IAEA-CN290-488

PESTICIDE RESIDUE SCREENING AND DETERMINATION IN AGRICULTURAL SOIL AND EFFLUENT WATER WITH GCMS AND FTIR METHODS FOR THE PURPOSE OF PESTICIDE REMOVAL USING GAMMA IRRADIATION

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2nd International Conference on

Applications of Radiation Science and Technology

#ICARST2022

22—26 August 2022

IAEA Headquarters

Vienna, Austria

Outline

1. Aim
2. Materials and Method (Sample collection, analysis)
3. Result and Discussions
4. Conclusion

Aim

Screening analysis of pesticides in agricultural soil and water after cultivated farmland in Myanmar using GCMS and FTIR analysis for the purpose of pesticide removal using gamma irradiation

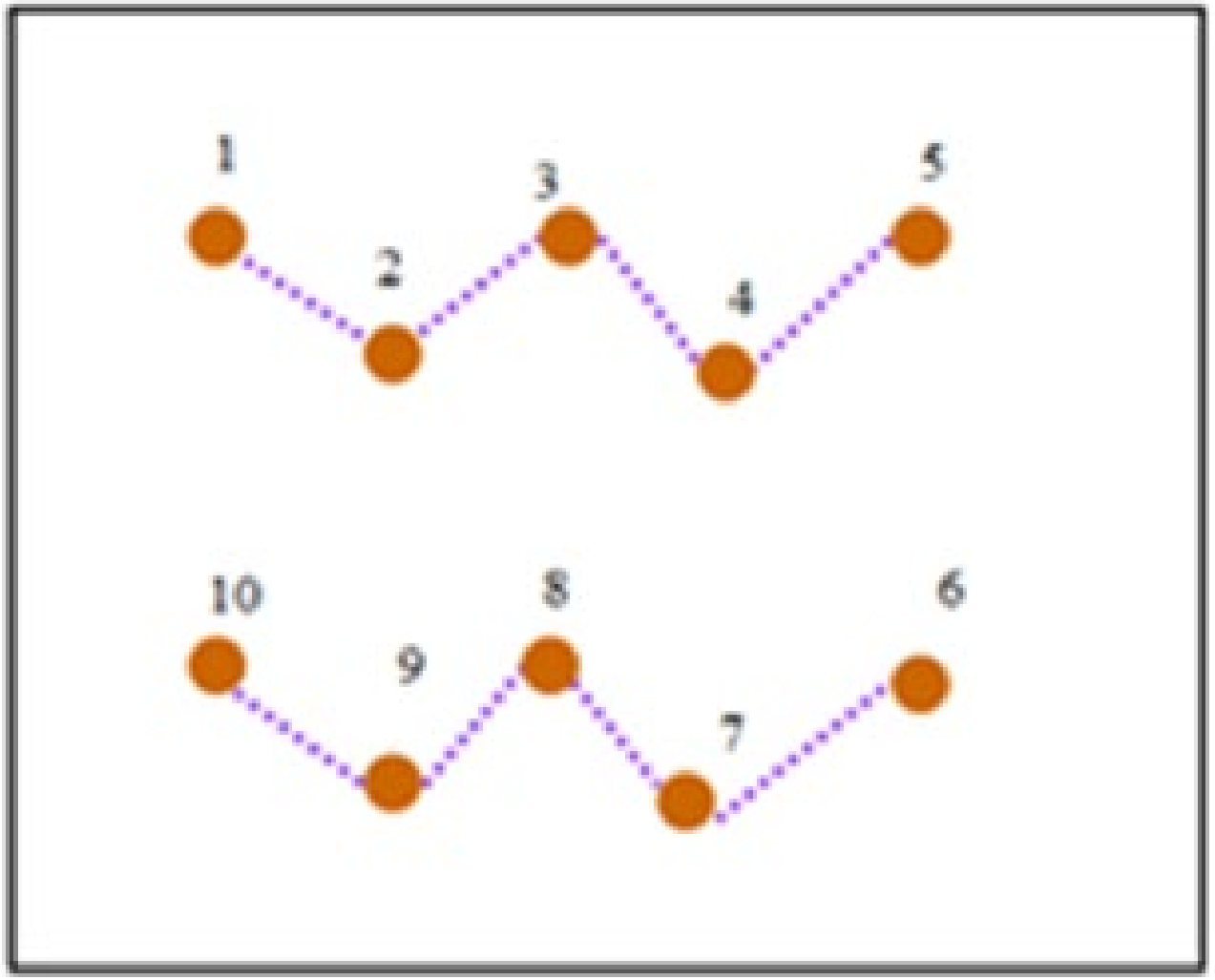
Materials and Method

- Sample Collection
- Sample Preparation
- Analysis

Sample Collection

- Target area: pumpkin and water melon in 30 acres in middle part of Myanmar.
- Collection in ten points from one acre among 30 acres of cultivated land in zigzag pattern at depth (15-25 cm).

Soil sampling design










Sample preparation

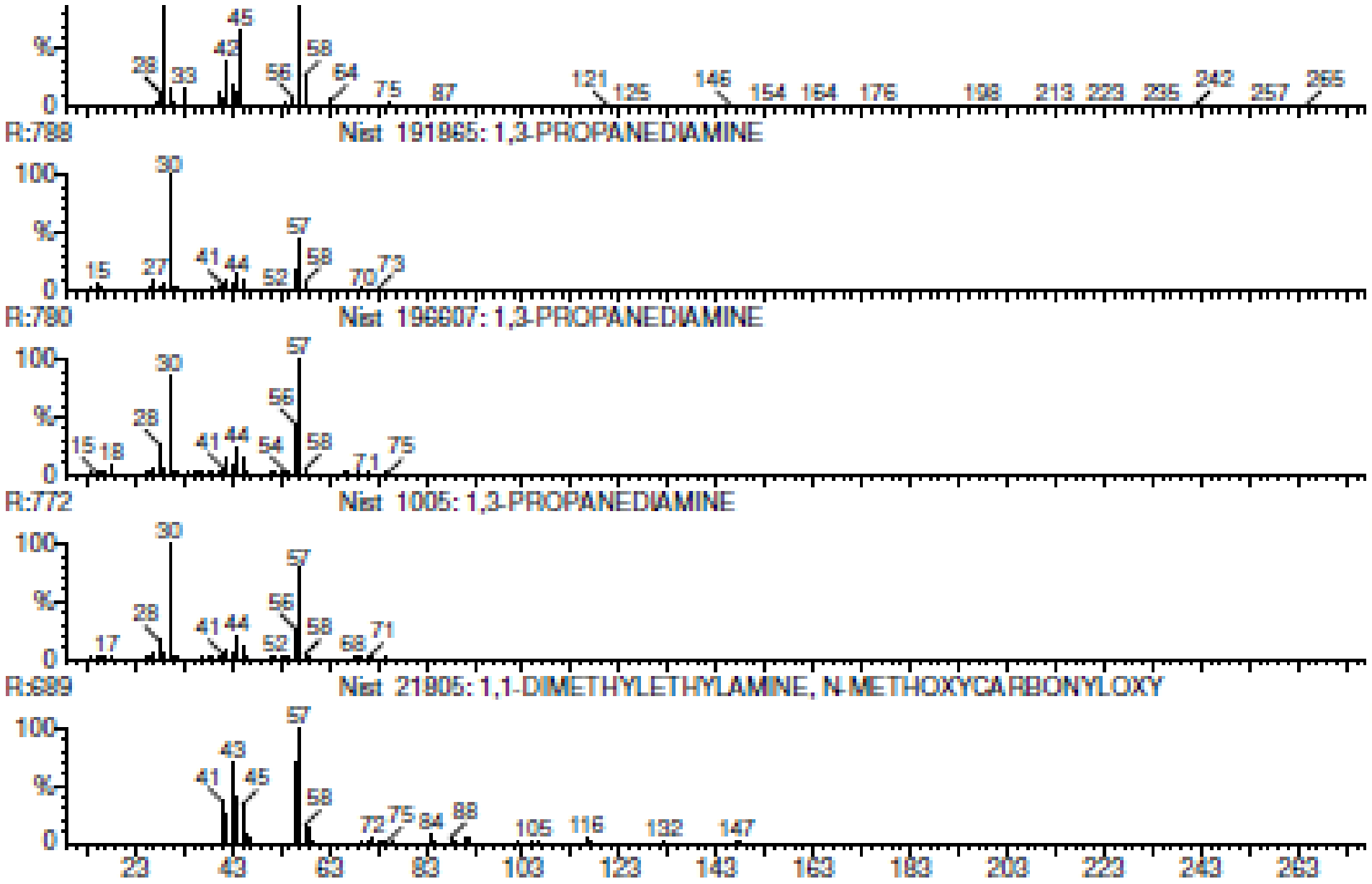
- Soil sieved and stored in air tight zipped plastic at 4 C until analysis
- Soil Extraction for GCMS analysis (NaCl, Methanol, Dichloromethane).
- Water sample collection with standard guideline
- Extraction with normal hexane GCMS analysis for effluent water.

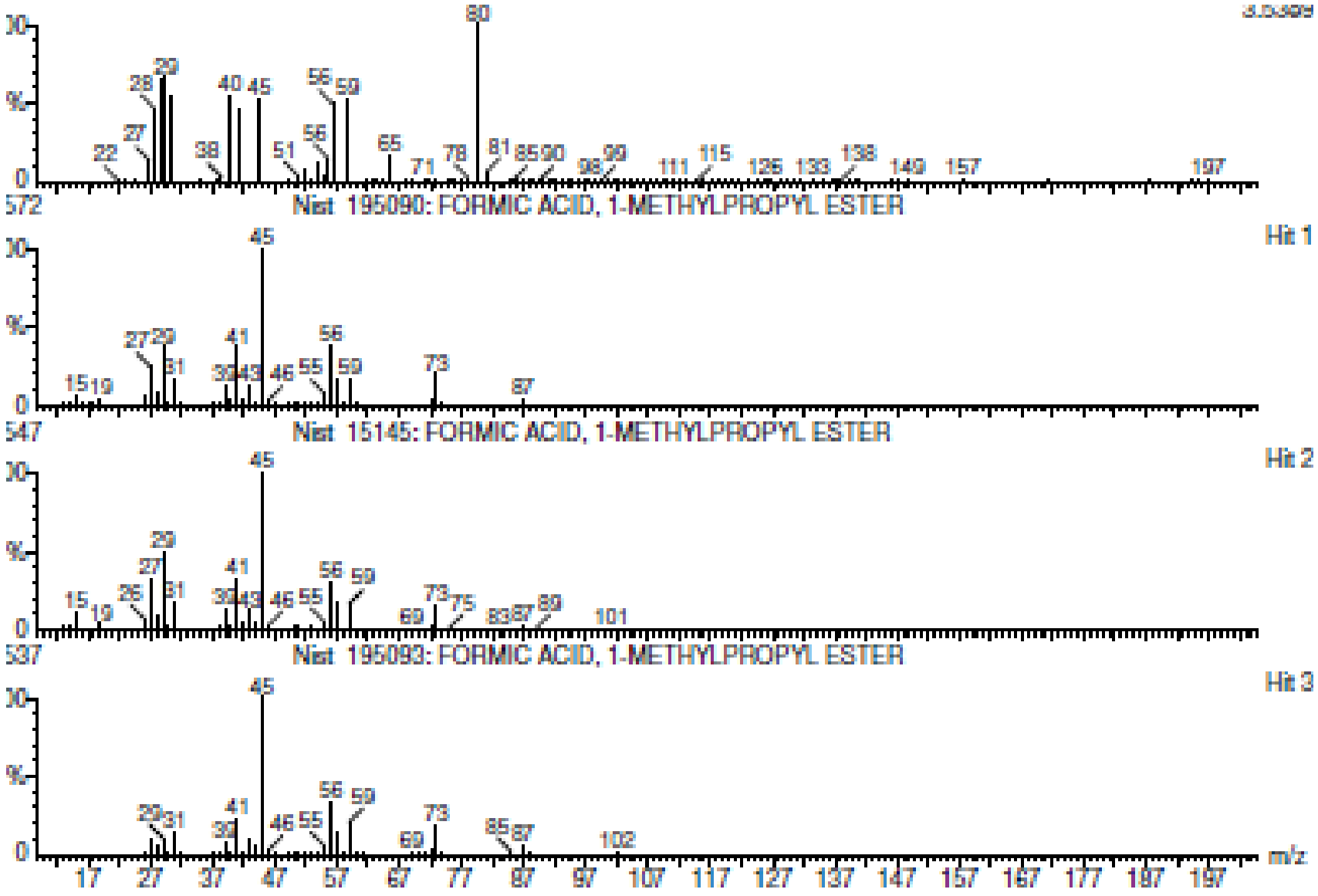
Analysis

- Gas Chromatography/Mass Spectroscopy ,GCMS (high-performance Clarus ® Gas Chromatograph/Mass Spectrometry)
- Fourier Transform Infrared Spectrometry, FTIR (MODEL Shimadzu IR Prestige-21 FTIR)

Result and Discussion

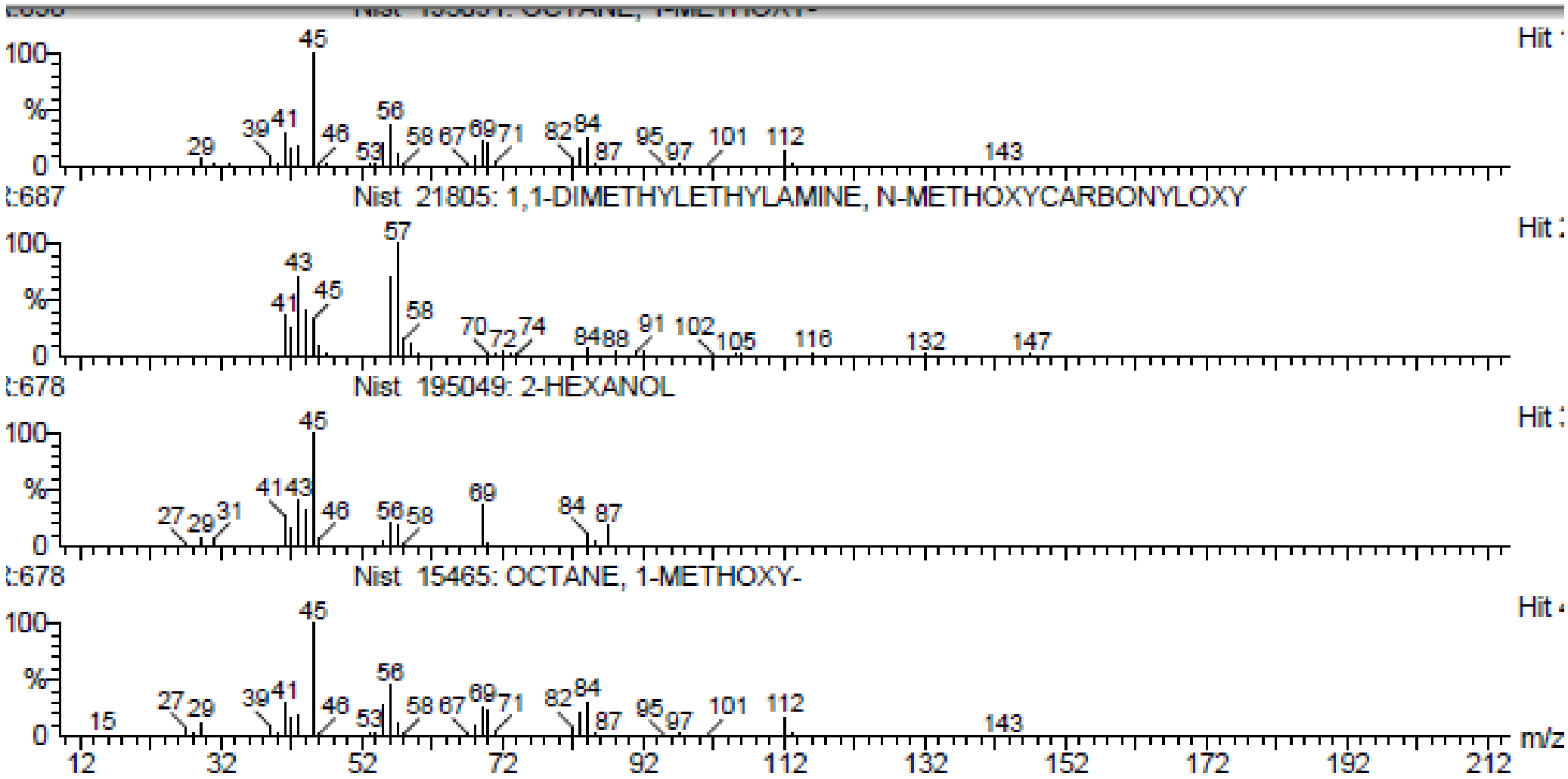
- From GCMS analysis for agricultural soil after cultivated,
- Organophosphate compound and carbonates pesticides (TERT-BUTYLCARBAMATE,1-METHYL-3-CARBMETHOXY- METHYLCARBAM- IDOYL DIAZIRIDINE and 3-AZONIA-5-HEXENE-1-OL, N,N-DIMETHYL-, CARBAMATE ESTER, BROMIDE.etc) of organophosphate groups in soil were investigated in GCMS results.

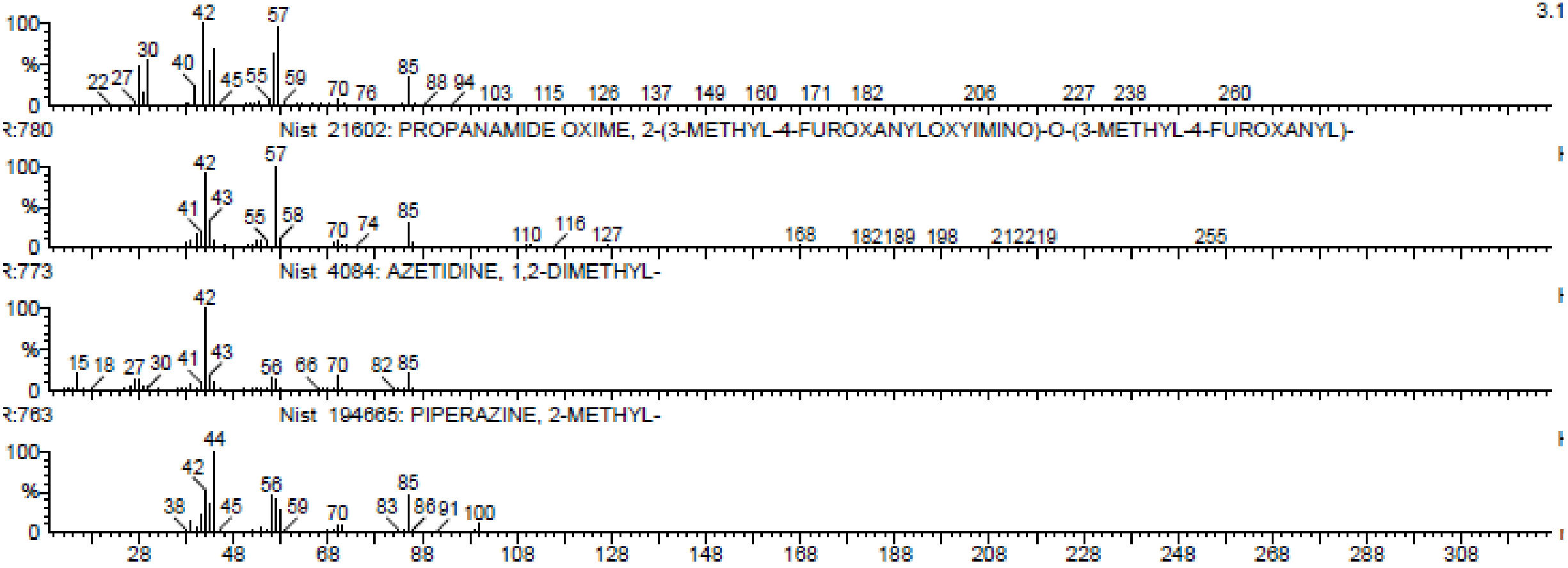

R:788
Nist 191965: 1,3-PROPANEDIAMINE
R:790
Nist 196607: 1,3-PROPANEDIAMINE
R:772
Nist 1005: 1,3-PROPANEDIAMINE
R:689
Nist 21805: 1,1-DIMETHYLETHYLAMINE, N-METHOXYCARBONYLOXY


572
Nist 195090: FORMIC ACID, 1-METHYLPROPYL ESTER
Hit 1
547
Nist 15145: FORMIC ACID, 1-METHYLPROPYL ESTER
Hit 2
537
Nist 195093: FORMIC ACID, 1-METHYLPROPYL ESTER
Hit 3
%
m/z

GCMS analysis for Effluent Water

- From GCMS analysis for agricultural effluent water after cultivated,
- 1H-IMIDAZOLE,1-METHYL-3-CARBMETHOXY-3-METHYL CARBAMIDOYL DIAZIRIDINE, NITROUS ACID, CYCLOHEXYL ESTER, etc of organophosphate group in waste water effluent from farmland were investigated in GCMS results.


Nist 21805: 1,1-DIMETHYLETHYLAMINE, N-METHOXYCARBONYLOXY
Nist 195049: 2-HEXANOL
Nist 15465: OCTANE, 1-METHOXY-
100
%
0
m/z
12
32
52
72
92
112
132
152
172
192
212


3.1
100
%
0
42
57
30
40
22
27
45
55
59
70
76
85
88
94
103
115
126
137
149
160
171
182
206
227
238
260
R:780
Nist 21602: PROPANAMIDE OXIME, 2-(3-METHYL-4-FUROXANYLOXYIMINO)-O-(3-METHYL-4-FUROXANYL)-
42
57
41
43
55
58
70
74
85
110
116
127
168
182189
198
212219
255
R:773
Nist 4084: AZETIDINE, 1,2-DIMETHYL-
42
15
18
27
30
41
43
56
66
70
82
85
R:763
Nist 194665: PIPERAZINE, 2-METHYL-
44
42
56
85
38
45
59
70
83
86
91
100
28
48
68
88
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128
148
168
188
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268
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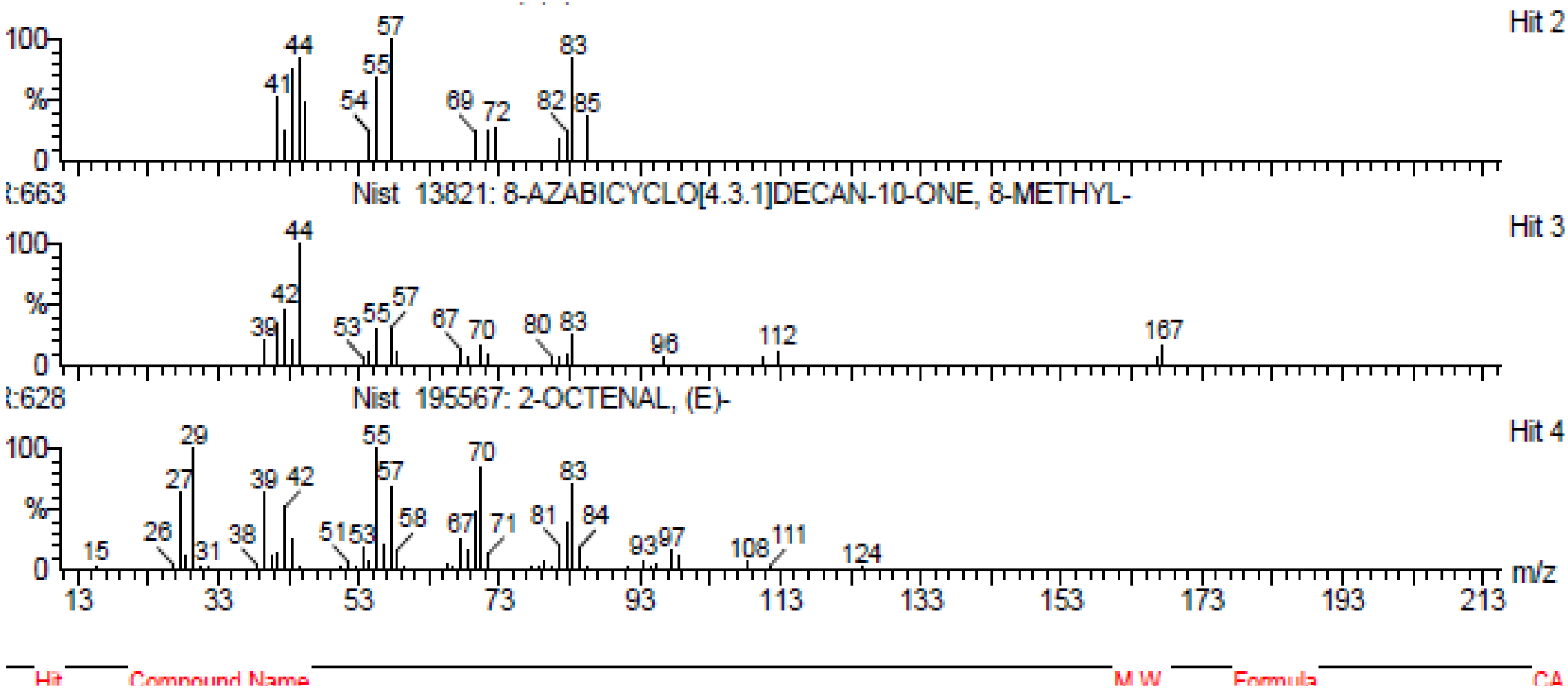
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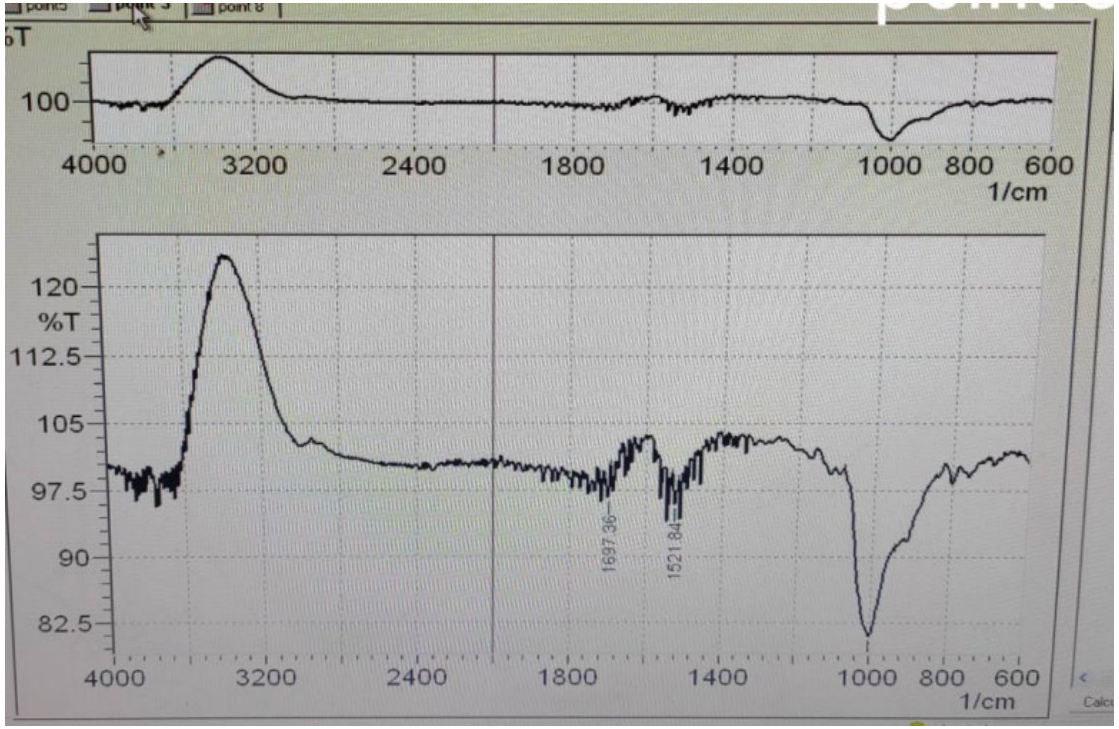
%
0
44
57
41
55
83
54
69
72
82
85
Nist 13821: 8-AZABICYCLO[4.3.1]DECAN-10-ONE, 8-METHYL-
Hit 3
100
%
0
44
42
39
53
55
57
67
70
80
83
96
112
167
Nist 195567: 2-OCTENAL, (E)-
Hit 4
100
%
0
29
55
70
27
39
42
57
83
26
38
51
53
58
67
71
81
84
15
31
93
97
108
111
124
13
33
53
73
93
113
133
153
173
193
213
m/z
Hit
Compound Name
M.W.
Formula
CA

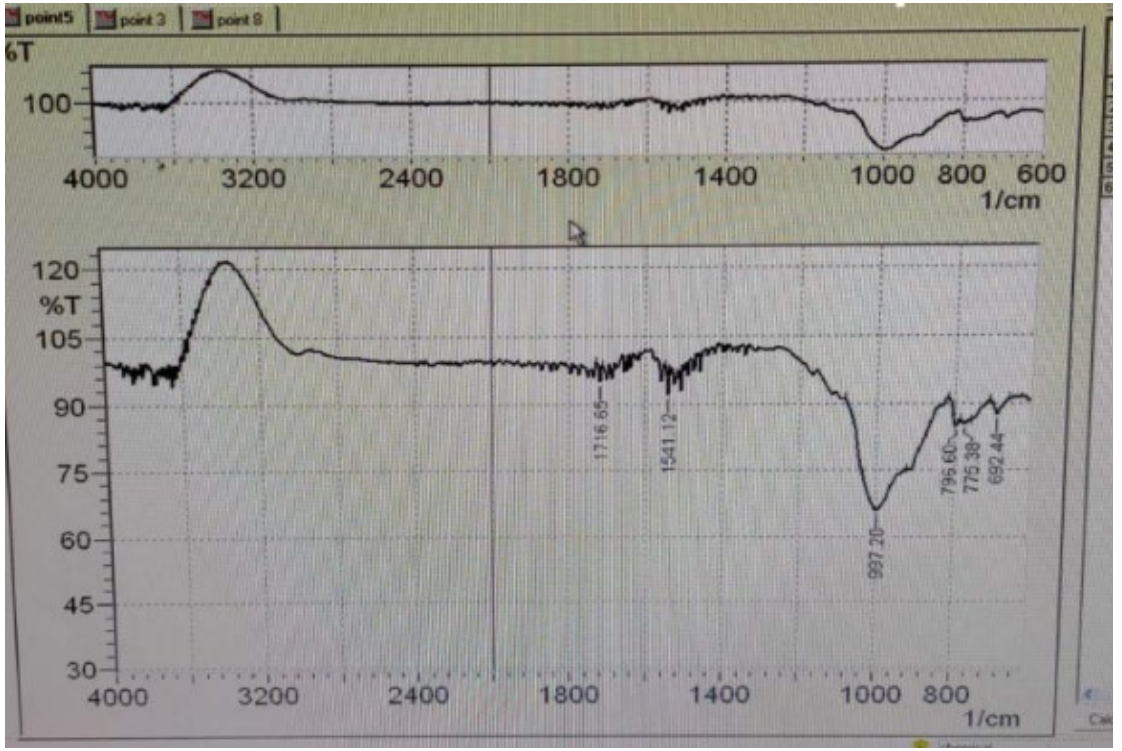
Screening for the Detection of Organophosphate Pesticides in soil and water samples with GCMS analysis

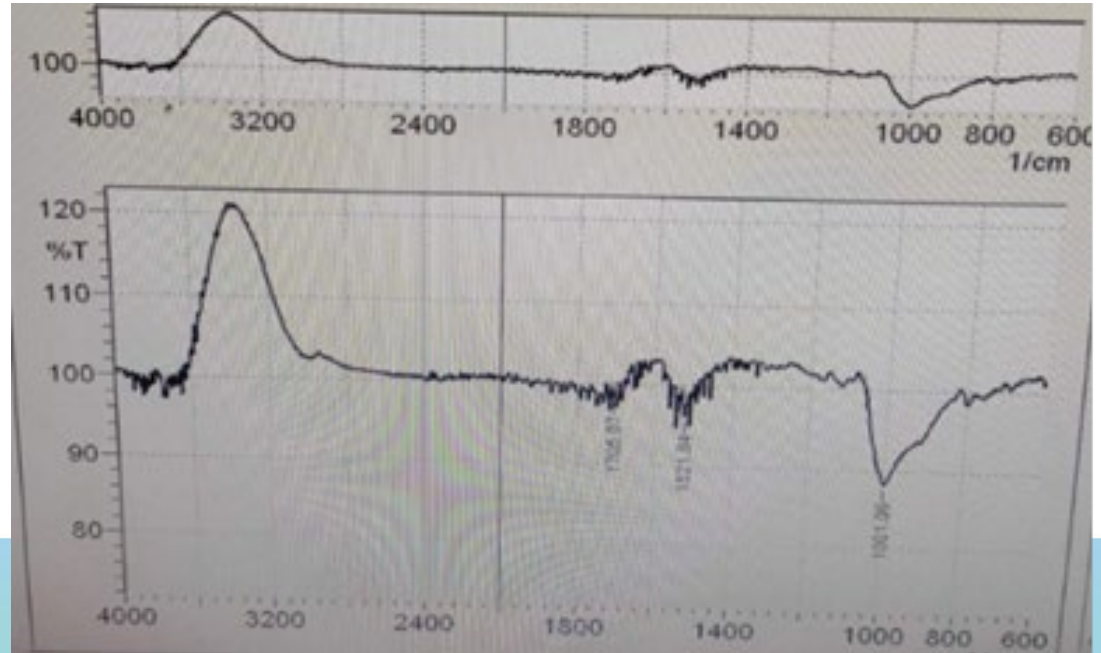
- For agricultural soil and effluent water, Organophosphate (OPP) group of amide, carboxylate and esters are mostly included
- Can be removed effectively using gamma radiation alone/combination methods for degradation of pesticides

Screening for the Detection of Organophosphate Pesticides in soil samples with Spectroscopic methods (FTIR)

- (1697.36, 1521.84, 1000) cm^{-1} at point 3
- (1716.65, 1541.12, 997.20, 796.60, 775.38, 692.44) cm^{-1} at point 5,
- (1706.07,1521.84,1001.06) cm^{-1} at point 8







FTIR Spectrum for agricultural soil at point 3, point 5 and point 8

FTIR analysis

- amide (1680-1630) cm^{-1}
- carboxylate (1610-1550)cm^{-1},
- esters (1750-1725) cm^{-1})
- finger print region of 700-999 cm^{-1} wave number that will be some minerals.
- Existence of organic matter :organophosphate (amide, carboxylate and esters) group

Conclusion

- Organophosphate (OPP) group existence before gamma traeatment
- Monitoring OPPs in real environmental water for ensuring environmental and health safety.
- Gamma Radiation alone and / with combination method on targeted pesticide and analysis on degradation of pesticide compound for next research work.

Thank you

Acknowledgements
IAEA CRP code. F23034

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