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PHYTOCHEMICAL EVALUATION OF *Coriandrum* L FLOWERS

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ABSTRACT

The flowers of *coriander* was extracted with methanol was subjected to preliminary phytochemical analysis. The methanolic crude extract was determined by GC/MS analysis.The present investigation revealed the following major compounds from *coriander*. Results from the analysis revealed that 30 bioactive phytochemical constituents were identified. Based on the peak area and molecular weight, benzofuran,2,3-dihydro (15.4) hexadecanoic acid, methyl ester (10.32 %) 2,4a-epioxy-3,4,5,6,7,8,-hexahydro-2,5,5,8a-tetramethyl-2h-1-benzofuran (9.35%), 2-methyoxy-4-vinylphenol (8.8%)2,3,5,6-tetrafluroanisole (8.62%) 2,6-dimethyl-3- aminobenzoquinone (6.81%) dodecanoic acid (5.00%) was observed as the major constituents.

Key words: Coriander, Flavonoids, Alkaloids, Glycosides.

INTRODUCTION

The genus *Coriandrum* L. has two species, *C sativum* L. is coriander, approximately 30–100 cm in height, with strong-smelling leaves (Paulraj *et.al.,* 2011). Coriander (*Coriandrumsativum* L.), an annual herb of the parsley family (Apiaceae), is native to the Mediterranean region and is extensively grown in Bangladesh, India, Russia, central Europe and Morocco and has been cultivated since human antiquity (Anonymous, 1950). The plant is grown widely all over the world for seed, as a spice, or for essential oil production. At one time, coriander was among the worldleading essential oil plants (Anonymous, 1950). The entire plant when young is used in preparing chutneys, sauces, in flavouring curries and soups. Coriander fruits are extensively used as condiments, inthe preparation of curry powder, pickling spices, sausages and seasonings. They are used for flavouring pastry, cookies, buns and cakes. It is widely used as folk medicine as carminative, spasmolytic, digestive and galactagogue; seed extract antimicrobial; used in lotions and shampoos; with castor oil useful in rheumatism (Kasra Maroufi *et al.,* 2010, Anonymous, 1950; Asolkar *et al.,* 1992; Chopra *et al.,* 1956; Ghani, 2003; Yusuf *et al.,* 1994, Nazrul Islam Bhuiyan *et al.,* 2009).

The odour and flavour of mature seed, fresh herbage and flower are completely different. A preliminary evaluation of anthelmintic activity of leaves is reported. Coriander seeds have a health-supporting reputation that is high on the list of the healing spices. In parts of Europe, coriander has traditionally been referred to as an "anti-diabetic" plant. In some parts of India, it has traditionally been used for its anti-inflammatory properties. In the United States, coriander has recently been studied for its cholesterol lowering effects (Kasra Maroufi et.al., 2010).Taking into consideration of the medicinal importance of this plant, the methanolic extract flower of coriander were analysed for the first time using GC MS. This work will help to identify thecompounds of therapeutic value. GC-MS is one of the best techniques to identify the bioactive constituents of long chain, branched chain hydrocarbons, alcohols, acids, ester etc. In this work we have determined the chemical composition of flower oils of *C. sativum*. These features allow it to be identified for medicinal use and classified among the other oils available in the international market.

METHOD AND MATERIALS

COLLECTION OF SAMPLE

Coriander is a tropical crop; it requires a cool and comparatively dry frost, free climate particularly at the time of flowering and seed formation stages, for good quality and high yields. The optimum temperature of germination and early Growth of coriander is 20°C-25°C (Verghese.J, 2001). The flowers of white with slightly brinjal like shades (Pandey Shivanand 2010) of plant materials of *C. Sativum* were collected from nursery garden and home garden. The collected plants were separated into root, stem, leaf and floral bud. The plant materials were dried in shade separately.

PLANT SAMPLE EXTRACTION

The dried samples (flower 250 g) were chopped into small pieces and extracted with methanol: water (80:20) by soaking for 48 hrs at room temperature (25°C). The methanolic extract was decanted, filtered under vacuum, concentrated in a rotary evaporator (40°C.). Reduces the volume to 1ml the extract contains both polar and non-polar phytocomponents.

PHYTOCHEMICAL SCREENING

Chemical tests were carried out on the diethyl ether, ethyl acetate, chloroform and water extracts of the flower of coriander *using* standard procedures to identify the constituents as described by Sofowora (Manorenjitha *et.al.,* 2013), Trease (Chopra, 1956) and Evans and Harborne 1973, Mohammad Nisar et al., 2011, M.S.Manorenjitha *et al.,* 2013, Pandey Shivanand 2010).

ALKALOIDS

About 0.2g of the extracts was wormed with 2% H SO for two minutes. It was filtered and a few drops of Dragondorff reagent were added. Orange red precipitate indicated the presence of alkaloids.

TANNINS

A small quantity of each extracts were mixed with water and heated on water bath and filtered. A few drops of ferric chloride were added to the filtrate. A dark green solution indicates the presence of tannins.

GLYCOSIDES

The extracts were hydrolysed with HCl and neutralized with NaOH solution. A few drops of Fehling solution A and B were added. Red precipitate indicates the presence of glycosides.

REDUCING Sugars

The extracts were shaken with distilled water and filtered. Then boiled with few drops of Fehling, s solution add to A and B for few minutes. An orange red precipitate indicates the presence of reducing sugars.

SAPONINS

About 0.2 g of the extract was shaken with 5ml of distilled water and then heated to boil. Frothing (appearance of creamy miss of small bubbles) shows the presence of saponins.

FLAVONOIDS

Extract of about 0.2 g was dissolved in diluted NaOH and Hcl was added. A yellow solution that turns colourless indicates the presence of flavonoids.

STEROIDS

2 ml of acetic anhydride was added to 0.5 g of the extract of each with 2 ml of H $S0_4$. The colour changed violet to blue or green in some samples indicate presence of steroids.

TEST FOR PHENOLS FERRIC CHLORIDE TEST

To 1ml of the extract, 2ml of distilled water followed by few drops of 10% ferric chloride was added. Formation of blue or green color indicates presence of phenols

TEST FOR ANTHOCYANIN AND BETACYANIN SODIUM HYDROXIDE TEST

To 2ml of plant extract, 1ml of 2N sodium hydroxide was added and heated for 5minutes at 100°C. Formation of bluish green color indicates the presence of anthocyanin and formation of yellow color indicates the presence of betacyanin.

GC-MS ANALYSIS

GC-MS analysis was carried out on an Agilent technologies 7890A GC system 7683 B series auto sampler, and gas chromatography interfaced to a mass spectrometer (GC-MSD 5975 C inert XL EI/CI MSD with triple axis detector) instrument employing the following conditions. HP-5MS fused Silica capillary column (30mmX0.25mmX0.25mmdf, composed of 5% Diphenyl / 95% Dimethyl poly Siloxane), operating in electron impact mode at 7oev; Helium (99.999%) was used as carrier gas at a constant flow of 0.1ml min and an injection volume of 2 ml was employed (split ratio of 20:1)injector temperature 250°C;lon- source temperature 280°C. The over temperature was programmed from 110°C (isothermal for 2min), with an increase of 10°C/min, to 200°C, then 5°C/min to 280°C, ending with a 9min isothermal at 320°C mass spectra were taken at 70ev; a scan interval of 0.2 seconds and fragments from 40 to 450 Da. Total GC running time is 38 min (1, 14 and 2).

RESULT AND DISCUSSION

PHYTOCHEMICAL SCREENING

The phytochemical analysis (Table 1) of the methanolic extract of *coriander*flowers based on the presence or absence of colour changes indicated the presence and absence of various constituents. Methanoli(80%)c extract of *coriander flower* contained alkaloids, flavonoids, steroids, reducing sugar and glycosides, saponins and tannins and anthocyanin.

Colour identifications test for phyto constituent were performed in coriander flower, in that anthocyanin test indicated for green colour, flanonoids (paleyellow), gulucosides (orange red), tannin (light green), reducing sugar (orange), alkaloid (orange red) phenol (dark green) and saponin, steroids in not indicating any relevant colour appearance.63 compounds were identified, in that 35 bio-active substance indentified from coriander flower by GC-MS analysis the active principles with their retention time (RT), Molecular Weight (MW) and concentration (% area % of GCMS) are presented in (Table 2) the prevailing compounds were benzofuran, 2, 3-dihydro (15.4) hexadecanoic acid, methyl ester (10.32 %) 2,4a-epioxy-3, 4, 5, 6, 7, 8,-hexahydro-2, 5, 5, 8a-tetramethyl-2h-1-benzofuran (9.35%), 2-methyoxy-4-vinylphenol (8.8%) 2, 3, 5, 6-stetrafluroanisole (8.62%) 2, 6-dimethyl-3-aminobenzoquinone (6.81%) dodecanoic acid (5.00%) 1-propane, 1-(1-adamantyl) -3-dimethylamino- (3.92) 9-octadedeconic acids (z)-, 2-dihydroxy-1-(hydroxy methyl) etyl ester (4.46%) propylamine,n-(9-borabicyclo (3.3.1) non-(9yl) - (3.25) acetamide, 2-chloro-n,n-diethyl (2.85%), dl-glycer aldehyde (1.25%), 4h-pyran-4-one,2,3-dihydro-3,5-dihdroxy-6-methyl-(1.03%) 1,3-dioxolan-2-one,4,5-

dimethyl-(1.08%) phenol,2,3,5,6-tetramethoxy-(1.31%), trans -2-dodecanoic acid (1.12%), phenol,2-methoxy (0.9%), d-glycero-d-ido-heptose (0.84%), oxalic acid, hexadecyl propyl ester (0.88%) and 5,5-diethyl-2-iminobarbituric acid (0.81%). The GC-MS analyses of coriander flower active compounds were picturized in figure 1.

Figure 1 - The GC-MS analyses of coriander flower active compounds

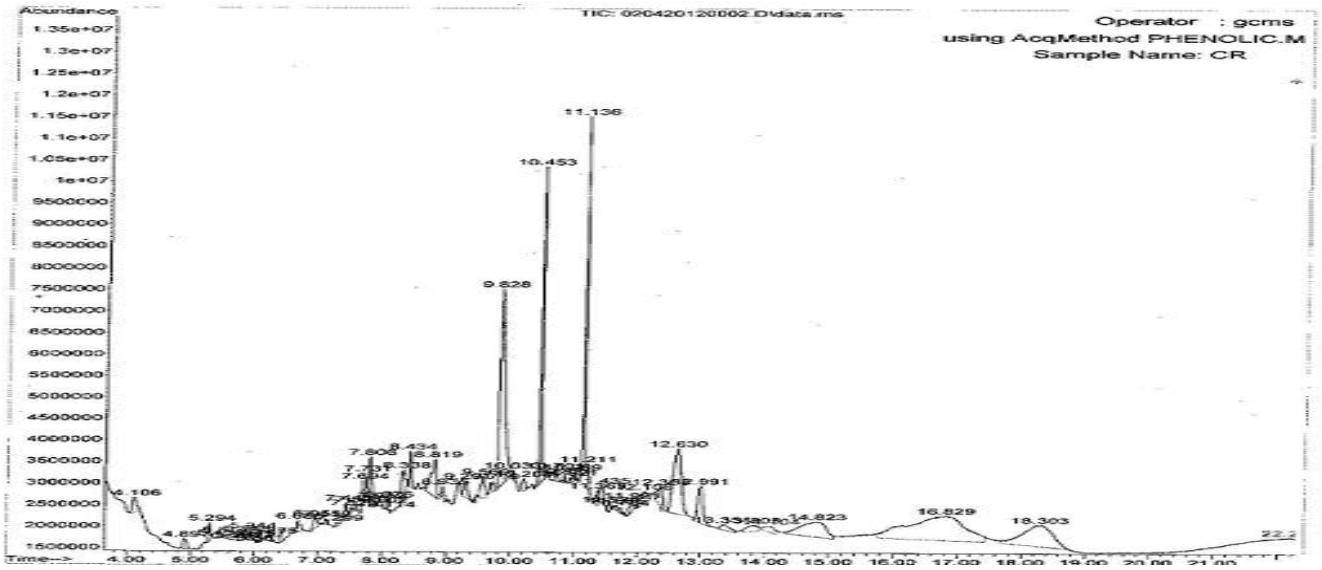

Table: 1- Phytochemical for identification test

Alkaloids	Saponins	Reducing Sugars	Glycosides	Tannins	Phenol	Anthocyanin	Flavonoid	Steroids
Yes	No	Yes	Yes	No	Yes	Yes	yes	No

Table: 2a - GC-MS analysis for 80% methanolic extract and identified compounds

Detected compounds	Area %	MW
dl-glycer aldehyde	1.21	180
1,2,15-pentadecanetriol	0.144	
1-propane,1-(1-adamantyl)-3-dimethylamino-	3.92	235
1,2-propanediol,3-(dimethylamine)	0.059	119
acetamide,2-chloro-n,n-diethyl	2.85	149
9-azabicyclo(3.1.0)non-4-en-9-amine	0.7	138
propanedioic acid	0.64	104
carbomic acid,2-(dimethylamino)ethylester	0.12	132
methyl n-isopropyl -3,3-trimethoxypropanimidate	0.11	219
n(3-(n-aziridyl)propylidene)-3-dimethylaminopropylamine	0.057	183
1,3-propanediol,2-(hydroxymethyl)-2-nitro-	0.16	151
1,4-butanediol	0.074	90
methylene asparagines	0.31	144
1-butanol,2,2-dimethyl-	0.257	102
4-(2-(5-amino-2h-1,2,3,4-tetrazol-2-yl)ethoxy)-1,2,5-oxadiazol-3-amine	0.17	212
1-aziridinepropanenitrile,.beta.-methyl-	0.67	110
piperzine,1,4-dimethyl-	0.048	114
pyrrolidin-1-proponic acid	0.31	143
1h-pyrrole-1-ethanamine,tetrahydro-alpha.-methyl-		128
1-pyrrolidinecarboxaldehyde	0.47	99
hydrouracil,1-methyl-	1.37	128
7-n-pentadecylaminomethyl-6-hydroxy-5,8-quinilidione	0.29	414
Pyrrolidine	0.3	71

2,5-dimethyl-4-hydroxy-3(2h)-furan	1.2	128
phenol,2-methoxy	0.9	124
1-nonene	0.19	126
octane,4-methyl	0.64	128
oxalic acid, hexadecyl propyl ester	0.88	356
n-Amyl acetate	0.41	186
4h-pyran-4-one,2,3-dihydro-3,5-dihdroxy-6-methyl-	1.03	141
1,3-dioxolan-2-one,4,5-dimethyl-	1.08	116
phenol,2,3,5,6-tetramethoxy-	1.31	150
benzofuran,2,3-dihydro	15.4	120
4(methylthio)-1-butanol	0.61	120
3(5)(1,2-dihydroxy-3-propoxy)methyl(-4-hydroxy-1h-pyrazole-5(3)carboxamide	0.193	231
2-methyoxy-4-vinylphenol	8.8	150
4-hydroxy-3-(1,3-dihydroxy-2-propoxy)methyl)1h-pyrozole-5-carboxamide	0.38	231
Glycerine	0.42	92
Glycerine		92
n-methoxy -n methylactamide	0.22	103
2,6-dimethyl-3-aminobenzoquinone	6.81	151
Di-glycerol	0.06	166
d-glycero-d-ido-heptose	0.84	210
1,2,3,4-butanetetrol,(s-(r*,r*))-	0.19	122
bis-(n,n-dimethyl)o-ethyl phosphorodiamidate	0.017	180
proponic acid,3-(bicyclo(2.2.1)hept-1-yl,methyl ester	0.048	180
5,5-diethyl-2-iminobarbituric acid	0.81	
dodecanoic acid,3-hydroxy-	0.22	216
2-dodecanoic acid	0.14	198
trans -2-dodecanoic acid	1.12	198
2,3,5,6-tetrafluroanisole	8.62	180
propylamine,n-(9-borabicyclo(3.3.1)non-9yl)-	3.25	179
tetra dodecanoic acid		228
dodecanoic acid	5	198
acetic acid,3-methylenebicyclo(3.2.1)oct-6-en-yl ester	0.5	178
1-(2,3-dihydroxypropyl)-pyrazolo(3,4-d)pyrimidin-4(5h)-one	-	210
9-methyltricyclo(4.2.1.1(2,5))deca-3,7-diene-9-,10-diol	-	178
isopulegyl acetate	-	196
2-butanone,4-2,6,6-trimetyhyl-2ccyclohexan1-yl-	-	197
2,4a-epioxy-3,4,5,6,7,8,-hexahydro-2,5,5,8a-tetramethyl-2h-1-benzofuran	9.35	226
pentadecanoic acid,14-methyl-methyl ester		270
hexadecanoic acid,methyl ester	10.32	270
9-octadedeconic acis(z)-,2-dihydroxy-1-(hydroxy methyl)etyl ester	4.46	356

Table: 2b - GC-MS analysis for 80%methanolic extract for bio active compounds

Detected compounds	Area %	MW	Functions
dl-glyceine ,aldehyde	1.21	180	Preservative
1-propane,1-(1-adamantyl)-3-dimethylamino-	3.92	235	Antioxidant
Acetamide,2-chloro-n,n-diethyl	2.85	149	Organic catalyst in the preparation of phosphorylated thiosemicarbazide.
propanedioic acid	0.64	104	Dicarboxylic acid /ester
1,4-butanediol	0.074	90	Preservative
methylene asparagines	0.31	144	Amino acid
1-butanol,2,2-dimethyl-	0.257	102	Flavoring agent

pyrrolidin-1-proponic acid	0.31	143	Antagonists
7-n-pentadecylaminomethyl-6-hydroxy-5,8-quinilidione	0.29	414	Antiseptic /disinfects
Pyrrolidine	0.3	71	Anticonvulsant, levetiracetam,
2,5-dimethyl-4-hydroxy-3(2h)-furan	1.2	128	Aromatic/flavouring agent
phenol,2-methoxy	0.9	124	Flavoring agent/antioxitant
n-Amyl acetate	0.41	186	Flavoring Agent
4h-pyran-4-one,2,3-dihydro-3,5-dihdroxy-6-methyl-	1.03	141	Flavonoids
1,3-dioxolan-2-one,4,5-dimethyl-	1.08	116	Ester
phenol,2,3,5,6-tetramethoxy-	1.31	150	Antioxitant
benzofuran,2,3-dihydro	15.4	120	Antiangiogenic activity
4(methylthio)-1-butanol	0.61	120	Flavouring agent
2-methyoxy-4-vinylphenol	8.8	150	Aromatic/flavour
Glycerine	0.42	92	Flavour/antimicrobial preservative
Glycerine		92	Flavouring agent
Di-glycerol	0.06	166	Preservative
d-glycero-d-ido-heptose	0.84	210	Sugar moity
proponic acid,3-(bicyclo(2.2.1)hept-1-yl,methyl ester	0.048	180	Preservative/ inhibit the mould and Bacteria
5,5-diethyl-2-iminobarbituric acid	0.81		
dodecanoic acid,3-hydroxy-	0.22	216	Fatty acid
2-dodecanoic acid	0.14	198	Fatty acid
Trans -2-dodecanoic acid	1.12	198	Antifibrinolytic
2,3,5,6-tetrafluroanisole	8.62	180	Fungicide
Tetra dodecanoic acid		228	Fatty acid
Dodecanoic acid	5	198	Antimicrobial/increasing HDL/fatty acid
Isopulegyl acetate	-	196	Flavouring agent
2,4a-epioxy-3,4,5,6,7,8,-hexahydro-2,5,5,8a-tetramethyl-2h-1-benzofuran	9.35	226	Anti malarial activity
Pentadecanoic acid,14-methyl-methyl ester		270	Fatty acid
hexadecanoic acid,methyl ester	10.32	270	Cosmetics/antipsychotic medication/ Antioxidant, hypocholesterolemic nematicide, pesticide, anti-androgenic flavor, hemolytic, 5-Alpha reductase inhibitor
9-octadedeconic acis(z)-,2-dihydroxy-1-(hydroxy methyl)etyl ester	4.46	356	Decreasing LDL Antiinflammatory, hypocholesterolemic cancer preventive, hepatoprotective, nematicide, insectifuge, antihistaminic antieczemic, antiacne, 5-Alpha reductase inhibitor, antiandrogenic, antiarthritic, anticoronary, insectifuge

CONCLUSIONS

Coriander flower (*Coriander sativum*L.) volatile oil is rich in beneficial phytonutrients and the flower have a health-supporting reputation that is high on the list of the healing spices and has been used as antispasmodic, carminative, stimulant, cytotoxic, lipolytic, fungicidal and stomachic compound. Coriander also possesses hypoglycemic, hypolipidemic, antibacterial, antimutagenic activity, insecticidal and aflatoxin controlling effects (Kasra Maroufi et al., 2010, Ullagaddi Rajeshwari, Bondada Andallu Tıbbi 2011). Besides, coriander also possesses many other traditional health benefits. The healing properties of coriander can be attributed to its exceptional phytonutrient content. Considering these potentials, coriander biomolecules

possess a tremendous future in the health-related industry.

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