Analysis of Ganja Chemical Content (Cannabis Sativa L.) Discussion Results in the Aceh Regional Police Region Using the GC-MS Method

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Abstract— Cannabis (Cannabissativa L.) is an annual plant, which can grow and spread in tropical or sub-tropical regions with a height of one to five meters (Emcdda, 2015). Human selection is done for various uses and climate-influenced natural selection produces various varieties and chemical compositions. Analysis of the chemical content of cannabis (Cannabis sativa L) as a result of confiscation in the Aceh Regional Police, namely Lhokseumawe Regional Police, Pidie Regional Police, East Aceh Regional Police (Idi Rayeuk), Benar Meriah Regional Police and Central Aceh Regional Police (Takengon) were conducted by GC-MS method. Cannabis was extracted with n-hexane and marijuana extract was analyzed by GC-MS. Δ9-THC and CBC compounds were found in all marijuana samples, CBN was found in 4 origin areas except Central Aceh Police Station, 2-Metoxy-5-isopropilaxy-7-propenylnaphthquinone was found in two police stations from Pidie Police and Central Aceh District Police. The biggest concentration of Δ9-THC is 80.92% of the East Aceh Police Station; Δ9-THCV is from two original police stations, namely East Aceh Police and Benar Meriah Police; CBN is the biggest 14.25% of Polres Benar Meriah; The biggest CBC is 10.98 from the East Aceh District Police..

Keywords- Cannabis, CBN, CBD and Δ9-THC.

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I. Introduction

Efforts to emphasize world drug abuse through the UNODC institution aim to make the world safer from crime, drugs, and terrorism. To be effective and sustainable, responses to these threats must include strategies covering various fields such as crime prevention, criminal justice reform and justice for childre [1]. The Indonesian government through the National Narcotics Agency (BNN) and the Republic of Indonesia Police (POLRI) is a professional non-ministerial institution capable of mobilizing all components of society, nation and state of Indonesia in implementing prevention and eradication of illicit drug trafficking, narcotics, precursors and addictive ingredients others in all regions of Indonesia (BNN Republic of Indonesia. 2015).

The National Police Lab is one of the laboratories authorized by the Government of the Republic of Indonesia through Republic of Indonesia Law No. 35 of 2009 concerning narcotics and the Decree of the Minister of Health of the Republic of Indonesia Number 194/Menkes/SK/VI/2012 concerning the appointment of narcotics and psychotropic examination laboratories to examine marijuana evidence at the qualitative and quantitative level (Minister of Health of the Republic of Indonesia 2014). According to data from the Directorate of Drug Narcotics of the Aceh Regional Police (Direktorat Reserse Narcotics of Aceh Regional Police), drug cases that occurred in 2016 amounted to 1,444 cases, which in

2017 increased to 1,562 cases. The number of suspects was 2,152 consisting of 2,061 men and 92 women, the secured evidence was 15,886, 6 kilograms of marijuana, 44,975.74 grams of Savu and 3,813 1/2 ecstasy items. Meanwhile, the marijuana fields that were revealed were 103 hectares of land with a total of 486,000 marijuana stems, of which 484,720 stems were immediately facilitated on location by burning up. The marijuana stem samples were secured as evidence of 1,280 stems [2].

Investigation Description of Analysis of Marijuana Evidence of Illicit Circulation of Narcotics in the Legal Area of the East Java Regional Police with the Gas Chromatography-Mass Spectrometry Method (GC-MS) was carried out by processing GC-MS Chromatogram data and analyzing data using Principal Component Analysis (PCA) with _Software Camo-unscramble sofware version 9.8_ and generated patterns of distribution of marijuana evidence into 3 groups including I: Pacitan City, Trenggalek, Lamongan, Mojokerto, Lumajang, Bondowoso, Situbondo, and Pamekasan have similar components of chemical compounds, II: Gresik City, Surabaya, Sidoarjo, Pasuruan , Probolinggo, Jember, Banyuwangi, Malang, Blitar, Tulungagung, Kediri, and Bojonegoro have similarities in chemical compound components and III: Madiun, Nganjuk, Kediri, Bangkalan, and Pasuruan cities have similar components of chemical compounds [3].

Systematic evaluations of the potential of growing cannabis plants in Albania have been carried out. The marijuana samples used came from different regions and were analyzed using the GC-MS method. The results showed the concentration of Δ9-THC was different in each growing region and the greatest concentration was found in marijuana flowers [4].

II. EXPERIMENTAL

A. General

Cannabis can cause euphoria, relaxation, and feeling healthy. Cannabis does not cause dangerous addiction, but at least mild degrees of dependence can occur. Cannabis can cause acute psychotoxic effects which in some ways resemble "bad trip" due to LSD [5].

The effect caused depends on the amount and how to use it. In the short term, it can cause feelings of relaxation, comfort and well-being, increased visual and auditory perceptions, lots of speech, a feeling of confusion and emotion decreasing memory ability, driving ability, and coordination. In cases of hallucinations are rare. On use with smoking, the effect will appear in one to three hours [6]. Whereas if eaten, the effect will appear 12 hours later. Death due to temporary overdose is unknown. The effects on long-term use can increase the risk of bronchitis, lung cancer, lethargy, being indifferent, neglecting work. The effects of using marijuana can also lower blood pressure and increase heart rate, so it is very dangerous when used by people who have heart disorders. The use of marijuana can reduce male and female fertility, and if used during pregnancy can cause premature birth (British Medical Association, 2005) [7].

The heaviest effect of marijuana is in the brain. Brain damage that occurs is irreversible or irreversible damage. The effect of marijuana in the brain depends on the length, amount and method of use. The effect that occurs is euphoria, feeling relaxed, drowsiness and reduced social interaction. In cases of poisoning (use in very large amounts) can arise excessive suspicion (paranoid), visual hallucinations [8], [9] and [10]. Cannabis can increase the effect of sedation on the central nervous system when used together with drugs that have sedative effects, such as anti-anxiety drugs, sleeping pills, anesthetic drugs, narcotics, analgesics, antipsychoses, antidepressants, antihistamines and alcohol (British Medical Association, 2005).

B. Equipment

Equipments used in this experiment include GC-MS. The GC-MS was used for comparison of samples from different areas of the Aceh Regional Police, Indonesia.

III. MATERIALS

Cannabis has psychoactive chemical constituents such as Δ9-Tetrahydrocannabinol (Δ9-THC). Cannabis is considered to have low toxicity and has the potential to be misused so that it disrupts human health. Δ9-THC becomes active if in the form of smoke [11].

A. Tools

- Instrument GC-MS Agilent 7890 A and 5975 Mass Selective Detector, with capillary column DB 5Hi (30 mm; 250 μm; 0,1μm).
- Hamilton Syringe 10 μl.
- Mattler Toledo Analytical Scales
- Fisher Thermo Scientific vortex.
- EBA 20 Hettich Zentrifugel.
- Glass vial
- Glassware device
- Whatman filter paper 42
- Blender.

B. Material

- The sample in this study was taken from the evidence of confiscation from the 5 (five) Aceh Regional Police areas, namely: Pidie Regional Police, Lhokseumawe Regional Police, East Aceh Regional Police, Benar Meriah Police, and Central Aceh Police (Takengon).
- N-Heksan p.a (merck).
- Helium Gas

C. Sample Preparation

The dried marijuana samples from the fields were smoothed and then weighed 1 gram (Hypergeometric sampling, UN 1998), extracted with 10 ml n-hexane solvent, by means of cortex for 15 minutes at room temperature, then filtered using filter paper (UNODC, 2009). The extracts were centrifuged at 13,000 rpm for 5 minutes and the liquid was ready to be injected into the GC-MS instrument.

D. Sample Analysis with GC-MS

Before the analysis is carried out, optimization of the conditions is carried out to obtain a chromatogram with peaks that are both reproducible and separate well (resolution> 1) [12]. Some of the optimized conditions of analysis include split ratio, gas flow rate as the flow rate, inlet (injection port) temperature and oven temperature program are as follows:

- Column : HI 5 DB capillary (30 mm; 250 μm; 0.1 μm);
- Carrier Gas : Helium (He);
- Flow Rate : 0.9 mL/min;
- Velocity : 34, 567 cm/sec;
- Split Flow : 0.9 mL/min;
- Temperature Settings :
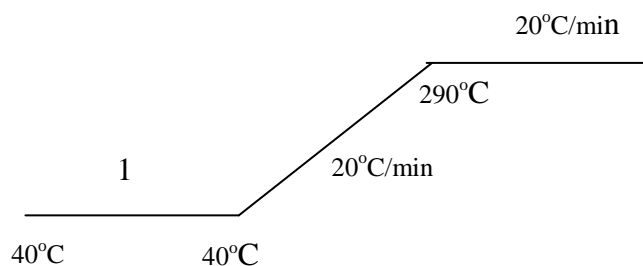
E. Data Analysis

Cannabis sample extract was injected into GC-MS with optimal conditions. Identity of compounds with certain m/e, compared with using a data base chromatogram found in the Agilent 7890 A and 5975MSD instruments [13]. The data base used is the Willey 14 N11 data base spectrum. L.

IV. RESULT

The results of the GC-MS analysis of the sample were obtained from the Aceh Regional Police of Indonesia, are as follows:

A. The Results of the GC-MS Analysis of Cannabis Samples from the Piddie District

Police Station produced a chromatogram showing 5 (five) peaks of the compound. The peak with RT 5.819 minutes with molecular weight 314 and molecular formula C21H30O2 at 76.02% with Quality 98 concluded as Dronabinol (DELTA-9–Tetrahidro cannabinol or Δ9-THC).
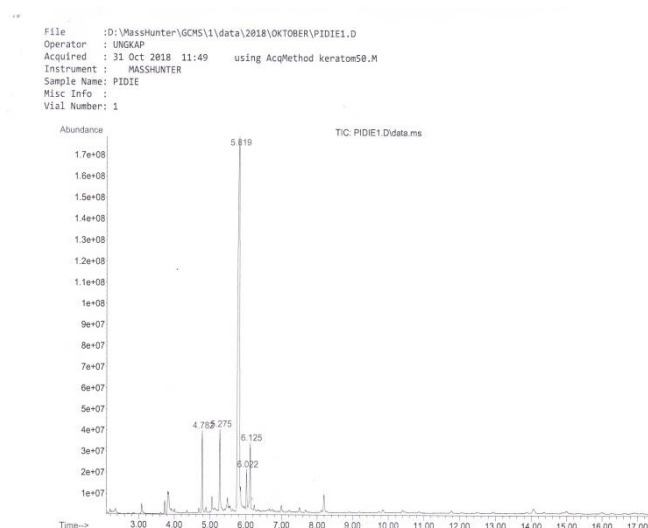

Figure 1. Chromatogram Samples of Marijuana from the Pidie District Police Station.

The table for the results of GC analysis of cannabis samples from the Pidie Police area is shown in the table below.

TABLE 1. THE CHEMICAL CONTENT OF CANNABIS SAMPLES WAS ANALYZED BY GC-MS FROM THE PIDIE DISTRICT POLICE STATION.

No.	Retention Time (RT)	Content (Area %)	Formula Molecular	Weight of Molecular	Chemical Compounds	Quality
1.	4, 782	6,77	$C_{27}H_{20}O_4$	288	2-Metoxy-5-isopropiloxy-7-propenilnapth quinone	98
2.	5,275	7,70	$C_{21}H_{30}O_2$	314	Cannabicromene	96
3.	5,819	76,02	$C_{21}H_{30}O_2$	314	Δ9-THC	98
4.	6,022	2,97	$C_{21}H_{32}O_2$	316	1,3-Diol, 2-(3,7-dimetl-2,6-octadienil) -5-pentil Benzena	99
5.	6,125	6,54	$C_{21}H_{26}O_2$	310	CBN	99

B. Results of Marijuana Analysis with GC-MS from the Lhokseumawe District Police Station

The results of GC analysis of cannabis samples from the Lhokseumawe District police station produced a chromatogram showing 5 (five) peak compounds (Figure 2). The compound peaks resulting from GC analysis of cannabis samples from the Lhokseumawe District Police Station were identified using MS and compared with libraries, the peak compound with RT 3.726 minutes with molecular weight 296 and molecular formula C20H40O 3.07% with Quality99 concluded as Phytol.
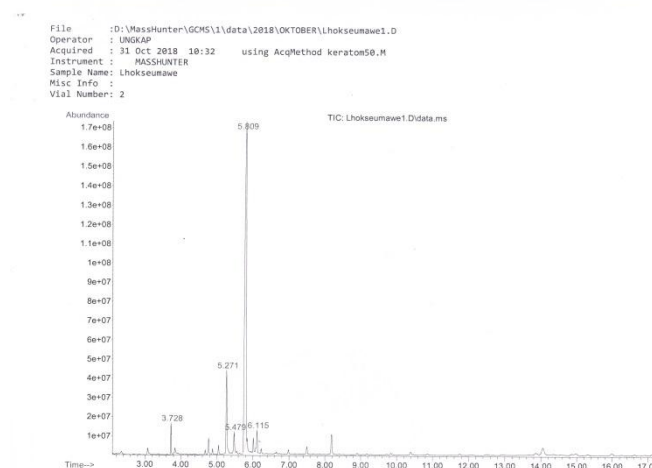

Figure 2. Chromatogram Samples of Marijuana from the Lhokseumawe District Police Station.

The table for the results of GC analysis of cannabis samples from the Lhokseumawe Regional Police Station is shown in the table below.

TABLE 2. THE CHEMICAL CONTENT OF CANNABIS SAMPLES WAS THE RESULT OF GC-MS ANALYSIS FROM THE LHOKSEUMAWE REGIONAL POLICE STATION.

No.	Retention Time (RT)	Content (Area %)	Formula Molecular	Weight of Molecular	Chemical Compounds	Quality
1.	3,728	3,07	$C_{20}H_{40}O$	296	Phytol	99
2.	33, 065	10,84	$C_{21}H_{30}O_2$	314	Cannabochromene	95
3.	34, 438	2,73	$C_6H_4F_3N_3O_2$	207	2-Oxo-4-nitrosometil-6-trifluoro-metil-1,2-dihidropirimidin	96
4	35, 033	80,46	$C_{21}H_{30}O_2$	314	Delta-9-Tetrahidrocanabinol	96
5.	35, 617	2,89	$C_{21}H_{26}O_2$	310	Cannabinol	98

C. Results of Marijuana Analysis with GC-MS from the East Aceh Police District

The results of GC analysis of cannabis samples from the East Aceh District police resulted in a chromatogram showing 5 (five) peaks of compound peak results from GC analysis of marijuana samples from the East Aceh police area identified using MS and compared with libraries with RT 4.824 minutes with molecular weight 286 and formulas the C19H26O2 molecule of 3.28% with Quality98 was concluded as Delta 9-Tetrahidrocannabivarin. With MS spectrum as shown in figure 3.
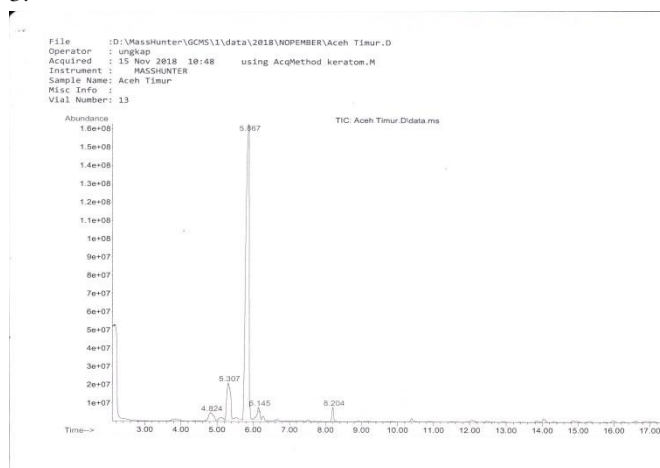

Figure 3. Chromatogram Samples of Marijuana from the East Aceh District Police Station.

The table for the results of GC analysis of cannabis samples from the East Aceh police area is shown in the table below.

TABLE.3. CHEMICAL CONTENT OF CANNABIS SAMPLES FROM GC-MS ANALYSIS FROM THE EAST ACEH DISTRICT POLICE.

No.	Retention Time (RT)	Content (Area %)	Formula Molecular	Weight of Molecular	Chemical Compounds	Quality
1.	4,837	3,28	$C_{19}H_{26}O_2$	314	Delta 9-Tetrahidrocannabivarin	98
2.	5,319	10,98	$C_{21}H_{30}O_2$	314	Cannabicromene	95
3.	5,843	80,92	$C_{21}H_{30}O_2$	314	Dronabinol	98
4.	6,155	2,84	$C_{21}H_{26}O_2$	310	Cannabinol	99
5.	8,194	1,98	$C_{22}H_{46}$	310	Docosane	97

D. The results of the Marijuana Analysis with GC-MS from the area of the Polres Benar Meriah

The results of GC analysis of cannabis samples from the Benar Meriah Police area produced a chromatogram that showed 5 (five) peaks of compounds (Figure 4). The five compound peaks resulting from GC analysis from cannabis samples from the Benar Meriah area were identified using MS and compared to the library, the compound as RT 4,769 minutes with molecular weight 286 and molecular formula C19H26O2 4.23% with Quality91 concluded as Δ9-THCV [14]. With the MS spectrum as in figure 4, the structure and fragmentation pattern of the compound Δ9-THCV are theoretically shown in Figure 4.
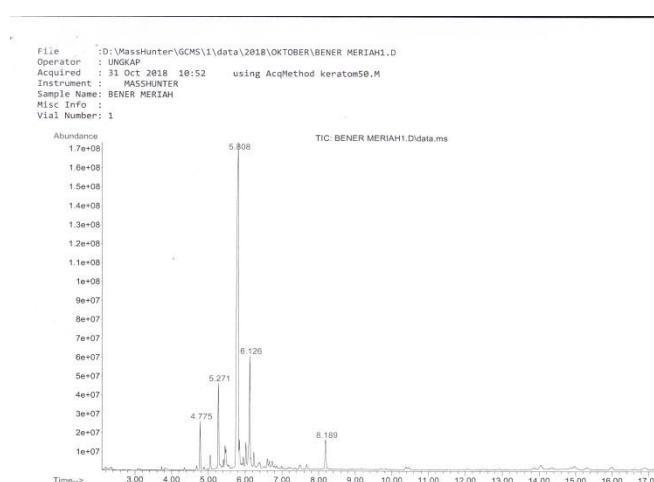

Figure 4. Chromatogram Samples of Marijuana from the Benar Meriah District Police Station.

The table for the results of GC analysis of cannabis samples from the Benar Meriah Police area is shown in the table below.

TABLE 4. THE CHEMICAL CONTENT OF CANNABIS SAMPLES FROM GC-MS ANALYSIS FROM THE REGIONAL POLICE STATION IS BENAR MERIAH.

No	Retention	Content	Formula	Weight of	Chemical	Quality

.	n Time (RT)	(Area %)	Molecular	Molecular	Compounds	y
1.	4,769	4,23	$C_{19}H_{26}O_2$	286	Δ9-THCV	91
2.	5,288-5,330	9,52	$C_{21}H_{30}O_2$	314	CBC	95
3.	5,786	67,93	$C_{21}H_{30}O_2$	314	Dronabinol	98
4.	6,129	14,25	$C_{21}H_{26}O_2$	310	CBN	95
5.	8,184	4,07	$C_{29}H_{60}$	408	2 Metil - Octacosane	99

E. *Results of Marijuana Analysis with GC-MS from the Central Aceh Police District (Takengon)*

The results of GC analysis of cannabis samples from the Central Aceh District Police Station (Takengon) produced a chromatogram that showed 4 (four) peak of the compound (Figure 5). The MS spectrum of the Heneic compound provides a spectrum with molecular ion peaks (M +) at m/e = 296 and followed by fragments at m/e = 239, 141, 113, 85 and 57 (figure 5). The structure and fragmentation pattern of the hyeneneane compounds is theoretically shown in Figure 5.


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File        :D:\MassHunter\GCMS\1\data\2018\OKTOBER\ACEH TENGAH1.D
Operator    : UNGKAP
Acquired    : 31 Oct 2018  11:12     using AcqMethod keratom50.M
Instrument :    MASSHUNTER
Sample Name: ACEH TENGAH
Misc Info   :
Vial Number: 2
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Abundance
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5.269
4.773
8.182
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1e+08
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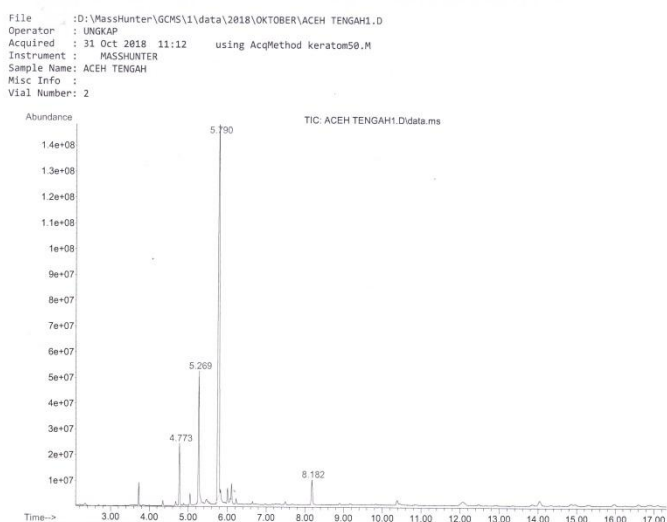

Figure 5. Chromatogram Samples of Marijuana from the Central Aceh District Police Station.

The table for the results of GC analysis of cannabis samples from the Central Aceh Police District (Takengon) is shown in the table below.

TABLE 5. THE CHEMICAL CONTENT OF CANNABIS SAMPLES FROM GC-MS ANALYSIS FROM THE CENTRAL ACEH POLICE STATION (TAKENGON).

No.	Retention Time (RT)	Content (Area %)	Formula Molecular	Weight of Molecular	Chemical Compounds	Quality
1.	4,769	6,08	$C_{17}H_{20}O_4$	288	2-Metoxy-5-isopropilaxy-7-propenylnaphthquinone	98
2.	5,288	16,14	$C_{21}H_{30}O_2$	314	Cannabichrome	96
3.	5,786	73,92	$C_{21}H_{30}O_2$	314	Dronabinol	98
4.	8,178	3,86	$C_{21}H_{44}$	296	Heneicosane	98
N	Retenti	Conten	Formula	Weight	Chemical	Qual

o.	on Time (RT)	t (Area %)	Molecular	of Molecular	Compounds	ity

According to the results of GC-MS analysis, the marijuana sample above from the North Aceh Police Station (Lhokseumawe) shows a specific marker, namely the presence of 2 (two) compounds (Cannabichromene and Phytol) [15]. The marijuana sample from Pidie Police Station (Pidie) showed a specific marker, namely the presence of Dionabinol with the highest percentage of 76.02%. Marijuana samples from the East Aceh police station showed specific markers, namely the presence of Canabicromene and Dionabinol with the highest percentage of 10.98% and 80.92%. Cannabis samples from the Benar Meriah Police Station showed specific markers namely CBC, Dionabinol and CBN with the highest percentage of 9.52%, 67.93% and 14.25% [16] and [17]. The marijuana sample from the Central Aceh Police Station (Takengon) shows a specific marker, namely the presence of the Heneicosane compound.

The variation of the chemical content of the fifth Polis marijuana shows that the composition of the chemical content of each Polres has its own specificity where there are no 2 (two) Polres which contain the exact same chemical composition, as shown in Table 6. For example the composition of the chemical content of Lhokseumawe Police marijuana is not the same as the composition of the chemical content of marijuana from the other 4 (four) Polres.

TABLE 6. CHEMICAL CONTENT OF MARIJUANA FROM 5 (FIVE) POLICE IN THE ACEH REGIONAL POLICE

Name of Compaund	Polres Pidie (%)	Polres Loksemawe (%)	Polres Aceh Timur (Idi Rayeuk) (%)	Polres Benar Meriah (%)	Polres Aceh Tengah (Takengon) (%)
Phytol	-	3,07	-	-	-
2-Metoxy-5-isopropilaxy-7-propenylnaphthquinone.	6,77	-	-	-	6,08
Cannabichrome (CBC)	7,70	10,84	10,98	-	16,14
2-Oxo-4-nitrosometil-6-trifluoro-metil-1,2-dihidropirimidin	-	2,73	-	-	-
2 Metil – Octacosane	-	-	-	4,07	-
Dacosane	-	-	1,98	-	-
1,3- diol, 2-(3,7-dimetl-2,6-octadienil) -5-pentil benzena	2,97	-	-	-	-
Canabinol (CBN)	2,96	2,89	2,84	14,25	-
CBC	-	-		9,52	
Δ9-THCV	-	-	3,28	4,23	
Dronabinol (Δ9-	76,0	80,48	80,92	67,93	73,92

| THC) | 2 | | | | |
| Heneicosane | - | - | - | - | 1,76 |

V. CONCLUSION

From the research on the Analysis of Chemical Content of Cannabis (Cannabis sativa L.) Confiscated in Aceh Police Region by GC-MS Method, this conclusion can be drawn as follows:

1. The main chemical content of cannabis samples from the 5 (five) regions of the Aceh Regional Police using the GC-MS instrument, namely marijuana samples from Pidie 2-Metoxy-5-isopropilaxy-7-propenylnaphthquinone police 6.77%; CBC 7.70%; 1,3-Benzene diol, 2- (3,7-dimethyl-2,6-octadienil) -5-pentyl 2,97%; CBN 2.96%; and Δ9-THC 76.02%; marijuana samples from Lhokseumawe police station: 3.07% Phytol; CBC 10.84%; CBN 2, 89%; Dronabinol (Δ9-THC) 80.48% and 2-Oxo-4-nitrosomethyl-6-trifluoro-methyl-1,2-dihydropyrimidine 2.73%; marijuana samples from East Aceh District Police (Idi Reyauk): CBC 10.98%; Dacosane 1.98%; CBN 2.84%; Δ9-THCV 4.23%; Dronabinol (Δ9-THC) 67.93%; marijuana samples from Benar Meriah Police: 2 Methyl-Octacosane 2.47%; CBN 14.25%, CBC 9.52%; Δ9-THCV 4.23% and Dronabinol (Δ9-THC) 67.93%; marijuana samples from Central Aceh Police (Takengon); 2-Metoxy-5-isopropilaxy-7-propenylnaphth quinone 6.08%; CBC 6.16%; Dronabinol (Δ9-THC) 73.92 and Heneicosane 1.76%.

2. Marijuana samples from 5 (five) different regions in the Aceh Regional Police have a slight difference (0–5%) between the respective Polres and from all samples containing Δ9- THC as the main active constituents.

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