whole	<0.01	
Sevilla, Spain, 1994	Protected	SC	3	0.048	0.0048	-1	whole	<0.01	NB 31
						0	whole	0.01	
						3	whole	0.01	
						5	whole	<0.01	
						7	whole	0.01	
Romani, Spain, 1986[1,2,4,5,7]	Field	EC	2	0.096	0.0048	0	whole	0.1	13
						4	whole	0.07	
						7	whole	0.02	
						14	whole	ND	
CANTALOUPE MELONS									
Parma, Italy, 1977[1-6]	Field	WP	1	0.012	0.003	10	whole	<0.01	NB 11
Parma, Italy, 1981[1,2,4]	Field	SC	3	0.024	0.0024	14	whole	<0.01	NB 24
WATERMELONS									
Parma, Italy, 1976[1,2,4]	Field	EC	3	0.020	0.002	11	whole	<0.01	NB 03
Parma, Italy, 1977[1-4]	Field	WP	3		0.0018+ 0.0024+ 0.003	10	whole	<0.01	NB 12
Campinas, Brazil, 1986[1,4,6]	Field	EC	4	0.018	not reported	4	whole	ND	NB 29
			4	0.036	not reported	4	whole	ND	

Underlined residues are from treatments according to GAP in Greece; those underlined twice from treatments according to GAP in Brazil.

ND - not detected
[1] No weather data submitted
[2] Method of analysis unspecified
[3] Low associated recoveries (65% for cantaloupe trial, 68% for watermelon trial)
[4] No example chromatograms submitted
[5] Duration of sample storage unspecified
[6] Crop variety unspecified
[7] No English tranlation provided

Pumpkins, courgettes and squashes. GAP was reported for pumpkins for The Netherlands (indoor only), Brazil, Japan and Peru, for squash for Argentina (summer) and Uruguay, for courgettes for The Netherlands, and for "cucurbits" in other countries. The maximum application rates are 0.012-0.06 kg ai/ha with PHIs of 1-7days.

No data on indoor trials were submitted. One trial on squash in Brazil, complying with GAP for Argentina and Uruguay (0.024 kg ai/ha, 4 days PHI), showed a residue of 0.005 mg/kg. One Australian replicated trial on zucchini courgettes and one on pumpkins accorded with Australian GAP for curcurbits (0.024 kg ai/ha, 3-day PHI). Residues were very low; 0.001-0.01 mg/kg three days after the final treatment. The duration of laboratory sample storage was not given in the Australian trials considered to be according to GAP.

Table 35. Supervised residue trials on squash, zucchini, courgettes and pumpkins (whole commodities analysed).

Location, year	Application				PHI, days	Residues, mg/kg	Ref.
	Form	No.	kg ai/ha	kg ai/hl			
SQUASH							
Campinas, Brazil, 1986[1,4,6]	EC	4	0.018	not reported	4	0.005	NB 29
		4	0.036	not reported	4	0.008	
Parma, Italy, 1977[1,2,3-6]	WP	3	0.12	0.003	15	<0.01	NB 10
Parma, Italy, 1981[1,2,4]	WP	4	0.024	0.0024	15	<0.01	NB 26
ZUCCHINI COURGETTES							
Pokolbin, NSW, Australia, 1985[1,5,6]			control	control	-	0.005	NB 30
	EC	4	0.01	not reported	3	0.01	
		4	0.02	not reported	3	0.01	
		4	0.03	not reported	3	0.02	
PUMPKINS							
Pokolbin, NSW, Australia, 1985[1,5,6]			control	control	-	0.001	NB 30
	EC	4	0.01	not reported	3	0.001	
		4	0.02	not reported	3	0.003	
		4	0.03	not reported	3	0.001	

Underlined residues are from treatments according to GAP for squash in Argentina and Uruguay; those underlined twice from treatments according to GAP for cucurbits in Australia
[1] No weather data provided
[2] Method of analysis unspecified
[3] Low associated recoveries (69%)
[4] No chromatograms submitted
[5] Duration of sample storage unspecified
[6] Crop variety unspecified

Tomatoes. GAP was reported for Denmark (glasshouse and field use), Italy, Japan, The Netherlands (glasshouse and field use), Spain and the UK. The maximum application rates are 0.036-0.072 kg ai/ha or 0.002-0.0048 kg ai/hl with PHIs of 1-7days.

Data were available from Italy, Spain, The Netherlands and Greece. Treatments in two Netherlands indoor trials were comparable to Danish GAP (0.036 kg ai/ha or 0.0048 kg ai/hl, 2-day PHI). Residues in both were 0.03 mg/kg at 2 days. Italian GAP (0.0048 kg ai/hl, 7-day PHI) and Spanish GAP (0.006 kg ai/hl, 7-day PHI) were reflected in one Spanish and two Italian trials with residues of 0.03, 0.03 and 0.05 mg/kg at 7days.

Peppers. GAP for peppers is the same as for tomatoes except that Denmark has no registered use.

Trials data were available from Italy, Spain and Israel. Spanish and Italian GAP (0.0048 or 0.006 kg ai/hl with a PHI of 7days) were represented by 6 trials in Italy and Spain. Residues were 0.03-0.07 mg/kg and 0.07-0.5 mg/kg respectively in samples taken 7 days after the final treatment. The duration of sample storage was not specified in the Spanish trials.

Egg plants (aubergines). Outdoor GAP was reported for Italy and Japan. The maximum application rates are about 0.04 kg ai/ha or about 0.002-0.0048 kg ai/hl with a PHI of 1 day in Japan and 7 days in Italy.

Only one Italian trial was reported, in which the residue was <0.01 mg/kg 15 days after harvest.

Table 36. Supervised residue trials on tomatoes, peppers and egg plants.

Location, year	Field/ protected	Application				PHI, days	Res, mg/kg	Ref.
		Form	No.	kg ai/ha	kg ai/hl			
TOMATOES								
Thessaloniki, Greece, 1994	Protected	EC	3	0.026 2 x 0.048	3 x 0.004	31	0.03	NE 12 GHE-P-4012
Grosetto, Italy, 1979[1-3]	Field	WP	3	0.084	0.0042	7	0.03	NE 03 I79-251
						14	0.06	
						21	<0.01	
Grosetto, Italy, 1979[1-3,5]	Field	WP	3	0.084	0.0042	7	0.03	NE 07 I79-250
						14	<0.01	
						21	<0.01	
Parma, Italy, 1981[1-3]	Field	SC	3	0.048	0.0042-0.0048	15	<0.01	NE 09 I81-258
Huissen, Netherlands, 1994	Protected	SC	3	0.048	0.0024	0	0.04	NE 11 R94-062-01
						1	0.04	
						2	0.03	
						3	0.03	
Bemmel, Netherlands, 1994	Protected	SC	3	0.048	0.0024	0	0.03	NE 11 R94-062-02
						1	0.03	
						2	0.03	
						3	0.02	
Marzarron, Spain, 1993[1]	Field	EC	3	*c.*0.06-0.08	0.0048	0	0.08	NE 08 GHE-P-3653
						2	0.06	
						7	0.05	
PEPPERS								

Location, year	Field/ protected	Application				PHI, days	Res, mg/kg	Ref.
		Form	No.	kg ai/ha	kg ai/hl			
Yad Natan, Israel, 1977[1-3]	Field	EC	2	0.036		30	0.03	NE 04 ISL79-2
						16	0.04	
						14	0.04	
						7	0.08	
						0	0.13	
			2	0.072		30	0.02	
						16	0.03	
						14	0.09	
						7	0.01	
						0	0.32	
Grosetto, Italy, 1979[1-3]	Field	WP	3		0.0042	7	0.07	NE 05 I79-250
						14	0.12	
						21	0.02	
Grosetto, Italy, 1979[1-3]	Field	WP	3		0.0042	7	0.03	NE 06 I79-251
						14	0.01	
						21	0.03	
Parma, Italy, 1981[1-3]	Field	SC	3	0.048	0.0048	15	<0.01	NE 10 I81-259
Cartagena, Spain, 1977[1-3,7]	Field		3		0.0024	30	0.03	NE 02 E77-129
					0.003		0.03	
Benifaio, Spain, 1986[1,3,6,7]	Field	EC	3	0.108	0.006	0	0.3	Ref. 13
						4	0.15	
						7	0.07	
						14	ND	
						21	ND	
Sollana, Spain, 1987[1,3,4,6,7]	Field	EC	1	0.126	0.006	0	0.27	Ref. 13
						3	0.23	
						7	0.12	
						14	0.05	
						21	0.03	
Benifaio, Spain, 1992[1,3,4,6,7]	Field	EC	1	0.15	0.006	0	0.6	Ref. 13
						3	0.56	
						7	0.5	
						14	0.2	
						21	0.1	
Benifaio, Spain, 1993[1,3,4,6,7]	Field	EC	1	0.12	0.006	0	0.21	Ref. 13
						3	0.26	
						7	0.08	
						14	0.05	
						21	0.03	
EGG PLANTS (AUBERGINES)								
Parma, Italy, 1981[1-3,5]	Field	SC	3		0.008	15	<0.01	NB 27 I81-260

Underlined residues are from treatments according to GAP in Spain and Italy

[1] No weather data submitted

[2] Method of analysis unspecified

[3] No example chromatograms submitted

[4] Duration of sample storage unspecified
[5] Crop variety unspecified
[6] No English translation provided
[7] The meeting was informed that samples were analysed within 24 hours of receipt at the laboratory.

Beetroots and carrots. Only Dutch GAP for "vegetables" was reported (0.036 kg ai/ha or 0.0024 kg ai/hl, 3-day PHI). There was one Netherlands trial on each of these crops in which residues were <0.01-0.02 mg/kg in samples taken 27 days after treatment.

Table 37. Supervised residue trials on beetroots and carrots at Slootdorp, The Netherlands, in 1984. 2 x 0.06 kg ai/ha EC applied in both trials (No example chromatograms submitted and no English translation provided for either trial).

PHI, days	Sample	Residues, mg/kg	Ref.
27	Beetroots, whole, roots and soil removed	0.01	KVW267/CTB/PD
		0.01	
		0.01	
		0.02	
		0.02	
27	Carrots, whole, soil removed	<0.01	KVW268/CTB/PD
		<0.01	
		<0.01	
		<0.01	

Globe artichokes. GAP was reported only for Italy (0.0048 kg ai/hl or 0.038 kg ai/ha, 7-day PHI). Six Italian trials with residues of <0.01-0.06 mg/kg were considered to reflect GAP. In two of these (1979) the analytical recovery was low (61%). In a Spanish trial a higher residue of 0.26 mg/kg was found at 7 days, but a high volume of water (2,500 l/ha) was applied and the spray concentration was higher (0.006 kg ai/hl) than that registered in Italy.

Table 38. Supervised residue trials on globe artichokes.

Location, year	Application				PHI, days	Residues, mg/kg	Ref.
	Form	No.	kg ai/ha	kg ai/hl			
Grosseto, Italy, 1979[1,24,5,7]		2	0.084	0.0042	7	<0.01	NI 01
					14	<0.01	
					21	<0.01	
Grosseto, Italy, 1979[1,2,4,5]	WP	3	0.084	0.0042	7	0.03	NI 02
					14	<0.01	
					21	<0.01	
Grosseto, Italy, 1981[1,2,6]	SC	3	0.048	0.0048	14	0.03	NB 28
			control	control	-	0.02	
Del Gardinia, Italy, 1994	SC	3	0.035-0.036	0.0036	-1	0.04	NI 05
					1	0.07	
					7	0.04	
					14	<0.01	
					21	<0.01	
Del Gardinia, Italy, 1994	SC	3	0.046-0.048	0.0048	-1	0.03	NI 05

Location, year	Application				PHI, days	Residues, mg/kg	Ref.
	Form	No.	kg ai/ha	kg ai/hl			
					1	0.10	
					7	0.06	
					14	0.02	
					21	<0.01	
Sezze, Italy, 1994	SC	3	0.031-0.035	0.0036	-1	0.02	NI 05
					1	0.11	
					7	0.05	
					14	0.02	
					21	<0.01	
Sezze, Italy, 1994	SC	3	0.042-0.047	0.0048	-1	0.05	NI 05
					1	0.19	
					7	0.06	
					14	0.04	
					21	0.02	
L'Alcudia, Spain, 1987[1,6,8]	EC	1	0.153	0.006	0	0.42	Ref. 13
					3	0.33	
					7	0.26	
					14	0.14	
					21	0.09	

Underlined residues are from treatments according to GAP in Italy
[1] No weather data submitted
[2] Method of analysis unspecified
[3] No control plot data
[4] Crops stored for 19 months before analysis
[5] Low recoveries (61%)
[6] No example chromatograms submitted
[7] Crop variety not specified
[8] No English translation provided

Witloof chicory. Only Dutch GAP for "vegetables" was reported (0.036 kg ai/ha or 0.0024 kg ai/hl, 3-day PHI). In a single trial residues were <0.01 mg/kg in samples taken 60 days after harvest.

Table 39. Supervised residue trials on witloof chicory at Slootdorp, The Netherlands, in 1984. 2 x 0.06 kg ai/ha of EC. No example chromatograms submitted and no English translation provided.

Sample	PHI, days	Residues, mg/kg	Reference
Crop	60	<0.01	KVW266/CTB/PD
Roots, soil removed	60	<0.01	

Pecans. GAP was reported for the USA and Mexico. The maximum application rates are 0.098 and 0.108 kg ai/ha with a PHI of 30 days in the USA and pre-flowering application in Mexico.

Twelve trials were carried out in the USA in four of which (one replicated) the final applications (0.074-0.12 kg ai/ha) were comparable to the registered rate in the USA (0.098 kg ai/ha). Residues were <0.002 and <0.002-0.02 mg/kg in the kernels and shells respectively after 35-153 days. In a further series of trials in which an exaggerated application rate was used (0.15-0.32 kg ai/ha) residues were <0.002-0.02 and <0.002-0.16 in the kernels and shells in samples taken 17-55 days after treatment. In one of these trials the laboratory samples were stored for 11 months before analysis.

Table 40. Supervised residue trials (field) on pecans in the USA.

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Ref.
	Form	No.	kg ai/ha	kg ai/hl				
Byron, GA, 1981[1]	EC	10	0.148*	0.003	30	kernel	<0.002	NM 01
Albany, GA, 1981[1,2,3]	SC	14	0.197*		35-39	kernel	<0.002	NM 01 RBC 81-25
						shell	0.164	
	EC	14	0.197*		35-39	kernel	0.02	
					55	shell	0.155	
Byron, GA, 1982[1]	EC	9	0.158*		55	kernel	<0.002	NM 01 USDA
						shell	<0.002	
Albany, GA, 1982[1]	EC	17	0.149*		29	kernel	<0.002	NM 01 RBC 82-1
						shell	<0.002	
					43	kernel	<0.002	
						shell	<0.002	
Albany, GA, 1982[1]	EC	17	0.149*		17	kernel	<0.002	NM 01 RBC 1, 2-5
						shell	<0.002	
Fitzpatrick, AL, 1982[1]	EC	14	0.149*		43	kernel	<0.002	NM 01 RDH 82-3
						shell	0.01	
Blakely, GA, 1982[1]	EC	11	0.12		38	kernel	<0.002	NM 02 RBC 83-12
					84	kernel	<0.002	
					107	kernel	<0.002	
					155	kernel	<0.002	
			0.12		38	shell	<0.002	
					84	shell	<0.002	
					107	shell	<0.002	
					155	shell	<0.002	
Artesia, MS, 1983[1]	EC	6	0.14		124	kernel	<0.002	NM 02 MS UNI
						shell	0.008	
		6	0.094		124	kernel	<0.002	
						shell	0.002	
Albany, GA, 1983[1]	EC	5	0.14		171	kernel	<0.002	NM 02 RBC 83-15
						shell	<0.002	
			0.32*		171	kernel	<0.002	
						shell	<0.002	
Albany, GA, 1983[1]	EC	11	0.12		25	kernel	<0.002	NM 02 RBC 83-16
			0.08		71	kernel	<0.002	
			0.063		94	kernel	<0.002	
			0.045		142	kernel	<0.002	
			0.12		25	shell	<0.002	
			0.08		71	shell	<0.002	
			0.063		94	shell	<0.002	
			0.045		142	shell	<0.002	
Fitzpatrick, GA, 1983[1]	EC	7	0.074		153	kernel	<0.002	NM 02 RDH 83-10
			0.10			kernel	<0.002	
			0.14			kernel	<0.002	
			0.11			kernel	<0.002	
			0.074		153	shell	0.02	

Location, year	Application				PHI, days	Sample	Residues, mg/kg	Ref.
	Form	No.	kg ai/ha	kg ai/hl				
			0.10			shell	0.004	
			0.14			shell	0.007	
			0.11			shell	<0.002	
Montgomery, AL, 1983[1]	EC	7	0.074		136	kernel	<0.002	NM 02 RDH 83-11
			0.10			kernel	<0.002	
			0.14			kernel	<0.002	
			0.11			kernel	<0.002	
			0.074		136	shell	0.014	
			0.10			shell	0.013	
			0.14			shell	0.023	
			0.11			shell	<0.002	

Underlined results are according to the registered application rate in the USA but are at longer PHIs; those underlined twice are from treatments according to GAP in the USA including the PHI.
* exaggerated application rate
[1] No weather data submitted
[2] Crops stored for 11 months before analysis
[3] Low associated recoveries (shells 44%)

Hops. GAP was reported for Germany and Spain. The maximum application rate was either 0.06 kg ai/ha or 0.0015 kg ai/hl with a 10-day PHI in Germany and 0.0048 kg ai/hl with an unspecified PHIs in Spain.

Four trials in Germany were all conducted according to German GAP. Residues in dried hops harvested 10 days after the final treatment were 2.22-3.55 mg/kg. Samples were stored for 13 months before analysis. The results are shown in Table 41.

Table 41. Supervised residue trials on hops, beer and spent yeast in Germany, 1990. All trials with 4 x 0.06 kg ai/ha (0.0015 kg ai/hl) of WP.

Location, year	PHI, days	Sample	Residues, mg/kg	Ref.
Rohr[1,2]	10	fresh hops	0.65	NJ 01 R90-616
		dried hops	3.15	
		spent hops	0.12	
		beer	<0.01	
		spent yeast	0.02	
Rohr[1,2]	10	fresh hops	1.12	NJ 01 R90-61B
		dried hops	3.55	
		spent hops	0.23	
		beer	<0.01	
		spent yeast	0.02	
Steinbach[1,2]	10	fresh hops	0.63	NJ 01 R90-61A
		dried hops	2.34	
		spent hops	0.14	
		beer	<0.01	
		spent yeast	0.02	
Rohr[1,2]	10	fresh hops	0.72	NJ 01 R90-61D
		dried hops	2.22	

Location, year	PHI, days	Sample	Residues, mg/kg	Ref.
		spent hops	0.12	
		beer	<0.01	
		spent yeast	0.02	

Underlined residues are from treatments according to GAP in Germany
[1] No weather data submitted
[2] Crops stored up to 13 months before analysis

Other commodites. GAP was also reported for peas in Japan and Italy and wheat in Japan, but no trials data were submitted.

Feeding trials on cattle and pigs

Twelve cattle (White Face) and twelve crossbred pigs were fed for 28 days on a diet containing nominally 0.1, 0.3 or 1.0 ppm fenarimol. The actual levels of the active ingredient in the treated feed were lower, apparently owing to the extraction procedures in which dichloromethane was used. The animals were killed 6 hours after the final feed. Tissues samples were extracted with methanol-acetonitrile, and the filtered extract partitioned with dichloromethane/aqeous NaCl. A cleaned up dichloromethane extract was then analysed by GLC with an ECD. Average procedural recoveries were 78-95% and 86-109% from cattle and pigs respectively. The residue distribution in tissues, corrected for recoveries, were as shown in Table 42 (Koons *et al*., 1984).

Table 42. Fenarimol residues in cattle and pigs.

Animal feeding level, ppm	Residue, mg/kg				
	Liver	Kidney	Muscle, loin	Muscle, round	Fat
Cattle					
0.1	0.005- 0.006	0.01	0.01	0.01	0.01
0.3	0.005-0.03	0.01	0.01	0.01	0.01
1.0	0.04-0.05	0.006-0.007	0.01	0.01	0.01
Pigs					
0.1	0.003-0.007	0.01	0.01	0.01	0.003-0.004
0.3	0.007-0.01	0.01	0.01	0.01	0.007-0.01
1.0	0.01-0.03	0.005-0.01	0.01	0.01	0.01-0.03

FATE OF RESIDUES IN STORAGE AND PROCESSING

In storage

No data were submitted.

In processing

Apples. Samples of apples with incurred residues of fenarimol were processed into juice, wet pomace following juice extraction, apple sauce, wet pomace following sauce production, and dry pomace. Samples were analysed by the method of Griggs and Decker (1981). Recoveries were variable but acceptable. Individual results are shown in Table 24 and a summary is given in Table 43.

Table 43. Summary of the distribution of fenarimol residues in apple and processed products.

Residues, mg/kg					
Whole fruit	Juice	Wet pomace from juice	Sauce	Wet pomace from sauce	Dry pomace
<0.002-0.04	<0.002-0.003	0.009-0.14	<0.002-0.009	<0.002-0.2	0.01-0.7

The residues in the wet pomace suggest that the residues were originally mainly in the peel. The individual results show that residues were generally concentrated about 2-fold from wet pomace to dry pomace during juice production, about 1-8-fold from wet pomace from sauce to dry pomace, and roughly 2-8-fold from whole fruit to wet pomace from juice (Decker and Day, 1983).

The concentration of residues between whole fruit and dry pomace is shown in detail in Table 44. Samples from the Cornel, Penn Univ and Winchester trials were soak-washed before analysis of the whole apples. The mean analytical recovery associated with the dry pomace results in these trials was high at 132%.

Table 44. Effect on residues of the production of dry pomace from whole apples.

Residues, mg/kg		Concentration factor	Ref.
Whole apple	Dry pomace		
<0.002	0.014	>7	NF 18 Cornel
0.037	0.67	18	NF 18 Penn Univ
0.017	0.20	12	NF 18 Penn Univ
0.059	0.31	5	NF 18 Winchester
0.057	0.36	6	NF 18 Winchester
0.014	0.12	9	NF 18 CMR 82-10
0.008	0.16	20	NF 18 CMR 82-10
<0.002	0.012	>6	NF 18 CMR 82-11
<0.002	0.013	>7	NF 18 CMR 82-11
0.007	0.12	17	NF 18 CMR 82-16
0.007	0.098	14	NF 18 CMR 82-16
0.004	0.068	17	NF 18 CDR 6-16
Median concentration factor		14	
Mean concentration factor		11.5	
Concentration factors excluding the trials from Cornel,		median 14	

Residues, mg/kg		Concentration factor	Ref.
Whole apple	Dry pomace		
Penn. Univ. and Winchester		mean 12.9	

Grapes. Grapes with incurred residues of fenarimol were processed into must and wine. Samples were analysed by the methods of Butcher and Perkins (1992) and Butcher (1994a). Recoveries from all substrates were acceptable. Individual results are are shown in Table 29. A summary is given in Table 45 (Butcher and Wood, 1994c).

Table 45. Distribution of fenarimol residues in grapes and processed products.

Residue, mg/kg		
Grapes	Wine	Must
0.01-0.03	<0.01	<0.01
0.02-0.04	<0.01	<0.01
0.01-0.02	<0.01	<0.01

The US residue trials on grapes included processing. Juice, pomace, raisin waste and raisins were all analysed. Most of the residue after processing was associated with the raisin waste. Further details including the individual results are shown in Table 30 (Dow Elanco Ltd., undated refs. NHO1, NHO2; Day, 1984a).

The concentration of residues from grapes to raisins is shown in Table 46 and from grapes to dry pomace in Table 47.

Table 46. Effect on residues of the production of raisins.

Residues, mg/kg		Concentration factor	Reference
Grapes	Raisins		
0.02	0.040	2.0	NH 01
0.004	0.005	1.3	NH 02
0.006	0.011	1.8	NH 02
0.004	0.004	1.0	NH 02
0.026	0.040	1.5	NH 02
0.019	0.040	2.1	NH 02
0.023	0.011	0.5	NH 17
0.024	0.015	0.6	NH 17
0.019	0.010	0.5	NH 17
0.021	0.009	0.4	NH 17
0.009	0.005	0.6	NH 17
0.046	0.017	0.4	NH 17
0.029	0.019	0.7	NH 17
0.025	0.014	0.6	NH 17
0.026	0.010	0.4	NH 17
0.029	0.012	0.4	NH 17
0.053	0.026	0.5	NH 17
0.053	0.021	0.4	NH 17
0.043	0.016	0.4	NH 17

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Residues, mg/kg		Concentration factor	Reference
Grapes	Raisins		
0.081	0.020	0.2	NH 17
0.032	0.014	0.4	NH 17
0.023	0.009	0.4	NH 17
0.024	0.007	0.3	NH 17
0.016	0.011	0.7	NH 17
0.024	0.007	0.3	NH 17
0.024	0.009	0.4	NH 17
0.024	0.020	0.8	NH 17
0.028	0.019	0.7	NH 17
0.040	0.013	0.3	NH 17
0.020	0.012	0.6	NH 17
0.009	0.012	1.3	NH 17
0.068	0.042	0.6	NH 17
0.052	0.050	1.0	NH 17
0.044	0.026	0.6	NH 17
0.040	0.023	0.6	NH 17
0.044	0.022	0.5	NH 17
0.067	0.024	0.4	NH 17
0.032	0.050	1.7	NH 17
.061	0.019	0.3	NH 17
0.061	0.015	0.2	NH 17
0.021	0.012	0.6	NH 17
0.100	0.064	0.6	NH 17
0.053	0.059	1.1	NH 17
0.085	0.034	0.4	NH 17
0.060	0.036	0.6	NH 17
0.034	0.042	1.2	NH 17
median concentration factor		0.6	

Table 47. Effect on residues of the production of dry grape pomace.

Residues, mg/kg		Concentration factor	Reference
Grapes	Dry grape pomace		
0.002	0.030	15	NH 17
0.004	0.047	12	
<0.002	0.012	>6	

In two Australian residue trials grapes were fermented into wine. The results are shown in Table 30 (NH 24). The residues in the wine were very low.

Hops. Samples of hops with incurred residues of fenarimol were processed into dried hops, beer and spent hops. Spent yeast following brewing was also analysed. Analyses were by the method of Butcher and Perkins (1992). Recoveries from all substrates were acceptable. The residues were as shown in Table 48.

Table 48. Distribution of fenarimol residues in hops and brewing products.

Residue, mg/kg				
Fresh hops	Dried hops	Spent hops	Beer	Spent yeast
0.63-1.12	2.22-3.55	0.12-0.23	0.01	0.02

Individual results (given in Table 41) showed a 3-5-fold increase in residues between fresh and dried hops and a roughly 15-25-fold decrease between dried hops and spent hops (Butcher and Perkins, 1991).

Residues in the edible portion of food commodities

Bananas. Several residue trials were carried out in which the residues in the pulp and whole bananas were determined separately. In one trial the peel was also analysed separately. Residues of fenarimol were found in the edible pulp, but were generally lower than in the peel. The results are given in Table 32 (Catta-Preta and Matos, 1993; Ishikura, 1991).

Melons. Several residue trials were carried out in which the pulp and peel were analysed separately. Residues in the pulp were low (≤0.02 mg/kg), although in most of the trials samples were taken up to 4 days after a single treatment. Details are given in Table 34.

Pecans. In thirteen US trials residues in the kernels and shells were determined separately. Residues in the edible kernels were all <0.002 mg/kg whereas residues in the shells were 0.002-0.164 mg/kg from trials at a variety of application rates. Individual results are given in Table 40 (Decker, 1983a, 1984).

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

Results of random monitoring analyses undertaken by the Australian Department of Primary Industries and Energy from 1st January 1989 to 30th June 1992 are shown below. Sampling of fruit and vegetables was of the whole commodity excluding stones, stems, crowns etc.

Table 49. Australian monitoring data for fenarimol.

Commodity	Residue, mg/kg	Number of samples
Apple	<0.01	45
	0.01-0.04	2
	0.05-0.1	1
	TOTAL	48
Fresh grapes	<0.01	165
	trace only	1
	0.01-0.02	10
	0.02-0.05	1

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	TOTAL	177
Pears	<0.01	17
	0.01-0.04	2
	TOTAL	19

NATIONAL MAXIMUM RESIDUE LIMITS

The national MRLs listed below were reported to the Meeting.

Country	Crop	MRL, mg/kg	Ref.
Argentina	apples	0.01	ref. 1
	grapes	0.1	
	peach	0.1	
	pear	0.01	
	squash, small	0.1	
Australia	pome fruit	0.2	ref. 2
	fruiting vegetables/cucurbits	0.2	
	grapes	0.1	
Brazil	apple	0.05	ref. 1
	cucumber	0.05	
	grapes	0.05	
	muskmelon	0.05	
	pumpkin	0.05	
	watermelon	0.05	
European Union[1]	citrus fruit	0.02*	ref. 3
	tree nuts	0.02*	
	pome fruit	0.3	
	stone fruit	(A)[2]	
	grapes, table & wine	0.3	
	strawberries	0.3	
	raspberries	0.3	
	currants	1	
	gooseberries	1	
	all other berries and small fruit	0.02*	
	root and tuber vegetables	0.02*	
	bulb vegetables	0.02*	
	fruiting vegetables	(A)	
	brassica vegetables	0.02*	
	leaf vegetables	0.02*	
	peas with & without pods	(A)	
	other legumes	0.02*	
	artichokes	(A)	
	other stem vegetables	0.02*	
	fungi	0.02*	
	pulses	0.02*	
	oil seeds	0.02*	
	potatoes	0.02*	
	tea	0.01*	
	hops	5	
	wheat/barley	(A)	
	other cereals	0.02*	

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Country	Crop	MRL, mg/kg	Ref.
	liver/kidney	(A)	
	other meat, milk or dairy	0.02*	
Hungary	apple	0.2	ref. 1
	blueberry/gooseberry	0.2	
	cherry	0.2	
	cucurbits	0.2	
	parsley	0.2	
	vineyards	0.2	
Japan	apple	1	
	aubergine	0.5	ref. 1
	cucumber	0.5	
	melon	1	
	pea, immature	0.5	
	peach	1	
	Japanese pear	1	
	pepper, sweet	0.5	
	persimmon	1	
	pumpkin	0.5	
	strawberries	1	
	tomato	0.5	
	watermelon	1	
	wheat	0.1	
Mexico	apples	0.1	ref. 1
	grapes	0.2	
	peas	0.1	
	pecan	0.1	
USA	apple	0.1	ref. 1
	cherry	1	
	grape	0.2	
	pear	0.1	
	pecan	0.1	
	cattle, fat	0.1	
	cattle, kidney	0.1	
	cattle, liver	0.1	
	cattle, meat by-products	0.01	
	cattle, meat	0.01	
	eggs	0.01	
	goats, fat	0.1	
	goats, kidney	0.1	
	goats, liver	0.1	
	goats, meat by-products	0.01	
	goats, meat	0.01	
	hog, fat	0.1	
	hog, kidney	0.1	
	hog, liver	0.1	
	hog, meat by-products	0.01	
	hog, meat	0.01	
	horse, fat	0.1	

Country	Crop	MRL, mg/kg	Ref.
	horse, kidney	0.1	
	horse, liver	0.1	
	horse, meat by-products	0.01	
	horse, meat	0.01	
	milk	0.003	
	poultry, fat	0.01	
	poultry, meat by-products	0.01	
	poultry, meat	0.01	
	sheep, fat	0.1	
	sheep, kidney	0.1	
	sheep, liver	0.1	
	sheep, meat by-products	0.01	
	sheep, meat	0.01	

[1] Applicable to Austria, Belgium, Denmark, Germany, Greece, Finland, France, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden and the UK
[2] To be set at 0.02* mg/kg (analytical limit of determination) unless further residue trials data are supplied

APPRAISAL

Fenarimol is a pyrimidin-5-ylbenzhydrol systemic fungicide, which is available in several formulations, the most important being emulsifiable concentrates, suspension concentrates, and wettable powders. It is registered for use on many crops world-wide. It was considered for the first time by the present Meeting.

Fenarimol is a crystalline solid of moderately low melting point and volatility. It has low solubility in water and is soluble in medium polarity solvents. The octanol/water partition coefficient indicates that the compound has the potential to accumulate to a moderate extent. It is photolabile in air and water and is not flammable, autoflammable, explosive or oxidizing.

In rats the major metabolic routes are oxidation of the carbinol, the chlorophenyl rings and the pyrimidine ring.

In goats a number of metabolites were formed, but they occurred at very low levels and would be unlikely to exceed 0.01 mg/kg following the feeding of crops (e.g apple pomace) which had been treated according to current GAP. The metabolites included *o*-chlorobenzoic acid and the methyl sulfone derivative of fenarimol, neither of which were identified as rat metabolites. Fenarimol was also detected in liver and kidney samples at low levels, and was the major component of the residue in pigs. In a poultry metabolism study the highest total residue occurred in the liver and kidneys. No identification of the residue was attempted although intakes by chickens from treated crops are likely to low (<0.1 ppm in the diet).

In apples and grapes fenarimol was degraded to numerous unidentified compounds at very low levels. These are likely to be photo-degradation products as they generally show very similar chromatographic characteristics. They do not occur in rats. The major component of the radioactive residue in apples, grapes and cucumbers was fenarimol. Six hours, 29 days and 49 days after spraying apples with [Æ-14C]fenarimol, the majority of the radioactive residue (81-92%) was associated with the peel.

A number of analytical methods were reported for a variety of substrates. Although these used different extraction and clean-up techniques, the determination in all was by GLC with an ECD, achieving LODs of 0.002-0.05 mg/kg.

Since the studies of metabolism by plants and livestock indicated that unchanged fenarimol was the major component of the residue, the Meeting concluded that the residue should be defined as fenarimol.

Residues in wine, grapes and cherries were found to be stable for at least 370, 370 and 104 days, respectively, following storage at *c.* -20°C. Additional data on the storage stability of residues were available for fortified peaches, tomatoes and melons, but were submitted too late for consideration by the Meeting: they will be evaluated by a future Meeting.

Important experimental details were missing from several of the residue trials. In cases where weather data, example chromatograms, crop variety or full details of the method of analysis for the particular trial were not provided the trials data were used, where applicable, to estimate maximum residue levels, since these omissions were not considered critical. However, where analytical recoveries associated with a trial were outside the range 70-120% the results were generally ignored. Similarly, if laboratory samples were stored frozen for more than 6 months or the duration and conditions of storage were unspecified the analytical results were not considered reliable. The exception to this was fruit crops for which data on the storage stability of residues were available. Finally in all cases a study report was considered necessary; a simple trial sheet was not considered to give sufficient information and such submissions as were not used in the estimation of maximum residue levels.

Apples. The results of a large number of trials were available from several countries around the world. The highest residues were found in trials according to Dutch GAP, but since the Dutch data were submitted only in summary form they were not used to estimate maximum residue levels. 16 Northern European trials reflected German GAP (0.0036 kg ai/hl, 21-day PHI) with residues of 0.02-0.21 mg/kg. A number of other German trials were reported but only summary sheets were submitted. US GAP was followed in eight trials in the USA, several of which were replicated, with residues 29-42 days after the final treatment of 0.002-0.059 mg/kg.

Eight trials according to GAP reported for Denmark, the UK and Ireland showed residues of 0.02-0.18 mg/kg. In further trials according to GAP in New Zealand, Brazil and Chile residues were 0.002-0.09 mg/kg. The Meeting estimated a maximum residue level of 0.3 mg/kg.

Pears. Four trials according to GAP were reported from the USA with residues of 0.01-0.04 mg/kg. Two trials were available with residues up to 0.13 mg/kg reflecting Italian and German GAP: the analytical recoveries associated with these trials were low at 63 and 67% respectively. The Meeting took into account the large number of trials on apples and the similar use patterns on the two crops, and estimated a maximum residue level of 0.3 mg/kg for pome fruits.

Peaches. Five peach trials in Spain and Italy according to Spanish GAP gave residues of 0.03-0.3 mg/kg at 7 days. In two of these trials the volume of spray per hectare was not clear and the results can therefore only be used as supplementary information. A further 1988 Spanish trial on apricots according to Spanish GAP for peaches with a residue of 0.36 mg/kg at 7 days provides support. The highest residues were from trials in which high water volumes were used but these complied with GAP. In a single Chilean nectarine trial according to Argentinian GAP residues were below the LOD at 2 days. No trials were available with results at the Japanese GAP PHI of one day. The Meeting estimated a maximum residue level of 0.5 mg/kg for peaches.

Cherries. Nine trials (3 with replicates) according to US GAP showed residues of 0.06-0.89 mg/kg at a 0- or 1-day PHI. It was recognised that no account was taken of the weights of the stones and the residues in the whole cherries would have been somewhat lower. The Meeting estimated a maximum residue level of 1 mg/kg for cherries.

Currants. Only 5 trials were available from The Netherlands and only one of these was according to GAP in Denmark, Ireland, The Netherlands or the UK. Furthermore, since the Dutch data were submitted only in summary form they could not be used. The Meeting concluded that there were insufficient data to estimate a maximum residue level for currants.

Gooseberries. Only one Dutch trial, reported in summary form only, was available: it complied with GAP reported for Ireland, The Netherlands and the UK. The Meeting concluded that there were insufficient data to estimate a maximum residue level.

Grapes. Residues in grapes treated according to GAP in the USA, Australia and France were generally low with residues of 0.003-0.06 mg/kg, 0.01-0.08 mg/kg and 0.02 mg/kg, respectively. A number of German trials were submitted of which six (2 with replicates) reflected German GAP (0.023 kg ai/ha, 35-day PHI). The residues were 0.01-0.15 mg/kg in samples taken 35 days after the final treatment. Seven of the German trials (two with replicates) which accorded with UK GAP (0.04 kg ai/ha, PHI 14 days) gave residues of 0.02-0.24 mg/kg in samples taken 14 days after the final treatment. There were no southern European trials at the highest GAP rate (0.06 kg ai/ha) or the shortest PHI (7 days). The Meeting estimated a maximum residue level of 0.3 mg/kg for grapes.

Strawberries. Residue trials data were available from Italy, Japan, Spain and The Netherlands. Three Italian trials were according to GAP (0.048 kg ai/hl, 7-day PHI), with residues of 0.12-0.18 mg/kg. Dutch trials reflecting GAP (0.084 kg ai/ha, treatment before flowering) showed residues of <0.01-0.02 mg/kg, but the data were submitted in summary form only and were therefore not considered further. Higher residues would result from Spanish GAP which has the shorter PHI of 3 days (0.0048 kg ai/hl) and which was represented by one trial with a residue of 0.25 mg/kg. Seven field trials were according to Japanese indoor GAP with a PHI of 1 day (0.03 kg ai/ha or 0.003 kg ai/hl). Residues in crops sampled one day after the final treatment were 0.04-0.56 mg/kg. The Meeting estimated a maximum residue level of 1 mg/kg for strawberries.

Raspberries. Only one residues trial was available from the UK and this was at a higher application rate than the GAP reported for Ireland and the UK. There were insufficient data to estimate a maximum residue level.

Bananas. Residue trials in Ecuador, Costa Rica and Honduras demonstrated that residues in unbagged bananas were generally higher than in bagged bananas. Six trials according to GAP in Honduras and Nicaragua (0.12 kg ai/ha, PHI 0 days) showed residues in unbagged bananas 0 or 1 day after the final treatment of <0.01-0.19 mg/kg. Six further trials at twice the registered application rate led to residues of 0.03-0.3 mg/kg in unbagged fruit. Residues were determined in the edible pulp. Although these were generally lower than those in the peel some were higher. The Meeting concluded that there was no consistent partition factor between the pulp and peel. It estimated a maximum residue level of 0.2 mg/kg.

Cucumbers. Only very limited data were available with one trial according to UK and Irish GAP (0.002 kg ai/hl, 2-day PHI) and one according to GAP in Uruguay. Residues were 0.03 mg/kg after 2 days and 0.003 mg/kg after 4 days respectively. The Meeting concluded that there were insufficient data to estimate a maximum residue level for cucumber.

Gherkins. Information on GAP gherkins in The Netherlands was reported as 0.0024 kg ai/hl, 6-day PHI, for both protected and field use. Two Dutch trials were reported with the high application concentration of 0.24 kg ai/hl but with the rate per hectare unspecified. However, since the data were submitted in summary form only they were unsuitable. The Meeting concluded that there were insufficient data to estimate a maximum residue level.

Melons (including cantaloupe) and watermelons. Data were available from two Spanish indoor trials but these were with a higher spray concentration than the reported Dutch GAP. Two trials were according to Brazilian GAP (0.024 kg ai/ha, 4-day PHI); the residues were 0.005 mg/kg in melons and "not detected" in watermelons.

Four French trials on melons were according to Greek GAP for "cucurbits" (0.024 kg ai/ha, 1-day PHI) with residues of <0.01 mg/kg in the pulp and up to 0.11 mg/kg in the peel of samples taken 2 days after the final treatment. However, no information was available on the weight ratio of the peel to the pulp. The manufacturer suggested a 30% peel to fruit weight ratio based on melon samples taken from other trials. Whilst the Meeting would not normally consider it appropriate to use an assumed weight ratio, this was considered an exceptional case since the residues were very low and calculations of the residues in whole melons from the trial with the highest residue level in the peel, based on an assumed peel:fruit weight ratio of 20-40%, would lead to values of 0.03-0.05 mg/kg if the residues in the pulp were at the limit of determination. Other trials were available which, although they did not correspond exactly to reported GAP (usually they were with exaggerated doses), indicated that residues were generally low. The Meeting estimated a maximum residue level of 0.05 mg/kg for melons. Since there were relatively few results the Meeting did not consider it appropriate to extrapolate this estimate to other cucurbits.

Pumpkins, courgettes and squashes. Only limited data were available, with no indoor trials according to Dutch indoor GAP.

Only one trial in Brazil, with a residue of 0.005 mg/kg, conformed to outdoor GAP in Argentina and Uruguay. Single Australian replicated trials on zucchini and pumpkins were according to Australian GAP for cucurbits. Residues were very low: 0.001-0.01 mg/kg three days after the final treatment. The Meeting concluded that there were insufficient data to estimate a maximum residue level for pumpkins, courgettes or squashes.

Tomatoes. Two indoor trials in The Netherlands were comparable to Danish GAP (0.036 kg ai/ha or 0.0048 kg ai/hl, 2-day PHI). Residues in both were 0.03 mg/kg at 2 days. Italian and Spanish outdoor GAP (0.0048 and 0.006 kg ai/hl, 7-day PHI) was reflected in two Italian trials and one Spanish trial with residues of 0.03, 0.03 and 0.05 mg/kg at 7 days. There were no outdoor trials according to Japanese GAP, which has a PHI of 1 day. Should submissions be made in the future, processing data will be required. There were insufficient data to estimate a maximum residue level.

Peppers. There were 6 trials in Italy and Spain according to Italian and Spanish GAP (the same as for tomatoes). The residues were 0.03 and 0.07 mg/kg in the Italian trials and 0.07, 0.08, 0.12 and 0.5 mg/kg in the Spanish trials, in samples taken 7 days after the final treatment. The Meeting estimated a maximum residue level of 0.5 mg/kg for peppers.

Aubergines. Only one Italian trial was available in which the residue was <0.01 mg/kg 15 days after treatment. This was insufficient to estimate a maximum residue level.

Beetroots and carrots. The only GAP reported for beetroots and carrots was the Dutch GAP for "vegetables" (0.036 kg ai/ha or 0.0024 kg ai/hl, 3-day PHI). Although one Netherlands trial was available for each of these crops, neither reflected GAP since samples were taken 27 days after treatment. No maximum residue level could be estimated.

Artichoke, Globe. Six Italian trials were considered to reflect Italian GAP (0.0048 kg ai/hl or 0.038 kg ai/ha, 7-day PHI) with residues of <0.01-0.06 mg/kg. Two of these trials (in 1979 with residues of <0.01 and 0.03 mg/kg) had a low associated analytical recovery (61%) and were therefore not considered reliable. A further Spanish trial gave a higher residue of 0.26 mg/kg at 7 days but a high volume of water (2,500 l/ha) was applied and the spray concentration (0.006 kg ai/hl) was higher than that registered in Italy. The Meeting estimated a maximum residue level of 0.1 mg/kg for globe artichokes.

Witloof chicory. Only one replicated trial in The Netherlands was available which complied with Dutch GAP for "vegetables". Residues were <0.01 mg/kg in samples taken 60 days after treatment. The Meeting concluded that there were insufficient data to estimate a maximum residue level for witloof chicory.

Pecans. Twelve trials were carried out in the USA of which four (one replicated) had application rates of 0.074-0.12 kg ai/ha, close to the registered rate in the USA (0.098 kg ai/ha). Residues in the kernels, to which the MRL applies, were <0.002 mg/kg at 35-153 days. In a further series of trials, residues in the kernels were all <0.002 mg/kg except in one trial with 0.02 mg/kg, at an exaggerated application rate (0.14-0.197 kg ai/ha). The residue of 0.02 mg/kg may have resulted from physical transfer from the shell. Recognising the need to establish MRLs at levels suitable for routine analysis by monitoring and enforcement laboratories, the Meeting estimated a maximum residue level of 0.02* mg/kg for pecans.

Hops. Four trials in Germany were all according to German GAP (0.06 kg ai/ha or 0.0015 kg ai/hl, 10-day PHI). The residues in dry hops harvested 10 days after the final treatment were 2.22-3.55 mg/kg, but in all the trials the hop samples were stored for 13 months before analysis. Brewing with these hops gave residues in the beer of <0.01 mg/kg. The results appeared very consistent and would suggest a maximum residue level of 5 mg/kg in dry hops, but in the absence of data confirming the stability of fenarimol in stored samples of a leafy crop the Meeting decided not to recommend an MRL: it was informed that a storage stability study on hops was now available.

Apple pomace. Processing data on apples indicated a concentration of residues from whole apples to dry pomace of 5-20-fold, with a median concentration factor of 14. Apple samples in several of the trials were "soak-washed" before analysis of the whole apples. The Meeting considered the data from these samples unsatisfactory. In the seven remaining trials with unwashed apples the median and mean concentration factors were 15 and 17 respectively. Although it was noted that the analytical recoveries from dry apple pomace were variable (68, 68, 76, 83, 108, 132 and 132%) the Meeting estimated a maximum residue level of 5 mg/kg for apple pomace, dry.

Dried grapes. Processing data on grapes indicated concentration factors for residues in whole grapes to those in raisins of 0.2-2.1. By applying the median concentration factor of 0.6 to the estimated maximum residue level of 0.3 mg/kg for grapes, the Meeting estimated a maximum residue level of 0.2 mg/kg for dried grapes.

Grape pomace, dry. Processing grapes to dry grape pomace increased the residues about 12-15 times, but as there were only two suitable results and residues in the grapes were low the Meeting could not establish a reliable concentration factor and therefore did not estimate a maximum residue level.

In a livestock feeding study beef cattle and pigs were fed for 28 days with fenarimol at various rates up to 1 ppm in the diet. At this dose residues of fenarimol in all tissue except liver were ≤0.01 mg/kg. Residues in the liver reached a maximum level of 0.03 mg/kg in pigs and 0.05 mg/kg in cattle. At rates of 0.1 and 0.3 ppm all tissue residues were <0.01 mg/kg.

Livestock will obtain fenarimol from wheat grain and straw, peas and pea straw, and fruit pomace. Of these items sufficient data on residues were available only for dry apple pomace (estimated maximum residue level 5 mg/kg). Dairy and beef cattle consume a maximum of 30% of their dietary dry matter as fruit pomace, whereas it is not generally fed to pigs. The maximum intake of fenarimol by beef cattle from fruit pomace would therefore be approximately 1 ppm in the diet. The Meeting recognized the need to establish MRLs at levels suitable for routine analysis by monitoring and enforcement laboratories, and estimated maximum residue levels of 0.02* mg/kg for cattle meat and kidney and 0.05 mg/kg for cattle liver.

There were insufficient data on pig feed items to estimate a maximum residue level for the meat or edible offal of pigs.

Although data on the environmental fate of fenarimol in soil were submitted to the Environmental Core Assessment Group at the present Meeting they were not, as would normally be expected, submitted for the consideration of the FAO Panel. The manufacturer agreed to submit the data to the FAO, for future consideration by the FAO Panel, as soon as possible. The Meeting concluded that in these circumstances temporary MRLs should be recommended, with a requirement for the studies on environmental fate.

RECOMMENDATIONS

The Meeting estimated the temporary maximum residue levels shown below, which are recommended for use as TMRLs.

Definition of the residue: fenarimol

CNN	Commodity	Recommended MRL, mg/kg	PHI on which based, days
AB 0266	Apple pomace, dry	5T	-
VS 620	Artichoke, Globe	0.1T	7
FI 327	Banana	0.2T	0
MM 812	Cattle meat	0.02*T	-
MO 1280	Cattle kidney	0.02*T	-
MO 1281	Cattle liver	0.05T	-
FS 13	Cherry	1T	0
DF 269	Dried grape	0.1T	-
FB 269	Grape	0.3T	14
VC 46	Melons, except Watermelon	0.05T	1
FS 247	Peach	0.5T	7
TN 672	Pecan	0.02*T	30
VO 445	Peppers, Sweet	0.5T	7
FP 9	Pome fruits	0.3T	14-28
FB 275	Strawberry	1T	1

FURTHER WORK OR INFORMATION

Required (by 1996)

Data on the environmental fate of fenarimol in soil.

Desirable

1. Full details of the methods of analysis used in all the residue studies where this information was not given. Validation of the methods of analysis for which validation data were not submitted.

2. A study to assess the likely residues in relevant succeeding or rotational crops or an explanation of why residues would not be expected.

3. Information on the melting point, octanol/water partition coefficient, solubility and specific gravity of pure fenarimol.

4. Submission of the study reports supporting the trials on apples, gooseberries, currants, gherkins and strawberries conducted in The Netherlands.

fenarimol

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