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COMPARATIVE ANALYSIS OF DIFFERENT ANALYTICAL INSTRUMENT

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ABSTRACT

Insecticides and Pesticides play vital roles in modern agricultural practices and effective domestic pest control. insecticides and Pesticides, generally including carbamate, organophsphorus, and organochlorine, etc, are also increasing the graph of mortality. The various Chromatographic methods, notably gas-liquid_chromatography_have been traditionally used to analyze the sample and their metabolites in different matrices these techniques help in identifying and quantifying the compounds. The objective of this research paper is to determine the efficient and accurate instrument for the analysis of the agricultural poison based on the retention time and concentration of the injected volume of the standard sample.

Keywords : GC-MS, GC-MS-MS, GC-NPD, GC-FID, HPLC, LCMS, Organochlorine

Introduction

Poisoning is emerging as one of the commonest emergencies that are increasing every year. The methodology used for the extra action of poisoning is based on the qualitative and quantitative extraction from the biological samples various substances have the toxicological significance such as sedative drugs, pesticides, and insecticides. These approaches were not only dependent upon on physiochemical properties but also on the nature of the specimen. The hyphenated analytical technique is mainly used for the detection of poisonous compounds and quantification of the substances this study is based on the comparative analysis of the different analytical instruments depending upon the retention time of the compound and concentration of each metabolite present in the poisoning compounds so that the bifurcation can be done based on the accuracy, specific and sensitivity to quantify the poisoning compounds. [1]Abalone viscera, is a protein-rich product, that is considered as a discarded wastes. In this study, four different proteases have been used for hydrolyzing abalone viscera for preparing high-activity antioxidant peptides, and their hydrolysis effects were compared by using different chromatography techniques. [2]Insecticides removed from the body in the form of urine and faecal matter especially chlorpyrifos remain in the body for long term detected by TlC -FID

Material and method

The methodology is based on the analysis of agriculture poison through different analytical instrument in order to justify the accurate instrument for the analysis of agriculture poison. There were different analytical hyphenated instrument were used such as Gas chromatography mass spectroscopy (GC-MS) , Gas chromatography tandem mass spectrometry (GCMS/MS) called as triple quad , Gas chromatography nitrogen phosphorus detector (GC/NPD), Gas chromatography flame ionization detector (GCFID),High performance liquid chromatography (HPLC),Liquid chromatography tandem mass spectrometry (LCMSMS) These are high profile instrument that were used for determining injected sample into the column. The target compound injected is organochlorine and the result is interpreted in the chromatogram form and represented in the form of table . This study focused on the two chief factors Retention time of the elute and the concentration in order to compare between the working of these instrument when the optimised condition, sample quantity, sample preparation and the software used of the entire instrument were kept same and then the variation is observed in the retention time and concentration of the targeted compounds (organochlorine). These analytical techniques are used to do comparative analysis for the injected targeted compounds how, faster or lower it elutes from the column and identify the concentration of the separated elutes. The aim of this

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study is to find out accurate, sensitive, less time consuming analytical instrument that is well suited for the agricultural poisons as well as comparing liquid chromatography with GC genera .This study also highlighted that there were few compounds that took more retention time and less concentration were identified vice versa there were few compounds that took less retention time and more concentration were identified depending upon the instruments.

OBJECTIVE: To identify the efficacy of the analytical method used for the detection of the poison.

RESULTS

Target Compound	**GC-MS**		**GCMSMS**		**GCFID**		**GCNPD**		**HPLC**		**LCMSMS**	
	RT min	**CONC Mcg/kg**	**RT min**	**CONC Mcg/kg**	**RT min**	**CONC Mcg/kg**	**RT min**	**CONC Mcg/kg**	**RT Min**	**CONC Mcg/kg**	**RT Min**	**CONC Mcg/kg**
Alpha HCH	7.404	53.93	7.404	61.3731	7.404	37.195	7.424	24.1626	7.413	18.817	7.404	41.12
Beta HCH	7.922	35.08	7.932	39.9218	7.922	24.195	7.917	15.717	7.923	12.229	7.947	26.732
Gamma HCH	8.021	63.57	8.041	72.3343	8.021	43.839	8.031	28.478	8.041	22.249	8.041	48.548
Delta HCH	8.347	25.78	8.554	29.3305	8.347	17.776	8.527	11.5474	8.527	9.011	8.547	19.684
Heptachlor	9.539	21.78	9.639	24.7895	9.539	15.024	9.609	9.7597	9.609	7.625	9.639	16.637
Aldrin	10.502	17.39	10.522	19.7902	10.502	11.994	10.507	7.7914	10.517	6.087	10.522	13.24
Alpha Endosulfan	11.569	10.51	11.589	11.9584	11.569	7.2475	11.529	4.708	11.519	3.678	11.594	10.682
Heptachlor Epoxide	11.539	14.00	11.589	15.9254	11.539	9.6518	11.519	6.2699	11.589	4.898	11.589	8.0258
Beta Endosulphan	12.533	21.30	12.587	24.2354	12.533	14.688	12.423	6.0498	12.583	4.726	12.487	16.265
Dieldrin	12.582	11.85	12.588	13.4796	12.582	8.1695	12.532	9.5415	12.582	7.434	12.838	9.0467
Endrin	12.428	13.50	12.588	15.3665	12.428	9.313	12.482	5.3069	12.522	4.146	12.838	10.31
PP DDE	13.112	111.25	13.202	126.595	13.112	76.724	13.128	49.8408	13.198	38.918	13.128	84.96
Endrin aldehy	13.226	12.80	13.260	14.5646	13.226	8.827	13.250	5.7341	13.236	4.48	13.260	9.724

Table1. Shows the comparative analysis of different analytical instruments at 2microlitre

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Endosulphan sulphate	14.145	11.94	14.045	13.5832	14.145	8.2323	14.042	5.3477	14.045	4.178	14.045	9.116
PP DDD	14.238	99.81	14.254	113.575	14.208	68.833	14.214	44.7148	14.254	34.913	14.250	76.22
PP DDT	15.108	69.21	15.115	78.7552	15.108	47.730	15.105	31.006	15.113	24.203	15.113	52.82
Methoxychlor	15.370	18.01	15.467	20.4983	15.370	12.423	15.427	8.0702	15.424	6.315	15.464	13.712

The table shows the various instrument and analytical comparison is done based on mentioned above factors the sample injected is organochlorine of 2microlitre and counting the retention time as well as the concentration of each separated compound present in organochlorine different instruments show different retention times which is measured in minute and concentration in terms of various compound which is mcg /kg as the segmented table show that. The instrument Gc-Ms shows different retention times of various detected compounds of OC which are as follows alpha HCH (7.404) min, beta HCH (7.922) min, gamma HCH (8.021) min, delta HCH(8.347) Heptachlor (9.539) min, aldrin (10.502) min, alpha Endosulfan (11.569) min, heptachlor Epoxide(11.539) min, Beta Endosulphan(12.533) min, dieldrin (12.582) min, endrin(12.428) min, PP DDE(13.112) min,endrinaldehyde (13.226) min, endosulfan sulfate (14.145) min, PP DDD(14.238 min, PP DDT (15.108) min and Methoxychlor (15.370) min.The concentration of these compounds which are measured in mcg/kg as follows alpha HCH (53.93) mcg/kg, beta HCH (35.08) mcg/gamma HCH (63.57) mcg/kg, delta HCH(25.78) mcg/kg, Heptachlor (21.78) mcg/kg, endrin (17.39) mcg/kg, alpha Endosulfan (10.51) mcg/kg, heptachlor Epoxide(14.0) mcg/kg, Beta Endosulphan(21.30) mcg/kg, dieldrin (11.85) mcg/kg, endrin(13.50) mcg/kg, PP DDE(111.25) mcg/kg, endrin aldehyde (12.80) mcg/kg, endosulfan sulfate (11.94) mcg/kg, PP DDD(99.81) mcg/kg, PP DDT (69.21) mcg/kg and Methoxychlor (18.01) mcg/kg. The instrument GCMSMS triple quad has a retention time of the compounds as follows alpha HCH (7.404) min, beta HCH (7.932) min, gamma HCH (8.041) min, delta HCH(8.554) min, heptachlor (9.639) min,aldrin (10.522) min , alpha Endosulfan (11.589) min, heptachlor Epoxide(11.589) min , Beta Endosulphan(12.587) min, dieldrin (12.588) min,endrin(12.588) min,PP DDE(13.202) min, endrin aldehyde (13.260) min,endosulphan sulphate (14.045) min,PP DDD(14.254) min,PP DDT (15.115) min and Methoxychlor (15.467) min.The concentration of these compounds which are measured in mcg/kg as follows alpha HCH (61.3731) mcg/kg ,beta HCH (39.9218) mcg/gamma HCH (72.3343) mcg/kg ,delta HCH(29.3305) mcg/kg ,Heptachlor (24.7895) mcg/kg , aldrin (19.7902) mcg/kg ,alpha Endosulfan (11.9584) mcg/kg, heptachlor Epoxide(15.9254) mcg/kg ,Beta Endosulphan(24.2354) mcg/kg, dieldrin (13.4796) mcg/kg, endrin(15.3665) mcg/kg,PP DDE(126.5956) mcg/kg,endrin aldehyde (14.5646) mcg/kg,endosulphan sulphate (13.5832) mcg/kg ,PP DDD(113.5756) mcg/kg ,PP DDT (78.7552) mcg/kg and Methoxychlor (20.44983) mcg/kg .The instrument GCNPD has retention time of the compounds are as follows alpha HCH (7.424) min ,beta HCH (7.917) min,gamma HCH (8.031) min ,delta HCH(8.527) min,heptachlor (9.609) min,aldrin (10.507) min ,alpha Endosulfan (11.529) min,heptachlor Epoxide(11.519) min ,Beta Endosulphan(12.423) min,dieldrin (12.532) min,endrin(12.482) min,PP DDE(13.128) min,endrin aldehyde (13.250) min,endosulphan sulphate (14.042) min ,PP DDD(14.214) min

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,PP DDT (15.105) min and Methoxychlor (15.427) min.The concentration of these compounds which are measured in mcg/kg as follows alpha HCH (24.1626) mcg/kg ,beta HCH (15.7173) mcg/gamma HCH (28.4781) mcg/kg ,delta HCH(11.5474) mcg/kg ,Heptachlor (9.7597) mcg/kg ,aldrin (7.7914) mcg/kg ,alpha Endosulfan (4.708) mcg/kg,heptachlor Epoxide(6.2699) mcg/kg ,Beta Endosulphan(6.0498) mcg/kg,dieldrin (9.5415) mcg/kg, endrin(5.3069) mcg/kg,PP DDE(49.8408) mcg/kg,endrin aldehyde (5.7341) mcg/kg,endosulphan sulphate (5.3477) mcg/kg ,PP DDD(44.7148) mcg/kg ,PP DDT (31.006) mcg/kg and Methoxychlor (8.0702) mcg/kg. The instrument GCFID show retention time of the compound are as follows alpha HCH (7.404) min ,beta HCH (7.922) min,gamma HCH (8.021) min ,delta HCH(8.347) min,Heptachlor (9.539) min,aldrin (10.502) min ,alpha Endosulfan (11.569) min,heptachlor Epoxide(11.539) min ,Beta Endosulphan(12.533) min,dieldrin (12.582) min,endrin(12.428) min,PP DDE(13.112) min,endrin aldehyde (13.226) min,endosulphan sulphate (14.145) min ,PP DDD(14.208) min ,PP DDT (15.108) min and Methoxychlor (15.370) min.The concentration of these compounds which are measured in mcg/kg as follows alpha HCH (37.1958) mcg/kg ,beta HCH (24.195) mcg/gamma HCH (43.839) mcg/kg ,delta HCH(17.7761) mcg/kg ,Heptachlor (15.024) mcg/kg ,aldrin (11.994) mcg/kg ,alpha Endosulfan (7.2475) mcg/kg,heptachlor Epoxide(9.6518) mcg/kg ,Beta Endosulphan(14.6881) mcg/kg,dieldrin (8.1695) mcg/kg, endrin(9.313) mcg/kg,PP DDE(76.7246) mcg/kg,endrin aldehyde (8.827) mcg/kg,endosulphan sulphate (8.2323) mcg/kg ,PP DDD(68.8337) mcg/kg ,PP DDT (47.7305) mcg/kg and Methoxychlor (12.4232) mcg/kg. The HPLC instrument show retentiontime of the compound are as follows alpha HCH (7.413) min ,beta HCH (7.923) min,gamma HCH (8.041) min ,delta HCH (8.527) Heptachlor (9.609) min,aldrin (10.517) min ,alpha Endosulfan (11.519) min,heptachlor Epoxide(11.589) min ,Beta Endosulphan(12.583)min,dieldrin (12.582) min,endrin(12.522) min,PP DDE(13.198) min,endrin aldehyde (13.236) min,endosulphan sulphate (14.045) min ,PP DDD(14.254) min ,PP DDT (15.113) min and Methoxychlor (15.424) min.The concentration of these compounds which are measured in mcg/kg as follows alpha HCH (18.817) mcg/kg ,beta HCH (12.229) mcg/gammaHCH (22.249) mcg/kg ,delta HCH(9.011) mcg/kg ,Heptachlor (7.625) mcg/kg ,aldrin (6.087) mcg/kg ,alpha Endosulfan (3.678) mcg/kg,heptachlor Epoxide(4.898) mcg/kg ,Beta Endosulphan(4.726) mcg/kg,dieldrin (7.434) mcg/kg, endrin(4.146) mcg/kg,PP DDE(38.918)mcg/kg,endrin aldehyde (4.48) mcg/kg,endosulphan sulphate (4.178) mcg/kg ,PP DDD(34.913) mcg/kg ,PP DDT (24.203) mcg/kg and Methoxychlor (6.315) mcg/kg. The LCMSMS show retention time of the compound are as follows alpha HCH (7.404) min ,beta HCH (7.947) min,gamma HCH (8.041) min ,delta HCH(8.547)min, Heptachlor (9.639) min,aldrin (10.522) min ,alpha Endosulfan (11.594) min,heptachlor Epoxide(11.589) min,Beta Endosulphan(12.487) min,dieldrin (12.838) min,endrin(12.838) min,PP DDE(13.128) min,endrin aldehyde (13.260) min,endosulphan sulphate (14.045) min ,PP DDD(14.250) minPPDDT (15.113) min and Methoxychlor (15.464) min.The concentration of these compounds which are measured in mcg/kg as follows alpha HCH (41.12) mcg/kg ,beta HCH (26.7332) mcg/gamma HCH (48.5485) mcg/kg ,delta HCH(19.6849) mcg/kg ,Heptachlor (16.6373) mcg/kg ,aldrin (13.242) mcg/kg ,alpha Endosulfan (10.6882) mcg/kg,heptachlor Epoxide(8.0258) mcg/kg ,Beta Endosulphan(16.2654) mcg/kg,dieldrin (9.0467) mcg/kg, endrin(10.3131) mcg/kg,PP DDE(84.9635) mcg/kg,endrin aldehyde (9.7249) mcg/kg,endosulphan sulphate (9.1163) mcg/kg ,PP DDD(76.2252) mcg/kg ,PP DDT (52.8259) mcg/kg and Methoxychlor (13.7172) mcg/kg.

DICUSSION

The highest retention time is of Methoxychlor and the lowest is alpha HCH whereas in the highest concentration is detected PPP DDE and the lowest detected of alpha Endosulfan in each compared analytical instrument. Additionally. When the GCMS and GCMSMS triple quad is compared in terms of retention time and concentration at the same injection volume and optimized condition then GCMSMS show more retention time for eluting the target compounds present in the poisoning sample in comparison with GCMS but in association with concentration part GCMSMS show best pesticide identification and the target compounds present in organochlorine can be best detected by triple quad when compared with GCMS. [3]Chromatographic methods, mainly gas & liquid chromatography have been

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traditionally been used for analyzing carbamate pesticides and their metabolites. When GCNDP is compared with the triple quad in terms of retention time then GCNDP shows less retention for the elutes in comparison to the triple quad but in the association of concentration part GCMSMS show the best pesticide identification and the target compounds present in organochlorine can be best detected by triple quad when compared with GCNPD where the concentration of the compound cannot be best detected when the same instrument is compared with GCMS then GCNPD has less retention time when compared with GCMS, therefore, the concentration of the target compound of organochlorine is not best detected in GCNPD when compared with GCMS. When GCFID is compared with another instrument such as GCMS then both GCMS and GCFID have the same retention time but the identification of target compound concentration in organochlorine is best detected by GCMS when compared with GCFID [4]pesticides cause a number of health risks, there is insufficient monitoring of these toxins. whereas when triple quad GCMSMS is compared with GCFID then GCFID has less retention time of elutes from triple quad [5]QuEChERS GC/MS technique was an analysis of 30 multiple contaminants in kiwano samples. but the identification of target compound concentration in organochlorine is best detected by GCMSMS from GCFID and when GCNPD is compared with GCFID then GCFID show less retention time from GCNPD [7]lipid from Japanese common squid skin and North Pacific starfish Dyer lipid extraction GCED and the identification of target compound concentration in organochlorine is best detected by GCFID when compared with GCNPD on less retention time. when HPLC is compared with other instrument such as GCMS then HPLC show more or high retention time of elutes compared with GCMS but the identification of target compound concentration in organochlorine is best detected by GCMS from hplc , whereas the same with the other instrument GCMSMS triple quad then retention time is more in triple quad from hplc and also the identification of target compound concentration in organochlorine is best detected by GCMSMS from HPLC , when again HPLC retention time is compared with GCNPD retention time then HPLC show more retention time but the identification of target compound concentration in organochlorine is best detected by GCNPD from hplc where as when the GCFID is compared with HPLC then GCFID show less retention time and show highest concentration of target compound present in organochlorine from HPLC When LCMSMS is compared with HPLC in term of retention time then HPLC show less retention time for most of the compound vice versa LCMSMS show more intake of retention time for the elutes but in association of concentration part LCMSMS show best pesticide identification and the target compounds present in organochlorine can be best detected by LCMSMS when compared with HPLC. When the LCMSMS technique is compared with other gaseous instrument such as GCMS, GCMSMS ,GCFID and GCNPD then LCMSMS target compound have more retention time with from GCMS, GCNPD ,GCFID,GCMSMS but identification of target compound present in organochlorine are best detected by above mentioned instrument compared with LCMSMS whereas the exception found in terms of concentration properties is that LCMSMS best detected pesticide concentration in organochlorine when compared with GCFID respectively.

CONCLUSION

The best instrument that can be used for the identification of target compounds or agriculture poisons is the GCMSMS followed by GC-MS and weak result given by GCNPD which takes less retention time and the identification of the concentration of target compound is less recorded. When HPLC is compared with GC techniques then HPLC have more retention time when compared with all the GC Instrument but in terms of identifying concentration of target compounds of poisoning sample then GC instrument are more overrated and give accurate result. The exception shows that when HPLC is compared with GCFID then GC-FID show less retention time and shows the highest concentration of target compound present in the poisoning sample from HPLC. When the LCMSMS technique is compared with other gaseous instruments such as GCMS, GCMSMS, GCFID and GCNPD then LCMSMS target compounds have more retention time with from above-mentioned instruments of GC but identification of target compound present in the poisoning sample is best detected with the GC technique from LCMSMS whereas the exception found in terms of concentration properties is that LCMSMS best detect pesticide concentration in poisoning sample when compared with GCFID respectively. Moreover when HPLC is compared with LCMSMS as both the technique is the liquid base

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when retention time is taken then HPLC show less retention time from LCMSMS but in the association of concentration part LCMSMS show best pesticide identification of target compounds present in poisoning sample when compared with HPLC.

Conflict of interest There is no conflict of interest as it is self-funded research work .

Ethical clearance- Not required as only direct organochlorine standard sample is injected inside the instrument no viscera extraction is taken from the body as well as no biological samples were taken for this study.

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