

Review Article on Chemical Constituents and uses of Turmeric Plant

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ABSTRACT

Turmeric is a traditional medicinal plant which Containing verity of active ingredients. Chemical constituents of various parts of turmeric plant (*Curcuma longa* L.) are extensively investigated. Today's date , at least 235 chemical constituent and their derivative compounds are studied those mainly contains, primarily phenolic compounds and terpenoids have been identified from the species, including; phenylpropene, diarylheptanoids, diarylpentanoids with other phenolic compounds, monoterpenes, sesquiterpenes, diterpenes, triterpenoids, sterols, alkaloids, and other compounds. Curcuminoids (diarylheptanoids) and essential oils are most bioactive chemical components showing various bioactivities in in-vitro and in-vivo bioassays. The present paper reviews the Introduction, Uses and chemical constituents of this plant.

KEYWORDS: *Curcuma longa*, Chemical constituent, turmeric

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INTRODUCTION

Turmeric (*Curcuma longa* L.) is a rhizomatous non-woody plant of the ginger family, Zingiberaceae. This is native to tropical South Asia but is now widely cultivated in the tropical and subtropical regions of the world. Rhizomes of this plant mostly use to prepare powder which can prepare by boiled first then dried. It has been commonly used as spice and medicine (Rhizome *Curcuma Longae*), in Asia. Turmeric also use as anti-inflammatory drug in Ayurvedic medicine and as stimulant, aspirant, carminative, cordial, emenagogue, astringent, detergent, diuretic and martirnet medicine in Chinese medicine [1-3].

In India and China, wild turmeric (*C. aromatic Salisb.* commonly called as *Kasthuri manjal* or *yujin*) is sometimes used as turmeric production [4].

This species is known ats *C. wenyujin* Y.H. Chen et *C. Ling* in China. It was also occasionally used to substitute Rhizome *Curcumae*.

There are extensive in-vitro and in-vivo study on turmeric extracts using ethanol, methanol, water, and ethyl acetate extracts or "pure" active "curcumin" (actually it was a mixture of three major curcumnioids in many cases) powder over the last 50 years. An according to the data of animal research, cell culture and clinical research curcumin may have potential therapeutic activity against in such

disease as pancreatitis, inflammatory bowel disease, chronic anterior uveitis and arthritis [3, 12].

The main pharmaceutical products from turmeric are dried whole rhizomes, ground turmeric, turmeric oils, turmeric oleoresin, and curcumin (maybe actually mixture of three curcuminoids) [13, 14].



Fig.1 Turmeric rhizomes with dry powder

USES:

A. General Traditional health benefits

- Turmeric promotes balanced mood.
- Turmeric helps wounds healing.
- Turmeric group seemed to enjoy more relief from joint pain.

- Turmeric helps in balanced blood sugar.
- Turmeric soothes irritated tissue.
- Turmeric also helps in cholesterol optimization.
- It can treat tonic and acute allergies and offers health benefits for asthma and eczema.
- It has been found to be effective in treating acne and psoriasis.
- It acts as powerful immune modulator.
- Traditionally Turmeric is used as home remedy for wound healing.
- Turmeric also helps to cure digestive disorder, Liver disease, cancer, and atherosclerosis, and osteoarthritis, menstrual problem of women, bacterial infection, and eye disorder.
- Turmeric is anti-inflammatory to the mucous membrane which coat the throat, lungs, stomach and intestine.

B. Pharmacological Activity

1. Anti-inflammatory-
2. Anti-oxidant-
3. Anti-coagulant-
4. Anti-diabetic-
5. Anti-microbial-
6. Anti-ulcer-
7. Wound healing-
8. Anti-fertility-
9. Anti-cancer
10. Flavoring agent
11. Coloring agent
12. Anti-virus
13. Anti-aging
14. Anti-bacterial
15. Anti-Parkinson

16. Food additives
17. Insect Repellent
18. local anesthetic
19. Antifungal
20. Antineoplastic

CHEMICAL CONSTITUENTS:

As per the review of many articles and research paper study 110 species of the genus *Curcuma* L., only about 20 species have been studied phytochemically [14].

Curcuma longa is the major chemically investigated species of *Curcuma*.

Today's, at least 235 chemical constituents with their derivatives are studied those contains; primarily phenolic compounds and terpenoids have been identified, including diarylheptanoids (including commonly known as curcuminoids), diarylpentanoids, monoterpenes, sesquiterpenes, diterpenes, triterpenoids, alkaloid, and sterols, etc.

Nutritional analysis showed that turmeric contains fat, calcium, phosphorous, sodium, potassium, iron, thiamine, riboflavin, niacin, ascorbic acid, carbohydrates, dietary fiber, sugars, and protein (Balakrishnan 2007). Turmeric is also a good source of the ω -3 fatty acid and α -linolenic acid (2.5%; Goud, Polasa, and Krishnaswamy 1993).

Many of them are still unknown of their therapeutic uses and most of compounds are under the research study.

Some of them are given in following tables:

Table No. 1 Table of chemical constituent of turmeric with uses

Sr. No.	Compound Name	Compound type	Use	Ref. No.
1.	Curcumin (Curcumin I)	Diarylheptanoid	Anti-inflammatory Anti-oxidant	15,16
2.	1,5-Epoxy-3-Carbonyl-1,7-Bis(4-Hydroxyphenyl)-4,6-Heptadiene	Diarylheptanoid	Anti-oxidant	5
3.	Demethoxycurcumin (Curcumin II)	Diarylheptanoid	Coloring agent and Food additive	15,16
4.	Bisdemethoxycurcumin (Curcumin III)	Diarylheptanoid	Coloring agent and Food additive	15
5.	Tetrahydroxycurcumin	Diarylheptanoid	Antimicrobial	15
6.	1-(4-Hydroxy-3-Methoxyphenyl)-7-(3, 4-Dihydroxyphenyl)-1, 6-Heptadiene-3, 5-Dione	Diarylheptanoid	Anti-cancer	17
7.	1-(4-Hydroxyphenyl)-7-(3, 4-Dihydroxyphenyl)-1, 6-Heptadiene-3, 5-Dione	Diarylheptanoid	Anti-cancer	17
8.	1-(4-Hydroxy-3-Methoxyphenyl)-5-(4-Hydroxyphenyl)-1, 4-Pentadiene-3-One	Diarylpentanoid	Unspecified	17
9.	3-Hydroxy-1,7-Bis-(4-Hydroxyphenyl)-6-Heptene-1,5-Dione	Diarylheptanoid	Anti-virus	17
10.	1,5-Dihydroxy-1-(4-Hydroxy-3-Methoxyphenyl)-7-(4-Hydroxyphenyl)-4,6-Heptadiene-3-One	Diarylheptanoid	Anti-virus	17
11.	1,5-Dihydroxy-1-(4-Hydroxyphenyl)-7-(4-Hydroxy-3-Methoxyphenyl)-4,6-Heptadiene-3-One	Diarylheptanoid	Anti-virus	17
12.	1,5-Dihydroxy-1,7-Bis(4-Hydroxy-3-Methoxyphenyl)-4,6-Heptadiene-3-One	Diarylheptanoid	Anti-virus	17
13.	1,5-Dihydroxy-1,7-Bis(4-Hydroxyphenyl)-4,6-Heptadiene-3-One	Diarylheptanoid	Anti-virus	17
14.	5-Hydroxyl-1-(4-Hydroxy-3-Methoxyphenyl)-7-(4-Hydroxyphenyl)-4,6-Heptadiene-3-One	Diarylheptanoid	Anti-virus	18

15.	5-Hydroxyl-1,7-Bis(4-Hydroxy-3-Methoxyphenyl)-4,6-Heptadiene-3-One	Diarylheptanoid	Anti-virus	18,19
16.	1,7-Bis(4-Hydroxyphenyl)-1-Heptene-3,5-Dione	Diarylheptanoid	Anti-virus	18
17.	5-Hydroxyl-7-(4-Hydroxy-3-Methoxyphenyl)-1-(4-Hydroxyphenyl)-4,6-Heptadiene-3-One	Diarylheptanoid	Anti-virus	18
18.	1,7-Bis(4-Hydroxy-3-Methoxyphenyl)-1,4,6-Heptatrien-3-One	Diarylheptanoid	Anti-oxidant	19
19.	Cyclocurcumine	Diarylheptanoid	Unspecified	20
20.	1,7-Bis-(4-Hydroxyphenyl)-1,4,6-Heptatrien-3-One	Diarylheptanoid	Unspecified	21
21.	1,5-Bis(4-Hydroxyphenyl)-Penta-(1E,4E)-1,4-Dien-3-One	Diarylpentanoid	Anti-oxidant	21
22	1,5-Bis(4-Hydroxy-3-Methoxyphenyl)-Penta-(1E,4E)-1,4-Dien-3-One	Diarylpentanoid	Unspecified	22
23	4''-(4'''-Hydroxyphenyl)-2''-Oxo-3''-Butenyl-3-(4'-Hydroxyphenyl-3'-Methoxy)-Propenoate	Phenylpropene	Unspecified	23
24	4''-(4'''-Hydroxyphenyl-3-Methoxy)-2''-Oxo-3''-Butenyl-3-(4'-Hydroxyphenyl)-Propenoate	Phenylpropene	Unspecified	23
25	Calebin-A	Phenylpropene	Unspecified	14
26	(E)-4-(4-Hydroxy-3-Methoxyphenyl)But-3-En-2-One	Phenylpropene	Unspecified	22
27	(E)-Ferulic Acid	Phenylpropene	Anti-aging, anti-cancer, Antioxidant	22
28	(Z)-Ferulic Acid	Phenylpropene	Anti-aging, anti-cancer, Antioxidant	22
29	Vanillic Acid*	Phenolic	Anti-inflammatory,	22
30	Vanillin	Phenolic	Flavoring agent	22
31	<i>P</i> -Cymene*	Monoterpenoid	Flavoring Agent	26,44
32	<i>M</i> -Cymene *	Monoterpenoid	Air-fresheners, fragrance,	27,44
33	α -Terpinene*	Monoterpenoid	Adhesive	27, 44
34	γ -Terpinene*	Monoterpenoid	Flavoring agent	27
35	β -Phellandrene*	Monoterpenoid	Antimicrobial, antifungal	27
36	<i>P</i> -Mentha-1,4(8)-Diene*	Monoterpenoid	Antimicrobial	28,44
37	terpinen-4-ol*	Monoterpenoid	Flavoring agent	28,44
38	4-terpinol*	Monoterpenoid	Anti-inflammatory	29,44
39	Limonene*	Monoterpenoid	Flavoring agent	30
40	Terpinolene*	Monoterpenoid	Insect Repellent	30
41	Thymol*	Monoterpenoid	Antiseptic, Antibacterial	28,44
42	Phellandrol*	Monoterpenoid	Unspecified	26
43	Carvacrol*	Monoterpenoid	Anti-bacterial	30
44	(E)-Carveol*	Monoterpenoid	Anti-Parkinson	30
45	γ -Terpineol*	Monoterpenoid	Perfumes and flavors	28
46	Menthol	Monoterpenoid	local anesthetic	25,44
47	1,3,8P-menthatriene	Monoterpenoid	Food-additive, flavor	24,44
48	<i>P</i> -Methyl acetophenone	Monoterpenoid	Food-additive, flavor	24,44
49	Piperitone	Monoterpenoid	Flavoring agent	25,44
50	<i>O</i> -Cymene*	Monoterpenoid	Cosmetics, fragrance	28,44
51	Carvone*	Monoterpenoid	Plant growth regulator	26,44
52	<i>P</i> -Menth-8-en-2-One*	Monoterpenoid	Perfumes and flavors	30
53	α -Thujene*	Monoterpenoid	Food-additive, flavor	27,44
54	α -Terpineol*	Monoterpenoid	Flavor, disinfectant, antioxidant	26,44
55	<i>P</i> -Cymen-8-Ol*	Monoterpenoid	Perfumes	28
56	<i>P</i> -Meth-8-En-2-One*	Monoterpenoid	CNS stimulant	28
57	Piperitoneoxide*	Monoterpenoid	Inactive	28,44
58	Sylvestrene*	Monoterpenoid	Antibiotics	28
59	Menthofuran*	Monoterpenoid	Food-additive, flavor	26,44
60	β, β -Dimethylstyrene	Monoterpenoid	Flavoring agent, fragrance	25
61	Camphor	Monoterpenoid	Anti-inflammatory, analgesic	25,44
62	Teresantalol	Monoterpenoid	Flavoring agent	25

63	Benzene, 1-Methyl-4-(1-Methylpropyl)	Monoterpenoid	Unspecified	25
64	2-Norpinanone*	Monoterpenoid	Unspecified	30
65	Borneol*	Monoterpenoid	Flavoring agent	27,44
66	Bornyl Acetate*	Monoterpenoid	Flavoring agent	30
67	(E)-Chrysanthenyl Acetate*	Monoterpenoid	Antimicrobial	30
68	(Z)-Cinerone*	Monoterpenoid	Unspecified	10
69	(Z)-sabinol*	Monoterpenoid	Anti-inflammatory	10,44
70	2-(2,5-Dihydroxy-4-Methylcyclohex-3-Enyl)Propanoic Acid	Monoterpenoid	Anti-cancer	32
71	Camphene*	Monoterpenoid	Food-additive, flavor	27,44
72	3-Carene*	Monoterpenoid	Flavoring agent	30
73	2-Carene*	Monoterpenoid	Perfume	26,44
74	Ascaridole*	Monoterpenoid	Anthelmintic drug	30
75	α -Pinene*	Monoterpenoid	Food-additive	26,44
76	β -Pinene*	Monoterpenoid	Flavoring agent	28
77	Cineole*	Monoterpenoid	CNS depressant	28
78	Cis-Ocimene*	Monoterpenoid	Perfume	27
79	Citronellal*	Monoterpenoid	Antifungal agent	26
80	Geranial*	Monoterpenoid	Flavoring agent, Perfume	27
81	Neral*	Monoterpenoid	Flavoring agent	27,44
82	Myrcene*	Monoterpenoid	Flavoring agent	27,44
83	R-Citronellol*	Monoterpenoid	Food-additive	28,44
84	Citronellyl Pentanoate*	Monoterpenoid	Fragrance agent	26,44
85	Nerol*	Monoterpenoid	Flavoring agent, Fragrance	26,44
86	Geraniol	Monoterpenoid	Insect Repellent	25
87	Iso-Artemisia Ketone*	Monoterpenoid	Unspecified	27
88	Trans-Ocimene*	Monoterpenoid	Perfume	27,44
89	Linalool*	Monoterpenoid	Anti-microbial agent	26,44
90	Neryl Acetate	Monoterpenoid	Fragrance agent	25,44
91	Geranic Acid	Monoterpenoid	Anti-fungal agent	25,44
92	Geranyl Acetate	Monoterpenoid	Flavoring agent	25,44
93	3-Bornanone	Monoterpenoid	Antitumor, Analgesic	25,45
94	4,8-Dimethyl-3,7-Nonadien-2-ol	Monoterpenoid	Flavoring agent	25,44
95	3,4,5,6-Tetramethyl-2,5-Octadiene	Monoterpenoid	Unspecified	25
96	3,7-Dimethyl-6-Nonenal	Monoterpenoid	Flavoring agent, Fragrance	25
97	2,6-Dimethyl-2,6-Octadiene-1,8-Diol	Monoterpenoid	Unspecified	25
98	4,5-Dimethyl-2,6-Octadiene	Monoterpenoid	Unspecified	25
99	Ar-Turmerone*	Bisabolane	Anti-microbial activity	7,34,44
100	α -Turmerone*	Bisabolane	Anti-microbial activity	32,34
101	β -Turmerone*	Bisabolane	Anti-microbial activity	32,34
102	2-Methyl-6-(4-Hydroxyphenyl)-2-Hepten-4-One	Bisabolane	Flavoring agent	23
103	2-Methyl-6-(4-Hydroxy-3-Methylphenyl)-2-Hepten-4-One	Bisabolane	Flavoring agent	31
104	2-Methoxy-5-Hydroxybisabola-3,10-Diene-9-One	Bisabolane	Flavoring agent	32
105	2-Methyl-6-(4-Formylphenyl)-2-Hepten-4-One	Bisabolane	Flavoring agent	32
106	5-Hydroxyl-Ar-Turmerone	Bisabolane	Cytotoxic	23
107	4-Methylene-5-Hydroxybisabola-2,10-Diene-9-One	Bisabolane	Unspecified	23
108	Ar-Curcumene*	Bisabolane	Flavoring agent	32,44
109	Ar-Turmerol*	Bisabolane	Unspecified	30
110	Bisabola-3,10-Diene-2-One	Bisabolane	Unspecified	30
111	Bisabolone	Bisabolane	Flavoring agent	8,44
112	4, 5-Dihydroxybisabola-2,10-Diene	Bisabolane	Biological role is unclear	23
113	4-Hydroxybisabola-2,10-Diene-9-One	Bisabolane	Biological role is unclear	37
114	4-Methoxy-5-Hydroxy-Bisabola-2,10-Diene-9-One	Bisabolane	Biological role is unclear	36
115	Bisacurone	Bisabolane	Anti-inflammatory	36
116	Bisacurone A	Bisabolane	Anti-inflammatory	22
117	Bisacurone B	Bisabolane	Anti-inflammatory	32
118	Bisacurone C	Bisabolane	Anti-inflammatory	37

119	Bisacurone -9-One	Bisabolane	Biological role is unclear	29
120	Bisacumol	Bisabolane	Biological role is unclear	36
121	Turmeronol A	Bisabolane	Anti-microbial	31,33
122	Turmeronol B	Bisabolane	Anti-microbial	23,33
123	A-Oxobisabolene*	Bisabolane	Biological role is unclear	28
124	α -Zingiberene*	Bisabolane	Flavoring agent	26
125	Xanthorrhizol*	Bisabolane	Toxic substance	25,44
126	Zingerone	Bisabolane	Antioxidant, Anti-inflammatory	26,44
127	Dehydrozingerone	Bisabolane	Flavoring , Anti-inflammatory	37,46
128	(Z)- α -Atlantone*	Bisabolane	Toxic substance	37
129	(E)- α -Atlantone*	Bisabolane	Toxic substance	38
130	β -Bisabolene*	Bisabolane	Flavoring agent	27,44
131	(6S,7R)-Bisabolene*	Bisabolane	Abortifacient, anti-ulcer, anti-viral	30
132	γ -Bisabolene*	Bisabolane	Flavoring agent	28
133	γ -Curcumene*	Bisabolane	Dietary supplement	27
134	β -Curcumene*	Bisabolane	Dietary supplement	39
135	α -Curcumene*	Bisabolane	Food-additive	27
136	β -Sesquiphellandrene*	Bisabolane	Relieve digestive problems	27
137	(Z)- γ -Atlantone*	Bisabolane	Unspecified	27, 38
138	(E)- γ -Atlantone*	Bisabolane	Unspecified	38
139	(6S)-2-Methyl-6-[(1R,5S)-(4-Methene-5-Hydroxyl-2-Cyclohexen)-2-Hepten-4-One	Bisabolane	Unspecified	36
140	Curcuphenol*	Bisabolane	Cytostatic	35
141	Curlone	Bisabolane	Nutrient	22
142	Curculonone C	Bisabolane	Unspecified	22
143	Curculonone D	Bisabolane	Unspecified	22
144	Curculonone B	Bisabolane	Unspecified	22
145	Curculonone A	Bisabolane	Unspecified	22
146	2, 5-Dihydroxybisabola-3, 10-Diene	Bisabolane	Unspecified	91
147	(6R)-[(1R)-1,5-Dimethylhex-4-Enyl]-3-Methylcyclohex-2-En-1-One	Bisabolane	Unspecified	22
148	β -Atlantone	Bisabolane	Unspecified	22
149	2,8-Epoxy-5-Hydroxybisabola-3,10-Diene-9-One	Bisabolane	Unspecified	31
150	α -Bisabolol	Bisabolane	Food additive	25
151	Dihydro-Ar-Turmerone	Bisabolane	Environmental hazard	38
152	Dehydrocurcumene	Bisabolane	Unspecified	24
153	(4S,5S)-Germacrone-4,5-Epoxy	Germacrane	Unspecified	36
154	Dehydrocurdione	Germacrane	Anti-inflammatory	36
155	Germacrene D*	Germacrane	Antibacterial	26
156	Germacrone	Germacrane	Unspecified	36
157	Germacrone-13-Al	Germacrane	Unspecified	36
158	β -Germacene*	Germacrane	Antibacterial	27
159	1,10-Dehydro-10-Deoxy-9-Oxozedoarondiol	Guaiane	Unspecified	22
160	Curcumenol	Guaiane	Anti-androgenic	36
161	Epiprocurcumenol	Guaiane	Anti-inflammatory	36
162	Isoprocurcumenol	Guaiane	Anti-inflammatory	36
163	Zedoaronediol	Guaiane	Anti-diabetic	36
164	Procurcumadiol	Guaiane	Anti-inflammatory	36
165	Procurcumenol	Guaiane	Anti-inflammatory	36
166	Naphthalene,1,2,3,4,4a,5,6,8a-Octahydro-4a,8-Dimethyl-2-(1-Methylethylidene)	Selinane	Surfactant	25
167	α -Selinene	Selinane	Anti-Parkinson	25
168	Juniper Camphor	Selinane	Biomarker for consuming food	25
169	Corymbolone*	Selinane	Anti-bacterial	28
170	α -Santalol	Santalane	Anesthesia	25

171	α -Santalene	Santalane	Flavoring agent	25
172	β -Santalene	Santalane	Flavoring agent	25
173	(<i>E</i>)-Caryophyllene*	Caryophyllane	Anti-inflammatory	29
174	Caryophyllene Oxide	Caryophyllane	Flavoring agent	25
175	β -Elemene*	Elemene	Antineoplastic	28
176	γ -Elemene	Elemene	Unspecified	25
177	Acoradiene	Acorane	Unspecified	25
178	Aristolene	Aristolene	Nutrient	25
179	(<i>Z</i>)- α -Bergamotene*	Bergamotane	Unspecified	30
180	Curcumenone	Carabrane	Unspecified	36
181	Di-Epi-Cedrene	Cedrane	Food additive	25
182	Himachalene	Himachalene	Nutrient	25
183	(<i>E</i>)-Sesquisabinene Hydrate*	Sesquisabinane	Unspecified	30
184	Bicyclo[7.2.0]Undecane, 10,10-Dimethyl-2,6-Bis(Methylene)	Sesquisabinane	Unspecified	25
185	γ -Gurjunen Epoxide	Sesquisabinane	Unspecified	25
186	1-Epi-Cubenol	Sesquisabinane	Unspecified	38
187	Cubebene*	Sesquisabinane	Unspecified	27
188	7-Epi-Sesquithujene*	Sesquisabinane	Metabolite	30
189	Caryophyllene*	Sesquisabinane	Anti-atherosclerosis	26
190	6 α -Hydroxycurcumanolide A	Sesquisabinane	Unspecified	22
191	Curcumanolide A	Sesquisabinane	Antioxidant	22
192	Curcumanolide B	Sesquisabinane	Antioxidant	22
193	Curcumin L	Sesquisabinane	Food additive	40
194	A-Humulene*	Sesquisabinane	Flavoring agent	27
195	12-Oxabicyclo[9.1.0]Dodeca-3,7-Diene, 1,5,5,8-Tetramethyl-,	Sesquisabinane	Unspecified	25
196	Adoxal	Sesquisabinane	Flavoring agent	25
197	2,6,10-Dodecatrien-1-ol, 3,7,11-Trimethyl-	Sesquisabinane	Unspecified	25
198	(<i>E,E</i>)- α -Farnesene*	Sesquisabinane	Flavoring agent	30
199	5,9-Undecadien-2-One, 6,10-Dimethyl-, (<i>Z</i>)-	Sesquisabinane	Disinfectant	25
200	Hxadecane-1,2-Diol*	Sesquisabinane	Unspecified	28
201	Nerolidal	Sesquisabinane	Unspecified	24
202	(<i>Z</i>)- β -Farnesene*	Sesquisabinane	Food additive	30
203	Nerolidyl Propionate	Sesquisabinane	Fragrance agent	25
204	Phytol*	Diterpenoid	Flavoring agent	28
205	(<i>E,E,E</i>)-3,7,11,15-Tetramethylhexadeca-1,3,6,10,14-Pentaene	Diterpenoid	Unspecified	25
206	2,6,11,15-Tetramethyl-Hexadeca-2,6,8,10,14-Pentaene	Diterpenoid	Unspecified	25
207	1,6,10,14-Hexadecatetraen-3-ol, 3,7,11,15-Tetramethyl-, (<i>E,E</i>)-	Diterpenoid	Unspecified	25
208	Hopenone I	Triterpenoid	Antioxidant	41
209	Hop-17(21)-En-3 β -ol	Triterpenoid	Unspecified	41
210	Hop-17(21)-En-3 β -yl Acetate	Triterpenoid	Unspecified	41
211	β -Sitosterol	Steroid	Consumer use	22,44
212	Stigmasterol	Steroid	Cytotoxic	22
213	Gitoxigenin	Steroid	Cytotoxic	25
214	20-Oxopregn-16-En-12-yl Acetate	Steroid	Schnurri-3 Inhibitors	25
215	Linoleic Acid*	Fatty Acid	Surfactant	28
216	8,11-Octadecadienoic Acid, Methyl Ester *	Fatty Acid	Unsaturated fatty acids	28
217	Palmitic Acid (N-Hexadecanoic Acid)*	Fatty Acid	Flavoring agent	28
218	Oleic Acid*	Fatty Acid	Surfactant, flavor	28
219	Stearic Acid*	Fatty Acid	Flavoring agent	28
220	Curcuma-J	Other	Food additive	42
221	2-(2'-Methyl-1'-Propenyl)-4,6-Dimethyl-7-Hydroxyquinoline	Other	Unspecified	37
222	2,3,5-Trimethylfuran	Other	Use for aroma	25
223	(1,2,3-Trimethyl-Cyclopent-2-Enyl)-Methanol	Other	Disinfectant	25
224	Dicumyl Peroxide	Other	Toxic one	25
225	1-(3-Cyclopentylpropyl)-2,4-Dimethyl-Benzene,	Other	Unspecified	25
226	1,4-Dimethyl-2-(2-Methylpropyl)-Benzene	Other	Toxic one	25
227	2,2'-Oxybis[Octahydro-7,8,8-Trimethyl-4,7-Methanobenzofuran	Other	Unspecified	25

228	Cyclohexyl Formate	Other	Flavoring agent	25
229	Methyleugenol	Other	Flavoring agent	25
230	3,3,5-Trimethyl-Cyclohexanol Acetate	Other	Flavoring agent	25
231	2,4-Dimethyl-8-Oxabicyclo[3.2.1]Oct-6-En-3-One	Other	Unspecified	25
232	2,6-Dimethyl-6-(4-Methyl-3-Pentenyl)-2-Cyclohexene-1-Carboxaldehyde	Other	Fragrance	25
233	Bicyclo[3.3.1]Nonan-9-One, 2,4-Dimethyl-3-Nitro- (Exo)-	Other	Unspecified	25
234	2,2,4-Trimethyl-3-(3,8,12,16-Tetramethyl-Heptadeca-3,7,11,15-Tetraenyl)-Cyclohexanol	Other	Anti-diabetic	25
235	Pyrazolo[1,5-A]Pyridine, 3,3a,4,7-Tetrahydro-3,3-Dimethyl-, (3as)	Other	Unspecified	25

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