IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 10, Issue 7 Ver. II (July 2017), PP 67-80
www.iosrjournals.org

Detection of Oxamyl and Imidacloprid Pesticide residues in Some Iraqi Vegetables

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***Abstract*:** *Application of pesticide on vegetables will protect them from pest injury, but in another hand will hold pesticide residues inside vegetables. These residues have harmful effect against all consumers. Detection about pesticide residues has been carried out for some Iraqi vegetables (tomato, cucumber, eggplant, and zucchini) by using Gas Chromatography/Mass Spectroscopy (GC/MS). QuEChERS method has been applied for extraction pesticide residues from targeted vegetables. The GC/MS has been carried out for distinguish the vegetables that are suffering from hyper concentration in pesticide residues more than maximum residues limits (MRLs) that is determinant by codex alimentarius. GC/MS analysis that is carried out reviled the existence of only bi-products belong to imidacloprid and oxamyl pesticides. The active ingredients of both pesticides degraded efficiently and there is no ability to trace them back. Some of the bi-products represent additives add to improve the ability of pesticides in killing pest. Some of those bi-products have toxicity when they combine with other kinds of components. The samples collected from two sites, the time of collection are beginning, mid, and end of month. The months that elected for collection samples are August, September, October, and November. The detection revealed that November is the best month regarding pesticide residues.*

***Keywords*:** *Imidacloprid, Oxamyl, Pesticide residues, QuEChERS, Vegetables*

Date of Submission: 05-07-2017 Date of acceptance: 24-07-2017

I. Introduction

Pesticide is defined as any substances or mixture of substances planned for avoiding , destroying, repelling, or mitigating any pests [1]. Pesticide residues defined as any substance or mixture of material in food for man or forage for animals resulting from the use of pesticide including any determinant derivatives, such as degradation and conversion products, metabolites, reaction products and uncleanness considered to have significant toxic effect [2]. There are two kinds of pesticide residues, bound and conjugated pesticide residues. A soil bound residue is "the un extractable and chemically un identifiable pesticide residues outstanding in fulvic acid, humic acid, and humin fraction after exhaustive sequential extraction with non polar organic and polar solvents". Conjugate pesticide residues are reflect more polar and less lipophlic than the parent pesticide molecules, and as such are therefore more basically could take out from animals and plants [3]. Agriculture in the world has altered greatly in the past one hundred years. Many farmers follow high yield by using low cost energy, plentiful water supply, efficient chemical fertilizers and pesticides [4]. Pesticide play as great value in the high productivity accomplished in agriculture through the control of plant or animal life pests. Although pesticides have advantages, some have defect, such as potential toxicity to human and other desired species. Exposure of general population to pesticide most generally occurs through consuming treated food sources [5]. Despite, good diet contain high percentage of vegetables and fruits show primary factor for reducing the risk of gastrointestinal and breast cancer disease, pesticide residues on vegetables forming possible danger to consumers and have adverse effect on human health [6]. Chemical pesticides are used extremely and regardless to manufacturing instructions. Moreover, 30% of pesticides soled in developing countries do not confront internationally quality standards [7]. Gas and liquid chromatography (GC and LC) coupled to sophisticated mass spectrometry (MS) instrument are among the most powerful analytical tools currently accessible for surveillance of pesticides in food [8].

II. Materials And Methods

Apparatus

The (Table 1) below shows apparatus that are used for detection process of pesticide residues in targeted vegetables

Table (1) show apparatus

No.	Instrument	Model	Company
1	Deep-Freeze	JSPC-420C	Concord
2	Blender	MX-GX1021	Panasonic
3	Balance	ALS220-4	Kern
4	Vortex	Gallenhamp	Spinmix
5	Centrifuge	5430R	Hamborg-Germany
6	GC/MS	QP2010Plus	Shimadzu-Japan
7	Polypropylene tubes	-	China
8	Knife	-	China
9	Glass gar	-	China

Chemicals and solvents

The chemicals and solvents brought from Sigma-Aldrich company (Germany) by OMA International office in Baghdad. All chemicals that are used described in the (Table 2) below.

Table (2) Chemicals and Solvents

Chemicals	M.wt g/mol	Chemical formula	Density g/mL	Company
Acetonitrile	41	C_2H_3N	0.786	Sigma-Aldrich
Glacial Acetic acid	60	$C_2H_4O_2$	1.049	Sigma-Aldrich
Anhydrous Magnesium Sulfate	120.37	$MgSo_4$	2.66	Sigma-Aldrich
Anhydrous Sodium Acetate	82.03	CH_3COONa	-	Sigma-Aldrich
Primary Secondary Amine	59	SiN_2H_3	-	Sigma-Aldrich
Graphitized Carbon Black	12	C	0.35	Sigma-Aldrich

GC/MS Optimal Condition Used for Samples Extracted by QuEChERS Method

Helium was used as the carrier gas (mobile phase) at flow rate of 1.0 ml/min. Separation were conducted using a Hp 5-Ms ultra inert 30m * 0.25mm * 0.25µl column (stationary phase). The injection volume was 25 µl, the injector temperature was held at (280 ºC). The program of GC/MS was set as follow: initial temperature started at (70 ºC), held for 2 min. Increased to (150 ºC) at 25 ºC/min, held for 1 min. Finally, increased to (280 ºC) at 8 ºC/min, held for 15 min [9].

Determination of Pesticide Residues

The determination of pesticide residues have been carried out by using mass spectroscopy coupled with gas chromatography [9].

Sample Collection

The targeted vegetables(tomato, cucumber, eggplant, and zucchini), have been collected from two sites, Al-Yusufiyah wholesaler market and Al-Rasheed wholesaler market. Table (3) shows the map of the two collection sites. The collection time were four months, (August, September, October, and November). The reason for chose those four months, are to cover the two kinds of planting for our targeted vegetables, exposed and green-house kinds of planting. Three times of collection were carried out per each month, starting of the month, middle of the month, and the end of the month. The reason for this kind of collection are to cover all the month targeted vegetables and to take comprehensive idea about pesticide residues in targeted vegetables. The total number of samples are (48) samples were distributed in targeted months as (Table 3) shows below.

Table (3) Sample Collection

Sample	Month	Date	Place of Planting	Place of Collection
Tomato	August	5/8/2016	Karbala	Al-Rasheed wholesaler
Tomato	August	15/8/2016	Erbil	Al-Rasheed wholesaler
Tomato	August	30/8/2016	Erbil	Al-Rasheed wholesaler
Tomato	September	5/9/2016	Erbil	Al-Rasheed wholesaler
Tomato	September	15/9/2016	Pengawin	Al- Yusufiyah wholesaler
Tomato	September	29/9/2016	Pengawin	Al- Yusufiyah wholesaler
Tomato	October	5/10/2016	Rabia'a	Al- Yusufiyah wholesaler
Tomato	October	17/10/2016	Sulaimaniyah	Al-Rasheed wholesaler
Tomato	October	29/10/2016	Pengawin	Al-Rasheed wholesaler
Tomato	November	2/11/2016	Rabia'a	Al- Yusufiyah wholesaler
Tomato	November	16/11/2016	Karbala	Al-Rasheed wholesaler
Tomato	November	23/11/2016	Karbala	Al-Rasheed wholesaler
Cucumber	August	5/8/2016	Sulaimaniyah	Al-Rasheed wholesaler
Cucumber	August	15/8/2016	Sulaimaniyah	Al-Rasheed wholesaler
Cucumber	August	29/8/2016	Sulaimaniyah	Al-Rasheed wholesaler
Cucumber	September	5/9/2016	Al-Momniyah	Al- Yusufiyah wholesaler

Cucumber	September	15/9/2016	Karbala	Al- Yusufiyah wholesaler
Cucumber	September	29/9/2016	Karbala	Al- Yusufiyah wholesaler
Cucumber	October	5/10/2016	Erbil	Al-Rasheed wholesaler
Cucumber	October	15/10/2016	Cragul	Al- Yusufiyah wholesaler
Cucumber	October	29/10/2016	Cragul	Al- Yusufiyah wholesaler
Cucumber	November	2/11/2016	Al- Harkawi	Al- Yusufiyah wholesaler
Cucumber	November	16/11/2016	Mahmudiyah	Al- Yusufiyah wholesaler
Cucumber	November	23/11/2016	Yusufiyah	Al-Rasheed wholesaler
Eggplant	August	5/8/2016	Yusufiyah	Al- Yusufiyah wholesaler
Eggplant	August	15/8/2016	Yusufiyah	Al-Rasheed wholesaler
Eggplant	August	24/8/2016	Yusufiyah	Al-Rasheed wholesaler
Eggplant	September	5/9/2016	Al-Momniyah	Al- Yusufiyah wholesaler
Eggplant	September	15/9/2016	Yusufiyah	Al- Yusufiyah wholesaler
Eggplant	September	29/9/2016	Essaouira	Al- Yusufiyah wholesaler
Eggplant	October	5/10/2016	Yusufiyah	Al- Yusufiyah wholesaler
Eggplant	October	15/10/2016	Yusufiyah	Al- Yusufiyah wholesaler
Eggplant	October	29/10/2016	Latifiyah	Al- Yusufiyah wholesaler
Eggplant	November	2/11/2016	Al-Saouira	Al- Yusufiyah wholesaler
Eggplant	November	16/11/2016	Al-Saouira	Al-Rasheed wholesaler
Eggplant	November	23/11/2016	Samarra	Al-Rasheed wholesaler
Zucchini	August	5/8/2016	Sulaimaniyah	Al-Rasheed wholesaler
Zucchini	August	15/8/2016	Sulaimaniyah	Al-Rasheed wholesaler
Zucchini	August	29/8/2016	Sulaimaniyah	Al-Rasheed wholesaler
Zucchini	September	9/9/2016	Erbil	Al-Rasheed wholesaler
Zucchini	September	18/9/2016	Erbil	Al-Rasheed wholesaler
Zucchini	September	29/9/2016	Erbil	Al-Rasheed wholesaler
Zucchini	October	5/10/2016	Yusufiyah	Al- Yusufiyah wholesaler
Zucchini	October	15/10/2016	Yusufiyah	Al- Yusufiyah wholesaler
Zucchini	October	29/10/2016	Latifiyah	Al- Yusufiyah wholesaler
Zucchini	November	2/11/2016	Al-Tahialiyah	Al- Yusufiyah wholesaler
Zucchini	November	16/11/2016	Yusufiyah	Al- Yusufiyah wholesaler
Zucchini	November	23/11/2016	Yusufiyah	Al-Rasheed wholesaler

Sample Storage

According to reference [10]. All samples had been stored in deep-freeze in (-20 ºC). The reason of that step is to be sure that the concentration of pesticide residues, will not effect by metabolisms process of micro-organisms decomposer when we are waiting our turn for analyzing our samples by GC/MS. The other purpose is to keep the concentration of pesticide residues, the same concentration when we reach the proper time for carryout treatment of pesticide residues experiment.

Extraction Method

The method that carried out for extract pesticide residues from targeted fruit tissue, is QuEChERS method. The reason behind choose this technique, is coming from the abbreviation name (QuEChERS). The name represent brief for those words, quick, easy, cheap, effective, rugged, and safe. The other reason representative with that, this technique is one of the innovation technique carried out for extraction pesticide residues from vegetables and fruit. According to reference [9]. The samples should be unwashed and with the peel intact. The samples were homogenized by using blender for time more than 1 min to gain homogenized mixture. After that, fifteen gram from homogenized mixture will be putted inside polypropylene centrifuge tube. Next, 15 ml of stock solution consist of (10 ml glacial acetic acid + 1 L acetonitrile), will be added to the tube. After that, 6 g of anhydrous magnesium sulfate + 1.5 g of anhydrous sodium acetate will be add to the mixture of the tube. Then the tube should be closed properly. Then samples should be shaken by using vortex for 1 min, and centrifuge sample for 1 min at 1.6 RCF. According to [13], If your machine working with RPM unit, instead of RCF unit, we need to convert our unit. So we must apply the following equation for conversion process:

RCF=1.12 * R * (RPM/1000)2
whereas:
R: the radius of rotation centrifuge head measured in millimeters.
So the equation will be:
1.6=1.12 * 180 * (RPM/1000)2
So RPM=89.09.

Then 2 ml of supernatant was transferred to polypropylene centrifuge tube contain 100 mg primary secondary amine + 300 mg anhydrous magnesium sulfate. Next 50 mg of graphitized carbon black was added to the tube. The tube was vortexed for 30 second and centrifuged again at 89.09 RPM for 1 min. After that, aliquot will be transferred to GC/MS vial. Now the analyte ready for GC/MS injection [9].

III. Result And Discussion

GC/MS Results

Samples were analyzed by using GC/MS instrument after extraction process had been done. (Table 4) show the results of GC/MS.

Table (4)

Sample	Date	Compound	Formula	Retention time	Peak area	Peak height	Relationship with pesticides
Tomato	5/8/2016	2,3 butanediol	$C_4H_{10}O_2$	2.312	475729	289042	One of the components used in manufacture imidacloprid.
	15/8/2016	2,3 butanediol	$C_4H_{10}O_2$	2.028	5710981	2266526	One of the components used in manufacture imidacloprid.
		Acetamiprid	$C_{10}H_{11}ClN_4$	23.791	645119	230417	Kind of neonicotinoid insecticide used widely in vegetables for combatant pests.
	30/8/2016	2,3-Butanediol	$C_4H_{10}O_2$	3.496	617123	419780	One of the components used in manufacture imidacloprid.
Tomato	5/9/2016	3-Butenoic acid, ethyl ester	$C_6H_{10}O_2$	4.098	27263	11950	Kind of insecticides
		Allyl vinyl ether	C_5H_8O	4.098	27263	11950	Natural product produced by plants for protect them from oxamyl toxicity under the stress of oxamyl.
		t-Butylethylideneamine	$C_6H_{13}N$	6.593	37510	17390	Adjuvant product add to oxamyl and imidacloprid pesticides for improve the properties of delivering the pesticide from soil to plant, it is also increase the activity of pesticides in killing pests.
		Shellsol 140	C_9H_{20}	7.876	93175	50685	Compound belong to oxamyl and imidacloprid solvent, it is part from the constituent of solvent composed of aromatic hydrocarbon.
		1- hexene	C_6H_{12}	10.502	858744	130194	Natural product produced by plants under stress of imidacloprid represent lignin emulsion, the emulsion of this product has ability to control imidacloprid toxicity by combination with active ingredients of pesticide.
		Heksan	C_6H_{14}	12.672	29150	18573	Kind of solvent used with imidacloprid pesticide, it has ability to dilute imidacloprid as, Heksan< 0.1 g/L at 20 °c
		Diheptyl phthalate	$C_{22}H_{34}O_4$	18.487	48141	26345	Compound add to imidacloprid pesticide for reduce the degradation of pesticide by oxidation, it is play important role in reduce the ability of pesticide carbon for absorb oxygen. and that will increase the activity of pesticide by increasing half-life of pesticide.
		Octamethylene glycol	$C_8H_{18}O_2$	20.691	51541	20776	Compound add to imidacloprid pesticide for reducing the formation of foam when farmers dilute the pesticide for reaching the proper concentration for application, foam reduce the solubility of pesticide and effect on pesticide activity in killing pests.
		Nonyl chloroacetate	$C_{11}H_{21}ClO_2$	20.691	51541	20776	Compound used in manufacturing 6-(5- chloropyridin-2-yl)-2-pent-2-ynyl-4,5-dihydropyridazin-3(2H)-one, the latest compound add to imidacloprid for synergism purposes.
		Farnesol	$C_{15}H_{26}O$	28.199	57195	18850	Compound add to imidacloprid pesticide for increase pesticide activity in killing pests.
Tomato	15/9/2016	Di-tert-butyldiazene	$C_8H_{18}N_2$	6.597	14371	6545	Kind of component belong to azithiram pesticide, this pesticide belong to carbamate group of pesticides so it has the same mode of action of oxamyl.
		1-hexen	C_6H_{12}	10.549	518769	57043	Natural product produced by plants under stress of imidacloprid represent lignin emulsion, the emulsion of this product has ability to control imidacloprid toxicity by combination with active ingredients of pesticide.
		Tetrahydrofurfuryl chloride	C_5H_9ClO	15.337	11548	6694	Compound used in production of clothianidin pesticide, the pesticide is kind of neonicotinoid group of pesticide so it has the same mode of action of imidacloprid
		Caprolactam	$C_6H_{11}NO$	10.549	518769	57043	Additives add to oxamyl and imidacloprid pesticide
		Hexadecanoic acid	$C_{16}H_{32}O_2$	19.500	356508	76682	Compound produced when plant under stress of imidacloprid
	29/9/2016	Isobutanol	$C_4H_{10}O$	2.025	22496	43911	Alcohols add to oxamyl and imidacloprid pesticides for better distribution of pesticides inside plants.
		2,2-Dimethyl pentane	C_7H_{16}	6.242	28416	18502	Compound produced by plants for formation of lignin-based matrix micro-particles for control imidacloprid active ingredients by formation of emulsion
		Caprolactam	$C_6H_{11}NO$	8.127	183619	25537	Additives add to oxamyl and imidacloprid pesticide
		Hexadecanoic acid	$C_{16}H_{32}O_2$	14.062	477118	222155	Compound produced when plant under stress of imidacloprid
		Dibutyl phthalate	$C_{16}H_{22}O_4$	14.117	41215	36105	Compound add to oxamyl and imidacloprid pesticides, it has grate impact in preventing volatilization, crystallization, and precipitation of active ingredients for both pesticides.
		Oleamide	$C_{18}H_{35}NO$	15.597	50502	20136	Compound has ability for make inhibition for acetylcholinesterase enzyme, so it is add with the mixture of oxamyl pesticide for fortification the impact of pesticide.
		3-Heptadecanol	$C_{17}H_{36}O$	16.724	986302	268894	Compound add to oxamyl and imidacloprid pesticides, it is represent fatty alcohols that is able to control drift of oxamyl and imidacloprid after application on soil.
Tomat	5/10/201	Hexadecanoic	$C_{16}H_{32}O$	20.44	2114454	90536	Compound produced when plant under stress of imidacloprid

o	6	acid	$_2$	9		7	
		Tridecanoic acid	$C_{13}H_{26}O_2$	20.449	2114454	905367	Additives add to oxamyl and imidacloprid pesticides for increase their control on pest
		E-9-Tetradecenal	C14H26O	25.217	411509	190276	Attractants add to oxamyl and imidacloprid pesticides for conservation environment, increase pesticide activity, and alter the pest behaviors.
		2,13-octadecadien-1-ol	$C_{18}H_{34}O$	25.217	411509	190276	This compound represent kind of insect pheromones add to oxamyl and imidacloprid pesticides as additives play important role in as insect attractive and alter the pest behaviors, it fortified the pesticides performance.
		E-11-Hexadecenal	$C_{16}H_{30}O$	25.217	411509	190276	Attractants add to oxamyl and imidacloprid pesticides for conservation environment, increase pesticide activity, and alter the pest behaviors.
Tomato	17/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	15.883	207277	57104	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	15.883	207277	57104	Additives add to oxamyl and imidacloprid pesticides for increase their control on pest
		E-9-Tetradecenal	$C_{14}H_{26}O$	25.216	1349473	509237	Attractant substance add to oxamyl and imidacloprid pesticides for conservation environment and increase the efficiency of pesticide by altering the behaviors of pest insect.
		2,13 octadecadien-1-ol	$C_{18}H_{34}O$	27.410	472691	146039	This compound represent kind of insect pheromones add to oxamyl and imidacloprid pesticides as additives play important role in as insect attractive and alter the pest behaviors, it fortified the pesticides performance.
		7-Hexadecenal	$C_{16}H_{30}O$	27.410	472691	146039	Attractant substance add to oxamyl and imidacloprid pesticides for conservation environment and increase the efficiency of pesticide by altering the behaviors of pest insect.
Tomato	29/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	15.926	673812	316233	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	15.926	673812	316233	Additives add to oxamyl and imidacloprid pesticides for increase their control on pest
		E-9-Tetradecenal	$C_{14}H_{26}O$	25.258	3768786	1617132	Attractant substance add to oxamyl and imidacloprid pesticides for conservation environment and increase the efficiency of pesticide by altering the behaviors of pest insect.
		E-11-hexadecenal	$C_{16}H_{30}O$	27.472	1475434	368856	Attractant substance add to oxamyl and imidacloprid pesticides for conservation environment and increase the efficiency of pesticide by altering the behaviors of pest insect.
		Diisopropyl sulfite	$C_6H_{14}O_3S$	2.423	110124823	19165230	Compound add to oxamyl and imidacloprid pesticides for formation emulsion that is help in more dispersion of pesticides.
Tomato	2/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves.
	16/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves.
	23/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves.
Eggplant	5/8/2016	2,3-Butanediol	$C_4H_{10}O_2$	2.200	244549	187208	One of the components used in manufacture imidacloprid.
	15/8/2016	2,3-Butanediol	$C_4H_{10}O_2$	2.208	301285	233036	One of the components used in manufacture imidacloprid.
	24/8/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves.
Eggplant	5/9/2016	Diheptyl phthalate	$C_{22}H_{34}O_4$	17.473	24686	11547	Compound add to imidacloprid pesticide for reduce pesticide oxidation, so this will play important role in reduce pesticide degradation, the compound play important role in reduce amount of oxygen that are absorbed by pesticide carbon that is found in pesticide structure.
Eggplant	5/9/2016	Diheptyl phthalate	$C_{22}H_{34}O_4$	17.473	24686	11547	
		Hexadecanoic acid	$C_{16}H_{32}O_2$	18.436	956470	254768	Compound produced by plants when they are under stress of imidacloprid.
		Oleamide	$C_{18}H_{35}NO$	22.320	697154	146643	Compound add to oxamyl pesticide for improve it's effect as acetyl cholinesterase enzyme inhibitor, it is consider as amide of oleic acid and classified as long chain alcohols, it play important role in block connexin molecules in acetyl cholinesterase enzyme.
		3-Heptadecanol	$C_{17}H_{36}O$	22.320	697154	146643	Compound add to imidacloprid and oxamyl pesticide as drift control agent, it represent kind of fatty alcohol.
		2,4-Dimethyl pentane	C_7H_{16}	7.084	28219	15128	Compound produced by plants for formation lignin-based matrix micro particles, the latest compound play important role in control release the active ingredients of pesticides and imidacloprid, is one of them.
Eggplant	15/9/2016	1-Hexene	C_6H_{12}	9.603	336969	42694	Natural product produced by plants under stress of imidacloprid represent lignin emulsion, the emulsion of this product has ability to control imidacloprid toxicity by combination with active ingredients of pesticide.
		Caprolactam	$C_6H_{11}NO$	9.603	336969	42694	Additives add to oxamyl and imidacloprid pesticide
		Hexadecanoic acid	$C_{16}H_{32}O_2$	18.439	1242773	277616	Compound produced by plants when they are under stress of imidacloprid.
		Dodecanal	$C_{12}H_{24}O$	2.063	2657962	708767	Kind of insect pheromone add to oxamyl and imidacloprid for attract the insect to pesticide compounds for more killing impact.
		Dimethyl formamide	C_3H_7NO	2.550	148967	39036	Kind of solvents used in preparation oxamyl pesticide.
Eggpla	29/9/201	Shellsol 140	C_9H_{20}	7.083	81917	38656	Compound belong to oxamyl and imidacloprid solvent, it is part

nt	6						from the constituent of solvent composed of aromatic hydrocarbon.
		Hexene	C_6H_{12}	9.554	810839	164590	Natural product produced by plants under stress of imidacloprid represent lignin emulsion, the emulsion of this product has ability to control imidacloprid toxicity by combination with active ingredients of pesticide.
		Diheptyl phthalate	$C_{22}H_{34}O_4$	17.477	98861	57201	Compound add to imidacloprid pesticide for reduce the degradation of pesticide by oxidation, it is play important role in reduce the ability of pesticide carbon for absorb oxygen. and that will increase the activity of pesticide by increasing half-life of pesticide.
		Caprolactam	$C_6H_{11}NO$	9.554	810839	164590	Additives add to oxamyl and imidacloprid pesticide
		Hexadecanoic acid	$C_{16}H_{32}O_2$	18.447	4544907	1712070	Compound produced by plants when they are under stress of imidacloprid.
Eggplant	5/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	15.914	2021625	875709	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	15.914	2021625	875709	Compound add to oxamyl and imidacloprid pesticides for increase the ability of pesticide on control of pest insects.
		Di isopropyl sulfite	$C_6H_{14}O_3S$	2.017	2223785	2411698	Compound add to oxamyl and imidacloprid pesticide, it play important role in formation of emulsion when we dilute pesticide for application purposes to reach more dispersion.
		Nonadecanoic acid	$C_{19}H_{38}O_2$	19.434	2021894	822358	Compound add to oxamyl and imidacloprid pesticides for formation suspension of active agricultural compounds that is important in manufacture of both pesticides.
		9-Octadecenoic acid (Z)	$C_{18}H_{34}O_2$	21.408	313707	159623	Substance add to imidacloprid and oxamyl pesticides, it play important role as attractant agent for pest spatially whitefly, for increase the effectiveness of pesticide on killing pests, it represent kind of fatty acid.
Eggplant	15/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	19.434	2021894	822358	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	19.434	2021894	822358	Compound add to oxamyl and imidacloprid pesticides for increase the ability of pesticide on control of pest insects.
		Di isopropyl sulfite	$C_6H_{14}O_3S$	2.017	2223785	2411698	Compound add to oxamyl and imidacloprid pesticide, it play important role in formation of emulsion when we dilute pesticide for application purposes to reach more dispersion.
		Nonadecanoic acid	$C_{19}H_{38}O_2$	19.434	2021894	822358	Compound add to oxamyl and imidacloprid pesticides for formation suspension of active agricultural compounds that is important in manufacture of both pesticides.
		9-Octadecenoic acid	$C_{18}H_{34}O_2$	21.222	1785010	462313	Substance add to imidacloprid and oxamyl pesticides, it play important role as attractant agent for pest spatially whitefly, for increase the effectiveness of pesticide on killing pests, it represent kind of fatty acid.
Eggplant	29/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	14.921	36739	15870	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	14.921	36739	15870	Compound add to oxamyl and imidacloprid pesticides for increase the ability of pesticide on control of pest insects.
		Di isopropyl sulfite	$C_6H_{14}O_3S$	2.016	268824	607766	Compound add to oxamyl and imidacloprid pesticide, it play important role in formation of emulsion when we dilute pesticide for application purposes to reach more dispersion.
		9-Octadecenoic acid	$C_{18}H_{34}O_2$	21.252	2799886	924281	Substance add to imidacloprid and oxamyl pesticides, it play important role as attractant agent for pest spatially whitefly, for increase the effectiveness of pesticide on killing pests, it represent kind of fatty acid.
Eggplant	2/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves.
Eggplant	16/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves.
Eggplant	23/11/2016						There is no compounds have relationship with pesticides or pesticides themselves.
Zucchini	5/8/2016	2,3-Butanediol	$C_4H_{10}O_2$	2.464	54625	36359	One of the components used in manufacture imidacloprid
	15/8/2016	2,3-Butanediol	$C_4H_{10}O_2$	2.464	54625	36359	One of the components used in manufacture imidacloprid
	29/8/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves.
Zucchini	9/9/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	14.069	231864	134256	Compound produced by plants when they are under stress of imidacloprid.
		2,2 Di methyl pentane	C_7H_{16}	6.245	17611	12314	Compound produced by plants for formation lignin-based matrix micro particles, the latest compound play important role in control release the active ingredients of pesticides and imidacloprid, is one of them.
Zucchini	18/9/2016	3-Hexene	C_6H_{12}	10.481	787007	140415	Natural product produced by plants under stress of imidacloprid represent lignin emulsion, the emulsion of this product has ability to control imidacloprid toxicity by combination with active ingredients of pesticide.
		Caprolactam	$C_6H_{11}NO$	10.481	787007	140415	Additives add to oxamyl and imidacloprid pesticide
Zucchini	18/9/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	19.450	1142434	303999	Compound produced by plants when they are under stress of imidacloprid.
Zucchini	18/9/2016	3-Heptadecanol	$C_{17}H_{36}O$	23.331	121780	35326	Compound add to oxamyl and imidacloprid pesticides, it is represent fatty alcohols that is able to control drift of oxamyl and imidacloprid after application on soil.
Zucchini	29/9/2016	Diheptyl phthalate	$C_{22}H_{34}O_4$	13.443	16203	11351	Compound add to imidacloprid pesticide for reduce the degradation of pesticide by oxidation, it is play important role in reduce the

							ability of pesticide carbon for absorb oxygen. and that will increase the activity of pesticide by increasing half-life of pesticide.
		Farnesol	$C_{15}H_{26}O$	19.647	43023	18067	Compound add to imidacloprid pesticide for increase pesticide activity in killing pests.
		Caprolactam	$C_6H_{11}NO$	8.142	74564	15335	Additives add to oxamyl and imidacloprid pesticide
		Hexadecanoic acid	$C_{16}H_{32}O_2$	14.071	347768	150751	Compound produced by plants when they are under stress of imidacloprid.
		Caprolactam	$C_6H_{11}NO$	8.142	74564	15335	Additives add to oxamyl and imidacloprid pesticide
Zucchini	5/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	15.955	2222739	807316	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	15.955	2222739	807316	Compound add to oxamyl and imidacloprid pesticides for increase the ability of pesticide on control of pest insects.
		Z-7-Tetradecenal	$C_{14}H_{26}O$	22.475	443896	265256	Attractant substance add to oxamyl and imidacloprid pesticides for conservation environment and increase the efficiency of pesticide by altering the behaviors of pest insect.
		E-11-Hexadecenal	$C_{16}H_{30}O$	27.475	1806401	603917	Attractant substance add to oxamyl and imidacloprid pesticides for conservation environment and increase the efficiency of pesticide by altering the behaviors of pest insect.
		Di isopropyl sulfite	$C_6H_{14}O_3S$	2.290	35791216	13202293	Compound add to oxamyl and imidacloprid pesticide, it play important role in formation of emulsion when we dilute pesticide for application purposes to reach more dispersion.
Zucchini	15/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	15.733	1876357	558461	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	15.733	1876357	558461	Compound add to oxamyl and imidacloprid pesticides for increase the ability of pesticide on control of pest insects.
		E-9-Tetradecenal	$C_{14}H_{26}O$	25.068	1137006	340748	Attractant substance add to oxamyl and imidacloprid pesticides for conservation environment and increase the efficiency of pesticide by altering the behaviors of pest insect.
		Diisopropyl sulfite	$C_6H_{14}O_3S$	2.380	61079927	17309165	Compound add to oxamyl and imidacloprid pesticide, it play important role in formation of emulsion when we dilute pesticide for application purposes to reach more dispersion.
		Dodecanoic acid	$C_{12}H_{24}O_2$	15.733	1876357	558461	Compound represent bio toxin produced by specific kind of fungous, *Pleurotus ostreatus* L. Add to oxamyl pesticide as additives and has ability to immobilizes 95% of nematodes in one hour, so it will fortified pesticide.
Zucchini	29/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	19.439	4199582	150667	Compound produced by plants when they are under stress of imidacloprid.
		Diisopropyl sulfite	$C_6H_{14}O_3S$	2.216	729949	298712	Compound add to oxamyl and imidacloprid pesticide, it play important role in formation of emulsion when we dilute pesticide for application purposes to reach more dispersion.
		Nonadecanoic acid	$C_{19}H_{38}O_2$	19.439	4199582	150667	Compound add to active ingredients of both pesticides, oxamyl and imidacloprid, for formation of suspension of active ingredients for both pesticides.
		4-Methyloctanoic acid	$C_9H_{18}O_2$	19.439	4199582	150667	Alkaloids add to oxamyl and imidacloprid pesticide for formation plant sap able to combine with active ingredients of both pesticides.
Zucchini	2/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves
Zucchini	16/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves
Zucchini	23/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves
Cucumber	5/8/2016	2,3-Butanediol	$C_4H_{10}O_2$	3.847	6415361	217964	One of the components used in manufacture imidacloprid
		1,3,4-thiadiazole	$C_3H_4N_2S_3$	24.375	638337	0	Kinds of fungicides
Cucumber	15/8/2016	Methoxyacetone 2,3-Butanediol	$C_4H_8O_2$ $C_4H_{10}O_2$	2.093 2.615	708957 2685383	557503 100793	Kind of herbicides Compound used in manufacture imidacloprid.
Cucumber	29/8/2016	Formamide	CH3NO	2.157	26444	14597	Compound resulting from incomplete degradation of oxamyl pesticide.
		2,3-Butanediol	$C_4H_{10}O_2$	2.556	263161	187847	One of the components used in manufacture imidacloprid
Cucumber	5/9/2016	Glycerol	$C_3H_8O_3$	9.213	72213	16918	Compound used in production of acrolein, acrolein used in the process of imidacloprid production pesticide.
		Hexadecanal	$C_{16}H_{32}O$	15.716	559743	326251	This compound represent kind of insect pheromones add to oxamyl and imidacloprid pesticides as additives play important role in as insect attractive and alter the pest behaviors, it fortified the pesticides performance.
		9,17-Octadecadienal	$C_{18}H_{32}O$	17.697	322515	175996	This compound represent kind of insect pheromones add to oxamyl and imidacloprid pesticides as additives play important role in as insect attractive and alter the pest behaviors, it fortified the pesticides performance.
		9,12,15-Octadecatrienal	$C_{18}H_{30}O$	17.768	1093551	544172	This compound represent kind of insect pheromones add to oxamyl and imidacloprid pesticides as additives play important role in as insect attractive and alter the pest behaviors, it fortified the pesticides performance.
Cucumber	15/9/2016	Farnesol	$C_{15}H_{26}O$	26.078	30931	16450	Compound add to imidacloprid pesticide for increase pesticide activity in killing pests.

		9,12,15-Octadecatrienal	$C_{18}H_{30}O$	17.803	113821	27970	This compound represent kind of insect pheromones add to oxamyl and imidacloprid pesticides as additives play important role in as insect attractive and alter the pest behaviors, it fortified the pesticides performance.
Cucumber	15/9/2016	Isovaleric acid	$C_5H_{10}O_2$	11.021	8014	5417	Compound produced by plants when they are under stress of oxamyl.
		2-Methylbutyl butyrate	$C_9H_{18}O_2$	15.757	56410	18399	Compound add to oxamyl pesticide as attractance.
		1-Cyclohexylethanamine	$C_8H_{17}N$	20.315	64220	11120	Compound add with oxamyl and imidacloprid pesticides as control agent for agricultural pest.
Cucumber	29/9/2016	Shellsol 140	C_9H_{20}	7.892	88638	44979	Compound belong to oxamyl and imidacloprid solvent, it is part from the constituent of solvent composed of aromatic hydrocarbon.
		3-Hexene	C_6H_{12}	10.502	800980	122081	Natural product produced by plants under stress of imidacloprid represent lignin emulsion, the emulsion of this product has ability to control imidacloprid toxicity by combination with active ingredients of pesticide.
		Farnesol	$C_{15}H_{26}O$	28.212	92363	26314	Compound add to imidacloprid pesticide for increase pesticide activity in killing pests.
		Caprolactam	$C_6H_{11}NO$	10.502	800980	122081	Additives add to oxamyl and imidacloprid pesticide
		2,3-Dimethylpentane	C_7H_{16}	7.892	88638	44979	Compound produced by plants for formation lignin-based matrix micro particles, the latest compound play important role in control release the active ingredients of pesticides and imidacloprid, is one of them.
Cucumber	5/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	19.424	700072	320558	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	19.424	700072	320558	Compound add to oxamyl and imidacloprid pesticides for increase the ability of pesticide on control of pest insects.
		Diisopropyl sulfite	$C_6H_{14}O_3S$	2.017	1495985	1726914	Compound add to oxamyl and imidacloprid pesticide, it play important role in formation of emulsion when we dilute pesticide for application purposes to reach more dispersion.
		9,11-Dodecadien-1-ol	$C_{12}H_{22}O$	18.675	28065	16930	Additive add to oxamyl and imidacloprid pesticides active ingredients, it make synergism with oxamyl and imidacloprid pesticides.
Cucumber	15/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	15.911	1421531	600891	Compound produced by plants when they are under stress of imidacloprid.
		Tridecanoic acid	$C_{13}H_{26}O_2$	15.911	1421531	600891	Compound add to oxamyl and imidacloprid pesticides for increase the ability of pesticide on control of pest insects.
		Dodecanoic acid	$C_{12}H_{24}O_2$	15.911	1421531	600891	Compound represent bio toxin produced by specific kind of fungous, *Pleurotus ostreatus* L. Add to oxamyl pesticide as additives and has ability to immobilizes 95% of nematodes in one hour, so it will fortified pesticide.
		Decanoic acid	$C_{10}H_{20}O_2$	15.911	1421531	600891	Compound represent bio toxin produced by specific kind of fungous, Pleurotus ostreatus L. Add to oxamyl pesticide as additives and has ability to immobilizes 95% of nematodes in one hour, so it will fortified pesticide.
		Undecanal	$C_{11}H_{22}O$	17.715	531133	287142	Synthetic fragrances add to imidacloprid and oxamyl pesticide, it increased the foliar penetration of active ingredients or create formulation of bait that increase the ability of pesticides on killing pests.
Cucumber	29/10/2016	Hexadecanoic acid	$C_{16}H_{32}O_2$	15.913	1060373	502959	Compound produced by plants when they are under stress of imidacloprid.
Cucumber	29/10/2016	Tridecanoic acid	$C_{13}H_{26}O_2$	15.913	1060373	502959	Compound add to oxamyl and imidacloprid pesticides for increase the ability of pesticide on control of pest insects.
		E-9-Tetradecenal	$C_{14}H_{26}O$	25.236	3062858	1518693	Attractant substance add to oxamyl and imidacloprid pesticides for conservation environment and increase the efficiency of pesticide by altering the behaviors of pest insect.
		Diisopropyl sulfite	$C_6H_{14}O_3S$	2.017	13855718	14225602	Compound add to oxamyl and imidacloprid pesticide, it play important role in formation of emulsion when we dilute pesticide for application purposes to reach more dispersion.
		Decanoic acid	$C_{10}H_{20}O_2$	15.913	1060373	502959	Compound represent bio toxin produced by specific kind of fungous, Pleurotus ostreatus L. Add to oxamyl pesticide as additives and has ability to immobilizes 95% of nematodes in one hour, so it will fortified pesticide.
Cucumber	2/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves
Cucumber	16/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves
Cucumber	23/11/2016	-	-	-	-	-	There is no compounds have relationship with pesticides or pesticides themselves

2,3 butanediol

According to [11], it has been discovered that determinant aqueous insecticidal composition based on combined with surfactant, inorganic carrier, antifreeze agent, insecticide of neonicotinoid, will form class of strong stable components. The additives will improve flow ability, good adherence to plant propagation material, dust-off, and excellent performance on cold or frozen seeds. Kind of neonicotinoid that is used for this purposes is imidacloprid. The aqueous insecticide comprises about 25% of at least one component of antifreeze,

for example 2,3 butanediol. Due to [12], ethanol, that is one of imidacloprid solvents, when it meet 2,3 butanediol, the mixture will become toxic to rats, so the mixture has toxic properties.

Acetamiprid

Kind of neonicotinoid insecticide, used for combating aphides and whitefly. The insecticide used widely in vegetables farms and has the same mode of action of imidacloprid[14].

1,3,4-thiadiazole

Compound used in the process of production pesticide against Rhizoctonia solani pest [15].

formamide

Oxamyl degradation happed by two pathway: hydrolysis to the oximino compound or enzymatic conversion via DMCF (dimethyl cyanoformamide) to N,N-dimethyloxamic acid. So formamide, is one of the compounds that forming the metabolism enzyme that is able for degrade oxamyl. It's existence clear evidence for complete degradation of active ingredients of oxamyl pesticide[16]. Formamide considered as irritant substance for respiratory system when analyte, it has median lethal dose (LD_{50}) of > 5,577 mg/kg and no observed adverse effective level (NOAEL) of 113 mg/kg/day. So it has toxic proparity[17].

3-Butenoic acid, ethyl ester

According to [18], the compound 3-Butenoic acid, ethyl ester has pesticide properties because it is able to combatant pests.

Allyl vinyl ether

As [19] reference mentioned that Allyl vinyl ether is one of oxamyl components that are represent caprolactam and/or caprolactam derivatives.

t-Butyl ethylideneamine

According to [20], herbicide, fungicides, insecticides, miticides, acaricides, and nematocides are broadly used in agriculture. pesticides contain adjuvant like surfactants to improve the handling of active ingredients and develop the composition of pesticide. Oxamyl and imidacloprid pesticides are one of the pesticides that this compound add to them for the mentioned purpose. It support some water condition to pesticide like chelating agent.

Shellsol 140

Due to [21], shellsol 140, is one of the organic solvents that could be used for liquefying pesticides for example oxamyl from carbamate pesticides. Reference [22], mentioned that, shellsol, is one of the solvent systems consist of aromatic hydrocarbons used to make active ingredients for pesticides like imidacloprid available for plants.

1-Hexene

As reference [23] mentioned that, hexene, is one of the organic solvents that are used in emulsifier pesticides like imidacloprid. It is one of the important compounds that is used in control release of imidacloprid pesticide active ingredients for prolong activity purposes .

Heksan

According to [24], heksan, is one of the organic solvents used for dilute imidacloprid pesticide. It is also used for mitigate the rate of imidacloprid photo degradation for prolong the duration life of imidacloprid impact.

Diheptyl phthalate

Diheptyl phthalate, is compound add to imidacloprid pesticide to reduce the degradation of pesticide by oxidation. It is considered as plasticizers components that add kind of elasticity to pesticide [25].

Octamethylene glycol

Due to the reference [26], this compound is add for low formation of foam for enhancing the reaction between water and imidacloprid pesticide when the farmer dilute it to reach the recommended concentration for application.

Nonyl chloroacetate

Compound used in preparing 6-(5-chloropyridin-2-yl)-2-pent-2-ynyl-4,5-dihydropyridazin-3(2H)-one. The latest compound add to imidacloprid pesticide for synergism purposes. The compound allow for the reaction to be slowly acclimatized with ambient temperature for putting aside any molecular destruction [27].

Farnesol
Compound add to imidacloprid for increase the pesticide ability for killing pest. There is significant relationship between increase the concentration of the compound and the efficiency of pesticide [28].

Di-tert-butyldiazene
Compound belong to azithiram pesticide, this pesticide belong to carbamate group, so it has the same mode of action[29].

Caprolactam
Represent polyester amide, it is biodegradable substance add to oxamyl and imidacloprid pesticide as plant treatment agent for improving the composition of pesticides[30 , 31].

Tetrahydrofurfuryl chloride
Compound used in the production of clothianidin insecticide, it has the same mode of action of imidacloprid[32]**.**

Hexadecanoic acid
Compound has toxicity to nematodes, so it is successfully used as nematocides like oxamyl and could be add to oxamyl for synergism purposes [33]. According to reference [34], plant Brassica juncea L. produce this compound when it will be under stress of imidacloprid.

Isobutanol
Compound add to imidacloprid and oxamyl pesticides for rapid uptake of active ingrediants by plants, better distribution of pesticide inside the plant and soil, and prevent any injury that maybe happed to the plants due to the effect of pesticides[35].

2,2-Dimethyl pentane
Organic solvent used with oxamyl and imidacloprid pesticide for producing lignin-based matrix micro-particles for the controlled release of an agricultural active ingredients includes forming an emulsion of an organic solution in an aqueous
solution [23].

Dibutyl phthalate
compound add to oxamyl and imidacloprid pesticide for preventing volatilization, crystallization, and precipitation of active ingredients for more effectiveness of pesticide in killing pest. It is also used to anti fouling compounds which play important role in conservation environment by preventing adherence of pesticide compounds with water for increase the ability of decomposers for decomposition[36 , 37].

Oleamide
This compound has great impact in inhibiting acetylcholinesterase enzyme. so it is add to oxamyl for fortified pesticide impact. The compound has ability for blocking connexin by long chain of alcohol found inside the structural formula. Connexin is class of transmembrane proteins that form assembled structures in vertebrates [38].

3-Heptadecanol
Kind of fatty alcohol, used as drift control agent that is add to pesticides like oxamyl and imidacloprid [39].
Glycerol
Substance used in the process of preparing pesticide intermediate acrolein by using glycerol [40].
Hexadecanal
Compound add to oxamyl and imidacloprid pesticide as insecticide attractant and killing agent. It increase the performance of insecticides in control pests[41].

2,13-Octadecadienal
compound classified as pheromones or insecticidal active compounds produced by the plant naturally. It add to pesticides like imidacloprid or oxamyl as attractive material [42].

9,12,15 Octadecatrienal
It is kind of insect pheromones add to imidacloprid pesticide for integrated pest management issue[43].

2-Methyl butyl butyrate

This compound represent Wheat germ alcohol extracts, they play important role as feeding attractant for larvae of *Spodoplera lilurae* L. It is add to many pesticides like oxamyl for their high ability in attract pests and that will fortifying the pesticide ability in killing pest[44]

1-cyclohexylethylamine

One of the amide compounds that shows excellent ability in controlling insect pests. It add to many pesticides and oxamyl is one of them[45].

Dodecanal

Is insect pheromones add to most carbamate pesticides as addatives. it is sexual pheromones able to make sexual disruption and reduce the population of insect pest[46].

Di-methylformamide

One of the solvents that are used to make oxamyl pesticide able to be up take by plant or soil[47].

Tridecanoic acid

The compound add to imidacloprid and oxamyl pesticide as anion surfactant. it will help in reduce the surface tension of liquid pesticide and that will serve for more diffusion [48]

E-9-Tetradecenal

substance produce by the plant add to pesticides like oxamyl and imidacloprid because this substance classified as pheromones, kairomones that defined as any substance that is produced by individual species for the advantages of other different recipient species or attractants [49].

2,13-octadecadien-1-ol

compound classified as pheromones or insecticidal active compounds produced by the plant naturally. It add to pesticides like imidacloprid or oxamyl as attractive material [50].

E-11-Hexadecenal

substance classified as classified as pheromones, kairomones that defined as any substance that is produced by individual species for the advantages of other different recipient species or attractants add to pesticides for fortification purposes [41].

Di isopropyl sulfite

This compound is used in the Process for the preparation of pesticide-comprising aqueous polymer dispersions With an average particle size of the dispersed particles of <1000 nm by radical polymerization of an oil-in-Water emulsion, In order to modify the properties of the polymers, we used Di isopropyl sulfite for that purpose. the compound is used in the process of production oxamyl and imidacloprid pesticide [51].

9,11-Dodecadien-1-ol

Compound add to imidacloprid pesticide to increase the dispersion of pesticide inside the environment applied and that will increase the activity of pesticide in killing pest [52].

Dodecanoic acid and Decanoic acid

The compound represent bio-toxin, purified from *Pleurotus ostreatus* L. fungus. Add to oxamyl pesticide as additives. It has the ability for immobilizes 95% of nematodes within one hour, so it will increase the control of pesticide on pests[53].

Undecanal

Fragrances synthetic add to imidacloprid pesticides and oxamyl to increase foliar penetration of active ingredients or create formulation of baits for pests[54].

Nonadecanoic acid

The compound represent monocarboxylic acids. It is kind of fatty acids that is add to oxamyl and imidacloprid pesticides for formation suspension belong to active ingredients of both pesticides[55].

4-Methyloctanoic acid

Compound represent polyhydroxyalkanoates.It is add to oxamyl and imidacloprid as kind of solid shape plant treatment. the compound facilitate the process of fusion between the active ingredient of pesticides and plant sap for systematic treatment with pesticides[56].

E-11-Tetradecenoic acid

Preservatives, add to imidacloprid pesticide for delay the fast decomposition process of pesticide for better effect[57].

9-Octadecenoic acid

kind of fatty acid add to imidacloprid pesticide as attractant. It showed ability for attract whitefly to any desired location, so it will fortified imidacloprid pesticide[58].

IV. Discussion Of GC/MS Results

The results of GC/MS, shows that the collection from November months is the better one because all kinds of pesticides and pesticides bi-products have been decomposed. The reason for that return back to the kind of agriculture applied, greenhouse kind of agriculture is applied in this month. According to reference [59], five

important factors affect the rate of decomposition that is happed by micro-organisms decomposer: temperature, aeration, soil pH, soil moisture, and C:N ratio. The highest average of temperature in Iraq reaches to 37.41 ºc in hottest months but there is high fluctuation in the temperatures between morning, afternoon, evening and night [60]. The optimal temperature for working micro-organisms decomposer is 30-40 ºc but the high fluctuation retard the decomposition process [59]. So this is the reason for fully decomposition for active ingredients for pesticides applied during life-cycle of targeted vegetables including the most important two pesticides that are used in planting vegetables, oxamyl and imidacloprid. But the high fluctuation in temperature do not let the decomposers done their work, that was happed in exposed kind of agriculture months, August, September, and October. but in greenhouse kind of agriculture that is happed in November, the plastic cover prevent the fluctuation of temperature due to it's ability for reverse the infrared beams that are coming from sun and return it back to soil and prevent the dispersion of them will keep the soil warm during the night and other equipments add to greenhouse that prevent the fluctuation of temperature. Best moisture soil contain for the optimal work of decomposers is 60 to 80 percent of the water-holding capacity [59]. So greenhouse kind of agriculture can set the moisture contain of soil better than exposed agriculture due to less evaporation that is happed in greenhouse. About soil aeration, soil pH and C:N ratio are the same in both kinds of agriculture because the farmer use the same field in both kinds of agriculture but the difference in plastic mulch. Aeration in both kinds of agriculture are served in optimal way and C:N ratio are kept in optimal ratio by fertilizers. Photo degradation water degradation of pesticide have grate impact on increase the rate of degradation in both kinds of agriculture [61 - 62]. The half-life of imidacloprid and oxamyl in tomato fruits (kind of vegetables) were 2.88,3.12, and 3.46 days after 12 days from application[63]. Our targeted vegetables are ephemeral plants, so their life cycle ended in 1-3 months. So before the targeted plants harvested, the concentration of pesticide reduced to half the concentration when it apply to plant, that is another reason of disappearing oxamyl and imidacloprid active ingredients in all samples. According to reference [64], imidacloprid can bind with soil organic matter and that reduce potentially the ability of imidacloprid for leaching throw the soil, this explain the reason of high ability for decomposers for degrade the active ingredients of imidacloprid.

The samples 29/8/2016, zucchini from Sulaimaniyah and 24/8/2016, eggplant from Al-Yusufiyah, showed no pesticide residues or pesticide bi-products residues, the investigation revealed that the kind of planting soil is sandy soil. Sand soil has ability for leaching imidacloprid up to 97%, so this is the reason of disappearing pesticides and pesticides bi-products[65 , 66].

The commercial formulation of imidacloprid pesticides contain components increase the leaching rate of active ingredients belong to pesticide more than their normal rate for environmental conservation purposes. When temperature reach to 20 ºC, the rate of imidacloprid solubility in water increase 610 higher than other circumstances with aqueous photolysis reach to 0.2 faster and water-sediment reach to 129 slower than other condition, this also explain the reason for disappear imidacloprid from November samples[66].

Oxamyl showed low persistence in the soil, the half-life for pesticide is 4-20 days[67]. Reduction is due to decomposition by aerobic and anaerobic bacteria[68]. Oxamyl decay rapidly in alkaline soils and more slowly in acidic soils[69]. Oxamyl does not bind or adsorb to soil particles, but it has ability to leach in soil[67, 69]. Oxamyl has strong adsorption in soils contain high concentration of organic matter, but their adsorption is week in sandy loam. any increase in temperature level make decrease in adsorption[70].

Due to the high ability of bacteria for decompose oxamyl, it is found rarely in surface water and frequently in ground water[71]. Oxamyl residual duration life in plants are 1-2 weeks. It is considered non toxic for plants[72]. Oxamyl metabolized rapidly by plants and can translocate easily in plant parts[69].

V. Conclusion

We can conclude that the targeted local Iraqi vegetables are healthy vegetables because the GC/MS results shows no pesticide residues and the existence of only pesticides bi-products. The degradation rate for pesticides are high in Iraqi soil, that reverse in best way on Iraq people's health. The greenhouse kind of agriculture is much better than exposed kind of agriculture. Despite the fact that our targeted pesticides, oxamyl and imidacloprid, are highly hazardous and moderate hazardous consequently. They look like safe to be used for agricultural purposes due to their short half-life and high ability for degradation. Some of the bi-products that appeared in GC/MS results, are safe for human health because they are natural compounds found in the plants, the other shows kind of hazardous, due to their toxicity or become toxic when they are combine with some compounds available inside the pesticide mixture.

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