

## 闭鞘姜 ( *Costus speciosus* ) 甾类皂甙元 ( steroid sapogenin ) 原料新资源

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### 一、前 言

由于对甾类激素药物的需求日益增多,国际上正愈来愈多地注意从薯蓣属 (*Dioscorea*) 以外的植物中寻求薯蓣皂甙元 ( diosgenin ) 的新来源。据不完全统计,自1970年 Dasgupta & Pandey 报导在闭鞘姜的根茎中含有 2.12% 的薯蓣皂甙元以来,有关对该植物的研究报告竟达70篇之多。除了印度在这一课题的研究处于领先地位外,缅甸 ( Zan 1980 )、中国 ( 陈延镛 1981 )、印度尼西亚 ( Lubis 1980 ) 等国都报导过从各自国家的闭鞘姜中可获得薯蓣皂甙元。为什么一个曾经是默默无闻的野草,突然之间受到如此的重视呢? 它在我国的应用前景又怎样呢? 为了引起有关部门的重视,下面我们对此作一个简单的介绍。

### 二、闭鞘姜的化学研究进展

Dasgupta & Pandey ( 1970 ) 首次报导在闭鞘姜的根茎中含有 2.12% 的薯蓣皂甙元 (  $C_{27}H_{42}O_3$  )。

Sarin ( 1976 )、Chakravarti ( 1976 ) 及 Kapahi et al ( 1978 ) 等报导从闭鞘姜的根茎中分离得:薯蓣皂甙元、替告皂甙元 ( Tigogenin )、Saponin A ( 谷甾醇 sitosterolglycosida )、Saponin B、C 及 D。文中还讨论了闭鞘姜作为商业原料的可能性,并介绍了它的栽培方法。后来, Tschesche ( 1978 ) 指出: Saponin B 为 Gracillin, Saponin C 为 Dioscin。

Rathore 等人 ( 1978 ) 介绍用悬浮培养法 ( suspension culture ), 从闭鞘姜中生产薯蓣皂甙元,发现在闭鞘姜的根茎及茎的组织培养中均可获得薯蓣皂甙元及替告皂甙元,但根茎愈伤组织中的含量较之茎愈伤组织中的含量为高。

Rathore ( 1977 ) 从闭鞘姜的愈伤组织中分离出:薯蓣皂甙元、替告皂甙元、羊毛甾醇 ( Lanosterol ) 和豆甾醇 ( stigmasterol )。

Singh 等人 ( 1980 ) 报导在闭鞘姜的种子中亦含有薯蓣皂甙元,且含量较根茎中的为高 ( 2.4%—2.8% )。

Sarin ( 1974, 1976, 1977, 1981 )、Bedi ( 1976 ) 讨论了闭鞘姜在印度的资源分布和薯蓣皂甙元的含量变化及其商业意义。文章指出闭鞘姜在印度分布广泛,容易繁殖,生长迅

速,资源丰富。从中提得之薯蓣皂甙元较之从薯蓣属(*Dioscorea*)植物中所得的为纯,因此具有潜在的商业价值。试验表明闭鞘姜根茎中薯蓣皂甙元的含量以节部为多,节间的含量最低。不同个体之间含量的差异,在200个试样中,变幅为0.39—3.65%。7—8月分开花时含量最高,9—10月分结果时含量锐减。因此收获季节应选在含量最高的月分。在地理分布与含量的关系方面,文章指出,印度近喜马拉雅山的地区(如喜马偕尔邦、北方邦)生长的闭鞘姜,其含量较西部及南部的为高,其变幅可以从0.58—2.63%。认为可通过选育种获得高产之品种。

Gupta等(1979—1982)连续发表多篇论文,报导闭鞘姜不同部位、不同生长阶段薯蓣皂甙元含量的变化。

Chandr(1977)、Panda(1980)报导过闭鞘姜的生长条件和栽培方法,指出栽后7—8个月就能收获,此时得率为1.00—1.56%。一般以开花时含量最高,但花后对含量无影响。

Datta等(1977)、Gandotra等(1977)探讨了闭鞘姜的最适收获期和薯蓣皂甙元的分析、生产方法。

此外,Pandey等人(1970—1980)还发表过一系列文章论述有关闭鞘姜的栽培、化学和药理等方面的问题。Tewari等人(1973)报导从闭鞘姜中取得之混合皂素,具有雌性激素的作用和抗生育的作用。

以上只是对有关闭鞘姜的研究进展作一简单介绍,详细情况读者可查阅本文末所附的文献目录。

### 三、闭鞘姜的特征及其在我国境内的分布

闭鞘姜(图1)亦名樟柳头、广商陆和水蕉花,是姜科(*Zingiberaceae*)多年生草本,由于具有螺旋状排列的叶片及管状的叶鞘而置于闭鞘姜亚科,有根状茎及地上茎,枝的顶端常旋卷。叶片圆形或披针形,背面密生绢毛。花序顶生,穗状,具有红色而顶端锐尖的苞片;花白色或红色,具有一个喇叭形的美丽唇瓣,发育雄蕊1枚,花瓣状。果为蒴果,具黑色,光亮的种子。花期:7—9月。

本种在我国台湾、福建、江西、广东、广西及云南均有分布。生于海拔45—1700米的疏林下、草丛、灌木丛、山谷阴湿地、水沟边等处。

本种栽培繁殖极易,用根茎或茎无性繁殖或种子繁殖均可。春季将根茎切成一段段,埋入土中或利用地上茎插条均可,宜栽于排水良好之沙壤土。

本种民间常用作中草药,根茎有消炎利尿、散瘀消肿的功效,治水肿、尿路感染及百日咳,煎水外洗治皮疹及荨麻疹。(参见《常用中草药彩色图谱》)。

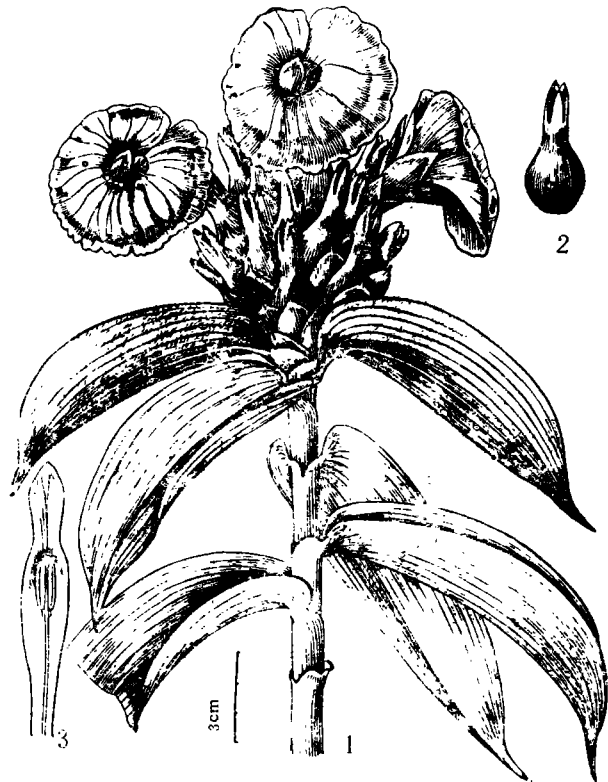
与闭鞘姜同属的植物,中国尚有下列2种,亦可考虑作筛选对象。

1.光叶闭鞘姜 *C. tonkinensis* Gagnep. 叶片倒卵状长圆形,花序单独由根茎生出。分布于云南、广西和广东。

2.莴笋花 *C. lacerus* Gagnep. 叶片椭圆形或披针状长圆形,背面被粗长毛;花序顶生,苞片被粗长毛,顶端不具硬尖头,老时破裂呈纤维状。分布于西藏、云南。

## 四、资源利用讨论

甾体皂甙元是合成甾体激素药物(如醋酸可的松、肤轻松等和避孕药)的重要原料,目前的需求量甚大,人们曾试图从薯蓣属以外的植物中寻找该类物质。文献曾报导过葫芦科、龙舌兰科等科植物中均有薯蓣皂甙元及其它甾体皂甙元之存在。但是只有当薯蓣皂甙元的含量超过1%,而且不含难以分离的其它甾体化合物时才有商业价值。闭鞘姜的根茎中含有大量的皂甙,其干燥根茎的乙醇提取物,经酸水解可获得3.86%的总皂甙元。经层析和重结晶,纯薯蓣皂甙的得率为2.1%,含量可和 *Dioscorea prazeri* 相媲美,但其资源远较后者为丰富,因此更有利作合成激素的原料。此点不但国外有人提出建议,用闭鞘姜的根茎作生产薯蓣皂甙元的原料。国内亦有人开始注意,如陈延镛等(1981)曾用广西、广东(海南岛)的材料作过分析,因含量低于1%(约0.5%),而未获得理想之结果。但我们认为此项工作仍值得进一步开展,因闭鞘姜中薯蓣皂甙元的含量往往因产地和采收期等条件的不同而有很大差异,幅度可在0.1—2.5%之间。同时,闭鞘姜是一个变异比较大的种,在我国分布范围亦比较广,因而有利于筛选工作的进行。鉴于印度已获得较高产的品种,因此不妨先从我国云南、广西着手,做些调查,有条件的话,也可以从西藏采点样,进行分析,以期获得具有商业价值的新资源植物。同时工作要过细,要比较不同产地和不同采收期和薯蓣皂甙元含量的关系。在获得高产的个体后,可采用组织培养等快速繁殖法进行栽培推广。在普查过程中,同属植物也应予以重视,因从近缘中寻求具有相似成份的原料植物种类也是发掘资源植物的一种有效方法。事实上国外已经有人(Luw, 1981)从一种产南部非洲的 *Costus afer* 中提取到甾类化合物。



闭鞘姜 *Costus speciosus* (Koenig) Smith  
1. 植株顶部; 2. 果; 3. 发育雄蕊和花柱。(黄少容绘)

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## COSTUS SPECIOSUS—A NEW SOURCE OF STEROID SAPOGENIN

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### Abstract

In this paper the author introduced the research progress of *Costus speciosus* as a new source of diosgenin in the world and discussed the significance of launching the research work in China. At the end of the paper, 69 articles for reference related to the subject are presented.