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# 南山藤属植物化学成分及生物活性研究进展

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**摘 要**:萝藦科南山藤属植物广泛分布于亚洲和非洲南部,全株药用,临床应用广泛。化学结构类型包括甾体、苯丙素、寡糖等,其中 $C_{21}$ 甾体类成分为该属植物中主要化学结构类型,并具有抗肿瘤、抗抑郁、抗炎及免疫调节等作用。本文对南山藤属植物化学成分及生物活性进行综述,以期为更好地开发和利用南山藤属植物资源提供参考。

**关键词**:南山藤属;化学成分;生物活性

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# Review on Chemical Constituents and Biological Activities of *Dregea E. Mey*

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**Abstract**: The plants of *Dregea E. Mey* belonging to Asclepiadaceae family were widely distributed in Asia and South Africa and had been used in the clinical application as medicinal herbs. The chemical constituents of *Dregea E. Mey* contain steroids, phenylpropanoids, oligosaccharides, in which steroids derivatives were the main constituents in this genus. Pharmacological studies on these plants had demonstrated anti-tumor, anti-depression, anti-inflammatory and immune-regulatory activities, *etc*. In this study, the chemical constituents and their biological activities from *Dregea E. Mey* were reviewed and summarized for its further development and utilization.

**Key words**: *Dregea E. Mey*; chemical component; pharmacological activity

南山藤属(*Dregea E. Mey*)为萝藦科(Asclepiadaceae)多年生藤本植物,主要分布于亚洲和非洲的南部地区。我国民间应用南山藤属植物的历史悠久,其中苦绳(*Dregea sinensis* Hemsl)的干燥根茎(傣百解)是我国傣族医药的传统药材,用于治疗风湿痹痛,咳嗽痰喘,跌打骨折,痈疮疖肿,乳汁不通等症[1-8]。近年研究表明南山藤属植物具有抗抑郁、抗癫痫、抗肿瘤、抗炎、抗寄生虫及免疫调节等多种生物活性,其化学成分主要结构类型为 $C_{21}$ 甾体类成分。本文综述了南山藤属植物化学成分及生物活性,为南山藤属药用植物资源的深入开发利用提供参考依据。

## 1 生物学特性及资源分布

南山藤属植物为攀援木质藤本;叶对生,纸质,基部常心形;花排成腋生的伞形花序式的聚伞花序;花萼裂片卵形,内面有腺体;花冠辐状,裂片向右覆盖;副花冠 5 裂;肉质,贴生在合蕊柱的背后,呈放射状开展;种子顶端有白毛绢质种毛[9]。该属植物多生长在海拔 500 ~ 3000 m 的山地疏林中或灌木丛中。目前全世界约有 12 种,见表 1[10,11]。我国原产植物 4 种,包括楔叶南山藤、苦绳、南山藤和丽子藤。

## 2 化学成分

南山藤属植物包括甾体、苯丙素、寡糖和其他成分等多种类型化合物,其中 $C_{21}$ 甾体类成分为主要化学结构类型。

### 2.1 $C_{21}$ 甾体类

$C_{21}$ 甾体是南山藤属植物主要的化学结构类型,根据甾体母核上取代方式的不同,将这些化学成分分为 7 种类型 A、B、C、D、E、F、G,见图 1。至 2015 年,从本属植物中共分离鉴定了 62 个 $C_{21}$ 甾体类化学成分,包括 49 个甾体皂苷,13 个甾体苷元,见表 2。

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**表 1　南山藤属植物种类**

Table 1　Plants species of *Dregea E. Mey*

| 中文名称<br>Chinese Name | 拉丁名称<br>Latin Name | 产地<br>Orgin |
|---|---|---|
| 南山藤甘蓝 | *D. abyssinica* (Hochst.) K. Schum | Ethiopia |
| 南山藤尾草 | *D. crinita* (Oliv.) Bullock | Nigeria |
| 楔叶南山藤 | *D. cuneifolia* Tsiang & P. T. Li | China |
| 福克纳南山藤 | *D. faulknerae* Bullock | Tanzania |
| 南山藤多花 | *D. floribunda* E. Mey | South Africa |
| 南山藤杉木 | *D. lanceolata* (Cooke) Santapau & Wagh | Maharashtra |
| 深红南山藤 | *D. rubicunda* K. Schum | Kenya, Uganda |
| 苦绳 | *D. sinensis* Hemsl | China |
| 南山藤假虎刺 | *D. schimperi* (Decne.) Bullock | Ethiopia |
| 南山藤柱 | *D. stelostigma* (K. Schum.) Bullock | Tropical Africa |
| 南山藤、华他卡藤 | *D. volubilis* (L. f.) Benth. ex Hook. f | China, Bangladesh, Cambodia, India, Indonesia, Kashmir, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam |
| 丽子藤 | *D. yunnanensis* (Tsiang) Tsiang & P. T. Li | China |

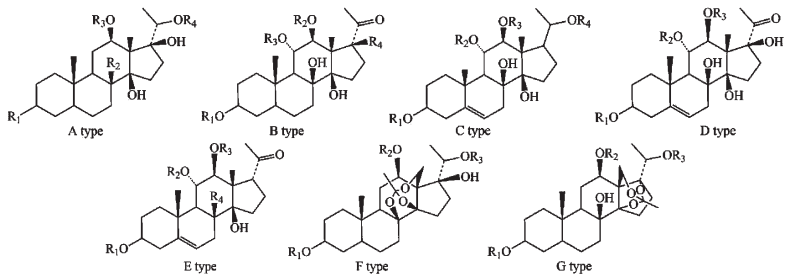


**图 1　不同取代方式的甾体母核**

Fig. 1　Types of steroidal aglycone

**表 2　南山藤属植物中的 $C_{21}$ 甾体化合物**

Table 2　$C_{21}$ steroids and steroidal glycosides from plants of *Dregea E. Mey*

| 序号<br>No. | 化合物<br>Compound | 来源<br>Source | 结构类型<br>Structure types | 参考文献<br>Ref |
|---|---|---|---|---|
| 1 | dresigenin B | *D. sinensis* Hemsl | A | 12 |
| 2 | dregeoside BⅡ | *D. sinensis* Hemsl. var. corrugata | A | 13 |
| 3 | dresigenin A | *D. sinensis* Hemsl | A | 14 |
| 4 | drevogenin Ⅰ | *D. sinensis* Hemsl. var. corrugata | A | 15 |
| 5 | dresgenin Ⅰ | *D. sinensis* Hemsl. var. corrugata | A | 16 |
| 6 | dresioside Ⅰ | *D. sinensis* Hemsl | A | 12 |
| 7 | dregeoside BⅠ | *D. sinensis* Hemsl. var. corrugata | A | 17 |
| 8 | dregeoside B | *D. sinensis* Hemsl. var. corrugata | A | 18 |
| 9 | dregeoside A | *D. sinensis* Hemsl. var. corrugata | A | 19 |
| 10 | drevogeninⅡ | *D. sinensis* Hemsl. var. corrugata | A | 13 |
| 11 | dregeoside B | *D. sinensis* Hemsl. var. corrugata | A | 20 |

| 序号 No. | 化合物 Compound | 来源 Source | 结构类型 Structure types | 参考文献 Ref |
|---|---|---|---|---|
| 12 | dregeoside C | *D. sinensis* Hemsl. var. corrugata | A | 20 |
| 13 | dregeoside | *D. sinensis* Hemsl. var. corrugata | A | 21 |
| 14 | 12-*O*-cinnamoyl-20-nicotinoyl-dihydrosarcostin 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*β*-D-oleandropyranosyl-(1→4)-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | A | 22 |
| 15 | 12-*O*-benzyl-dihydrosarcostin 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*β*-D-oleandropyranosyl-(1→4)-*β*-D-digitoxopyranosyl-(1→4)-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | A | 22 |
| 16 | 12-*O*-nicotinoyl-20-cinnamoyl-dihydrosarcostin 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*β*-D-oleandropyranosyl-(1→4)-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | A | 22 |
| 17 | 12-*O*-cinnamoyl-dihydrosarcostin 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*β*-D-oleandropyranosyl-(1→4)-*β*-D-digitoxopyranosyl-(1→4)-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | A | 22 |
| 18 | 12-*O*-cinnamoyl-dihydrosarcostin 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*β*-D-oleandropyranosyl-(1→4)-dcymaropyranosyl-(1→4)-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | A | 22 |
| 19 | 12-acetyl-20-methylbutanoyl-dihydrosarcostin 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*β*-D-oleandro-pyranosyl-(1→4)-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | A | 22 |
| 20 | 12-benzyl-tayloron-3-*O*-*β*-D-thevetopyranosyl-(1→4)-*β*-D-oleandropyranosyl-(1→4)-*β*-D-digitoxopyranosyl-(1→4)-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | B | 22 |
| 21 | 12-cinnamoyl-tayloron 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*β*-D-oleandropyranosyl-(1→4)-*β*-D-digitoxopyranosyl-(1→4)-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | B | 22 |
| 22 | 12-*O*-cinnamoyltayloron 3-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | B | 23 |
| 23 | 12-*O*-cinnamoyl-tayloron 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-digitoxopyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | B | 23 |
| 24 | Dresioside E | *D. sinensis* Hemsl | B | 24 |
| 25 | 3-*O*-[*β*-Glucopyranosyl-(1→4)-6-deoxy-3-*O*-methyl-*β*-allopyanosyl-(1→4)-*β*-digitoxopyranoside]-11α,12*β*-di-*O*-benzoyl-17*β*-marsdenin-5,6-dihydrogen | *D. sinensis* Hemsl | B | 25 |
| 26 | 3-*O*-[6-Deoxy-3-*O*-methyl-*β*-allopyanosyl-(1→4)-*β*-digitoxopyranoside]-11α, 12*β*-di-*O*-benzoyl-17*β*-marsdenin-5,6-dihydrogen | *D. sinensis* Hemsl | B | 25 |
| 27 | lanceogenin | *D. lanceolata* | C | 26 |
| 28 | lanceolin | *D. lanceolata* | C | 26 |
| 29 | lancin | *D. lanceolata* | C | 26 |
| 30 | Dregeoside H | *D. volubilis* (L.) benth | C | 27 |
| 31 | Dregeoside Dp1 | *D. volubilis* (L.) benth | C | 27 |
| 32 | Dregeoside Da1 | *D. volubilis* (L.) benth | C | 27 |
| 33 | 20-*O*-tigloylmarsecto-hexol-D-3-*O*-*β*-D-cymaropyranoside | *D. volubilis* (L.) benth | C | 28 |
| 34 | marsectohexol-D-3-*O*-*β*-D-cymaropyranoside | *D. volubilis* (L.) benth | C | 28 |
| 35 | Dregeoside Gp1 | *D. volubilis* (L.) benth | C | 27 |
| 36 | Dregeoside Ga1 | *D. volubilis* (L.) benth | C | 27 |
| 37 | Dregeoside Kp1 | *D. volubilis* (L.) benth | C | 27 |
| 38 | Dregeoside Ka1 | *D. volubilis* (L.) benth | C | 27 |
| 39 | Drelin | *D. lanceolata* | D | 29 |
| 40 | Ceolin | *D. lanceolata* | D | 29 |
| 41 | Dregealin | *D. lanceolata* | D | 30 |
| 42 | dregenin | *D. lanceolata* | D | 30 |
| 43 | Lancinin | *D. lanceolata* | E | 26 |
| 44 | Dregeoside Ap1 | *D. volubilis* (L.) benth | E | 27 |

| 序号 No. | 化合物 Compound | 来源 Source | 结构类型 Structure types | 参考文献 Ref |
|---|---|---|---|---|
| 45 | Dregeoside Ao1 | *D. volubilis* (L.) benth | E | 27 |
| 46 | Dregeoside Aa1 | *D. volubilis* (L.) benth | E | 27 |
| 47 | Dregeoside A11 | *D. volubilis* (L.) benth | E | 27 |
| 48 | Dregeoside C11 | *D. volubilis* (L.) benth | E | 27 |
| 49 | 3-*O*-[*β*-Glucopyranosyl-(1→4)-6-deoxy-3-*O*-methyl-ballopyanosyl-(1→4)-*β*-digitoxopyranoside]-11α,12*β*-di-*O*-benzoyl-17*β*-marsdenin | *D. sinensis* Hemsl | E | 25 |
| 50 | 3-*O*-[6-Deoxy-3-*O*-methyl-*β*-allopyanosyl-(1→4)-*β*-digitoxopyranoside]-11α, 12*β*-di-*O*-benzoyl-17α-marsdenin | *D. sinensis* Hemsl | E | 25 |
| 51 | Dresioside D | *D. sinensis* Hemsl | E | 24 |
| 52 | 3-*O*-[6-Deoxy-3-*O*-methyl-*β*-allopyanosyl-(1→4)-*β*-digitoxopyranoside]-11α-*O*-benzoyl, 12*β*-*O*-tigloyl-17*β*-marsdenin | *D. sinensis* Hemsl | E | 25 |
| 53 | 3-*O*-[6-Deoxy-3-*O*-methyl-*β*-allopyanosyl-(1→4)-*β*-digitoxopyranoside]-11α-*O*-benzoyl, 12*β*-*O*-tigloyl-17α-marsdenin | D. sinensis Hemsl | E | 25 |
| 54 | 12-*O*-acetyl-20-*O*-benzoyl-(8, 14, 18-orthoacetate)-dihydrosarcostin 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandro-pyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | F | 31 |
| 55 | 12-*O*-acetyl-20-*O*-benzoyl-(8,14,18-orthoacetate)-dihydrosarcostin 3-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | F | 31 |
| 56 | 12-Oacetyl-20-*O*-benzoyl-(8,14,18-orthoacetate)-dihydrosarcostin 3-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | F | 31 |
| 57 | 12-*O*-acetyl-20-*O*-benzoyl-(8,14,18-orthoacetate)-dihydrosarcostin 3-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | F | 31 |
| 58 | 12-*O*-acetyl-20-*O*-benzoyl-(8,14,18-orthoacetate)-dihydrosarcostin 3-*O*--dglucopyranosyl-(1→4)-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-theveto-pyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | F | 31 |
| 59 | 12-*O*-acetyl-20-*O*-benzoyl-(14,17,18-orthoacetate)-dihydrosarcostin 3-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | G | 31 |
| 60 | 12-*O*-acetyl-20-*O*-benzoyl-(14, 17, 18-orthoacetate)-dihydrosarcostin 3-*O*-*β*-D-glycopyranosyl-(1→4)-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | G | 31 |
| 61 | 12-*O*-acetyl-20-*O*-benzoyl-(14, 17, 18-orthoacetate)-dihydrosarcostin 3-*O*-*β*-D-glycopyranosyl-(1→4)-*O*-*β*-D-thevetopyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | G | 31 |
| 62 | 12-*O*-acetyl-20-*O*-benzoyl-(14, 17, 18-orthoacetate)-dihydrosarcostin 3-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-glucopyranosyl-(1→4)-*O*-*β*-D-theveto-pyranosyl-(1→4)-*O*-*β*-D-oleandropyranosyl-(1→4)-*O*-*β*-D-cymaropyranoside | *D. sinensis* var. corrugata | G | 31 |

## 2.2 苯丙素类

贾少华[33]等从苦绳(*Dregea sinensis* Hemsl)根的乙醇提取物中分离鉴定出5个木脂素类成分,分别为4′,4″-二羟基-3,3′,3″,5,5′,5″-六甲氧基-7,9′:7′,9-二环氧-4,8″-氧-8,8′-倍半新木质素-7″,9″-二醇(**63**)、4′,4″-二羟基-3,3′,3″,5,5′-五甲氧基-7,9′:7′,9-二环氧-4,8″-氧-8,8′-倍半新木质素-7″,9″-二醇(**64**)、(+)-异落叶松树脂醇(**65**)、赤式-愈创木酚基甘油基-*β*-O-4′-松柏醇(**66**)、diasyringaresinol(**67**)。

陈显宏[34]等亦从苦绳原变种(*Dregea sinensis* var. *corrugate*)中分离得到并鉴定了8个苯丙素类化合物,分别为丁香脂素(**68**)、松脂素(**69**)、syringaresinol-4′-*O*-*β*-D-glucoside(**70**)、3,4′-二甲氧基-4,9,9′-三羟基-苯并呋喃木脂素-7′-烯(**71**)、coniferaldehyde(**72**)、sinapicaldehyde(**73**)、松柏素(**74**)、3-hydroxy-1-(3-methoxy-4-hydroxyphenyl)-propan-1-one(**75**)。

## 2.3 寡糖类

从苦绳(*Dregea sinensis*)中分离得到苦绳双糖

苷(**76**)、三糖苷(**77**)和四糖苷(**78**),从南山藤[*Dregea volubilis* (L. f.) Benth. ex Hook. f]中分离得到α-甲基-茯苓双糖苷(**79**)和α-甲基-牙节双糖苷(**80**)[17,32]。

### 2.4 其它类

除上述化学成分,从南山藤属植物中还获得二十烷酸(**81**)、α,γ-二棕榈酸甘油脂(**82**)、β-谷甾醇(**83**)、4α-甲基-胆甾-7-烯-3-β-醇(**84**)、谷甾醇-β-D-葡萄糖苷(**85**)、α-amyrin acetate(**86**)、β-amain(**87**)、β-sitosterol(**88**)[35]。

## 3 生物活性

### 3.1 抗肿瘤作用

早在1976年,印度Chadha YR[36]实验证明南山藤的乙醇提取物对小鼠肉瘤180具有较好的抑制活性。Yoshimura SI等从华他卡藤[*Dregea volubilis* (L.) Benth]中分离得到具有抗艾氏瘤活性的化合物dregeoside $A_{p1}$和$A_{01}$,其抑瘤率分别为22.5%和46.5%;化合物dregeoside $A_{01}$还具有抗MelanolnaB-16活性,抑瘤率为43.4%[27]。

### 3.2 免疫调节作用

龚方苑[37]应用南山藤乙醇提物总浸膏给药患肝病BALB/c小鼠,结果表明能极其显著地降低升高的ALT和AST活性,起到对肝脏的保护作用;肝脏病理检查可以观察到DVE可明显改善小鼠肝组织出现的明显病变;对TNF-a、IL-2、IL-4、IFN-y等细胞因子在肝组织中的表达及分泌均有显著抑制作用;小鼠脾脏T细胞表现出明显的凋亡。曹宁[28]等研究发现,从南山藤乙醇提取物的乙酸乙酯部分获得的化合物marsectohexol-D-3-*O*-β-D-cymaropyranoside可以通过促进Caspase 3、Caspase 9、bid等凋亡蛋白的剪切,诱导活化T细胞进行线粒体通路的凋亡,以此达到对活化T细胞的免疫抑制作用,是一种具有选择性免疫抑制的化合物。

贾少华等[24]用酶联免疫吸附试验(ELISA)方法,对Dregeoside D和Dresioside E进行体外白介素2受体(IL-2*R*)细胞活性评估,结果表明两个化合物对IL-2*R*有一定的抑制作用,其$IC_{50}$值分别为10.21 μM和13.63 μM。

### 3.3 抗炎作用

刘云宝[31]从苦绳变种(*Dregea sinensis* var. corrugate)中分离得到的12-*O*-acetyl-20-*O*-benzoyl-(8,14, 18-orthoacetate)-dihydrosarcostin-3-*O*-β-*D*-thevetopyranosyl-(1→4)-*O*-β-*D*-oleandropyranosyl-(1→4)-*O*-β-*D*-cymaropyranoside具有中等程度的抗炎活性,抑制率为29.0%。

Hossain E等[38]以卡拉胶产生的生物炎症作为模型,对南山藤叶甲醇提取物、石油醚萃取部分和氯仿萃取部分进行研究,发现石油醚和氯仿部分都能够明显降低由卡拉胶产生的动物足部水肿,且作用强于甲醇部分。在对小鼠腹腔巨噬细胞受到LPS刺激产生一氧化氮实验中,南山藤叶甲醇提取物给药在25~100 μg/mL浓度梯度内,一氧化氮的产生量以百分数形式下降,说明此部分物质可以减少脂多糖诱导一氧化氮的产生,从而起到抑制炎症的作用。

### 3.4 神经保护作用

早在印度生药学[36]中有记载,南山藤的乙醇提取物对于中枢神经系统具有保护活性。2013年,印度学者Jadhav RS[39]等从南山藤[*Wattakaka volubilis* (L. f) (Stapf.)]中得到皂苷混合物和多羟基孕烷配糖体。药理实验证明,在皂苷混合物浓度为50 mg/kg,多羟基孕烷配糖体浓度为10 mg/kg时,均可通过抗氧化作用,使得脑缺血组织中丙二醛含量降低,一氧化氮合成酶活性降低,超氧化歧化酶活性增强,从而对大脑中动脉闭塞产生的缺血和再灌注的实验小鼠具有神经保护作用。

### 3.5 抗白血病

贾少华等对苦绳中分离得到的6种新的多羟基类固醇糖苷类化合物进行体外细胞毒活性筛选,发现化合物3-*O*-[6-Deoxy-3-*O*-methyl-β-allopyanosyl-(1→4)-β-digitoxopyranoside]-11α,12β-di-*O*-benzoyl-17β-marsdenin-5,6-dihydrogen和3-*O*-[6-Deoxy-3-*O*-methyl-β-allopyanosyl-(1→4)-digitoxopyranoside]-11α,12β-di-*O*-benzoyl-17α-marsdenin对人类白血病细胞(HL-60)具有一定的抑制活性,其$IC_{50}$值分别为14.10 μM和19.16 μM[25]。

### 3.6 抗蚊虫活性

Hossain E等对南山藤[*D. volubilis* (L. f.) Benth. ex Hook. f]的甲醇提取物在不同浓度下进行杀死幼虫的研究,给药量在0.5%浓度时死亡率最高,给药72 h后的死亡率高于24 h和48 h的,并且死亡率也与药物浓度呈现一定的相关性[40]。

## 4 结语

萝藦科南山藤属植物是重要的药用植物资源,

在我国资源丰富,化学成分类型多样且活性明显,现代药理学研究表明南山藤属植物中 $C_{21}$ 甾体类成分具有抗肿瘤和免疫调节的作用,木质素类化合物具有抗病毒、抗炎等活性[41,42]。因此,该属植物具有较大的开发潜力,其药用价值有待进一步研究和提升,建议对其进行深入研究并综合开发利用。首先,该属植物在我国分布范围广,尤其在西南民族地区,产量大,资源丰富,是傣族常用的特色药材之一,然而多数没有利用起来,未得到充分利用。其次,近年的药理作用研究多集中于该属植物的粗提物和少数化合物上,虽然验证了其临床应用的疗效,但对临床应用的物质基础并没有系统的阐明。如傣百解(*Dregea sinensis* Hemsl)在我国傣族有着悠久的用药历史,不仅是一味特色单方药,也是傣药复方-百解胶囊的重要组成成分[43],尽管对傣百解的化学成分及其药理作用开展了研究,但其发挥作用的物质基础仍不清楚。因此,有必要将化学成分与生物活性研究紧密结合起来,以系统阐明该属植物的药效物质基础,为其资源的综合开发应用提供基础数据。对于未来这一属植物化学成分的研究,希望能够借助多种分离提取分析手段,在利用高效液相色谱、制备色谱、LC-MS 联用等技术的基础上,寻找更适合带有糖基的甾体类化合物分离方法。

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