



Characterization and Evaluation of Bioactive Compounds of Extract Ethanol *Tagetes erecta* L. by GC-MS

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Abstract : *Tagetes erecta* L. is one of the plants with a variety of chemical constituents. This study aims to characterize the ethanol extract and determine bioactive compounds. Characterization of extracts taken is the determination of moisture content, total ash value and the total value of acid insoluble ash. Evaluation the content of bioactive compounds using gas chromatography - mass spectrometry (GC-MS). Characteristics of the extract obtained results of moisture content $8.28 \pm 0.540\%$ v/w, the value of total ash content of $2.54 \pm 0.038\%$ w/w and the value of acid insoluble ash content was $0.98 \pm 0.064\%$ w/w. Identification GC-MS produces 17 types of compound with a retention time of 31.284 to 50.614. Three compounds with the greatest abundance are Neophytadine 43.88%, 9,12,15-Octadecatrienoic 13.45% acid- methyl ester and hexadecanoic acid-methyl ester 13.24%.

Keywords : characterization of extract, GC-MS, ethanol extract.

Introduction

Tagetes erecta L is an ornamental plant with flowers that are yellow or orange lit. *T. erecta* is very easy to grow fast and bloom even without special treatment. This plant is commonly used as a natural insecticide because it produces a distinctive odor. *T. erecta* in Indonesia began with difficulties due to the low economic value of this plant. The flower of *T. erecta* have a scent unfavorable and only part interest only commonly used as ornamental flowers ⁽¹⁾.

The leaves of *T. erecta* has been used empirically by Indonesian to treat various illnesses. Some diseases that are believed to be cured by *T. erecta* including respiratory tract infections, cough, scabies, boils and open sores on the skin. Chemical constituents of this plant include saponins, flavonoids, tagetiin, polyphenols, quercetin and quercetagetin. Several scientific studies that have been reported are antibacterial and antioxidant properties of extract *T. erecta*. Extract of *T. erecta* have also been investigated and were able to heal the wounds of the rat kidney and wounds on the skin of white rats ⁽²⁻⁵⁾.

The present study aimed to characterize the ethanol extract of *T. erecta* leaves and identify compounds by Gas chromatography – Mass spectrometry (GC-MS). Characterization are the determination of moisture content, total ash and total acid insoluble ash content. GC-MS analysis of the extracts were then compared with a database on MS to obtain data on the compounds contained.

Material and Method

Plant Collection, Identification and Extraction

Fresh leaves of *T. erecta* were collected from Bandungan, Central Java, Indonesia. This leaves was identified by the department of pharmaceutical biology UGM. Its voucher number is BF/38/Ident/Det/ I/2015. Extraction begins with a clean wash the leaves with water and dry by oven at 40°C. The leaves are dried then crushed and extraction process performed by remaserasi. Leaves powder soaked with ethanol 96%, shake for 24 hours at 150 rpm. Repeat the process of maceration to obtain an almost clear filtrate. The solvent was evaporated by rotary evaporator and continued using a water bath to obtain a thick extract.

Moisture Content

Determination of the moisture content contained in the extract using a boiling flask with Toluene. Boil the toluene and 5g extract until the water does not evaporate. The water content is calculated in % w/v.

Total Ash

2g extract heat in the furnace until the charcoal out and chill. Total ash contained counted against the weight of the extract were tested and expressed in % w/w.

Acid Insoluble Ash

Simmer ash obtained in the determination of total ash with 25 ml of dilute hydrochloric acid. Collect all the parts that are not soluble acid and filtered using ash-free filter paper. Preheat the screening results in tuner to terpijar perfect. Weigh acid insoluble ash as % w/w of the weight of the test material.

GC-MS analysis

The GC-MS was performed by HP 5ms columns Agilent's 30-meter. Column diameter was 0.25 mm and the thickness of the film 0,25µm. The carrier gas is helium and ionizing used EL (70Ev). GC conditions: *Column oven temperature* 40°C, *injector temperature* 300°C by injection models are split with a ratio of 207.9. *Flow control mode* is pressure 12 kPa. *Column flow* 0,56 mL/min, *linear velocity* 27,1 cm/sec. *Mass spectrometri* used under conditions *Ion source temperature* 250°C, *interface temperature* 300°C. *Scan range* 28-600m/z speed 1250, time scan starts at minute 0 to minute 50.

Result and Discussion

Extract characterization was analyzed three times (Table 1). The moisture content of no more than 10% is expected to be derived extracts that are not easily invaded by fungi or microorganisms. Total ash and acid insoluble ash will provide information on the content of inorganic materials contained in the extract. ^(6,7).

Table 1. Physicochemical analysis of of Extract Ethanol *Tagetes erecta* L.

Analysis of physicochemical	Replication			Average
	1	2	3	
Moisture content (% v/w)	8,90	7,95	7,98	8,28 ± 0,540 % v/w
Total ash (% w/w)	2,57	2,50	2,56	2,54 ± 0,038 % w/w
Acid insoluble ash (% w/w)	0,94	0,94	1,05	0,98 ± 0,064 % w/w

GC-MS chromatogram of the ethanol extract *T. erecta* leaves (Fig. 1) shows 17 peaks indicating that this extract contain 17 phytochemical compounds.

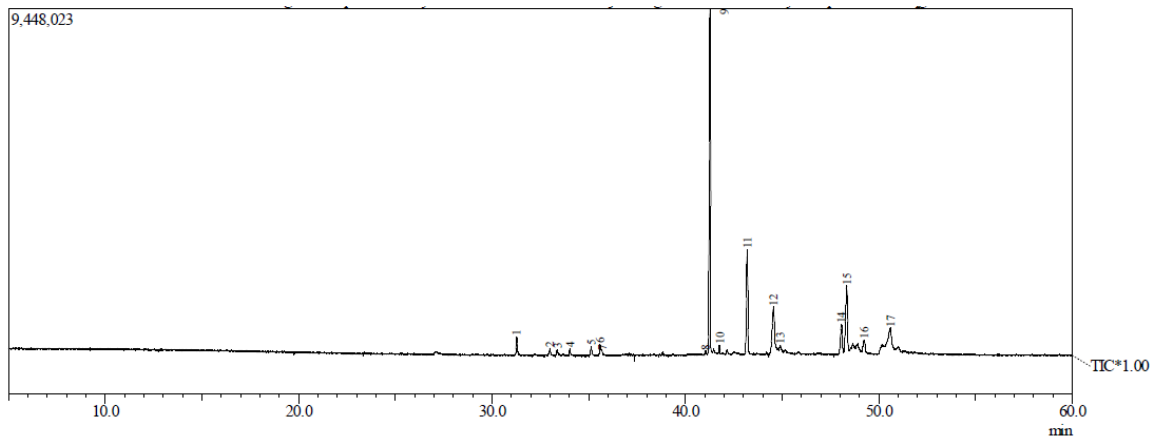


Figure 1.Kromatogram of Extract Ethanol *Tagetes erecta* L. by GC-MS

There are 17 compounds analyzed (Tabel 2), The first compound at retention time of 31.284 was caryophyllane. Last compound with a retention time of 50.614 was Linolenic acid-methyl ester. Three compounds are most Neophytadine 43.88%, 9,12,15-acid-methyl ester Oktadecadienoic 13.45%, and hexadecanoic acid-methyl ester 13.24%.

Table 2.Phytochemical compounds identified in ethanol extract of *T. erecta* leaves.

Peak	Retention time	% Peak area	Name of the compound	M ⁺
1	31,284	2,15	Caryophyllene	204
2	32,992	0,67	Germacrene	204
3	33,383	0,45	Bicyclogermacrene	204
4	34,042	0,72	Pentane, 1,1'-oxybis	187
5	35,134	1,14	1,6,10-Dodecatrien-3-ol,3,7,11-trimethyl	189
6	35,594	1,25	Spathulenol	220
7	35,708	0,44	5-chloro-6,6-dimethyl-spiro	206
8	41,042	0,39	Pentadecanoic acid-methyl ester	256
9	41,290	43,88	Neophytadiene	151
10	41,773	0,81	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	278
11	43,207	13,24	Hexadecanoic acid-methyl ester	270
12	44,567	9,69	Palmitic acid	256
13	44,911	0,43	Hexadecanoic acid-ethyl ester	284
14	48,071	5,29	9,12-Oktadecadienoic acid	294
15	48,351	13,45	9,12,15-Oktadecadienoic acid-methyl ester	236
16	49,242	2,53	Heptadecanoic acid	298
17	50,614	3,47	Linolenic acid-metil ester	222

Neophytadine efficacious as antibacterial and antimicrobial^(8,9). Compounds of 9,12,15-Octadecatrienoic acid- methyl ester efficacious as antioxidant, anticancer and antimicrobial⁽¹⁰⁻¹²⁾. Hexadecanoic acid methyl ester efficacious as antioxidant and antimicrobial^(8,13).

Conclusion

The character of the ethanol extract of *T. erecta* leaves are moisture content 8.28 ± 0.540 % v/w, total ash content 2.54 ± 0.038 % w/w and acid insoluble ash 0.98 ± 0.064 % w/w. Identification of bioactive compounds by GC-MS there are 17 types of compound with a retention time of 31.284 to 50.614. Compounds containing more than 10% are Neophytadiene 43.88%, 9,12,15-Octadecatrienoic acid-methyl ester 13.45% and hexadecanoic acid-methyl ester 13.24%.

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