姜黄属植物的化学成分研究进展

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[摘要] 依据 ScienceDirect、JNP、ACS、Wiley Online 及 CiNii 等数据库,以姜黄属(Curcumna)为检索词及进行检索,以时间为序进行文章编排。目前从姜黄属植物中分离并鉴定出 190 多种化合物,主要成分为挥发油类和姜黄素类,其他还有二萜类,生物碱类,甾醇类等。姜黄属植物富含挥发油类成分,是倍半萜类化合物的宝库。该文对姜黄属植物化学成分及药理作用进行较为全面的综述,为新药的开发扩大了物质基础。

[关键词] 姜黄属; 挥发油; 姜黄素; 药理作用
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Progress in Chemical Composition of *Curcuma*

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[**Abstract**] Based on the Database, including ScienceDirect、JNP、ACS、Wiley Online and CiNii, retrieved by the search term of Curcuma and choreographied in chronological order. By the relevant reports, 190 compounds were isolated and identified from Curcuma currently, among which the main components were volatile oils and curcuminoids, and others were diterpenes, alkaloids, sterols, etc. Curcuma rich in volatile oil and known as a treasury of sesquiterpene compounds. This article reviewed the chemical constituents and pharmacological effects in Curcuma more comprehensive, and aimed to expand the material basis for the development of new drugs.

[**Key words**] *Curcuma*; volatile oil; curcumin; pharmacologic actions

姜黄属(*Curcuma* genus)属于被子植物亚门、单子叶植物纲、姜科。

临床常用的姜黄属中药包括姜黄(*Curcuma longa* L.);郁金常见的药用来源有 4 种,分别为姜黄 *Curcuma. longa* L.、温郁金 *Curcuma. wenyujin* Y. H. Chen et C. Ling、广西莪术 *Curcuma. kwangsiensis* S. G. Lee et C. F. Ling、蓬莪术 *Curcuma. phacocaulis* Val. 的干燥块根;莪术来源于蓬莪术 *C. phacocaulis* val.、广西莪术 *C. kwangsiensis*、温郁金 *C. wenyujin* 的干燥根茎[1]。我国对姜黄属植物的药用记载始于《唐本草》,"其性味辛、苦,温,入心、肝、脾经,可行气破瘀,通经止痛"。在印度等国,当地人用姜黄素作为食物色素的添加剂,也有民间把姜黄当做颜料的传统。

姜黄属植物中含有的活性成分主要包括两大类:挥发油类化合物(essential oils)和姜黄素类(curcuminoids)。其中姜黄素类化合物具有广谱抗癌作用,在对肺癌、胃癌、结肠癌、白血病、黑色素瘤的研究上均有疗效。挥发油类化合物也具有抗血栓,抗真菌,抗肿瘤[2-4]等作用,从挥发油中提取出的 β-榄香烯已经制成注射液,临床应用于肿瘤病人的治疗。

国内外学者对姜黄属植物的化学成分进行提取分离、结构鉴定、活性筛选等研究方面取得了很多成果,为新药的开发扩大了物质基础。本文对姜黄属植物的化学研究作一介绍,主要内容包括化学成分研究进展和常用的提取方法。

1 化学成分

1.1 姜黄属挥发油类化学成分 1965 年,Hiroshi 等人首次从姜黄属植物蓬莪术(*Curcuma. phacocaulis* Val.)挥发油中分离并鉴定出了莪术醇(curcumol),此后,研究者们相继分离出了莪术二酮(curdione)、姜黄酮(turmerone)、姜黄烯(curcumene)、α-蒎烯(α-pinene)、β-蒎烯(β-pinene)、樟烯(camphene)、樟脑(camphor)、异龙脑(isoborneol)、异呋喃吉

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马酮(isofuranogermacrone)、吉马酮(germacrone)和榄香烯(elemene)等。迄今为止,从姜黄属中发现的单萜类、倍半萜类及其衍生物等化合物约有 140 多种,其中大多为倍半萜类化合物。

根据从姜黄属植物中已分离到的倍半萜类的结构骨架,可以把该类化合物分为Ⅰ.愈创木烷型(guaiane type),Ⅱ.吉马烷型(germacrane type),Ⅲ.菖烷型(carane typee),Ⅳ.没药烷型(bisabolane type),Ⅴ.桉烷型(eudesmane type),Ⅵ.榄香烷型(elemane type),Ⅶ.螺内酯型(spironolactone type),Ⅷ.蛇麻烷型(humulane type),Ⅸ.苍耳烷型,Ⅹ.杜松烷型,Ⅺ.拉松烷,Ⅻ.其他,见图 1。分离得到的化合物见表 1。

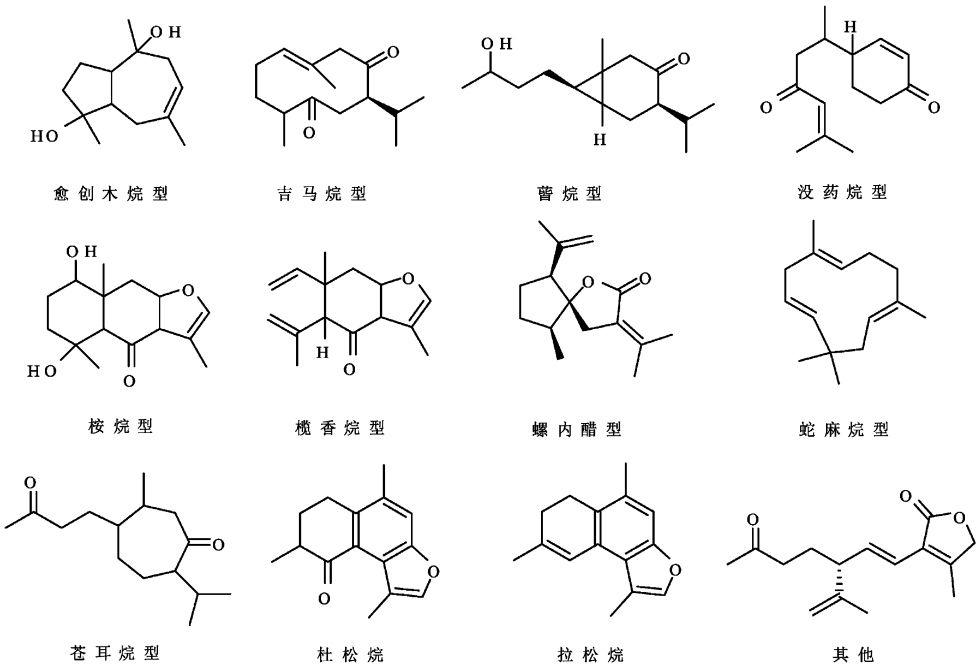

图 1 挥发油类成分的主要构型

表 1 挥发油类中倍半萜类及其衍生物

No.	化合物	类型	文献	No.	化合物	类型	文献
1	curcumol	Ⅰ	[5-6]	17	gweicurculactone	Ⅰ	[16,9]
2	isocurcumenol	Ⅰ	[6-8]	18	zedoalactone A	Ⅰ	[17]
3	curcumadiol	Ⅰ	[9]	19	zedoalactone B	Ⅰ	[8,17]
4	linderazulene	Ⅰ	[10]	20	curcumafuranol	Ⅰ	[18]
5	procurcumenol	Ⅰ	[11,12,8]	21	neocurcumenol	Ⅰ	[8]
6	epiprocurcumenol	Ⅰ	[12]	22	alismoxide	Ⅰ	[8]
7	aerugidiol	Ⅰ	[8,13]	23	zedoarolide A	Ⅰ	[8]
8	isozedoarondiol	Ⅰ	[11]	24	zedoarolide B	Ⅰ	[8]
9	methylzedoarodiol	Ⅰ	[11]	25	guaidiol	Ⅰ	[19]
10	zedoarol	Ⅰ	[14]	26	epicurcumenol	Ⅰ	[9]
11	zedoarondiol	Ⅰ	[11,15,8]	27	neoprocurcumenol	Ⅰ	[20]
12	oxycurcumenol	Ⅰ	[6]	28	9-oxo-neoprocurcumenol	Ⅰ	[20]
13	procurcumadiol	Ⅰ	[12]	29	7α,11α-epoxy-5β-hydroxy-9-guaiane-8-one	Ⅰ	[8]
14	curcumenol	Ⅰ	[12,8]	30	methyisozedoarondiol	Ⅰ	[11]
15	4-epicurcumenol	Ⅰ	[8]	31	1,10-dehydro-10-deoxy-9-oxozedoarondiol	Ⅰ	[21]
16	isoprocurcumenol	Ⅰ	[12,8]	32	zederone	Ⅱ	[15]

续表 1

No.	化合物	类型	文献
33	curdione	Ⅱ	[22,11,8]
34	neocurdione	Ⅱ	[11,8]
35	(1*R*,10*R*)-epoxy-(-)-1,10-dihydrocurdione	Ⅱ	[23]
36	furanodiene	Ⅱ	[24,8]
37	dehydrocurdione	Ⅱ	[11,25,12,6]
38	furanodienone	Ⅱ	[26]
39	furanogermenone	Ⅱ	[27]
40	(4*S*,5*S*)-(+)-germacrone-4,5-epoxide	Ⅱ	[11,28,12,8]
41	germacrone	Ⅱ	[11,29,8,6]
42	13-hydroxygermacrone	Ⅱ	[14]
43	germacron-13-al	Ⅱ	[12]
44	wenjine	Ⅱ	[23]
45	(1*S*,10*S*),(4*S*,5*S*)-germacrone-1(10),4-diepoxide	Ⅱ	[23]
46	glechomanolide	Ⅱ	[8]
47	(+)-germacrone4,5-epoxide	Ⅱ	[8]
48	(4*S*,5*S*)-13-hydrixygernacrone4,5-epoxide	Ⅱ	[30]
49	(4*S*,5*S*)-13-acetoxygermacrone4,5-epoxide	Ⅱ	[30]
50	(4*S*,5*S*)-12-acetoxygermacrone4,5-epoxide	Ⅱ	[30]
51	(4*S*)-13-hydroxydehydocurdione	Ⅱ	[30]
52	(4*S*)-13-acetoxydehydocurdione	Ⅱ	[30]
53	dehydrocurdione	Ⅱ	[30]
54	13-hydroxygermacrone	Ⅱ	[30]
55	acetoxyneocurdione	Ⅱ	[30]
56	aeruginolactone	Ⅱ	[31]
57	comosone Ⅲ	Ⅲ	[32]
58	dimethoxycurcumenone	Ⅲ	[32]
59	curcumenone	Ⅲ	[11,12,33,8]
60	curcumenolactones A	Ⅲ	[34]
61	curcumenolactones B	Ⅲ	[34]
62	curcumenolactones C	Ⅲ	[34]
63	4s-dihydrocurcumenone	Ⅲ	[8]
64	curcarabranol A	Ⅲ	[8]
65	curcarabranol B	Ⅲ	[8]
66	curlone	Ⅳ	[35,36]
67	bisacurone	Ⅳ	[12,8,36]
68	bisacurone B	Ⅳ	[37]
69	bisacumol	Ⅳ	[12,8,36]
70	bisacurol	Ⅳ	[36]
71	bisacurone epoxide	Ⅳ	[37]
72	bisabola-3,10-dien-2-one	Ⅳ	[12]
73	bisacurone C	Ⅳ	[37]
74	4-hydroxybiszbola-2,10-diene-9-one	Ⅳ	[12]
75	4-methoxy-5-hydroxy-bisabola-2,10-diene-9-one	Ⅳ	[12]
76	2,5-dihydroxybisabola-3,10-diene	Ⅳ	[12]
77	α-turmerone	Ⅳ	[38]
78	β- turmerone	Ⅳ	[38]
79	ar-turmerone	Ⅳ	[38]
80	turmeronol A	Ⅳ	[39]
81	turmeronol B	Ⅳ	[39]
82	bisacurone A	Ⅳ	[37]
83	(6*S*)-2-methyl-6-(4-hydroxyphenyl-3-methyl)-2-hepten-4-one	Ⅳ	[40]
84	(6*S*)-2-methyl-6-(4-formylphenyl)-2-hepten-4-one	Ⅳ	[40]
85	(6*S*)-2-methyl-6-(4-hydroxyphenyl)-2-hepten-4-one	Ⅳ	[40]
86	bisabolone	Ⅳ	[40]
87	bisabolone-4-one	Ⅳ	[40]
88	5-hydroxyl-ar-turmerone	Ⅳ	[40]
89	α-curcumene	Ⅳ	[41]
90	xanthorrhizol	Ⅳ	[41]
91	corculonone A	Ⅳ	[21]
92	corculonone B	Ⅳ	[21]
93	corculonone C	Ⅳ	[21]
94	corculonone D	Ⅳ	[21]
95	curcolone	Ⅴ	[42]
96	α-selinene	Ⅴ	[53]
97	β- selinene	Ⅴ	[53]
98	β-eucesmol	Ⅴ	[8]
99	β-dictyopterol	Ⅴ	[8]
100	curcolonol	Ⅴ	[19]
101	wenyujinlactone A	Ⅴ	[43]
102	neolitamone A	Ⅴ	[43]
103	zedoarofuran	Ⅴ	[44]
104	curcolide	Ⅴ	[45]
105	curcodione	Ⅴ	[45]
106	(+)-comosol	Ⅴ	[32]
107	(-)-comosol	Ⅴ	[32]
108	zedoarone	Ⅵ	[46]
109	curzerene	Ⅵ	[24]
110	curzerenone	Ⅵ	[26]
111	epicurzerenone	Ⅵ	[26]
112	β-elemene	Ⅵ	[47]

续表 1

No.	化合物	类型	文献	No.	化合物	类型	文献
113	δ-elemene	Ⅵ	[47]	129	pyrocurzerenone	Ⅺ	[26]
114	γ-elemene	Ⅵ	[47]	130	isofuranodienone	Ⅺ	[26,8]
115	6α-hydroxycurcumanolide A	Ⅶ	[21]	131	gajutsulactone A	Ⅻ	[8]
116	curcumalactone	Ⅶ	[48]	132	gajutsulactone B	Ⅻ	[8]
117	curcumanolide A	Ⅶ	[6,33]	133	3,7-dimethylindan-5-carboxylic acid	Ⅻ	[19]
118	curcumannlide B	Ⅶ	[6,33]	134	parviflorene A	Ⅻ	[52]
119	zerumbone	Ⅷ	[6]	135	parviflorene B	Ⅻ	[50]
120	α-humelene	Ⅷ	[53]	136	parviflorene C	Ⅻ	[50]
121	curcumadione	Ⅸ	[8]	137	parviflorene D	Ⅻ	[50]
122	curcumadionol	Ⅸ	[45]	138	parviflorene E	Ⅻ	[50]
123	curzeone	Ⅹ	[14,49]	139	parviflorene F	Ⅻ	[50]
124	comosone Ⅰ	Ⅹ	[32]	140	parviflorene G	Ⅻ	[52]
125	comosone Ⅱ	Ⅹ	[32]	141	parviflorene H	Ⅻ	[52]
126	cadalenequinone	Ⅹ	[50]	142	parviflorene I	Ⅻ	[52]
127	8-hydroxycadalene	Ⅹ	[50]				
128	6-hydroxy-9-oxogermacra-3,7(11)-dieno-12,6-lactone	Ⅺ	[51]				

1.2 姜黄素类成分 姜黄素类化合物主要存在于姜黄属植物的根茎中,迄今为止,已从姜黄属植物中分离、鉴定出的姜黄素类化合物有 40 多个。按庚烷母体结构中取代基的种类和数目,把该类化合物分为 9 大类:庚(烯)酮类、庚(烯)二酮类、庚(烯)醇类、庚醇酮类、庚二醇酮、庚烯醇二酮类、庚二醇类、庚三醇类和环醚型庚烷类。常见的有姜黄素、去甲氧基姜黄素、双去甲氧基姜黄素。分离得到的化合物见表 2。

1.3 二萜类 黄伟等[9]从温郁金块根中分离得到 5 个二萜类化合物,命名为 curcumrinol A-C, curcuminol D-E; Ma Z J 等[51]从块根中分离得到 curcumrinol F; Zhang P[68]也分离得到了具有细胞毒作用的 curcuminol D,E。

1.4 生物碱类 王丽瑶等[69]从黄丝郁金块根中提取分离出生物碱 2-(2′-methyl-1′-propenyl)-4, 6-dimethyl-7-hydroxyquinoline; 黄伟等[9]从温郁金中分离得到 curcuminol Ⅰ. Ma Z J 等[51]分离得到 aurantiamide。

1.5 甾醇类 据刘立鼎[70]和易进海[71]对郁金化学成分分离,分别得到了 β-谷甾醇(β-sitosterol)和胡萝卜苷(daucosterol),陶正明等[72]从温郁金的地上部分也分离到了这 2 个甾体化合物还有 1 个甾体化合物 mangdesisterol。

2 药理作用

姜黄属植物为传统的植物药用途广泛,可以用作食品调料,染料等,根据现代研究表明,其药理活性主要为抗肿瘤、抗炎、抗氧化和免疫抑制等。临床可用于治疗癌症,降血脂,保肝利胆,其中在癌症方面的治疗是近年来研究的热点。

2.1 抗肿瘤活性 金海峰等[73]采用 MTT 比色法检测阳性对照药顺铂(cis-plautinum complexes, DDP)和温郁金醚提物中二萜类化合物 C 在不同浓度时对 SGC-7091 细胞增殖的影响,用流式细胞仪检测化合物 C 不同浓度对 SGC-7091 细胞周期分布的影响及其凋亡率,结果表明温郁金醚提物中二萜类化合物 C 对胃癌 SGC-7901 细胞的增殖有显著的抑制作用,其作用机制可能是阻滞胃癌细胞周期,抑制细胞增殖有关。用 Western Blot 杂交法检测二萜类化合物 C 的 4 个浓度组中人的胃癌 SGC-7901 细胞的 Caspase-9, 7, 3 和 PARP (89KD)蛋白的表达,结果表明化合物 C 可通过上调四者的表达来诱导人胃癌 SGC-7901 细胞发生凋亡[74]。何必立等[75]使用超临界 CO_2 萃取法提取得到温郁金成分,运用半定量逆转录多聚酶链反应(RT-PCR)方法检测提取物对胃癌细胞血管内皮生长因子(VEGF) mRNA 表达的影响,采用 MTT 法测定其对体外培养胃癌细胞的增殖影响。结果温郁金提取物能下调 VEGF165 和 VEGF121 mRNA 表达,显著抑制人胃癌细胞 SGC-7901 生长,下调 VEGF 表达可能是其抗癌机制。应用放射免疫测定法分析温郁金提取物对细胞培养液中 IGF-Ⅰ, IGF-Ⅱ浓度水平影响,结果表明温郁金提取物可以降低胃癌细胞培养液中 IGF-Ⅰ, IGF-Ⅱ浓度水平,显著抑制胃癌细胞生长[76]。徐毅等[77]对温郁金水提物、醚提物和乙醇提取物进行 MTT 法测定,应用 HE 染色、电镜及流式细胞仪分析,结果表明 3 种提取物对人胃癌细胞 SGC-7901 细胞生长有显著抑制作用,其机制可能与诱导细胞凋亡有关。

金海峰等[78]采用 MTT 法检测温郁金醚提物中二萜化合物 C 对结肠癌细胞 SW620 增殖的影响,使用流式细胞术

表 2　姜黄素类化合物

No.	化合物	类型	文献
143	alnustone	Ⅰ	[54]
144	1,7-diphy-6(*E*)-hepten-3-one	Ⅰ	[55]
145	1-(4-hydroxyphenyl)-7-phenyl-(6E)-6-hepten-3-one	Ⅰ	[56]
146	1,7-bis(4-hydroxyphenyl)-1,4,6-heptatrien-3-one	Ⅰ	[57]
147	(*E*)-1,7-bis(4-hydroxyphenyl)-6-hepten-3-one	Ⅰ	[58]
148	5'-methyloxycurcumin	Ⅱ	[59]
149	1-(4-hydroxy-3-methoxyphenyl)-7-(3,4-dihydroxyphenyl)-1,6-heptadiene-3,5-dione	Ⅱ	[57]
150	1-(4-hydroxyphenyl)-7-(3,4-dihydroxyphenyl)-1,6-heptadiene-3,5-dione	Ⅱ	[60]
151	1,7-diphenyl-6(*E*)-hepten-3-ol	Ⅲ	[55]
152	1,7-diphenyl-4(*E*),6(*E*)-heptadiene-3-ol	Ⅲ	[55]
153	5-hydroxy-7-(4-hydroxyphenyl)-1-phenyl-(1*E*)-1-heptene	Ⅲ	[61]
154	7-(3,4-dihydroxyphenyl)-5-hydroxy-1-phenyl-(1*E*)-1-heptene	Ⅲ	[61]
155/156	(3*S*) or (3*R*)-1-(4-methoxyphenyl)-7-phenyl-(6*E*)-6-hepten-3-ol	Ⅲ	[56]
157	1,7-diphenyl-3-acetoxy-6(*E*)-heptene	Ⅲ	[55]
158/159	(3*S*) or (3*R*)-1,7-bisbis(4-hydroxyphenyl)-(6*E*)-6-hepten-3-ol	Ⅲ	[58]
160/161	(3*S*) or (3*R*)-1-(3,4-dihydroxyphenyl)-7-(4-hydroxyphenyl)-(6*E*)-6-hepten-3-ol	Ⅲ	[58]
162/163	(3*S*) or (3*R*)-1-(3,4-dihydroxyphenyl)-7-(4-hydroxyphenyl)heptan-3-ol	Ⅲ	[58]
164	(3*R*)-1-(3,4-dihydroxyphenyl)-7-phenyl-(6*E*)-6-hepten-3-ol	Ⅲ	[58]
165/166	(3*S*) or (3*R*)-3-acetoxy-1-(3,4-dihydroxyphenyl)-7-(4-hydroxyphenyl)-(6*E*)-6-heptene	Ⅲ	[58]
167/168	(3*S*) or (3*R*)-3-acetoxy-1-(3,4-dihydroxyphenyl)-7-(4-hydroxyphenyl)heptanes	Ⅲ	[58]
169	1-(3-hydroxyphenyl)-7-(3,4-dihydroxyphenyl)-3-methoxy-(6*E*)-heptene	Ⅲ	[62]
170	1,7-diphenyl-6(*E*)-hepten-3-one-5-ol	Ⅳ	[55]
171	curcumin	Ⅳ	[63]
172	demethoxycurcumin	Ⅳ	[64]
173	bisdemethoxycurcumin	Ⅳ	[64]
174	1,5-dihydroxy-1,7-bis(4-hydroxyphenyl)-4,6-heptadiene-3-one	Ⅴ	[60]
175	1,5-dihydroxy-1-(4-hydroxy-3-methoxyphenyl)-7-(4-hydroxyphenyl)-4,6-heptadiene-3-one	Ⅴ	[60]
176	1,5-dihydroxy-1-(4-hydroxyphenyl)-7-(4-hydroxy-3-methoxyphenyl)-4,6-heptadiene-3-one	Ⅴ	[60]
177	1-hydroxy-1,7-bis(4-hydroxy-3-methoxyphenyl)-6-heptene-3,5-dione	Ⅵ	[65]
178	3-hydroxy-1,7-bis-(4-hydroxyphenyl)-6-heptene-1,5-dione	Ⅵ	[60]
179	1,7-bis(4-hydroxy-3-methoxyphenyl)heptan-3,5-diol	Ⅶ	[66]
180	(3*R*,5*R*)-1-(3,4-dihydroxyphenyl)-7-phenyl-heptane-3,5-diol	Ⅶ	[61]
181	2,3,5-trihydroxy-1-(4-hydroxyphenyl)-7-(3,5-dimethoxy-4-hydroxyphenyl)heptane	Ⅷ	[67]
182	(3*S*,5*S*)-1,7-bis(4-hydroxy-3-methoxyphenyl)-heptan-3,5-diol	Ⅸ	[64]

检测化合物 C 对 SW620 细胞的凋亡抑制率及细胞周期的影响,结果表明化合物 C 能诱导 SW620 细胞凋亡,且诱导细胞凋亡率呈现一定的浓度和时间依赖性,能阻滞细胞周期,抑制癌细胞增殖。沈雁等[79]为了探究温郁金醚提物中化合物 C 诱导结肠癌 SW620 细胞凋亡的机制,用 Western blot 法检测化合物 C 作用后,SW620 细胞中 ERK, p-ERK, p-JNK, p38, p-p38 及 Caspase-3 蛋白水平变化,揭示化合物 C 诱导细胞凋亡的机制可能与抑制 MAPK 信号转导通路、活化

caspase-3 相关。

Xiao Yu 等[80]为了探究温郁金精油对诱导肝癌 HepG2 细胞的凋亡,采用 MTT 法检测药物对肝癌细胞的凋亡,使用流式细胞术对细胞周期及线粒体跨膜电位进行检测,运用流式细胞仪对 PARP 表达及 Caspase-3 蛋白水平检测。结果表明温郁金精油与抑制 HepG2 细胞的增殖呈现一定的剂量依赖性,Caspase-3 酶和蛋白水平及 PARP 表达呈现显著的剂量依赖。温郁金精油诱导细胞凋亡,抑制肝癌 HepG2 细胞增殖,其机制可能与细胞周期阻滞,细胞色素 C 易位,Caspase-3 活化,PARP 降解,线粒体膜电位缺失有关。

石峰[81]对近年来姜黄素的抗肿瘤作用机制进行整理,发现姜黄素对消化系统肿瘤、血液系统肿瘤、及妇科的乳腺癌、子宫平滑肌肉瘤、宫颈癌等有很好的药理活性。

2.2 对肝损伤的保护 韩向北等[82]探究郁金对 CCl_4 所致急性肝损伤小鼠肝细胞凋亡机制,小鼠灌胃给药,取血处死,测血清中谷丙转氨酶(ALT),谷草转氨酶(AST)的含量,TUNUL 染色法观察细胞凋亡的情况,免疫组化观察肝组织中 Bcl-2 和 Bax 的蛋白表达。结果郁金各剂量组小鼠血清 ALT,AST 含量降低,TUNUL 染色细胞明显减少。郁金中、低剂量组小鼠肝组织 Bax 表达下调,Bcl-2 表达上调。郁金水煎剂抑制 CCl_4 急性肝损伤小鼠瞎报凋亡的机制可能与调剂细胞凋亡因子 Bcl-2 和 Bax 有关。同时使用 RT-PCR 法检测四氯化碳致急性肝损伤细胞中 IL-1β 及 TNF-α mRNA 表达水平;免疫组化法观察 IL-18 蛋白表达水品,结果表明郁金水煎剂可能通过抑制肝组织细胞因子 IL-1β,IL-18 及 TNF-α 的表达,调节肝脏免疫功能而减轻 CCl_4 所致的急性肝损伤[83]。

秦华珍等[84]研究广西郁金抗肝纤维化作用,实验结果表明广西郁金具抗肝纤维化作用,其作用机制可能与抗脂质过氧化、清除自由基、抗肝损伤有关。邹宇宏等[85]对传统中药制剂 BJ-JN(Yuzhu Xiaogu)对 CCl_4 所致大鼠肝纤维化进行研究,研究发现 BJ-JN 能降低血清 ALT,AST,NO 和肝脏丙二醛(MOA),使血清白蛋白/球蛋白,肝脏超氧化物歧化酶含量,胸腺指数增加;减轻肝纤维化程度,减轻肝纤维化病理组织改变。提示该药的抗小鼠肝纤维化作用可能与其抗氧化作用,免疫调节作用和抑制肝星状细胞(HSC)的功能相关。

2.3 降血脂 张文科等[86]通过观察患者口服郁金平脂颗粒和常规西药,记录患者血压变化,进行客观疗效比较,结果合用郁金平脂颗粒组较单纯西药组疗效更显著($P<0.05$),该药治疗血脂异常疗效可靠。

2.4 抗菌 B. Wilson 等[87]采用琼脂扩散法和肉汤稀释法对 *Curcuma* zedoaria 和 *Curcuma* malabarica 的块根的抑菌活性进行了研究,石油醚等 5 个提取部分都具有抗微生物和抗真菌的活性,且 *Curcuma malabarica* 具有抗金黄色葡萄球菌(*Staphylococcus aureus*)的作用,而 *Curcuma* malabarica 没有。

2.5 抗抑郁 张惠珍[88]等以糖水消耗实验和 Open-Fied 法对照研究慢性应激诱导的抑郁模型大鼠的行为动力学指标,实验结果表明,加味菖蒲郁金汤可明显改善孤养和长期不可预见的受中等强度应激诱导的抑郁大鼠模型的行为。

2.6 抗动脉粥样硬化作用 刘全未等[89]对有关姜黄素抗动脉粥样硬化作用进行整理,发现动脉粥样硬化(AS)的发生机制十分复杂,至今仍未完全阐明。众多研究表明,姜黄素具有抗氧化、清除自由基、抗凝、抗炎等复杂的药理作用,能有效拮抗 AS 的发生与发展。

2.6 其他 龚敏操[28]等通过测算给药前后的小鼠痛阈值的变化,证明郁金提取物 β-榄香烯可以提高小鼠的痛阈值,具有明显的镇痛作用。

姜黄属植物的挥发油类和姜黄素类化合物被国内外研究者证明具有很好的生物活性,中药材及其制剂在临床上用于治疗癌症,降血脂,保肝利胆。

姜黄属植物化学成分的药理活性不断地被挖掘,受到了全世界科学界和医药学界的重视,并对其植物学来源,化学成分,药理活性,制剂等方面进行了丰富的研究,新的成分和药理作用在不断地被证实。因此,对我国姜黄属植物的研究与开发,规范其栽培、工艺提取、质量标准等方面,具有重要的意义。

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