Risk Mitigation Methods for Removal of Pesticide Residues in Tomato for Food Safety

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An ISO 17025 Certified Laboratory

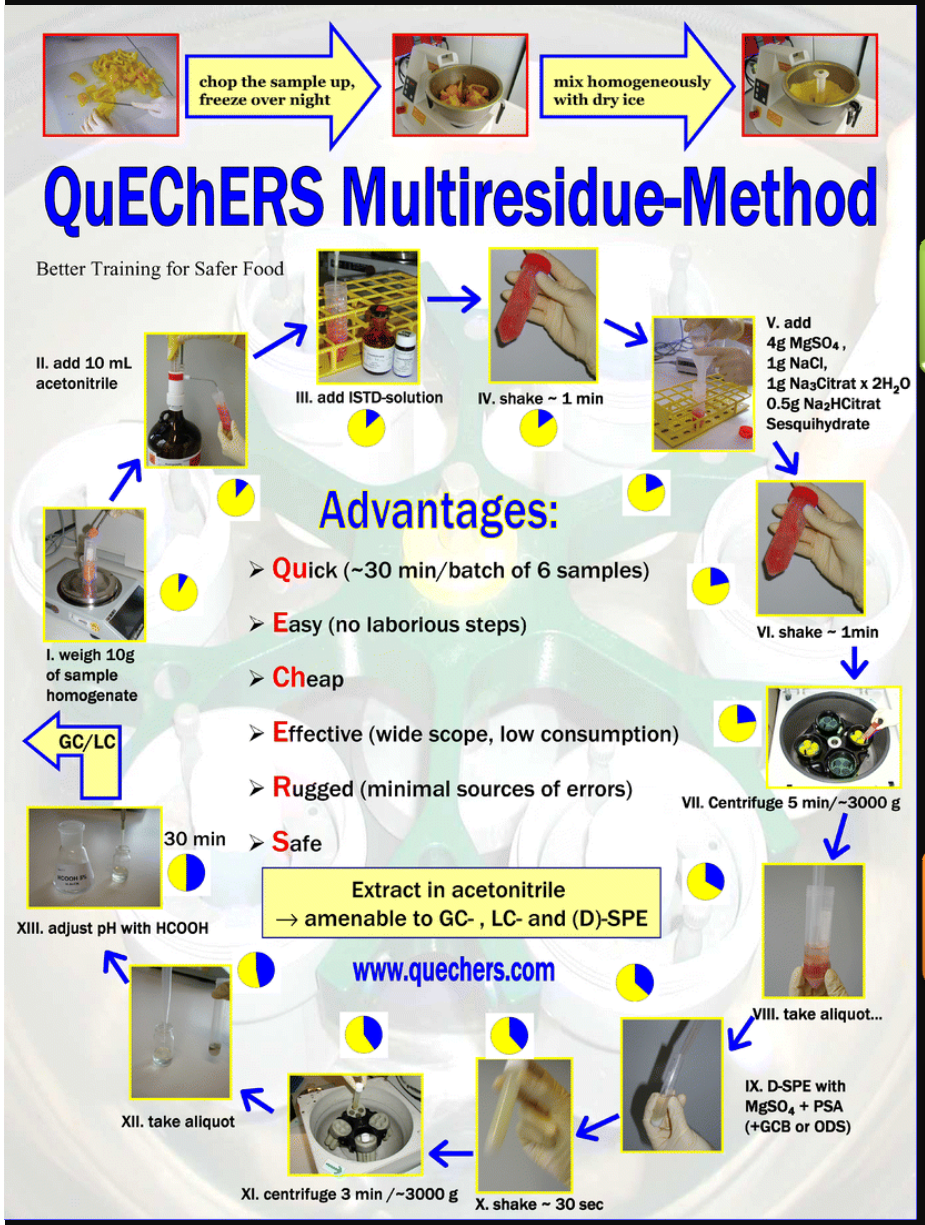
Recommended Pesticides On Tomato As Per 'CIBRC'

Agricultural use

INSECTICIDES	Common name of the pest	Dosage /ha		Waiting period
		a.i(gm)	Formulation (gm/ml)	
Azadirachtin 1% (10000 ppm) Min. Neem Based E.C. Containing	Fruit borer (Helicoverpa armigera)	--	1000-1500	3
Azadirachtin 5% w/w Min. Neem Extract Concentrate Containing	Aphids, Whitefly, Fruit borer	--	200	5
Bacillus thuringiensis var. galleriae	Fruit borer (Helicoverpa armigera)	--	1.0-1.5	--
Carbofuran 3% CG	White fly	1200	40000	--
Chlorantraniliprole 18.5% SC	Fruit borer	30	150	3
Dazomet Technical	Root-knot nematode	30-40	--	--
Dimethoate 30% EC	White fly	300	990	--
Fenazaquin 10% EC	Two spotted spider mite	125	1250	7
Flubendiamide	NPV of Helicoverpa armigera 0.43% AS Strain No. BIL/HV-9	Helicoverpa armigera	--	1500	--
Flubendiamid M/M S	Oxydemeton – methyl 25% EC	White fly	250	1000	--
Imidacloprid	Phorate 10% CG	White fly	1500	15000	
Indoxacarb 1					
Lambda-Cyhalo CS	Phosalone 35% EC	Fruit borer	450	1285	
Lambda-Cyhal EC	Quinalphos 20% AF	Fruit borer	300-350 15001750	1500-1750	7
Malathion 5	Quinalphos 25% EC	Fruit borer	250	1000	--
Methomyl 4	Spiromesifen 22.9% SC	Whiteflies & Mites	150	625	3
Novaluron 1	Thiamethoxam 25% WG	White flies	50	200	5
Nuclear Polyhed of Helicoverpa 0.43%	Trichlorofon 5% Gr	Fruit and shoot borer	500 gm.		
NPV of Heli armigera 2.	Trichlorofon 5% Dust	Fruit and shoot borer	500 gm.		
Bio-tech inte Strain No. B	COMBINATION PRODUCT				
	Novaluron 5.25% + Indoxacarb 4.5% SC	Fruit borer & leaf eating caterpillar	43.31 + 37.13 to 45.94 +	825-875	5

S.No	Treatments	Dosage	
		ml / lit	g ai /ha
T1	Untreated Control	-	-
T2	Profenophos 50 EC	2ml/lit	500
T3	Chlorpyrifos 20 EC	2ml/lit	200
T3	Dimethoate 30 EC	4ml/lit	600
T4	Malathion 50 EC	3ml/lit	750
T5	Phosalone 35 EC	3ml/lit	525
T6	Quinalphos 25 EC	2ml/lit	250
T7	Triazophos 40 EC	2.5ml/lit	500
T8	Lambda cyhalothrin 5 EC	0.6ml/lit	15

S.No	Treatment details
RM-1	Washing with Tap water
RM-2	Dipping in 2% salt solution for 10 min
RM-3	Dipping in 2% Tamarind solution for 10 min
RM-4	Dipping in Lemon water (1Lemon/1lit) for 10min
RM-4	Dipping in 0.1% Sodium Bicarbonate solution for 10min
RM-5	Dipping in 4% Acetic acid solution keep for 1 min
RM-6	Dipping in Formula 1 (4% Acetic acid+ 0.1%$NaHCO_3$+ 1Lemon (1Lemon/1lit): 160 ml of acetic acid, 4 gms of sodium bicarbonate, lemon juice of 4 lemons added to 4 lts of water) for 10 min
RM-7	Cooking in Pressure Cooker for 10 min
RM-8	Washing with commercially available Biowash (2 ml/lit) for 10 min



Field collected samples from different insecticide treatments are homogenized with high volume homogenizer

15 g sample taken into 50 ml tube added with 30 ml acetonitrile. The sample is homogenized at 14000 rpm for 2-3 min with silent crusher

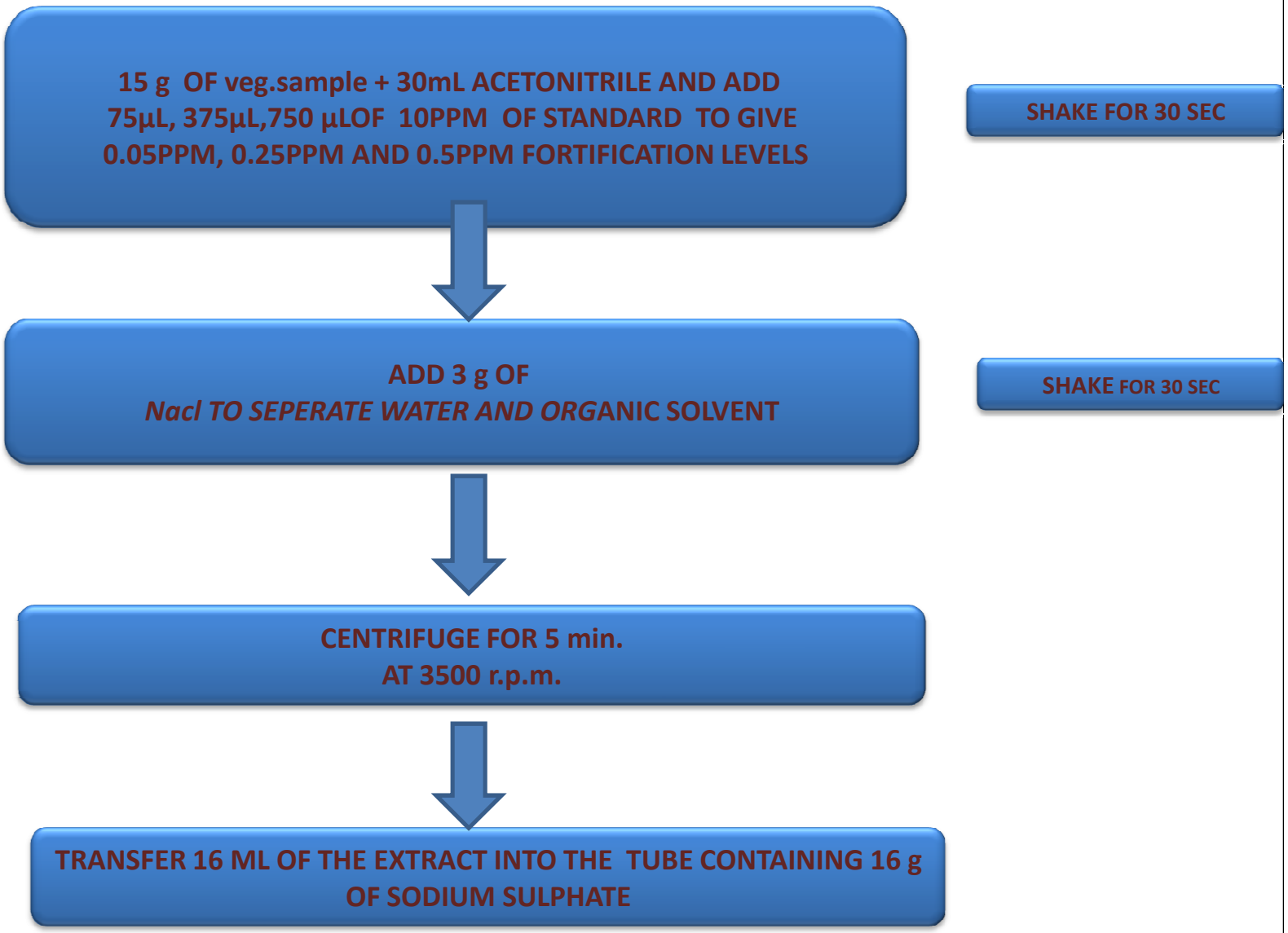
The sample is added with 3g NaCl, mixed gently, and centrifuged at 3000 rpm to separate organic layer

16 ml top oraganic layer was taken in 50 ml tube added with 9 g anhydrous Na2SO4 and mixed to remove moisture

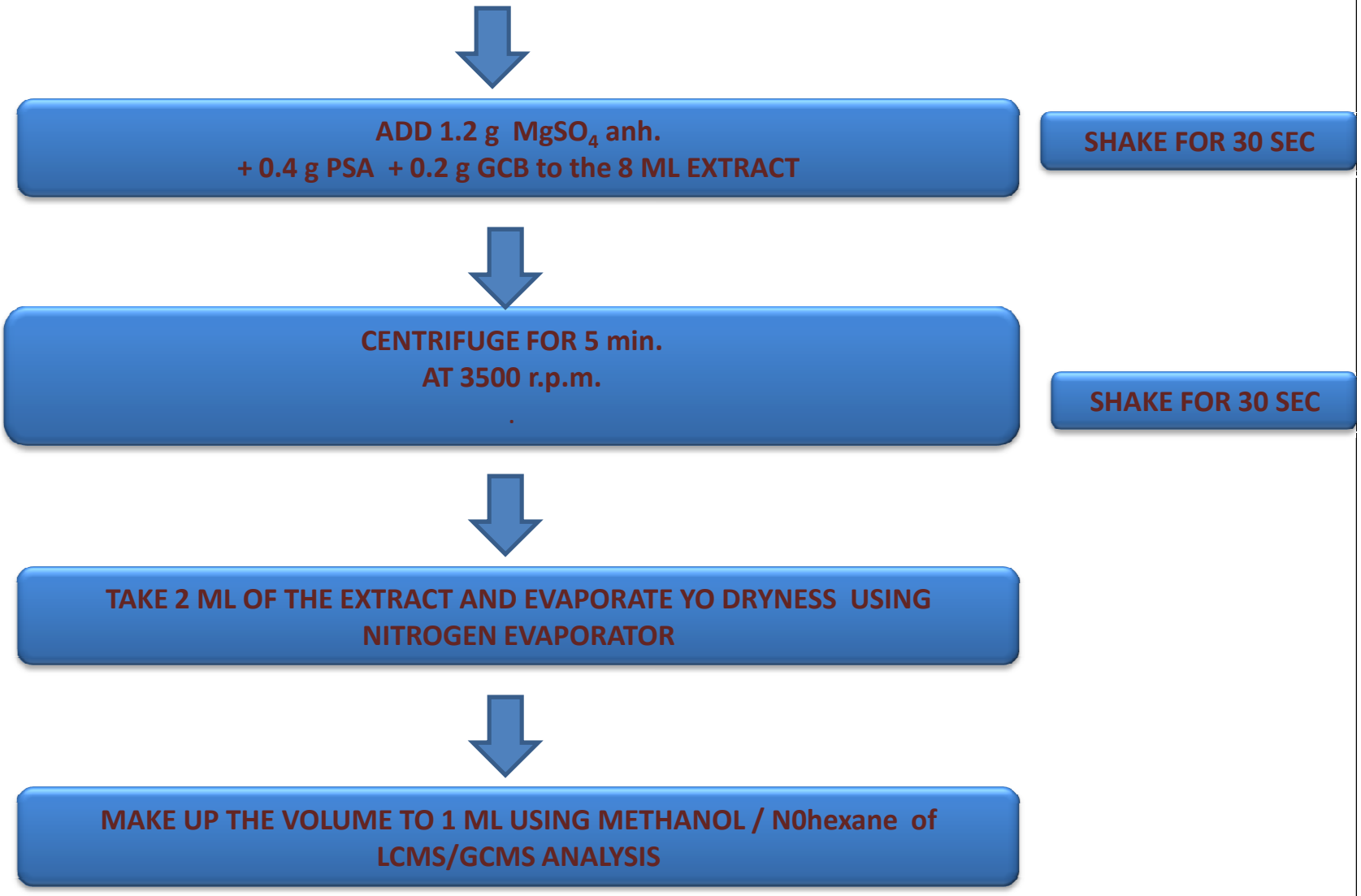
8 ml extract was taken in 15 ml tube added with 0.4 g PSA and 1.2 g MgSO4, vortexed for 30 sec followed by centrifugation at 3000 rpm

Extract about 2ml is taken and evaporated using turbovap and volume made to 1 ml using suitable solvent for analysis

Validation of QuEChERS method for extraction and cleanup of samples



Validation of QuEChERS method for vegetable samples



GC parameters
for
Profenophos, Chlorpyrifos, Dimethoate, Malathion, Phosalone, Quinalphos, Triazophos, Lamda cyhalothrin analysis

Gas Chromatograph	SHIMADZU – 2010
Detector	Electron Capture Detector and Flame photometric detecteor
Column	GC Capillary Column, MR 1 30 mts, 0.25 mm ID, 0.25mm Film Thickness
Injector Temp	260°C
Injector Status	Split 10
Carrier Gas	Nitrogen (Prox Air)
Carrier Gas Flow	1.0 ml/min
Column Oven	150 °C-5 min hold up to 200 °C and then 5min hold and increase 2 °C/min – up to 280°Chold it for 10 min. TOTAL 60.00 min
ECD Temp	300°C
ECD makeup	25 ml/min

Retention Time (min)		**ECD**	**FPD**
	Dimethoate	15.3 min	15.19 min
	Malathion	21.8min	21.73 min
	Chlorpyrifos	22.2 min	22.11min
	Quinalphos	26.7 min	26.58 min
	Profenophos	30.7 min	30.60 min
	Phosalone	47.7 min	34.43 min
	Triazophos	-	37.40 min
	Lamda cyhalothrin	48.4 min	-

FORTIFICATION & RECOVERY RESULTS

Replication	Profenophos		Chlorpyrifos		Dimethoate	
	0.5 mg/kg		0.5 mg/kg		0.5 mg/kg	
	Calculated Level (ppm)	% Recovery	Calculated Level (ppm)	% Recovery	Calculated Level (ppm)	% Recovery
R1	0.63	126	0.50	100	0.51	102
R2	0.58	116	0.45	90	0.46	92
R3	0.57	114	0.49	98	0.48	96
Average/ Stdev	0.59	119	0.48	96	0.48	97

Replication	Malathion		Phosalone		Quinalphos	
	0.5 mg/kg		0.5 mg/kg		0.5 mg/kg	
	Calculated Level (ppm)	% Recovery	Calculated Level (ppm)	% Recovery	Calculated Level (ppm)	% Recovery
R1	0.54	108	0.60	120	0.49	98
R2	0.48	96	0.55	110	0.44	88
R3	0.52	104	0.56	112	0.46	92
Average/ Stdev	0.51	103	0.57	114	0.46	93

Replication	Triazophos		Lamda cyhalothrin	
	0.5 mg/kg		0.5 mg/kg	
	Calculated Level (ppm)	% Recovery	Calculated Level (ppm)	% Recovery
R1	0.51	102	0.48	96
R2	0.49	98	0.46	92
R3	0.48	96	0.51	102
Average/ Stdev	0.49	99	0.48	97

Pesticide Residues in Food and Feed

COMMODITY DETAILS

VO 0448 – Tomato

- **Class**
  Primary Food Commodities of Plant Origin
- **Type**
  Vegetables
- **Category**
  Fruiting Vegetables, other than Cucurbits

Maximum Residue Limits for Tomato

Pesticide	MRL	Year of Adoption	Symbols	Note
Ethoprophos	0.01 mg/Kg	2005	(*)	
Abamectin	0.02 mg/Kg	2001		
Quintozene	0.02 mg/Kg	2003		
Pyrethrins	0.05 mg/Kg	2003	(*)	
Spinetoram	0.06 mg/Kg	2009		
Hexythiazox	0.1 mg/Kg	2010		
Esfenvalerate	0.1 mg/Kg	2013		
Methidathion	0.1 mg/Kg			
Cyfluthrin/beta-cyfluthrin	0.2 mg/Kg	2008		
Cypermethrins (including alpha- and zeta- cypermethrin)	0.2 mg/Kg	2009		
Penconazole	0.2 mg/Kg	1997		
Benalaxyl	0.2 mg/Kg	2010		
Pyraclostrobin	0.3 mg/Kg	2006		
Dinocap	0.3 mg/Kg	2003	D	
Spinozad	0.3 mg/Kg	2003		
Myclobutanil	0.3 mg/Kg	1999		
Bifenthrin	0.3 mg/Kg	2011		
Deltamethrin	0.3 mg/Kg	2004		
Mandipropamid	0.3 mg/Kg	2009		
Fluopyram	0.4 mg/Kg	2013		
Bifenazate	0.5 mg/Kg	2007		
Malathion	0.5 mg/Kg	2003		
Amitraz	0.5 mg/Kg	1991		
Clofentezine	0.5 mg/Kg	2008		
Spirodiclofen	0.5 mg/Kg	2010		
Carbendazim	0.5 mg/Kg	2001	b,C	
Thiacloprid	0.5 mg/Kg	2007		
Endosulfan	0.5 mg/Kg	2003		
Diazinon	0.5 mg/Kg	1997		
Cyprodinil	0.5 mg/Kg	2005		Withdrawal recommended by the 2013 JMPR.
Difenoconazole	0.5 mg/Kg	2008		Withdrawal recommended by the 2013 JMPR.
Fludioxonil	0.5 mg/Kg	2006		
Triforine	0.5 mg/Kg			
Indoxacarb	0.5 mg/Kg	2006		
Imidacloprid	0.5 mg/Kg	2004		
Metalaxyl	0.5 mg/Kg			
Metaflumizone	0.6 mg/Kg	2010		
Tebuconazole	0.7 mg/Kg	2012		
Pyrimethanil	0.7 mg/Kg	2008		
Trifloxystrobin	0.7 mg/Kg	2006		
Fenbutatin Oxide	1 mg/Kg	1995		
Acephate	1 mg/Kg	1999		
Buprofezin	1 mg/Kg	2009		
Chlorpyrifos-Methyl	1 mg/Kg	2010		

CODEX ALIMENTARIUS
International Food Standards

World Health Organization | Food and Agriculture Organization of the United Nations

Codex Pesticides Residues in Food Online Database

Pesticide	MRL	Year of Adoption	Symbols	Note
Clethodim	1 mg/Kg	2003		
Fenpropathrin	1 mg/Kg	1995		
Permethrin	1 mg/Kg			
Tebufenozide	1 mg/Kg	2004		
Azinphos-Methyl	1 mg/Kg	1997		
Methomyl	1 mg/Kg	2009		
Cycloxydim	1.5 mg/Kg	2013		
Oxamyl	2 mg/Kg			
Famoxadone	2 mg/Kg	2005		
Dithiocarbamates	2 mg/Kg	2006	p	
Methoxyfenozide	2 mg/Kg	2005		
Propamocarb	2 mg/Kg	2007		
Propargite	2 mg/Kg			
Dichlofluanid	2 mg/Kg			
Flubendiamide	2 mg/Kg	2011		
Piperonyl Butoxide	2 mg/Kg	2004		
Fenhexamid	2 mg/Kg	2006		
Ethephon	2 mg/Kg	2001		
Zoxamide	2 mg/Kg	2008		
Tolylfluanid	3 mg/Kg	2004		
Bitertanol	3 mg/Kg	2003		
Folpet	3 mg/Kg	2006		
Captan	5 mg/Kg	2008		
Iprodione	5 mg/Kg	1999		
Chlorothalonil	5 mg/Kg			Withdrawal recommended (JMPR 2010). Withdrawal recommended (JMPR 2010). The CCPR decided to retain the CXL for four years under the periodic review, noting the manufacturers would submit supporting data for these commodities (43-34).
Carbaryl	5 mg/Kg	2004		
Profenofos	10 mg/Kg	2009		
Bromide Ion	75 mg/Kg			

(*) At or about the limit of determination.

GC MS method for 64 compound

Column	: Phenominex ZB 5ms
Oven temp	: 50^0C hold for 3min; increase to 150^0C - @20^0C hold for 0 min; increase to 230^0C @ 3^0 C hold for 5min; Increase to 290^0 c @ 10^0c/min hold for 4min. Total 49.67 min.
Injector	: 260^0c
Detector source	: TQD (Triple quadrupole)
Carrier flow-He	: 1ml/min
Mass Range	: 50-400 M/Z
Transfer line temp	: 250^0C
Source temp	: 220^0C
Manifold temp	: 40^0C

S.no	COMPOUND NAME	RETENTION TIME	PRECURSOR ION	QUANTIFIER ION	QUALIFIER ION
	abamectin	17.187	894	305	567
	acephate	0.553	184	143	49
	acetamaprid	1.315	223	126	99
	allethrin	15.54	303.2	123.05	135
	anilophos	13.543	369.9	125	198.9
	atrazine	7.477	216.1	174.1	96.15
	azinophos ethyl	11.619	346	131.95	160
	carbaryl	6.077	202.1	145	127
	carbendizim	1.898	192	159.95	131.95
	carbofuran	4.809	222.1	165.1	123
	chlorfenviphos	13.776	360.9	155	98.9
	chlorpyriphos	15.83	351.9	96.8	199.8
	chlorpyriphos methyl	14.338	323.9	124.95	291.75
	cypermethrin	16.576	433.1	190.95	127
	demeton-s-methylsulfone	0.711	263	168.9	109
	diazinon	13.553	305.1	169.05	153
	dichlorvas	4.809	222	165	123
	dimethoate	1.383	230	198	125
	ethion	15.637	384.9	199	142.95
	fenamidone	10.175	312.1	92.05	236
	fenpropathrin	15.761	349.9	96.9	125
	fluvalinate	16.995	503.1	208	181
	hexaconazole	13.892	314.1	70.05	92
	imidacloprid	1.015	256	209	175
	indoxacarb	14.881	527.9	203	293
	l-cyhalothrin	16.547	467.1	224.95	449
	malathion	10.654	331	99	127
	malaxon	5.724	315	99.05	127
	metalaxyl	8.395	280.1	220.05	192
	Methamidophos	0.547	142	94	125
	methomyl	0.751	163	88	108
	monocrotophos	0.818	224	127.05	193
	myclobutanil	11.149	289.1	70	125
	nitenpyram	11.707	271.1	163.05	225
	parathion	0.767	292	181	2,11,130
	penconazole	13.242	284.1	70	158.9
	pendimethalin	15.832	282.1	212	43
	phorate	13.826	261	75.05	47
	phosalone	13.545	367.9	125	182
	phosphomidan	3.616	300	174.05	127
	profenophos	15.113	372.9	302.8	299
	quinolphos	12.789	299	163	147
	simazine	4.296	202.1	124	145
	spinosad-a	16.328	732.4	142.1	99
	spinosad-d	16.763	746.4	142.15	98
	spiromesifen	16.078	371	273.1	255
	spirotetramat	11.901	374.2	302.1	33,02,16,374
	tebuconazole	13.482	308.1	70.05	125
	thiacloprid	1.789	253	125.95	90
	thiamethoxam	0.755	293.5	211.1	133
	thiodicarb	7.679	355	88	108
	tricyclozole	2.207	190	162.95	135.95
	trifloxystrobin	14.859	409	186.05	206

Method Validation Protocol as per SANCO/12495/2011

(Guidance Document on Analytical Quality Control and Validation Procedures for Pesticide Residue Analysis in Food and Feed)

S.No	Sample set sequence
1	Reagent Blank
2	1 blank (non-spiked) sample
3	5 spiked samples at target LOQ
4	5 spiked samples at 5X LOQ
5	5 spiked samples at 10 X LOQ

S.No	Instrumental Sample sequence
1	Calibration standards in solvent
2	Calibration standards in Matrix
3	Reagent blank
4	Blank sample
5	5 spiked samples at target LOQ
6	5 spiked samples at 5 X LOQ
7	5 target samples at 10 X LOQ
8	Calibration standards in Matrix

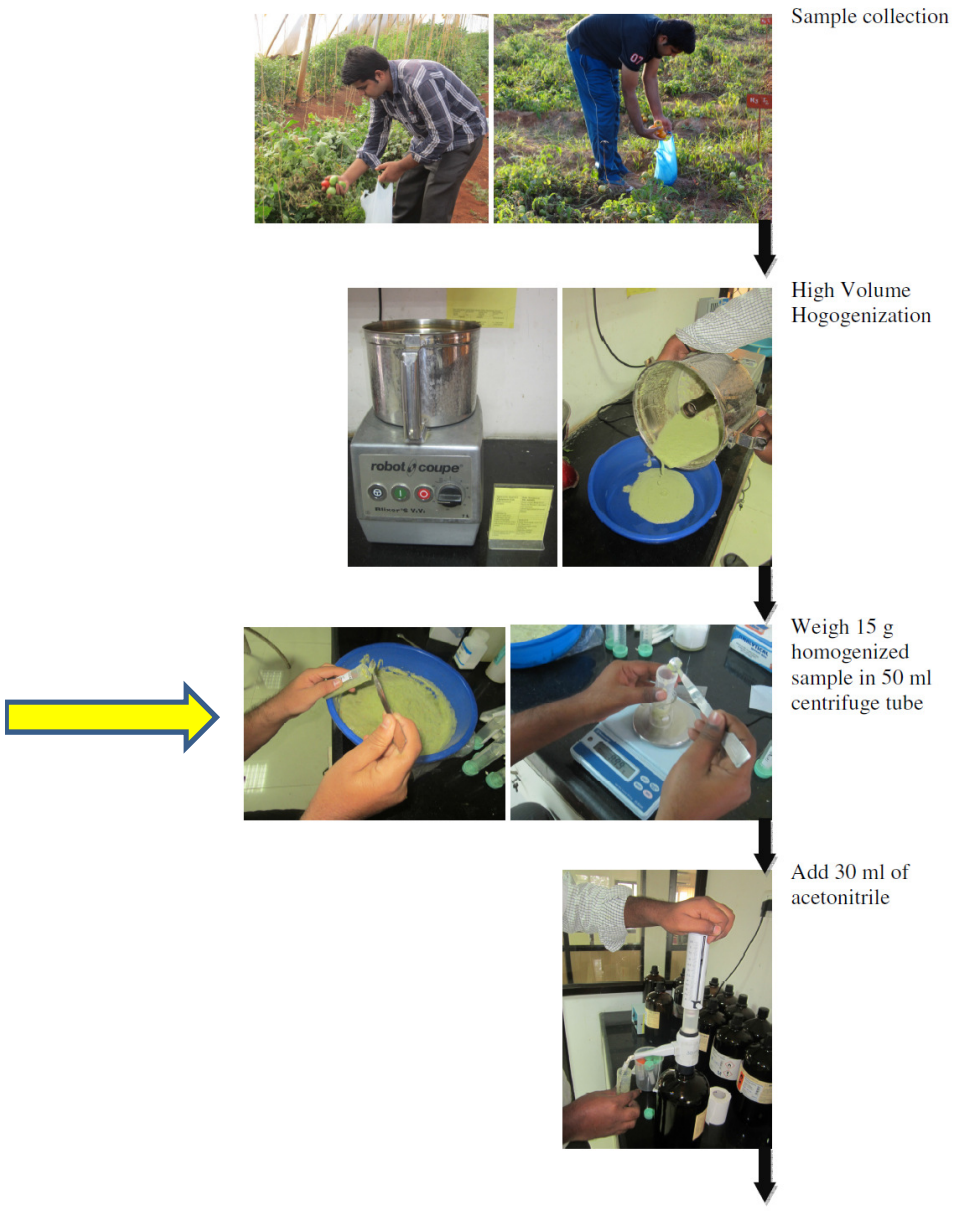


Plate 5: Flow chart of QuEChERS method (1/3)

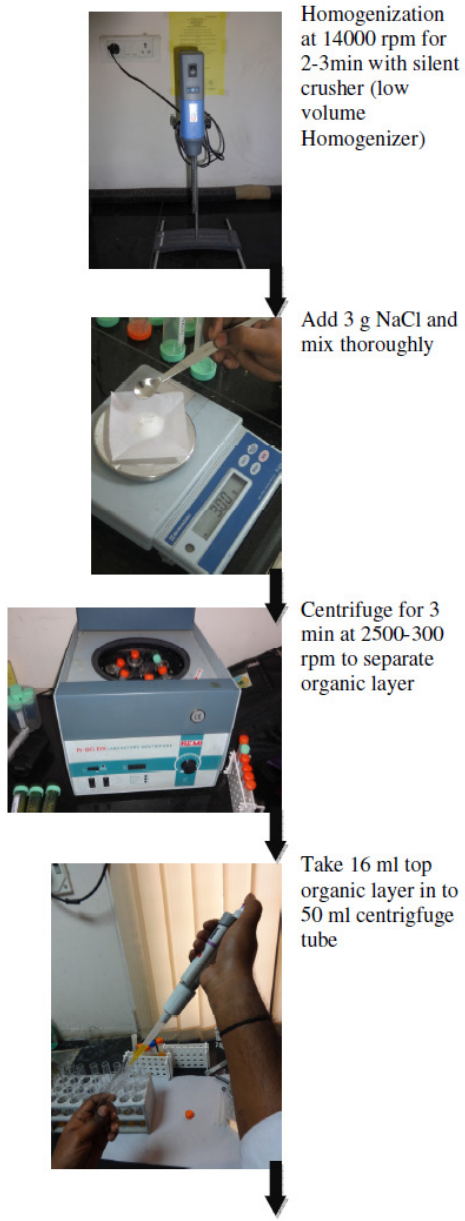


Plate 5: Flow chart of QuEChERS method (2/3)

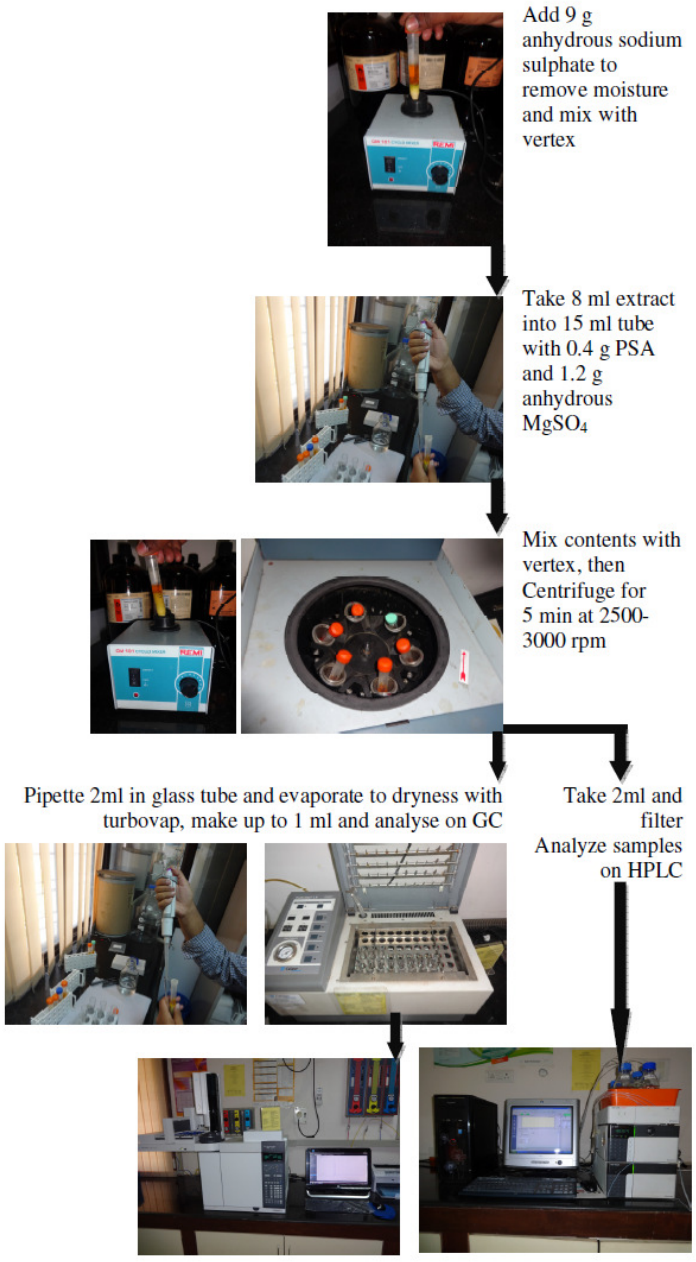


Plate 5: Flow chart of QuEChERS method (3/3)

Food Contaminants

- Physical
- Chemical
  - Aflatoxins
  - Pesticide Residues
  - Dyes
  - Other Chemicals
- Microbial


Warning
Pesticides
What's
on my
food?
FREE
Mac App
iPhone App
DOWNLOAD
DOWNLOAD


Warning !
Pesticide !!

Decontamination Methods

For

Removal of Pesticide Residues

Prepare at HOME……..

Vinegar	50 mL
Sodium bicarbonate (soda)	2 tea spoons
Water	¼ lt

HOME REMEDY……..

Dip fruits & Vegetables with 2% salt solution for 10 min……
Wash with tap water

Removes 30-70% for various pesticides in fruits and Vegetables

Groups of products, materials or items tested	Specific tests or types performed	Specification , Standard (method) or technique used	Limit of detection/ Quantification (LOQ) (mg/kg)	Range of testing (mg/kg)	Measurement of Uncertainty (MU) (mg/kg) (±)			Analysis
					MU at LOQ (mg/kg)	MU at 5X LOQ (mg/kg)	MU at 10X LOQ (mg/kg)	
Pesticide Residues in TOMATO	Dichlorvos	AOAC official method of analysis 2011, Chapter 10, page no 21 (QuEChERS method)	0.05	0.05-1.00	0.05 ±0.0080	0.25 ±0.0385	0.5 ±0.0758	GCMS
	Alpha HCH		0.05	0.05-1.00	0.05 ±0.0074	0.25 ±0.0379	0.5 ±0.0939	GCMS
	Dimethoate		0.05	0.05-1.00	0.05 ±0.0082	0.25 ±0.0483	0.5 ±0.0832	GCMS
	Beta HCH		0.05	0.05-1.00	0.05 ±0.0079	0.25 ±0.0395	0.5 ±0.0999	GCMS
	Atrazine		0.05	0.05-1.00	0.05 ±0.0084	0.25 ±0.0430	0.5 ±0.0925	GCMS
	Lindane		0.05	0.05-1.00	0.05 ±0.0082	0.25 ±0.0372	0.5 ±0.0995	GCMS
	Diazinon		0.05	0.05-1.00	0.05 ±0.0099	0.25 ±0.0395	0.5 ±0.0929	GCMS
	Delta HCH		0.05	0.05-1.00	0.05 ±0.0084	0.25 ±0.0424	0.5 ±0.0919	GCMS
	Chlorpyrifos methyl		0.05	0.05-1.00	0.05 ±0.0081	0.25 ±0.0382	0.5 ±0.0840	GCMS
	Methyl parathion		0.05	0.05-1.00	0.05 ±0.0088	0.25 ±0.0412	0.5 ±0.0970	GCMS
	Alachlor		0.05	0.05-1.00	0.05 ±0.0077	0.25 ±0.0454	0.5 ±0.0777	GCMS
	Heptachlor		0.05	0.05-1.00	0.05 ±0.0074	0.25 ±0.0547	0.5 ±0.0994	GCMS
	Fenitrothion		0.05	0.05-1.00	0.05 ±0.0079	0.25 ±0.0447	0.5 ±0.0891	GCMS
	Malathion		0.05	0.05-1.00	0.05 ±0.0087	0.25 ±0.0488	0.5 ±0.0931	GCMS
	Aldrin		0.05	0.05-1.00	0.05 ±0.0081	0.25 ±0.0450	0.5 ±0.0991	GCMS
	Chlorpyrifos		0.05	0.05-1.00	0.05 ±0.0095	0.25 ±0.0419	0.5 ±0.0997	GCMS
	Parathion		0.05	0.05-1.00	0.05 ±0.0085	0.25 ±0.0449	0.5 ±0.0825	GCMS
	Fipronil		0.05	0.05-1.00	0.05 ±0.0076	0.25 ±0.0473	0.5 ±0.0777	GCMS
	Chlorfenvinphos		0.05	0.05-1.00	0.05 ±0.0092	0.25 ±0.0502	0.5 ±0.0979	GCMS
	Quinalphos		0.05	0.05-1.00	0.05 ±0.0096	0.25 ±0.0381	0.5 ±0.0942	GCMS
	o,p DDE		0.05	0.05-1.00	0.05 ±0.0073	0.25 ±0.0426	0.5 ±0.0998	GCMS
	o,p DDD		0.05	0.05-1.00	0.05 ±0.0080	0.25 ±0.0381	0.5 ±0.0992	GCMS
	Alpha endosulfan		0.05	0.05-1.00	0.05 ±0.0081	0.25 ±0.0446	0.5 ±0.0930	GCMS
	Butachlor		0.05	0.05-1.00	0.05 ±0.0094	0.25 ±0.0452	0.5 ±0.0919	GCMS
	Hexaconazole		0.05	0.05-1.00	0.05 ±0.0078	0.25 ±0.0472	0.5 ±0.0956	GCMS
	Beta endosulfan		0.05	0.05-1.00	0.05 ±0.0082	0.25 ±0.0494	0.5 ±0.0842	GCMS
	p,p DDD		0.05	0.05-1.00	0.05 ±0.0097	0.25 ±0.0432	0.5 ±0.0998	GCMS

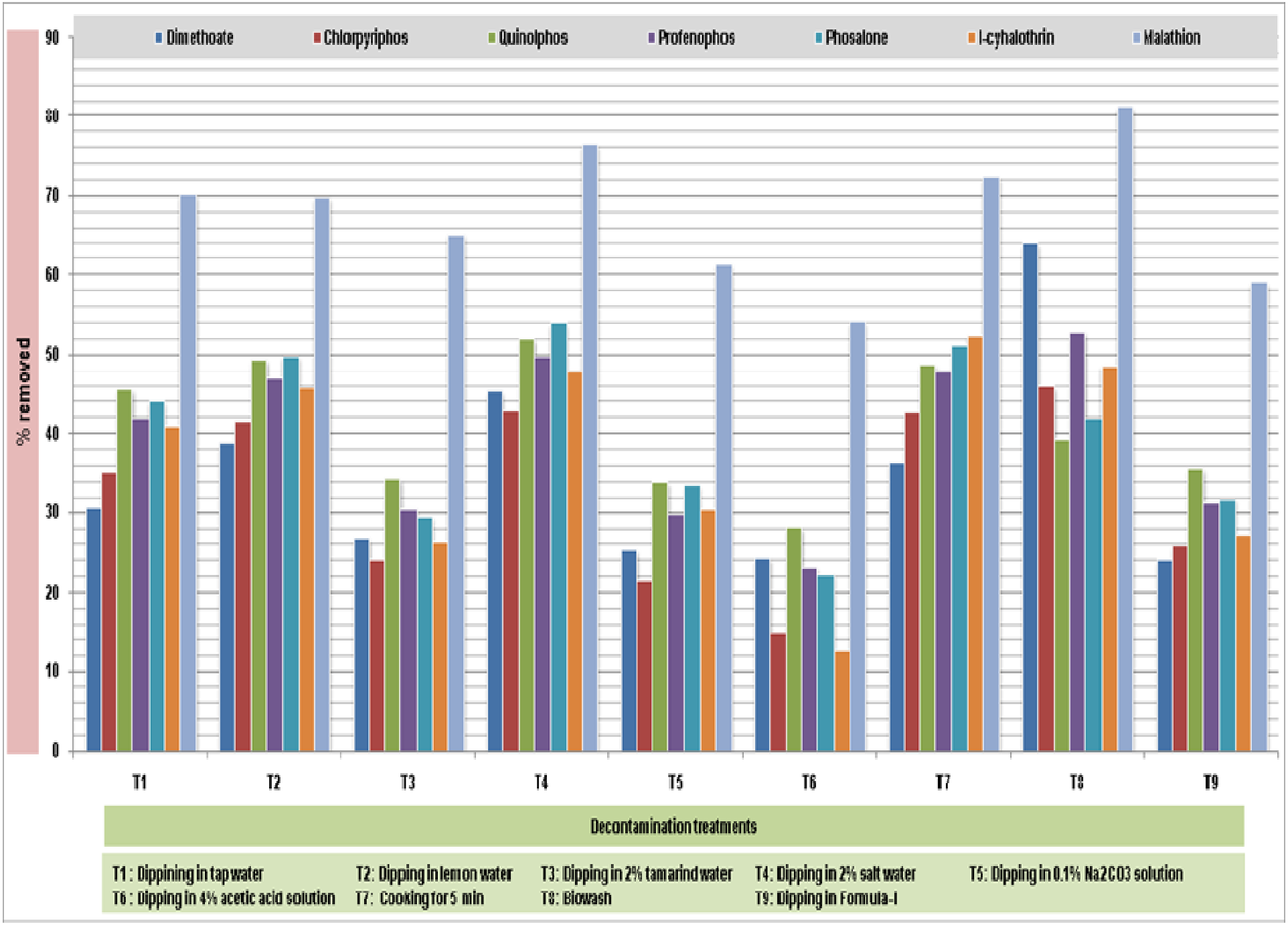
Groups of products, materials or items tested	Specific tests or types performed	Specification , Standard (method) or technique used	Limit of detection/ Quantification (LOQ) (mg/kg)	Range of testing (mg/kg)	Measurement of Uncertainty (MU) (mg/kg) (±)			Analysis
					MU at LOQ (mg/kg)	MU at 5X LOQ (mg/kg)	MU at 10X LOQ (mg/kg)	
Pesticide Residues in TOMATO	o,p DDT	AOAC official method of analysis 2011, Chapter 10, page no 21 (QuEChERS method)	0.05	0.05-1.00	0.05 ±0.0093	0.25 ±0.0458	0.5 ±0.0994	GCMS
	Ethion		0.05	0.05-1.00	0.05 ±0.0080	0.25 ±0.0487	0.5 ±0.0887	GCMS
	Endosulfan sulphate		0.05	0.05-1.00	0.05 ±0.0080	0.25 ±0.0476	0.5 ±0.0990	GCMS
	p,p DDT		0.05	0.05-1.00	0.05 ±0.0097	0.25 ±0.0461	0.5 ±0.0992	GCMS
	Bifenithrin		0.05	0.05-1.00	0.05 ±0.0081	0.25 ±0.0379	0.5 ±0.0761	GCMS
	Fenpropathrin		0.05	0.05-1.00	0.05 ±0.0086	0.25 ±0.0450	0.5 ±0.0823	GCMS
	Permetrin		0.05	0.05-1.00	0.05 ±0.0075	0.25 ±0.0450	0.5 ±0.0921	GCMS
	Cyfluthrin		0.05	0.05-1.00	0.05 ±0.0088	0.25 ±0.0404	0.5 ±0.0889	GCMS
	Cypermethrin		0.05	0.05-1.00	0.05 ±0.0078	0.25 ±0.0412	0.5 ±0.0834	GCMS
	Fenvalarate		0.05	0.05-1.00	0.05 ±0.0096	0.25 ±0.0498	0.5 ±0.0861	GCMS
	Deltamethrin		0.05	0.05-1.00	0.05 ±0.0075	0.25 ±0.0482	0.5 ±0.0877	GCMS
	Phorate		0.05	0.05-1.00	0.05 ±0.0083	0.25 ±0.0406	0.5 ±0.0931	GCMS
	Trifloxystrobin		0.05	0.05-1.00	0.05 ±0.0083	0.25 ±0.0458	0.5 ±0.0857	GCMS
	p,p DDE		0.05	0.05-1.00	0.05 ±0.0083	0.25 ±0.0429	0.5 ±0.0973	GCMS
Pesticide Residues in TOMATO	Metalaxyl	AOAC official method of analysis 2011, Chapter 10, page no 21 (QuEChERS method)	0.01	0.01-1.00	0.01 ±0.0016	0.05 ±0.0074	0.1 ±0.0182	LCMS
	Phosphomidon		0.01	0.01-1.00	0.01 ±0.0016	0.05 ±0.0075	0.1 ±0.0176	LCMS
	Carbaryl		0.01	0.01-1.00	0.01 ±0.0018	0.05 ±0.0099	0.1 ±0.0167	LCMS
	Imidacloprid		0.01	0.01-1.00	0.01 ±0.0018	0.05 ±0.0088	0.1 ±0.0181	LCMS
	Acetamaprid		0.01	0.01-1.00	0.01 ±0.0018	0.05 ±0.0077	0.1 ±0.0166	LCMS
	Carbofuran		0.01	0.01-1.00	0.01 ±0.0016	0.05 ±0.0076	0.1 ±0.0157	LCMS
	Methomyl		0.01	0.01-1.00	0.01 ±0.0019	0.05 ±0.0095	0.1 ±0.0188	LCMS
	Monocrotophos		0.01	0.01-1.00	0.01 ±0.0017	0.05 ±0.0092	0.1 ±0.0185	LCMS
	Thioclorid		0.01	0.01-1.00	0.01 ±0.0015	0.05 ±0.0075	0.1 ±0.0155	LCMS
	Isopruturon		0.01	0.01-1.00	0.01 ±0.0015	0.05 ±0.0077	0.1 ±0.0149	LCMS
	Thiodicarb		0.01	0.01-1.00	0.01 ±0.0015	0.05 ±0.0075	0.1 ±0.0164	LCMS
	Dimethoate		0.01	0.01-1.00	0.01 ±0.0015	0.05 ±0.0076	0.1 ±0.0177	LCMS
	Acephate		0.01	0.01-1.00	0.01 ±0.0019	0.05 ±0.0099	0.1 ±0.0170	LCMS

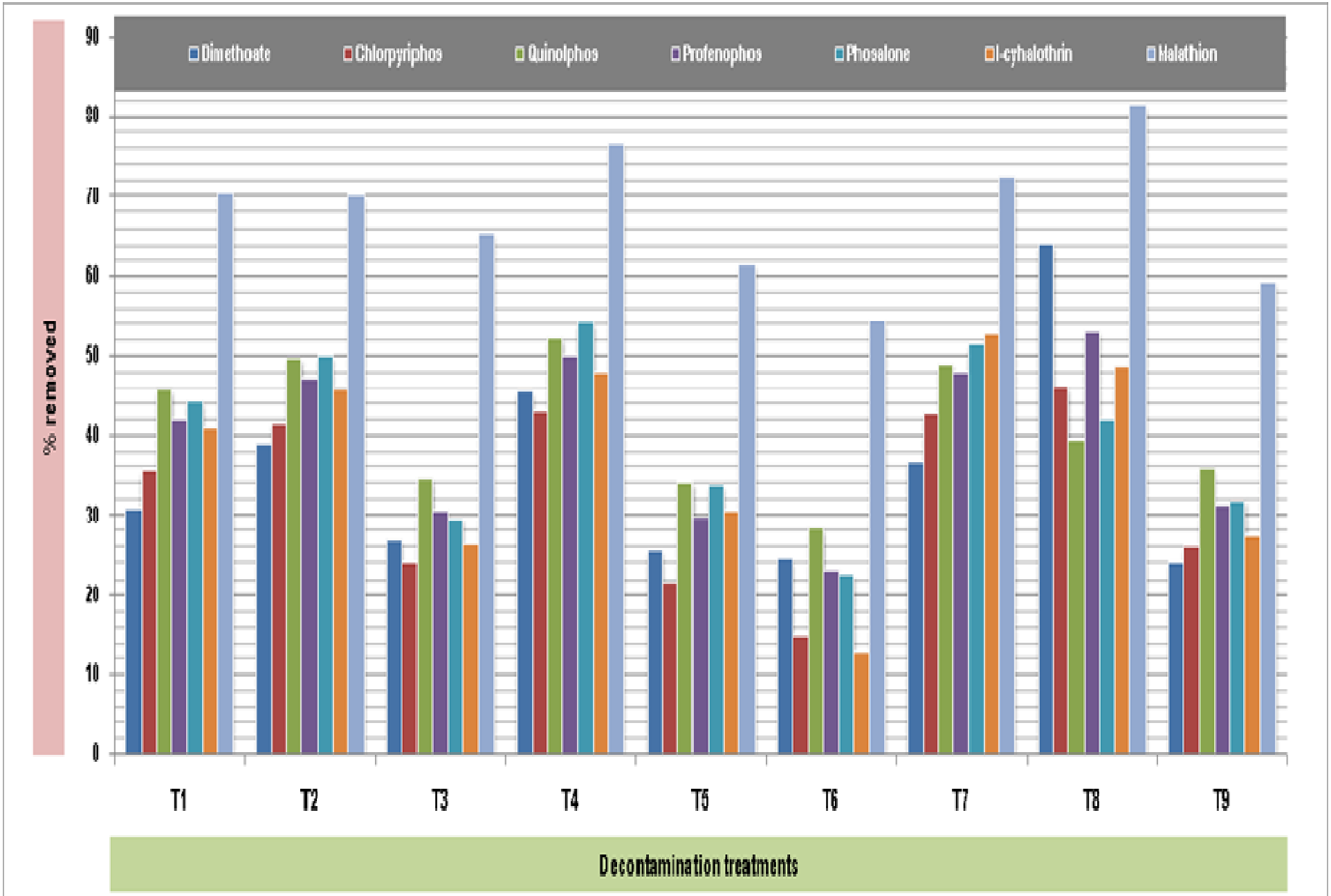
Pesticide Residues (mg/kg) in tomato Samples collected at 2 hrs after spray CONTROL								
Pesticide	Residues (mg/kg)				SDEV	% RSD	MRL (mg/kg)	
	R1	R2	R3	AVERAGE			FSSAI	CODEX
Dimethoate	1.72	1.57	0.74	1.34	0.53	39.55	2.00	NA
Chlorpyriphos	0.92	0.89	0.81	0.88	0.06	6.29	0.20	NA
Quinalphos	1.33	1.27	1.09	1.23	0.13	10.28	NA	NA
Profenophos	1.60	1.56	1.35	1.50	0.13	8.93	NA	NA
Phosalone	2.28	2.22	1.51	2.00	0.43	21.32	1.00	NA
Lamda cyhalothrin	0.15	0.15	0.13	0.14	0.01	10.15	NA	0.300
Malathion	4.45	4.40	3.23	4.03	0.69	17.18	3.00	NA

Pesticide	% removal of pesticide residues over control								
	Tap Water	Lemon water	2% tamarind solution	2% salt solution	0.1% sodium bicarbonate solution	4% Acetic Acid solution	BIO WASH	Cooking	Formula-I
Dimethoate	30.700	39.000	26.800	45.300	25.400	24.400	36.500	64.000	24.100
Chlorpyriphos	35.300	41.500	24.100	43.000	21.500	14.800	42.700	45.900	25.900
Quinalphos	45.600	49.500	34.400	52.100	34.000	28.100	48.800	39.400	35.700
Profenophos	42.000	47.100	30.500	49.800	29.800	23.100	47.900	52.900	31.300
Phosalone	44.100	49.900	29.500	54.000	33.600	22.400	51.300	42.000	31.800
l-cyhalothrin	40.900	45.700	26.300	47.900	30.400	12.700	52.500	48.700	27.100
Malathion	70.300	69.900	65.300	76.500	61.300	54.200	72.500	81.400	59.100

Pesticide	% removal of pesticide residues over control								
	Tap Water	Lemon water	2% tamarind solution	2% salt solution	0.1% sodium bicarbonate solution	4% Acetic Acid solution	BIO WASH	Cooking	Formula-I
Dimethoate	30.700	39.000	26.800	45.300	25.400	24.400	36.500	64.000	24.100
Chlorpyriphos	35.300	41.500	24.100	43.000	21.500	14.800	42.700	45.900	25.900
Quinolphos	45.600	49.500	34.400	52.100	34.000	28.100	48.800	39.400	35.700
Profenophos	42.000	47.100	30.500	49.800	29.800	23.100	47.900	52.900	31.300
Phosalone	44.100	49.900	29.500	54.000	33.600	22.400	51.300	42.000	31.800
l-cyhalothrin	40.900	45.700	26.300	47.900	30.400	12.700	52.500	48.700	27.100
Malathion	70.300	69.900	65.300	76.500	61.300	54.200	72.500	81.400	59.100

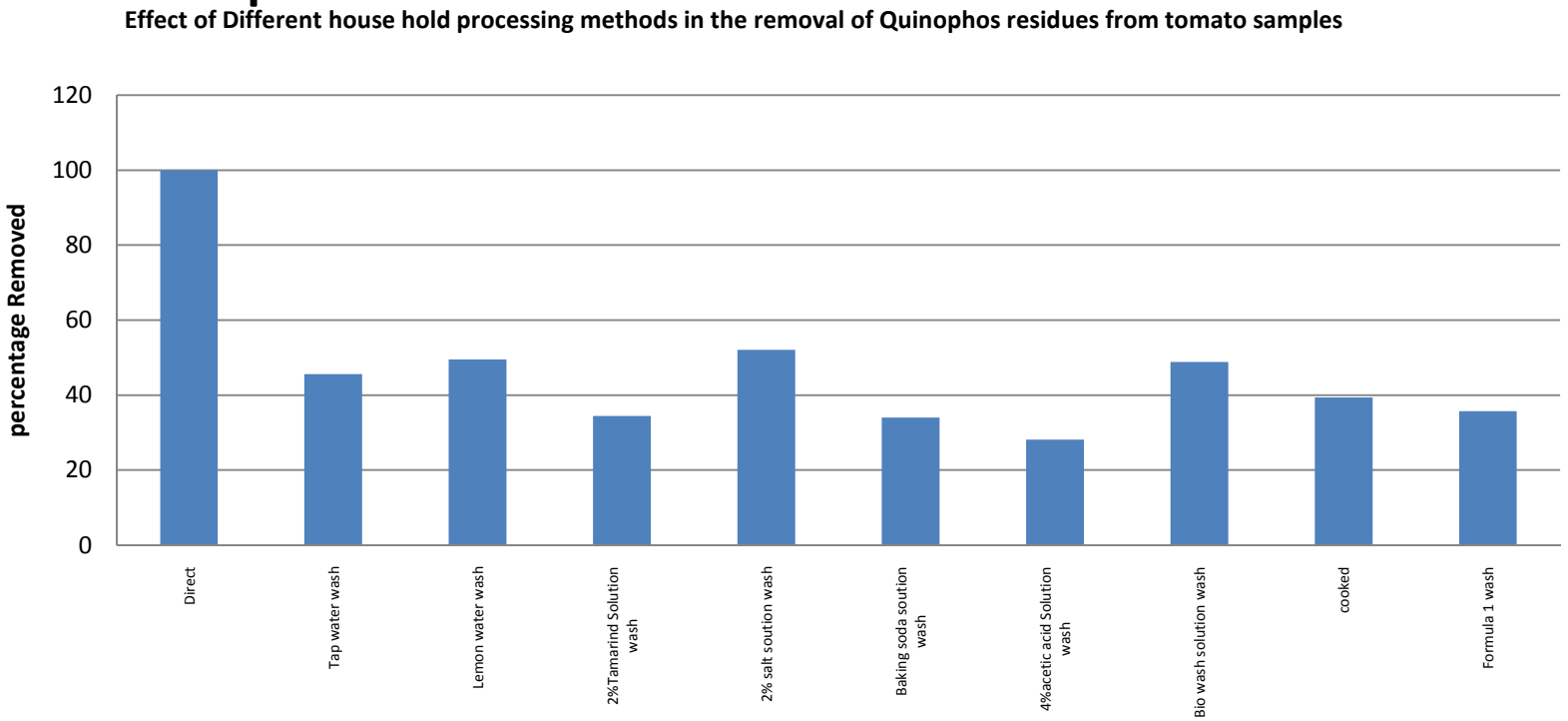
Cooking was observed to be more effective in reducing the residues followed by the salt water solution.
Cooking removes the residues up to 81.4 percentage.
Tap water wash Remove less quantity of Lambda cyhalothrin 30.7% and removes higher Malathion 70.3%.
Lemon water wash Remove less quantity of Dimethoate 39.0% and higher Malathion 69.9%.
2% Tamarind solution Remove less quantity of Chlorpyrifos 24.1% and higher Malathion 65.3%.
2% Salt solution Remove less quantity of Chlorpyrifos 43.0% and higher Malathion 76.5%.
0.1% sodium bicarbonate Remove less quantity of Chorpyrifos 21.5% and removes higher Malathion 61.3%.
4% Acetic acid solution Remove less quantity of Lambda cyhalothrin 12.7% and higher Malathion 54.0%.
Bio wash Remove less quantity of Dimethoate 36.5% and higher Malathion 72.5%.
Cooking in pressure Cooker Remove less quantity of Quinalphos 39.4 % and higher Chlorpyrifos 81.4%.


Dimethoate
Chlorpyriphos
Quinolphos
Profenophos
Phosalone
l-cyhalothrin
Malathion
% removed
90
80
70
60
50
40
30
20
10
0
T1
T2
T3
T4
T5
T6
T7
T8
T9
Decontamination treatments
T1 : Dippining in tap water
T2: Dipping in lemon water
T3: Dipping in 2% tamarind water
T4: Dipping in 2% salt water
T5: Dipping in 0.1% Na2CO3 solution
T6 : Dipping in 4% acetic acid solution
T7: Cooking for 5 min
T8: Blowash
T9: Dipping in Formula-I

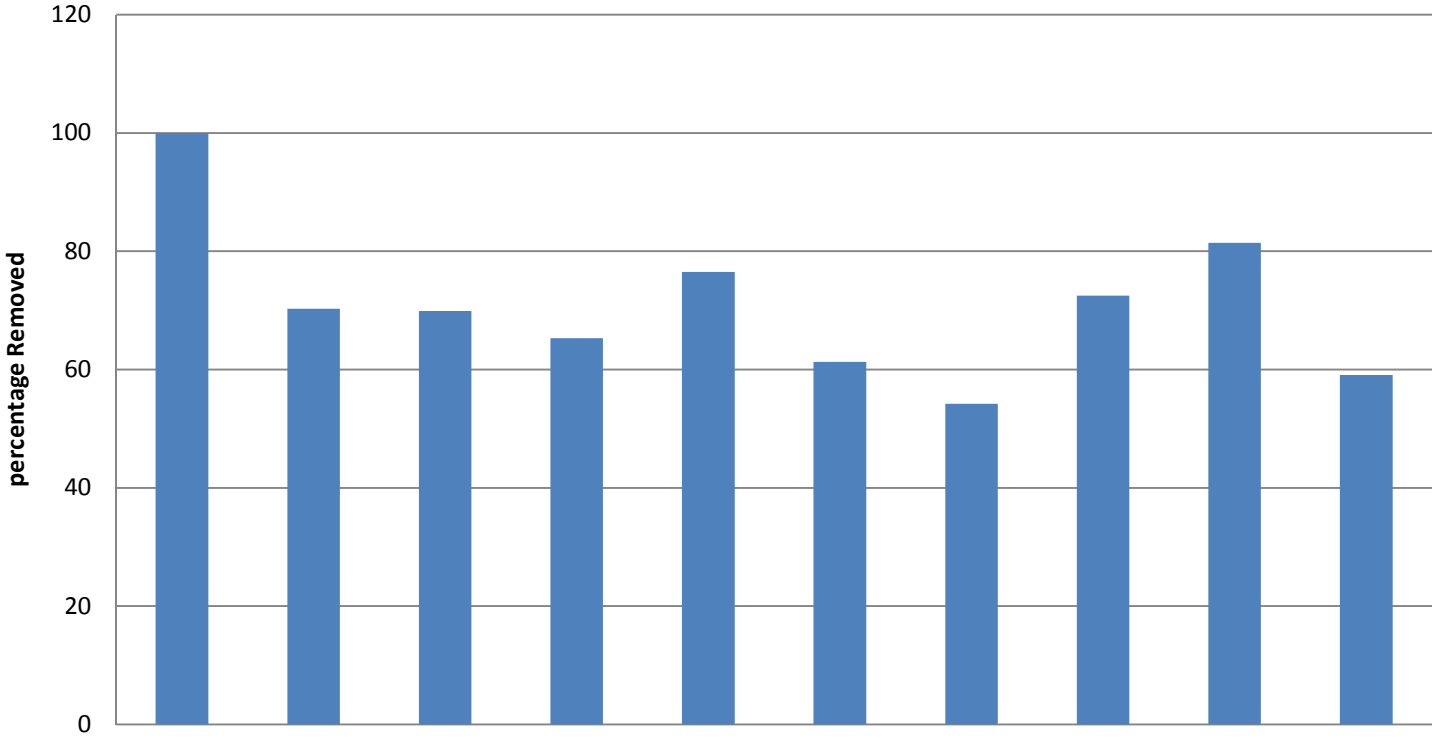

Dimethoate
Chlorpyriphos
Quinolphos
Profenophos
Phosalone
l-cyhalothrin
Malathion
% removed
90
80
70
60
50
40
30
20
10
0
T1
T2
T3
T4
T5
T6
T7
T8
T9
Decontamination treatments

Effect of Different house hold processing methods in the removal of Certain Organo Phosphates from Tomato samples in ECD

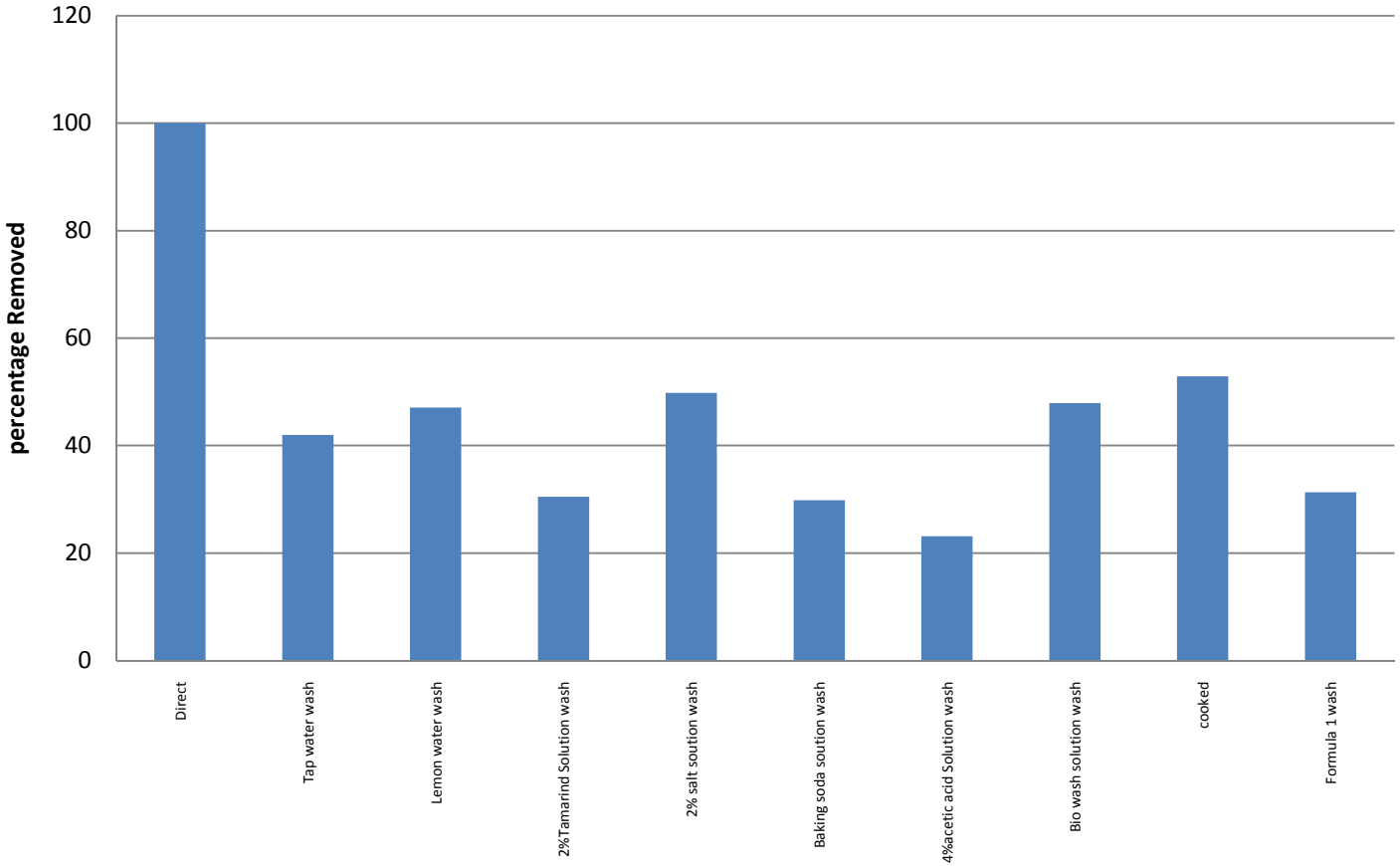
- Quinalphos



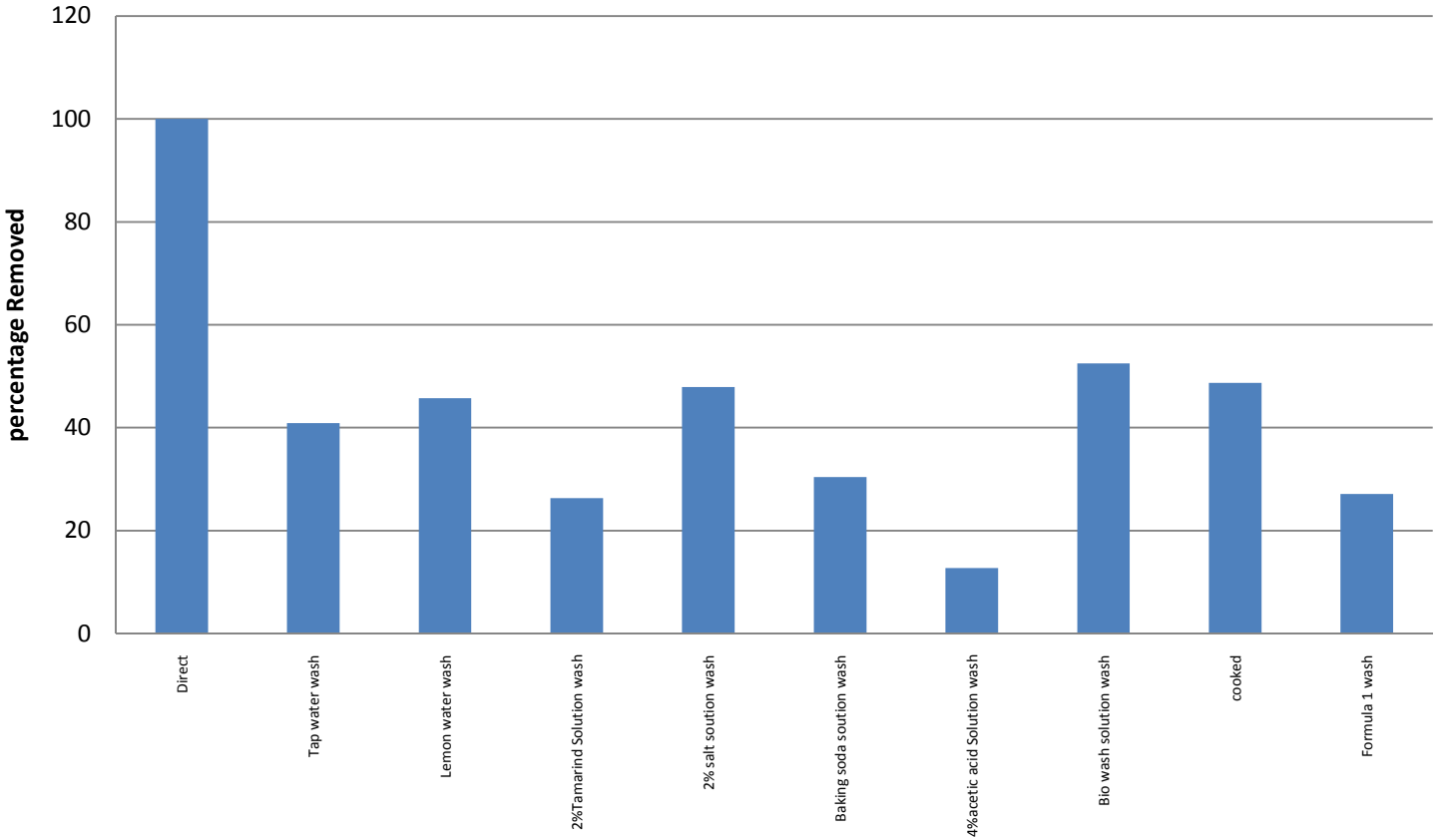
Effect of Different house hold processing methods in the removal of Malathion residues from tomato samples



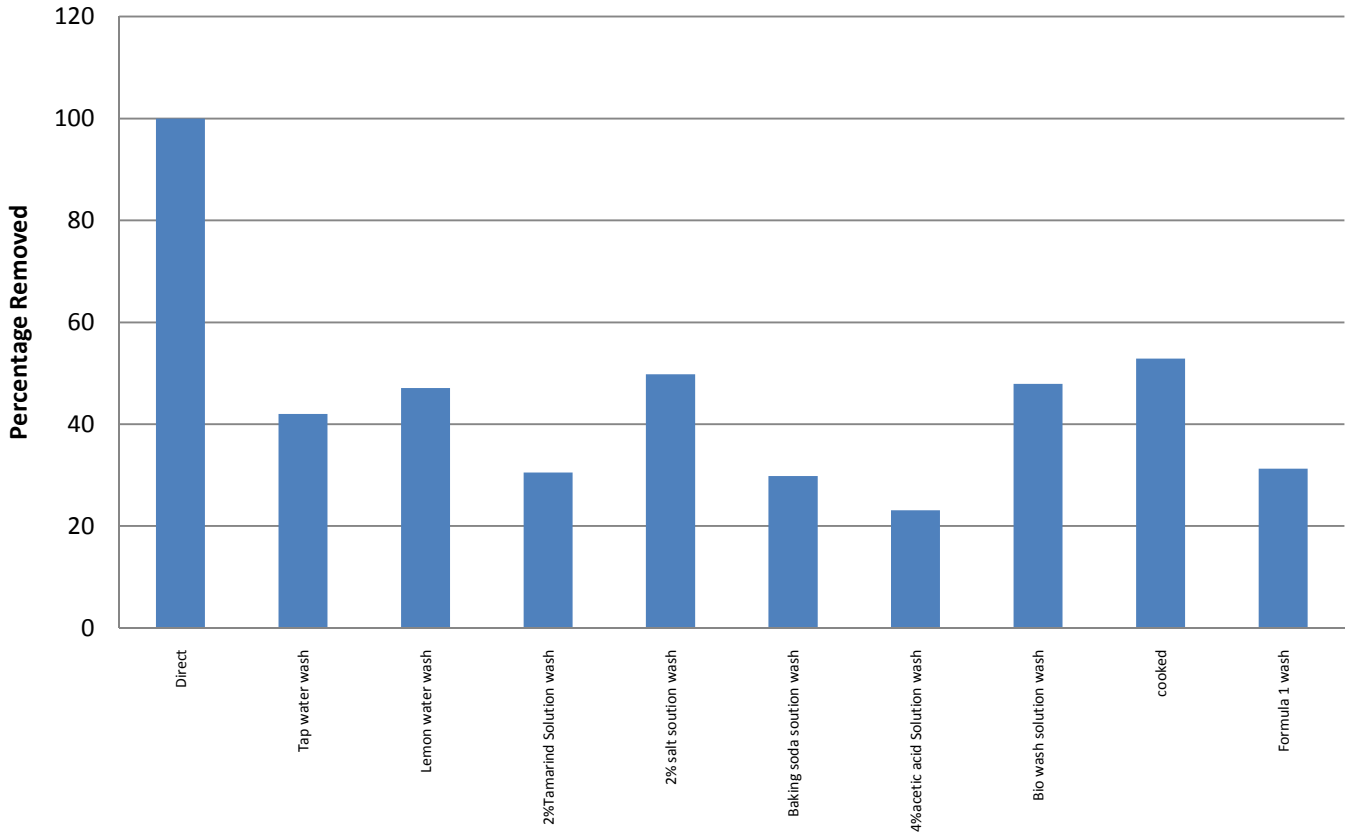
Effect of Different house hold processing methods in the removal of Phosalone residues from Tomato samples



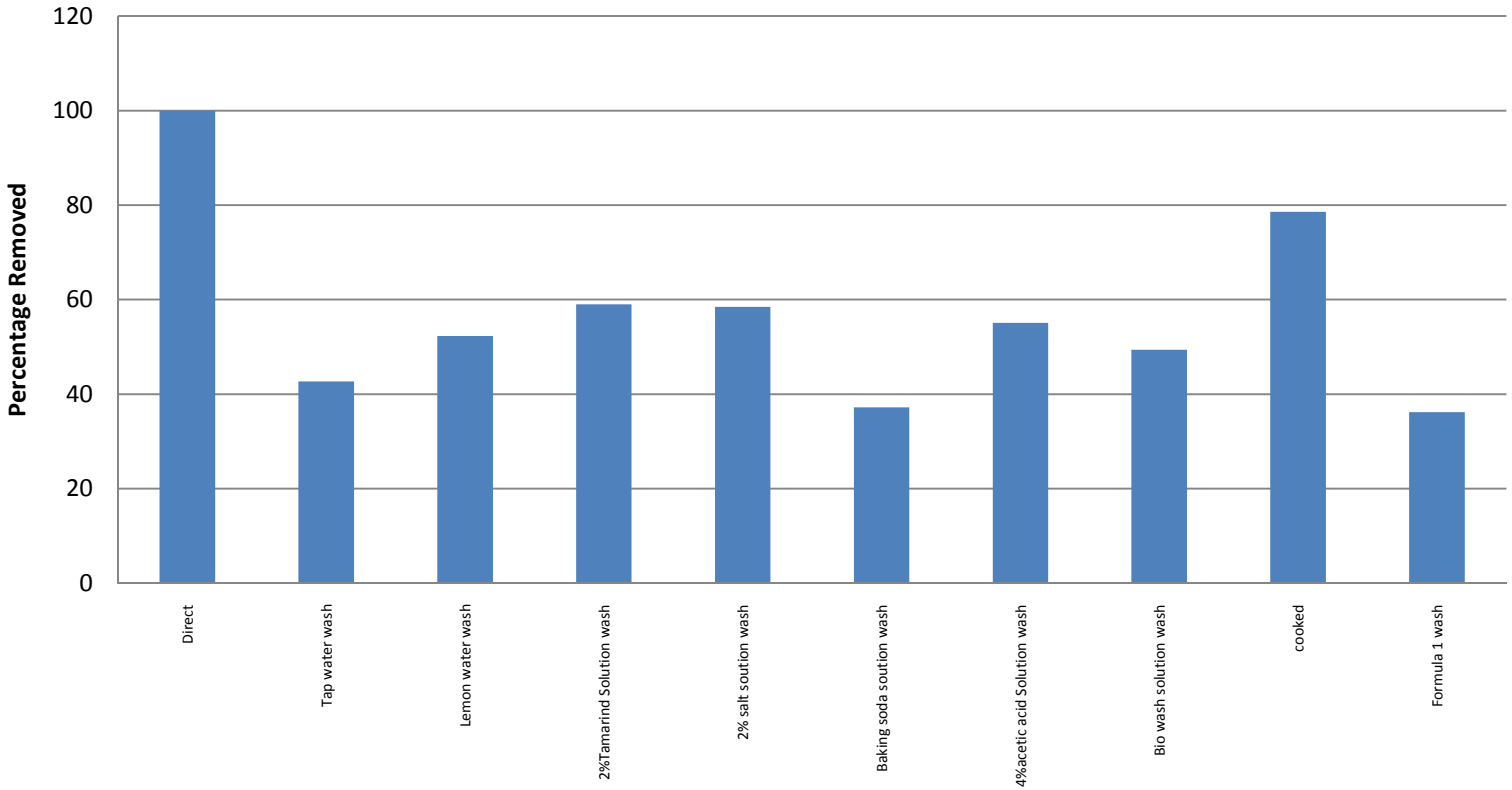
Effect of Different house hold processing methods in the removal of Lamda cyhalothrin residues from tomato samples



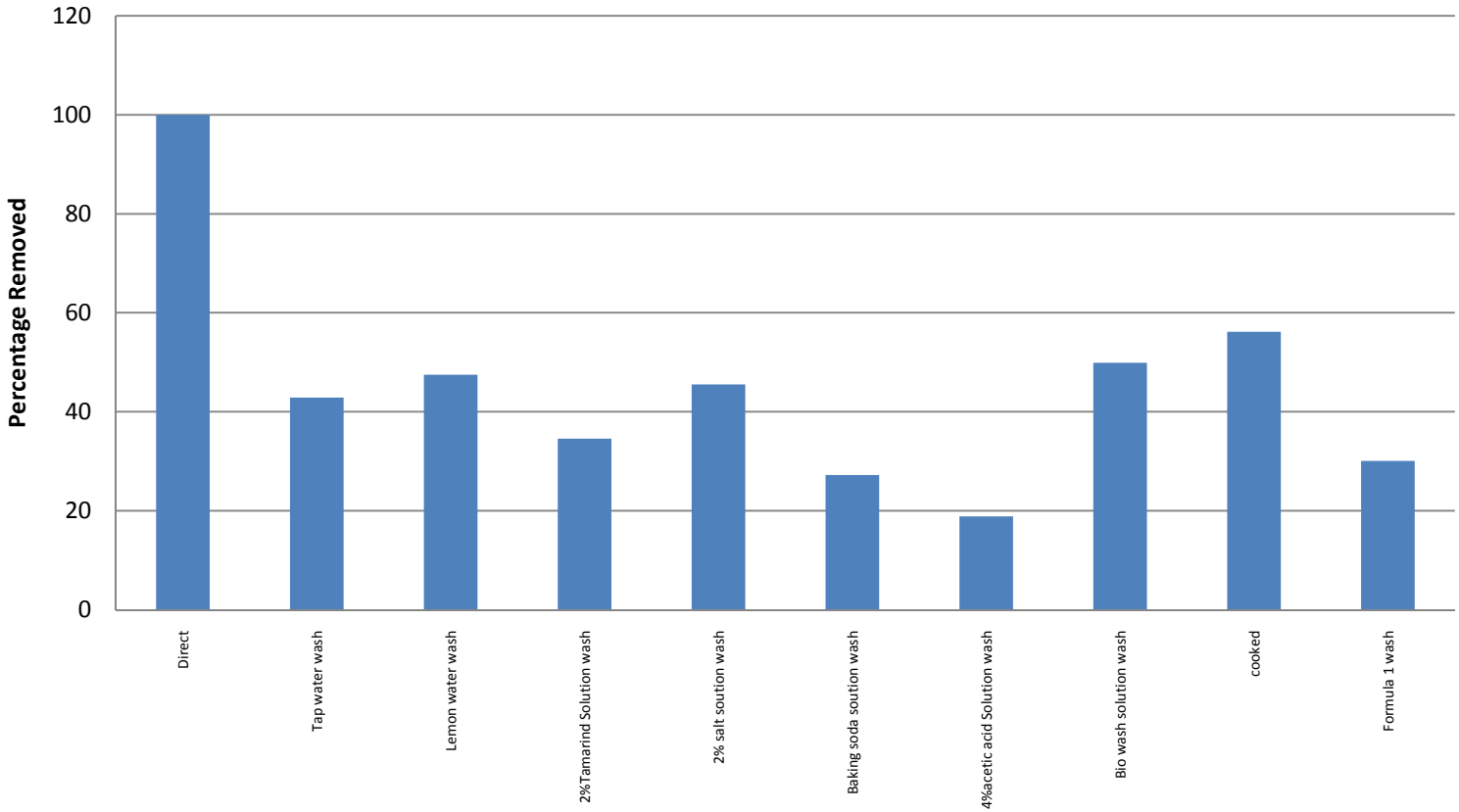
Effect of Different house hold processing methods in the removal of Profenophos residues from tomato samples



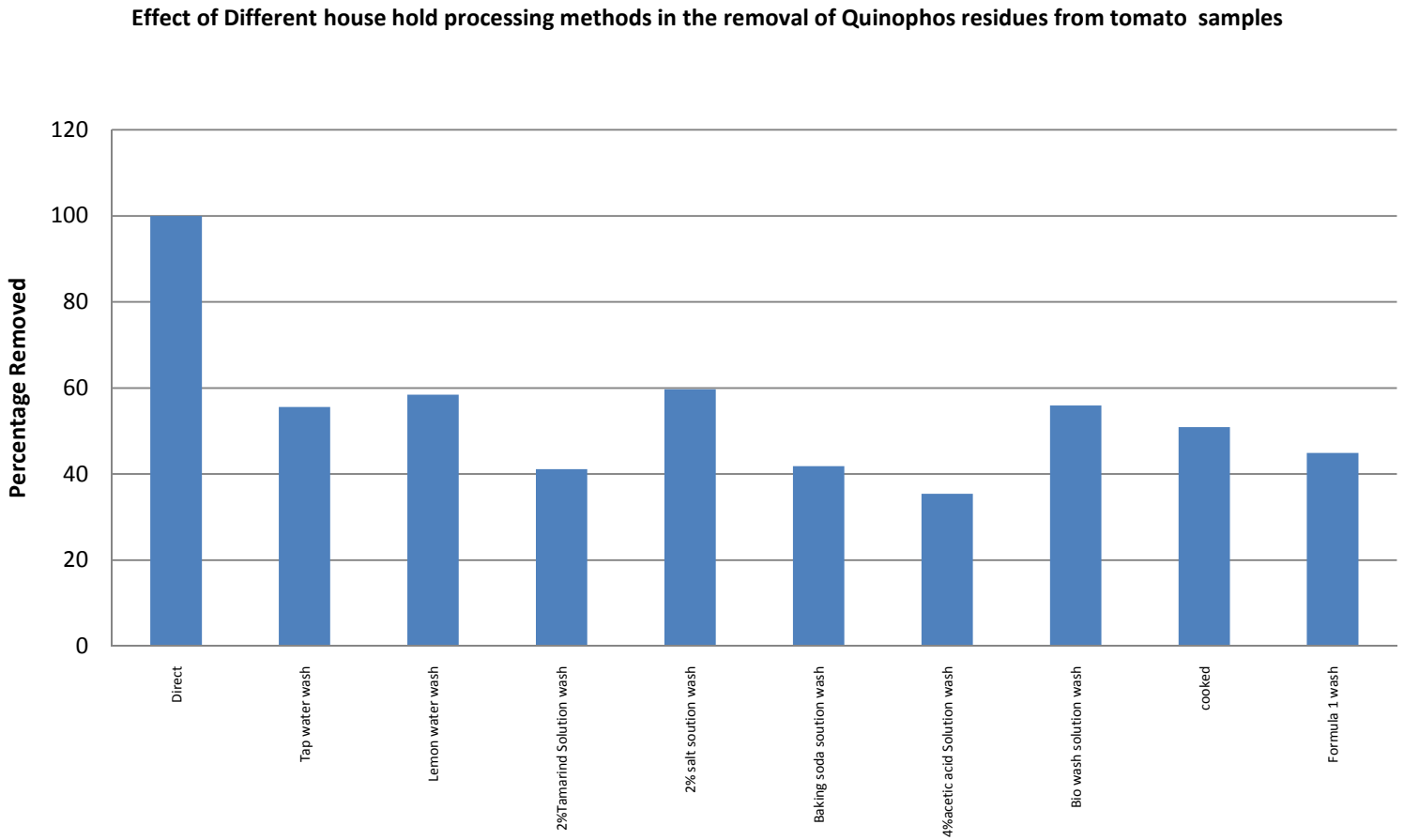
Effect of Different house hold processing methods in the removal of Dimethoate residues from tomato samples

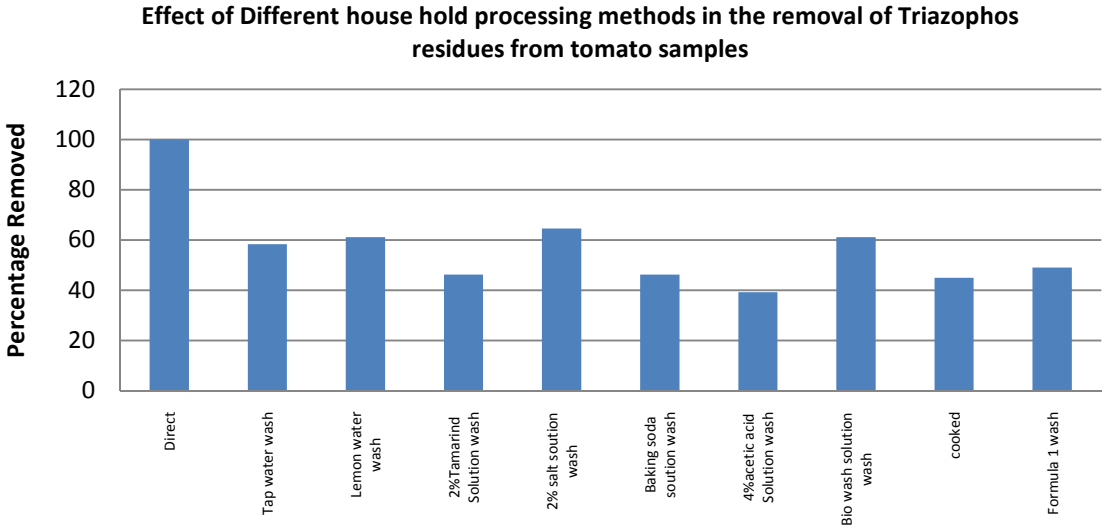


Effect of Different house hold processing methods in the removal of Chlorpyrifos residues from tomato samples

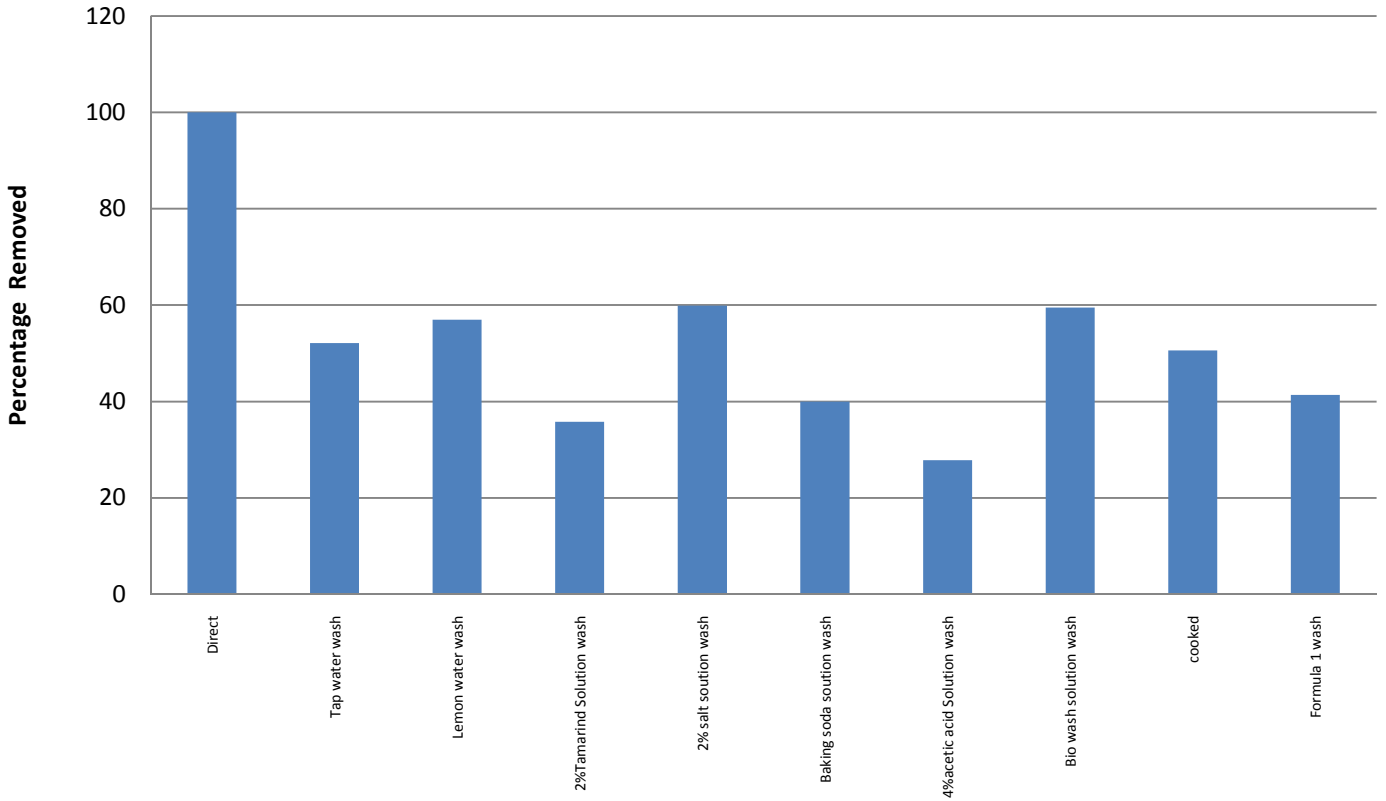


Effect of Different house hold processing methods in the removal of Certain Organo Phosphates from Tomato samples using FPD

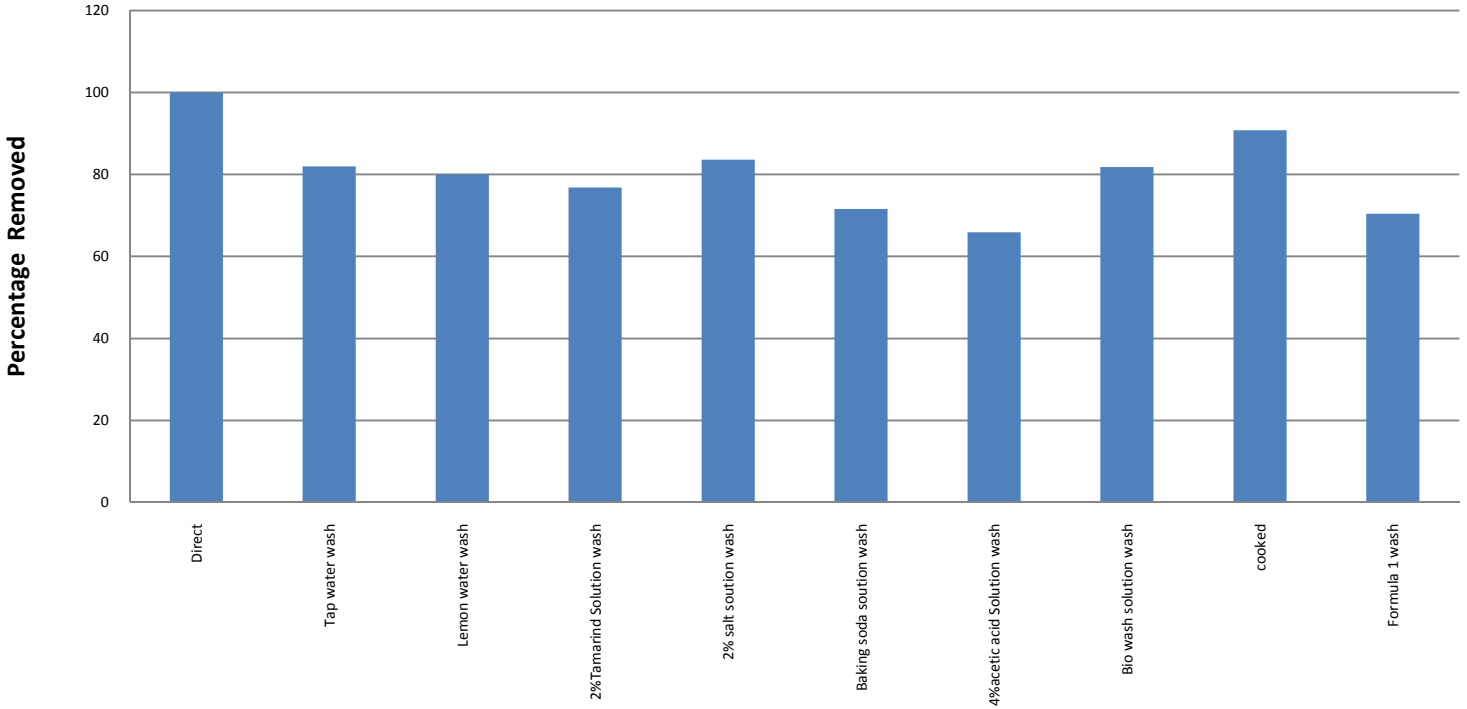



Effect of Different house hold processing methods in the removal of Triazophos residues from tomato samples
Percentage Removed
120
100
80
60
40
20
0
Direct
Tap water wash
Lemon water wash
2%Tamarind Solution wash
2% salt soution wash
Baking soda soution wash
4%acetic acid Solution wash
Bio wash solution wash
cooked
Formula 1 wash

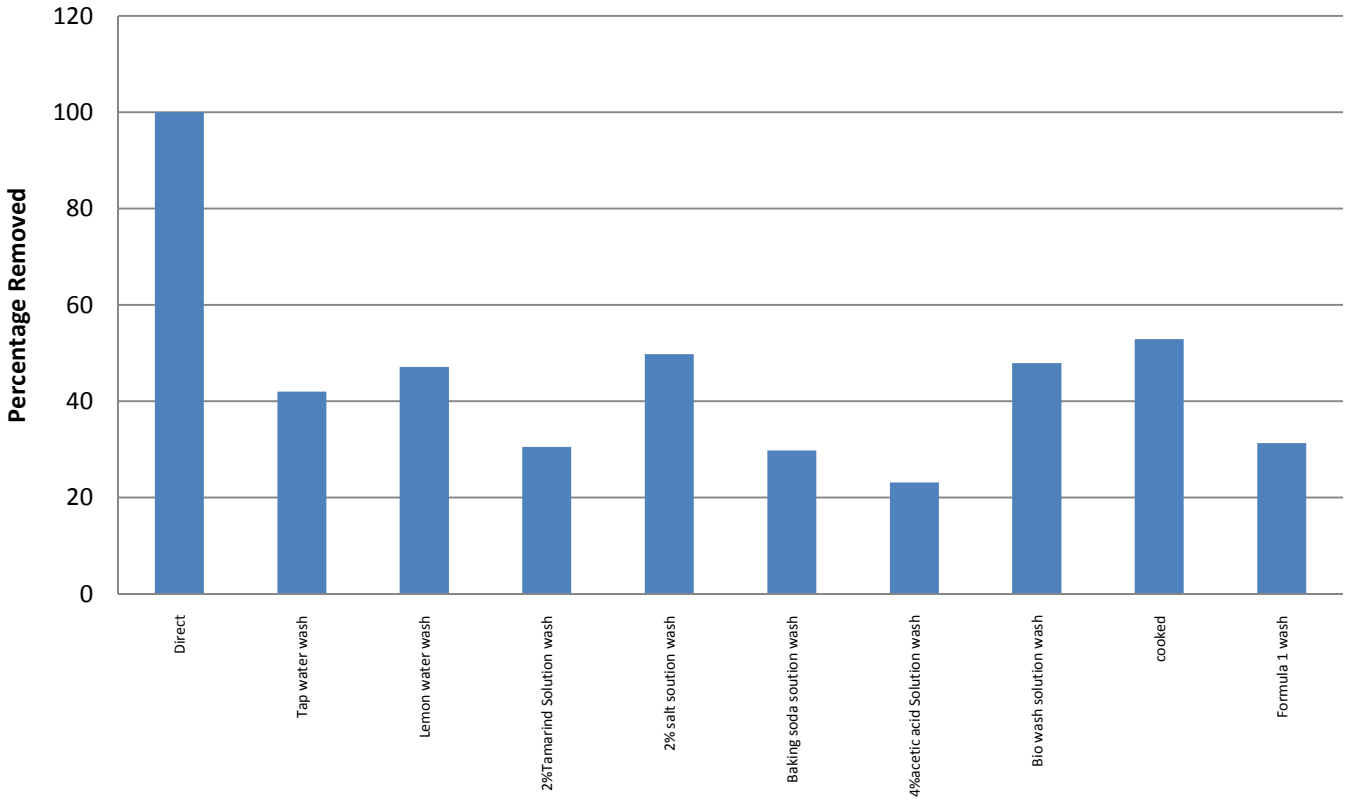
Effect of Different house hold processing methods in the removal of Phosalone residues from tomato samples



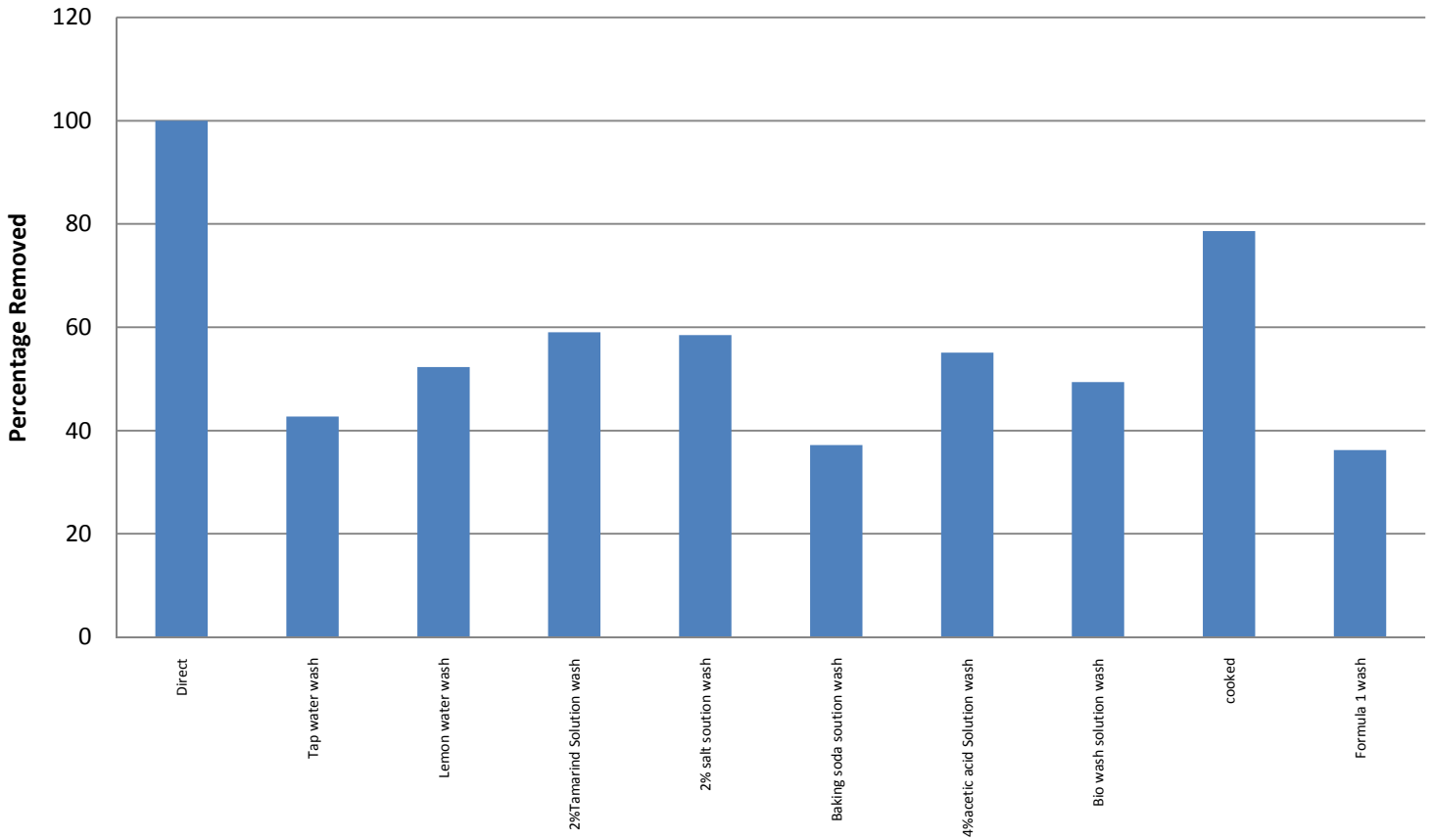
Effect of Different house hold processing methods in the removal of Malathion residues from tomato samples



Effect of Different house hold processing methods in the removal of Profenophos residues from tomato samples



Effect of Different house hold processing methods in the removal of Dimethoate residues from tomato samples



CONCLUSIONS

Tomato is an important food crop, used in different ways in curries.

- Food safety issues are crucial in international trade under SPS regulations.
- National Residue Monitoring Program gives information on residue levels for promotion of GAPs and setting MRLs.
- Residue Analysis Methods should able to detect and quantity maximum number of pesticides at below MRL or at least 0.05 mg/kg where recommendations and MRLs are unavailable.
- MRM method with QuEChERS principles with a scope of 54 pesticides used in the study is highly useful for National Residue Monitoring Studies on Brinjal as it includes all pesticides.
- The recovery varies from 84-118%, which is acceptable.
- The MU (measurement of uncertainty) calculated is within the range.
- The analysis is on GC-MS/MS and LC-MS/MS with MRM (multiple reaction monitoring) methods which is mandatory for residue analysis for confirmatory analysis.\
- The methods are now used for Residue Monitoring Program as it is validated as per SANCO guidelines.

SAFETY FIRST

THE SAFE WAY IS
THE BEST WAY

Home Food Safety

Thank You!