NUMERICAL DATA

Assessment of the Levels and Potential Health Risk Posed by Selected Organophosphate Pesticide Residues in Vegetable Farms in Manzini Region, Eswatini (2019)

Recoveries of selected OPPs in soil, cabbage and tomatoes.

Pesticide	**% Mean Recoveries ± RSD (n=6) Soil Cabbage**		**Tomatoes**
Dichlorvos	86.17 ± 14.82	88.90 ± 2.49	**79.78 ± 3.58**
Dimethoate	92.08 ± 2.19	81.20 ± 15.46	**86.99 ± 10.98**
Chlorpyrifos	78.07 ± 1.46	103.76 ± 4.24	**70.61 ± 11.74**
Malathion	84.18 ± 19.23	71.40 ± 11.37	**75.85 ± 5.84**
Profenofos	**72.48 ± 7.84**	**95.49 ± 19.05**	**71.90 ± 3.51**

The recoveries for all OPPs analysed range from 70.61% to 103.76% with percentage relative standard deviation < 20%.

Source:https://www.researchgate.net/publication/333001336_Assessment_of_the_Levels_and_Potential_Health_Risk_Posed_by_Selected_Organophosphate_Pesticide_Residues_in_Vegetable_Farms_in_Manzini_Region_Eswatini

Determination of Major Organophosphate Insecticide Residues in Cabbage Samples from Different Markets of Dhaka (2019)

The level of residues (mg/kg) of different pesticides found in the analyzed cabbage samples (N=50)

Sl. No.	Area of collection	Name of detected pesticide	Level of residue (mg/kg)	MRLs (mg/kg)*
1.	Rampura	Diazinon	0.12 ± 0.01	**0.01**
2.	Rampura	Chlorpyrifos	0.15 ± 0.02	**0.01**
3.	Rampura	Diazinon	0.07 ± 0.01	**0.01**
4.	Taltola Bazar	Diazinon	0.05 ± 0.01	**0.01**
5.	Taltola Bazar	Chlorpyrifos	0.06 ± 0.01	**0.01**
6.	**Taltola Bazar**	**Chlorpyrifos**	**0.18 ± 0.02**	**0.01**

* According to the EU Pesticide Database (European Commission 2005)
MRL = Maximum Residue Limit

Table showing the number of pesticide residues found in the analyzed cabbage samples together with their corresponding MRLs. Out of the 50.0 samples, 6 samples (12% of the total samples) contained diazinon and chlorpyrifos residues and 38 samples (88% of the total) contained no detectable pesticide residue. But interestingly all the samples where pesticide residue was able to detect were above MRLs set by EC and were collected from two markets namely Rampura and Taltola Bazar, whereas samples from other three markets appear to be uncontaminated.

Source:
https://www.researchgate.net/publication/334231199_DETERMINATION_OF_MAJOR_ORGANOPHOSPHATE_INSECTICIDE_RESIDUES_IN_CABBAGE_SAMPLES_FROM_DIFFERENT_MARKETS_OF_DHAKA

Rapid degradation of the organophosphate pesticide – Chlorpyrifos by a novel strain of Pseudomonas nitroreducens AR-3 (2019)

Degradation of chlorpyrifos (CP) by bacterial isolates and their tolerance to CP and its degradation product 3,5,6 trichloro 2-pyridinol (TCP).

	% Degradation		**Tolerance (mg/L) to CP**			**Tolerance (mg/L) to TCP**		
		100	500	1000		100	500	**1000**
***Bacillus tequilensis* AR-1**	52.94 ± 2.3	+	—	—		—	—	—
***Bacillus megaterium* AR-2**	52.13 ± 3.1	+	—	—		—	—	—
***Pseudomonas nitroreducens* AR-3**	**70.45 ± 1.6**	+	+	+		+	+	+

Screening of agricultural land soil samples in (minimal medium) MSM/agar medium containing varying concentrations of chlorpyrifos yielded six isolates that tolerated up to 100 mg/L of CP. Among these, three were found to grow in MSM/agar plates with 100 mg/L of CP.

Source: https://www.sciencedirect.com/science/article/pii/S0960852419312556

Statistical and chemometric view of the variation in the concentration of selected organophosphates in peeled unwashed and unpeeled washed fruits and vegetables (2019)

Comparison of the proposed method with other research works for detection of selected organophosphates in fruit and vegetables

Fruits/Vegetables	Pesticide	Found (mg kg $^{-1}$)		Method	Ref
Orange	Chlorpyrifos	0.01-0.14		QuEChERS-UPLC-MS/MS & GC-MS	**(Bakırcı, Yaman Acay, Bakırcı, & Ötleş, 2014)**
Apple	Chlorpyrifos	0.01-0.074			
	Phosalone	0.01-1.59			
Tangerine	Chlorpyrifos	0.01-0.226			
Zucchini	Chlorpyrifos	0.57			
Cucumber	Chlorpyrifos	0.052			
Kiwi	Chlorpyrifos	0.01-0.43			
Tomato	Chlorpyrifos	0.01-0.053			
Apple	Diazinon	0-0.034		DLLME–SFO-HPLC-UV	**(Pirsaheb, Fattahi, Rahimi, Sharafi, & Ghaffari, 2017)**
	Chlorpyrifos	0.-0.035			
Cucumber	Diazinon	0.008		UASE-DLLME-SFO-HPLC-UV	**(Pirsaheb, Fattahi, & Shamsipur, 2013)**
	Fenthion	ND			
Apple	Diazinon	ND		SDLLME - SFHPLC-UV	**(Pirsaheb, Fattahi, Pourhaghighat, Shamsipur, & Sharafi, 2015)**
Tomato	Diazinon	ND-0.003		UASE–DLLME–GC–FPD	**(Bidari, Ganjali, Norouzi, Hosseini, & Assadi, 2011)**
	Chlorpyrifos	ND			
	Fenthion	ND			
Apple	Profenofos	0.03-0.032		SPE-HPLC-UPLC/MS	**(Sivaperumal, Anand, & Riddhi, 2015)**
Tomato	Profenofos	0.016-0.161			
		Unpeeled (µg. kg $^{-1}$)	**Peeled (µg. kg $^{-1}$)**		
Kiwi	Azinphos-methyl	84.75-160.69	47.37-70.81	TFME-HPLC-UV	**Present study**
	Fenthion	27.25-59.81	6.75-16.12		
	Phosalone	35.56-64.56	10.87-18.87		
	profenofos	0-50.69	0-15		
	Diazinon	115.06-180.75	32.68-60.18		
	Chlorpyrifos	20.69-50.12	6.43-13.37		
Orange	Azinphos-methyl	81.8-157	28-59.25		
	Fenthion	33.06-127.75	7.68-39.37		
	Phosalone	26.75-54	7.56-14.81		
	Profenos	0-23.94	0-7.8		
	Diazinon	49.8-82.38	14.5-25.06		
	Chlorpyrifos	27.12-63.31	7.75-		

			19.06		
Apple	Azinphos-methyl	93.81-179.44	32.62-82.37		
	Fenthion	28.25-70.5	7.25-23		
	Phosalone	22.44-55.25	6.94-17.25		
	profenofos	37.88-85.06	10.06-22.43		
	Diazinon	49.5-177.75	14.5-62.25		
	Chlorpyrifos	35.56-55.56	9.37-16.31		
Tomato	Azinphos-methyl	89.19-151.75	26.75-51.31		
	Fenthion	42.83-67.12	9.87-19.37		
	Phosalone	23.94-40.94	6.06-12.44		
	Diazinon	109.19-215.5	37.0-71.75		
	Chlorpyrifos	28.0-54.75	7.87-16.69		
Cucumber	Azinphos-methyl	75.62-126.62	27.31-57.69		
	Fenthion	49.88-64.19	9.37-22.13		
	Phosalone	37.44-60.56	10.25-18.81		
	profenofos	44.56-62.06	10.12-17.37		
	Diazinon	51.69-188.75	15.68-73.06		
	Chlorpyrifos	23.69-53.56	6.87-15.62		
Tangerine	Azinphos-methyl	63.75-131.12	17.18-33.12		
	Fenthion	41.31-68.06	11.18-20.37		
	Phosalone	42.44-80	8.03-24.1		
	profenofos	0-60	0-17		
	Diazinon	0-65	0-20		
	Chlorpyrifos	20.5-38.54	4.81-12.26		
Zucchini	Azinphos-methyl	28-75.25	11.16-28.17		
	Fenthion	31.33-58.58	6.16-13.92		
	Phosalone	0-55	0-12		
	profenofos	0-60.42	0-15.03		
	Diazinon	0-45	0-15		
	Chlorpyrifos	36.33-73.58	4.08-16.75		

Source: https://www.sciencedirect.com/science/article/pii/S0308814619313287

The impact of organophosphorus pesticide on Solanum melongena, Capsicum annum and Soil (2018)

Table 1: Freundlich Changes in soil quality after the addition of Malathion.

Malathion					Eggplant					
Concentration	Total Nitrogen (%)		Available Phosphorus (ppm)		Potassium (ppm)		pH		EC	
	7 days	14 days	7 days	14 days	7 days	14 days	7 days	14 days	7 days	14days
Control	0.006±0.01	0.012±0.003	6.05±0.86	6.19±0.69	28.43±2.24	30.88±2.03	7.34±0.4	7.31±0.6	0.92±0.1	0.95±0.05
2 ml L^{-1}	0.021±0.05	0.027±0.02	6.21±1.55	6.54±1.38	33.60±1.08	40.72±1.48	7.23±0.5	7.26±0.5	1.15±0.1	1.04±0.09
4 ml L^{-1}	0.013±0.004	0.022±0.005	6.12±1.95	6.29±0.99	32.26±2.01	36.69±2.00	7.23±0.2	7.22±0.8	1.09±0.8	1.00±0.3
6 ml L^{-1}	0.011±0.01	0.020±0.004	6.02±0.93	6.27±2.04	29.01±1.82	35.65±3.39	7.21±0.2	7.14±0.2	1.01±0.4	0.96±0.6
Green chilli Plant										
Control	0.009±00.3	0.017±0.11	6.01±1.73	6.42±0.64	29.41±2.06	29.52±1.47	7.32±0.09	7.33±0.5	0.96±0.07	0.99±0.02
2 ml L^{-1}	0.025±0.08	0.031±0.01	6.88±0.93	7.31±0.99	36.58±3.24	38.32±3.54	7.26±0.28	7.28±0.61	1.21±0.02	1.08±0.01
4 ml L^{-1}	0.016±0.03	0.025±0.003	6.43±0.88	6.98±1.39	33.84±1.09	41.78±5.24	7.24±0.03	7.27±0.01	1.16±0.04	1.13±0.08
6 ml L^{-1}	0.017±0.12	0.021±0.013	6.08±1.92	6.79±1.02	34.32±1.76	41.04±0.62	7.18±0.01	7.21±0.7	1.15±0.09	1.07±0.04

Source: www.asianjab.com/.../16-125.-The-impact-of-organophosphorus-pesticide-on-Solanum melongena, Capsicum annum and Soil

Organophosphate pesticide in agricultural soils from the Yangtze River Delta of China: concentration, distribution, and risk assessment (2018)

Table 1: Statistical summary of the concentrations (ng g−1) of OPPs in agricultural soils across the YRD region.

Compound	Concentration range				Mean concentration [detection frequency (%)]				
	Jiangsu	Zhejiang	Shanghai	Total	Jiangsu	Zhejiang	Shanghai		Total
O,O,O-triethylphosphorothioate	ND	ND	ND	ND	ND [0]	ND [0]	ND [0]		ND [0]
Thionazin	ND–49.0	ND–38.2	ND–13.4	ND–49.0	18.2 [52.2]	17.3 [4.13]	13.4 [3.33]		18.1 [22.0]
Sulfotep	ND–16.6	ND–8.39	ND–5.61	ND–16.6	8.07 [13.3]	6.98 [3.31]	5.61	[3.33]	7.67 [7.05]
Phorate	ND–82.9	ND–19.1	ND–24.2	ND–82.9	10.0 [27.8]	8.97 [4.14]	12.0	[10.0]	10.1 [13.7]
Dimethoate	ND–318	ND–201	ND–395	ND–395	56.6 [83.3]	33.3 [81.8]	113 [70.0]		50.8 [80.9]
Disulfoton	ND–120	ND–31.6	ND–12.6	ND–120		20.5 [10.0]	13.2	[29.8]	8.15 [26.7]
Methyl parathion	ND–55.6	ND–87.0	ND–12.2	ND–87.0		11.6 [91.1]	8.50	[8.0]	ND [3.33]
Parathion	ND–89.0	ND–73.7	ND–27.6	ND–89.0		14.1 [43.3]	9.56	[13.2]	11.3 [13.3]
Famphur	ND–23.8	ND–85.4	ND	ND–85.4		12.6 [5.56]	20.8	[10.7]	ND [0]
Total OPPs	ND–521	ND–208	ND–440	ND–521		81.8 [97.8]	41.6	[94.2]	116 [73.3]

Source: https://link.springer.com/article/10.1007/s11356-016-7664-3

Effect of interaction among storage periods, wheat varieties and seed treatments on insect infestation percentage. (2017)

Varieties	Storage periods/months								
		0			6			18	
Seed treatments	Sakha	Gem.	Giza	Sakha	Gem.	Giza	Sakha	Gem.	Giza
	93	10	168	93	10	168	93	10	168
Control	0.0	0.0	0.0	7.2	8.2	6.2	13.5	14.5	12.5
Recommended does Of malathion	0.0	0.0	0.0	0.0	0.0	0.0	8.0	9.0	7.0
Half does of malathion	0.0	0.0	0.0	7.0	8.0	5.7	14.o	14.0	12.0
Scran ethanol	0.0	0.0	0.0	7.0	7.0	5.3	13.0	14.0	12.0
Nerium ethanol	0.0	0.0	0.0	7.0	8.0	6.1	13.7	14.0	13.0
Scran ethanol + malathion	0.0	0.0	0.0	0.0	0.0	0.0	8.8	9.0	8.0
Nerium ethanol + malathion	0.0	0.0	0.0	0.0	0.0	0.0	9.0	10.0	9.0
Scran ethanol+ half does of malathion	0.0	0.0	0.0	2.7	3.0	2.33	8.7	8.7	8.3
nerium ethanol+ half does of malathion	0.0	0.0	0.0	4.3	3.7	2.3	9.7	11.0	7.7
L.S.D at 0.05%					0.7				

Effect of interaction among storage periods, wheat varieties and seed treatments on seed dry weight loss percentage. (2017)

Varieties	Storage periods/months								
		0			6			18	
Seed treatments	Sakha	Gem.	Giza	Sakha	Gem.	Giza	Sakha	Gem.	Giza
	93	10	168	93	10	168	93	10	168
Control	0.0	0.0	0.0	2.9	3.1	2.6	7.9	8.1	7.6
Recommended does of malathion	0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.7	3.2
Half does of malathion	0.0	0.0	0.0	2.3	2.4	2.0	7.9	8.0	7.8
Scran ethanol	0.0	0.0	0.0	1.9	2.0	1.9	7.9	7.9	7.8
Nerium ethanol	0.0	0.0	0.0	2.4	2.6	2.0	7.9	8.2	7.9
Scran ethanol + malathion	0.0	0.0	0.0	0.0	0.0	0.0	3.9	3.9	3.4
Nerium ethanol + malathion	0.0	0.0	0.0	0.0	0.0	0.0	4.3	4.5	3.9
Scran ethanol+ half does of malathion	0.0	0.0	0.0	1.8	1.8	1.7	4.7	5.2	3.9
nerium ethanol+ half does of malathion	0.0	0.0	0.0	1.9	1.9	1.6	5.3	5.6	4.7
L.S.D at 0.05%					0.2				

Source: https://pdfs.semanticscholar.org/f5a6/44fa79bc3bca075c3efff44565ea2c856cf1.pdf

Effect of temperature at different concentrations of Methyl Parathion on growth of Staphylococcus aureus (104 log cfu/ml) (2016)

Methyl Parathion concentration (µg/ml)	*Staphylococcus aureus* (104 log cfu/ml)				
	10°C	**20°C**	**30°C**	**40°C**	**50°C**
100	100	100	100	1.812	1.255
150	0.845	1.763	1.954	1.799	1.176
200	0.903	1.707	1.949	1.732	1.00
250	0.698	1.662	1.949	1.698	0.954
300	0.301	1.602	1.903	1.643	0.954
350	0.301	1.342	1.869	1.505	0.602

Due to temperature- F(cal)5%=134.26> F(tab)5%=2.87, S.E= 0.071, C.D at 5%= 0.148(S)
Due to concentration- F(cal)5%=10.73 > F(tab)5%= 2.71, S.E= 0.071, C.D at 5%= 0.148(S)

Source: Jyotsna K. Peter at al.(2016), Organophosphate Pesticide (Methyl Parathion) Degrading Bacteria Isolated from Rhizospheric Soil of Selected Plants and Optimization of Growth Conditions for Degradation, International Journal of Research

Effect of pH and different concentrations of Methyl Parathion on growth of Pseudomonas aeruginosa (104 log cfu/ml). (2016)

Methyl Parathion concentration (µg/ml)	***Pseudomonas aeruginosa* (104 log cfu/ml)**						
	3	**4**	**5**	**6**	**7**	**8**	**9**
100	1.748	1.806	1.903	2.00	2.113	1.982	**1.939**
150	1.698	1.770	1.924	2.017	2.060	1.954	**1.903**
200	1.707	1.755	1.897	1.986	2.079	1.908	**1.880**
250	1.643	1.698	1.875	1.963	2.045	1.880	**1.875**
300	1.556	1.653	1.778	1.944	2.017	1.724	**1.732**
350	**1.518**	**1.505**	**1.785**	**1.851**	**1.995**	**1.698**	**1.698**

Due to pH- F(cal)5%= 93.36> F(tab)5%= 2.42, S.E= 0.019, C.D at 5%= 0.039(S)
Due to concentration- F(cal)5%=36.22> F(tab)5%= 2.53, S.E= 0.019, C.D at 5% = 0.039(S)

Source: Harison Masih at al. (2016), Organophosphate Pesticide (Methyl Parathion) Degrading Bacteria Isolated from Rhizospheric Soil of Selected Plants and Optimization of Growth Conditions for Degradation, International Journal of Research

Bacterial population at 104 cfu/ml in soil from rhizosphere of selected plants amended with different concentration of Methyl Parathion at periodic time intervals (2016)

Concentration of Methyl Parathion (µg/ml	Time (h)			
	24	48	72	96
Cabbage				
100	221.13±27.64	195.9+27.13	161.8±37.34	**134.06±25.87**
150	144.4±30.75	128.26+27.47	94.73±33.81	**68.86±32.87**
200	128.6±16.12	105.80+14.87	81.13±15.94	**59±19.69**
250	120.46±13.65	107.00+11.22	87.53±18.49	**61.73±18.29**
300	72.2±13.11	61.73+18.29	53.26±10.81	**29±12.28**
350	27.8±5.17	23.40+4.62	17.8±4.59	**12.66±2.69**
Guava				
100	235±34.46	206.80+24.69	184.13±23.09	**127.93±23.11**
150	184.73±10.32	165.73+17.33	144.26±13.43	**107.6±24.81**
200	119.2±12.82	114.53+12.88	102.53±16.68	**93.46±15.70**
250	121.93±8.51	113.73+11.82	101.86±15.67	**80.2±14.63**
300	99.33±9.15	92.13+10.08	83.563±12.21	**70.26±9.40**
350	45.66±11.60	39.40+11.67	32.53±9.86	**18.93±6.78**
Tomato				
100	218±28.75	194.53+26.12	169.26±29.74	**120.73±24.11**
150	154.6±33.09	126.80+24.84	89.73±15.73	**34.4±9.01**
200	117.06±22.04	77.73+19.57	41.13±16.91	**24.86±8.14**
250	129.86±15.11	112.60+13.71	90.93±12.28	**50.93±15.27**
300	62.6±9.89	56.13+8.64	44.40±5.67	**25.33±4.27**
350	**29.66±6.33**	**25.67+5.64**	**20.60±4.94**	**13.86±3.27**

Due to hours- F(cal)5%=51.196 > F(tab)5%=2.75, S.E=3.486, C.D at 5%= 7.055(S)
Due to concentration- F(cal)5%=171.696 > F(tab)5%=2.52, S.E=6.971, C.D at 5%=14.109(S) Due to plants - F(cal)5%=19.8043 > F(tab)5%=2.52, S.E= 4.500, C.D at 5%=9.108(S)
The values are mean of 15 replicates + SD.

Source: Yashab Kumar at al. (2016), Organophosphate Pesticide (Methyl Parathion) Degrading Bacteria Isolated from Rhizospheric Soil of Selected Plants and Optimization of Growth Conditions for Degradation, International Journal of Research

The spiked recoveries, relative standard deviation, and matrix effect of five organophosphate esters (2016)

Compound	**50 ng**			**100 ng**			**Matrix effect**[b]	
TnBP	75 ± 6[a]	89±4	80±2	114±2	80±4	74±2	92±1	**83±1**
TCEP	113±4	99±3	87±3	87±3	80±4	87±5	111±3	**98±3**
TPhP	56 ± 3	62 ± 1	64 ± 2	66 ± 1	58 ± 2	84 ± 3	97 ± 5	**96 ± 3**
TCPP	89 ± 4	94 ± 4	112 ±4	82 ± 1	89 ± 6	106 ± 7	96 ± 4	**90 ± 2**
TBEP	**107 ± 1**	**119 ± 1**	**106 ±1**	**114 ± 1**	**117 ± 5**	**109 ± 8**	**121 ± 1**	**108 ± 2**

[a]Spiked recovery, mean value (%) ± standard deviation

[b]Sewage sludge compost sample with sawdust as amendment

Source: Long Pang at al.(2016), Accelerated solvent extraction combined with solid phase extraction for the determination of organophosphate estersfrom sewage sludge compost by UHPLC–MS/MS, Anal Bioanal Chemistry.