

藏药西藏凹乳芹及其近似种的数字化生药学研究

王艺娱^{1,2}, 高必兴^{1*}, 齐景梁¹, 李倩¹, 苟琰¹, 高驰¹, 王颖¹, 兰志琼^{2*} (1. 四川省药品检验研究院, 国家药品监督管理局中成药质量评价重点实验室, 成都 611731; 2. 成都中医药大学药学院, 现代中药产业学院, 中药材标准化教育部重点实验室, 西南特色中药资源国家重点实验室, 成都 611137)

摘要:目的 建立藏药西藏凹乳芹与其近似品种的生药学鉴别及数字化表征方法。方法 采集西藏凹乳芹及其近似种的原植物并制作腊叶标本,使用数码相机、体式显微镜、光学显微镜及数码成像技术对其原植物、药材性状、根横切面及粉末显微鉴别进行生药学研究及数字化表征。结果 建立了西藏凹乳芹及7个近似品种(迷果芹、西藏棱子芹、东当归、松潘棱子芹、羽苞藁本、裂叶独活、峨参)的植物、药材性状及显微鉴别分类检索表,发现各品种间植物的主要区别在于花及果实;药材性状的主要区别在根头部、表面及断面特征;显微的主要区别在于分泌组织类型及是否有后含物等。结论 所建立的分类检索表能有效鉴别西藏凹乳芹及其近似种,为其品种分类及临床使用提供科学依据,以及智能识别技术在藏药鉴别上的应用探索奠定基础,也为中药数字标本平台提供资料。

关键词: 西藏凹乳芹; 加哇; 生药学; 数字化; 基原鉴定; 药材性状; 显微鉴别

doi:10.11669/cpj.2024.18.006 中图分类号:R282 文献标志码:A 文章编号:1001-2494(2024)18-1705-10

Digitized Pharmacognostical Study of *Vicatia tibetica* de Boiss and Its Similar Species

WANG Yiyu^{1,2}, GAO Bixing^{1*}, QI Jingliang¹, LI Qian¹, GOU Yan¹, GAO Chi¹, WANG Ying¹, LAN Zhiqiong^{2*} (1. NMPA Key Laboratory of Quality Evaluation of Chinese Patent Medicines, Sichuan Institute for Drug Control, Chengdu 611731, China; 2. MOE Key Laboratory of Standardization of Chinese Herbal Medicine, State Key Laboratory of Traditional Chinese Medicine Resources of Southwestern China, College of Modern Chinese Medicine Industry, College of Pharmacy, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China)

ABSTRACT: OBJECTIVE To establish a method for the pharmacognostic identification and digital characterization of the *Vicatia tibetica* de Boiss and its similar species. **METHODS** The original plant specimens of *Vicatia tibetica* de Boiss. and its similar species, and carried out pharmacognostic studies and digital characterization of morphologic characteristics, character identification, microscopic identification using digital camera, body microscope, light microscope, and digital imaging systems were collected and made. **RESULTS** Taxonomic checklists of morphologic characteristics, character identification and microscopic identification were established for the *Vicatia tibetica* de Boiss and 7 similar varieties [*Sphallerocarpus gracilis* (Bess.) K.-Pol., *Pleurosperrum hookeri* var. *thomsonii* C. B. Clarke, *Angelica acutiloba* (Sieb. et Zucc.) Kitagawa, *Pleurosperrum franchetianum* Hemsl., *Ligusticum daucooides* (Franch.) Franch., *Heracleum millefolium* Diels, *Anthriscus sylvestris* (L) Hoffm.], and it was found that the main differences between the 8 plants were in the flowers and fruits, and that the main differences in character identification were in the characteristics of the root heads, surfaces, and cross-sections, and that the main differences in the microscopic identifications were in the types of secretory tissues and the presence or absence of posterior inclusions, etc. **CONCLUSION** The established taxonomic checklists can effectively identify *Vicatia tibetica* de Boiss and its similar species, and provide a scientific basis for its species classification and clinical use. It also lays a foundation for the exploration of the application of intelligent identification technology in the identification of Tibetan medicines, and provides information for the platform of digital specimens of traditional Chinese medicine.

KEY WORDS: *Vicatia tibetica* de Boiss.; Jiawa; pharmacognostical study; digitization; character identification; morphologic characteristics; microscopic identification

藏药ཇལ, 音译名“加哇”, 为常用藏药, 始载于《四部医典》^[1], 其药用部位为根, 功效为补肾、干黄水、祛腰肾寒症等, 主要治疗肾病, 腰痛, 肾虚, 隆病, 黄水病, 消化不良等。加哇在诸多藏医药典籍中均

基金项目: 四川省中医药管理局科研项目资助(2024MS521)

作者简介: 王艺娱, 女, 硕士研究生 研究方向: 中药品种、质量与资源开发应用研究 * 通讯作者: 高必兴, 男, 博士, 主管中药师 研究方向: 中药及民族药质量研究 Tel: (028)65182693; 兰志琼, 女, 博士, 副教授, 硕士生导师 研究方向: 中药品种、质量与资源开发应用研究 Tel: (028)61800231

有记载,但描述简单,记载混乱,古本草^[1-6]与近现代本草中^[7-11]记载的加哇涉及品种复杂,包括有西藏凹乳芹(*Vicatia tibetica* de Boiss.)、迷果芹[*Sphallerocarpus gracilis* (Bess.) K. -Pol.]、西藏棱子芹(*Pleurospermum hookeri* var. *thomsonii* C. B. Clarke.)、刺果峨参[*Anthriscus nemorosa* (M. Bie.) Spreng]、西藏白苞芹(*Nothosmyrnum xizangense* Shan et T. S. Wang)等,严重影响加哇的临床用药。

针对五省藏区藏医院及药用企业调研发现,不同藏区使用加哇品种不一致,西藏地区认为加哇的正品基原为西藏凹乳芹,且在西藏地区已成为加哇的主流品种使用。加哇品种鉴别困难且部分无相关标准控制,调研结果得出西藏凹乳芹为藏医院最常用的品种,目前尚未见对西藏凹乳芹鉴定方面的报道研究。同时,野外实地调研发现,作为伞形科植物,西藏凹乳芹在野外近似品种较多,鉴别较为困难,易造成临床使用混乱。故本实验研究并建立西藏凹乳芹与藏区常见近似种(迷果芹、西藏棱子芹、东当归、松潘棱子芹、羽苞藁本、裂叶独活、峨参)的植物、性状及显微鉴别分类

检索表,为其野外鉴定、质量标准以及临床应用提供科学依据。

中药原植物、性状和显微鉴定的数字化表征是以实物为基础,参考植物形态解剖学研究方法制定研究规范,应用多种数字化技术对鉴别特征进行多维度的表征^[12]。本实验应用体式显微镜、光学显微镜等仪器设备及数码成像技术手段,对西藏凹乳芹及其7个近似品种进行生药学比较研究及数字化表征,总结出8个品种在原植物、药材及显微鉴别的区别,为西藏凹乳芹品种分类及临床应用提供参考。

1 仪器与材料

BX63 光学显微镜,DP74 成像系统, SZX16 体式显微镜, DP74 成像系统(日本 OLYMPUS 公司); D750 数码相机(日本 NIKON 公司)。

样品均为实地调研采集,信息见表1,经四川省药品检验研究院黎跃成主任中药师鉴定为基原准确的药材,保存于四川药品检验研究中药民族药检验所中药标本馆。

表1 西藏凹乳芹及其近似种的药材样品信息

Tab. 1 Sample information of *Vicatia tibetica* de Boiss. and its similar species

No.	Species	Place of origin (in Chinese)	No.	Species	Place of origin (in Chinese)
A-1	<i>Vicatia tibetica</i> de Boiss.	Panzhihua Sichuan(四川攀枝花)	M-1	<i>Sphallerocarpus gracilis</i> (Bess.) K. -Pol.	Basu Xizang(西藏八宿)
A-2	<i>Vicatia tibetica</i> de Boiss.	Liangshan Sichuan(四川凉山)	M-2	<i>Sphallerocarpus gracilis</i> (Bess.) K. -Pol.	Zhangye Gansu(甘肃张掖)
A-3	<i>Vicatia tibetica</i> de Boiss.	Liangshan Sichuan(四川凉山)	M-3	<i>Sphallerocarpus gracilis</i> (Bess.) K. -Pol.	Aba Sichuan(四川阿坝)
A-4	<i>Vicatia tibetica</i> de Boiss.	Liangshan Sichuan(四川凉山)	M-4	<i>Sphallerocarpus gracilis</i> (Bess.) K. -Pol.	Xining Qinghai(青海西宁)
A-5	<i>Vicatia tibetica</i> de Boiss.	Liangshan Sichuan(四川凉山)	M-5	<i>Sphallerocarpus gracilis</i> (Bess.) K. -Pol.	Yushu Qinghai(青海玉树)
A-6	<i>Vicatia tibetica</i> de Boiss.	Liangshan Sichuan(四川凉山)	M-6	<i>Sphallerocarpus gracilis</i> (Bess.) K. -Pol.	Guoluo Qinghai(青海果洛)
A-7	<i>Vicatia tibetica</i> de Boiss.	Changdu Xizang(西藏昌都)	D-1	<i>Angelica acutiloba</i> (Sieb. et Zucc.) Kitagawa	Ya'an Sichuan(四川雅安)
A-8	<i>Vicatia tibetica</i> de Boiss.	Naqu Xizang(西藏那曲)	D-2	<i>Angelica acutiloba</i> (Sieb. et Zucc.) Kitagawa	Ya'an Sichuan(四川雅安)
A-9	<i>Vicatia tibetica</i> de Boiss.	Shannan Xizang(西藏山南)	D-3	<i>Angelica acutiloba</i> (Sieb. et Zucc.) Kitagawa	Leshan Sichuan(四川乐山)
A-10	<i>Vicatia tibetica</i> de Boiss.	Lasa Xizang(西藏拉萨)	D-4	<i>Angelica acutiloba</i> (Sieb. et Zucc.) Kitagawa	Liangshan Sichuan(四川凉山)
A-11	<i>Vicatia tibetica</i> de Boiss.	Linzhi Xizang(西藏林芝)	D-5	<i>Angelica acutiloba</i> (Sieb. et Zucc.) Kitagawa	Leshan Sichuan(四川乐山)
L-1	<i>Pleurospermum hookeri</i> var. <i>thomsonii</i> C. B. Clarke	Ganzi Sichuan(四川甘孜)	SP-1	<i>Pleurospermum franchetianum</i> Hemsl.	Aba Sichuan(四川阿坝)
L-2	<i>Pleurospermum hookeri</i> var. <i>thomsonii</i> C. B. Clarke	Ganzi Sichuan(四川甘孜)	SP-2	<i>Pleurospermum franchetianum</i> Hemsl.	Aba Sichuan(四川阿坝)
L-3	<i>Pleurospermum hookeri</i> var. <i>thomsonii</i> C. B. Clarke	Ganzi Sichuan(四川甘孜)	SP-3	<i>Pleurospermum franchetianum</i> Hemsl.	Aba Sichuan(四川阿坝)
L-4	<i>Pleurospermum hookeri</i> var. <i>thomsonii</i> C. B. Clarke	Guoluo Qinghai(青海果洛)	SP-4	<i>Pleurospermum franchetianum</i> Hemsl.	Aba Sichuan(四川阿坝)
L-5	<i>Pleurospermum hookeri</i> var. <i>thomsonii</i> C. B. Clarke	Guoluo Qinghai(青海果洛)	SP-5	<i>Pleurospermum franchetianum</i> Hemsl.	Ganzi Sichuan(四川甘孜)
YB-1	<i>Ligusticum daucooides</i> (Franch.) Franch.	Ganzi Sichuan(四川甘孜)	LY-1	<i>Heracleum millefolium</i> Diels	Aba Sichuan(四川阿坝)
YB-2	<i>Ligusticum daucooides</i> (Franch.) Franch.	Ganzi Sichuan(四川甘孜)	LY-2	<i>Heracleum millefolium</i> Diels	Ganzi Sichuan(四川甘孜)
YB-3	<i>Ligusticum daucooides</i> (Franch.) Franch.	Ganzi Sichuan(四川甘孜)	LY-3	<i>Heracleum millefolium</i> Diels	Aba Sichuan(四川阿坝)
YB-4	<i>Ligusticum daucooides</i> (Franch.) Franch.	Ganzi Sichuan(四川甘孜)	LY-4	<i>Heracleum millefolium</i> Diels	Guoluo Qinghai(青海果洛)
YB-5	<i>Ligusticum daucooides</i> (Franch.) Franch.	Aba Sichuan(四川阿坝)			
ES-1	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Leshan Sichuan(四川乐山)			
ES-2	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Aba Sichuan(四川阿坝)			
ES-3	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Liangshan Sichuan(四川凉山)			
ES-4	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Ganzi Sichuan(四川甘孜)			
ES-5	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Leshan Sichuan(四川乐山)			

2 方法与结果

2.1 基原鉴定

对西藏凹乳芹、迷果芹、西藏棱子芹、东当归、松潘棱子芹、羽苞藁本、裂叶独活及峨参原植物调研采集并制作腊叶标本,采用数码相机拍摄以及成像系统记录其特征,发现西藏凹乳芹与近似品种存在着较大的差异,依据《中国植物志》第55(1~3)卷伞形科植物特征,制定西藏凹乳芹与7个近似品种植物的分类检索表,如下所示。

1. 果实有翅
 2. 花药青黑色……羽苞藁本[*Ligusticum daucoides*(Franch.)Franch.]
 2. 花药黄白色至黄绿色
 - …西藏棱子芹(*Pleurospermum hookeri* var. *thomsonii* C. B. Clarke)
1. 果实无翅
 3. 果实椭圆形
 4. 小总苞片匙形,边缘白色膜质

- ……松潘棱子芹(*Pleurospermum franchetianum* Hemsl.)
4. 小总苞片线形,有毛
 - ……裂叶独活(*Heracleum millefolium* Diels)
3. 果实长圆形或长卵形
 5. 果实无棱,光滑或疏生小瘤点,顶端渐狭成喙状
 - ……峨参[*Anthriscus sylvestris*(L.)Hoffm.]
 5. 果实有棱
 6. 侧棱狭翅状,较背棱宽
 - ……东当归[*Angelica acutiloba*(Sieb. et Zucc.)Kitagawa]
 6. 侧棱线形,与背棱同
 7. 小总苞片线形,无毛
 - ……西藏凹乳芹(*Vicatia tibetica* de Boiss.)
 7. 小总苞片长卵形至广披针形,边缘膜质
 - ……迷果芹[*Sphallerocarpus gracilis*(Bess.)K.-Pol.]

西藏凹乳芹原植物图见图1,各品种原植物鉴别特征见图2,西藏凹乳芹标本图见图3,各品种标本对比图见图4。



1-原植物;2-5-果实;6-7-花序;8-叶;9-根。

1 - Plant; 2 - 5 - Fruit; 6 - 7 - Inflorescence; 8 - Leaf; 9 - Root.

图1 西藏凹乳芹原植物图

Fig. 1 Plant photo of *Vicatia tibetica* de Bioss.

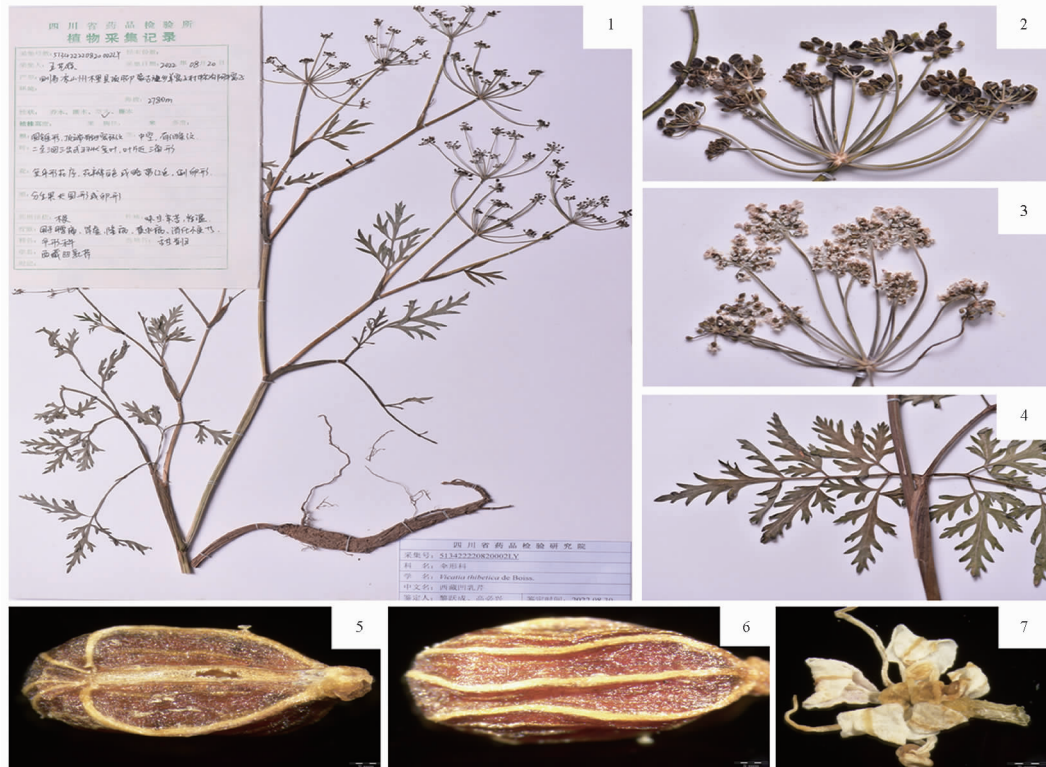


1 - 羽苞藁本 (花药青黑色); 2 - 西藏棱子芹 (花药黄色); 3 - 松潘棱子芹 (小总苞片匙形, 边缘白色膜质); 4 - 裂叶独活 (小总苞片线形, 有毛); 5 - 峨参 (果实无棱); 6 - 东当归 (果实侧棱狭翅状, 较背棱宽); 7 - 迷果芹 (小总苞片长卵形, 边缘白色膜质); 8 - 西藏凹乳芹 (小总苞片线形, 无毛)。

1 - *Ligusticum daucooides* (Franch.) Franch. (greenish-black anthers); 2 - *Pleurospermum hookeri* var. *thomsonii* C. B. Clarke (yellow anthers); 3 - *Pleurospermum franchetianum* Hemsl. (involucral bracteoles are spoon-shaped with white membranous margins); 4 - *Heracleum millefolium* Diels (involucral bracteoles are linear and hairy); 5 - *Anthriscus sylvestris* (L.) Hoffm. (fruit without ribs); 6 - *Angelica acutiloba* (Sieb. et Zucc.) Kitagawa (fruit lateral ribs narrowly winged, wider than dorsal ribs); 7 - *Sphallerocarpus gracilis* (Bess.) K.-Pol. (involucral bracteoles are long ovate, margin white membranous); 8 - *Vicatia tibetica* de Boiss. (involucral bracteoles linear and glabrous).

图2 8个品种原植物鉴别特征图

Fig. 2 Characterization photo for identification of 8 species of plants



1 - 标本; 2 - 果实; 3 - 花序; 4 - 叶; 5 - 分生果合生面; 6 - 果棱; 7 - 花。

1 - Specimen; 2 - Fruit; 3 - Inflorescence; 4 - Leaf; 5 - Symbiosis of two fruits; 6 - Fruit ribs; 7 - Flower.

图3 西藏凹乳芹标本图

Fig. 3 Specimen of *Vicatia tibetica* de Boiss.



1 - 羽苞蘼本; 2 - 西藏棱子芹; 3 - 松潘棱子芹; 4 - 裂叶独活; 5 - 峨参; 6 - 东当归; 7 - 迷果芹; 8 - 西藏凹乳芹。

1 - *Ligusticum daucooides* (Franch.) Franch.; 2 - *Pleurospermum hookeri* var. *thomsonii* C. B. Clarke; 3 - *Pleurospermum franchetianum* Hemsl.; 4 - *Heracleum millefolium* Diels; 5 - *Anthriscus sylvestris* (L.) Hoffm.; 6 - *Angelica acutiloba* (Sieb. et Zucc.) Kitagawa; 7 - *Sphallerocarpus gracilis* (Bess.) K.-Pol.; 8 - *Vicatia thibetica* de Boiss.

图4 藏药西藏凹乳芹及其近似种标本及特征图

Fig. 4 Specimens and characterization photo of *V. thibetica* de Boiss. and its similar species

2.2 性状鉴别

通过眼看、手摸、鼻闻、口尝等方法,直接观察药材外观性状特征,并用数码相机拍摄,各品

种药材对比图及特征部位对比图见图5和图6,各品种药材间的区别见表2,最后建立其药材性状分类检索表,如下所示。

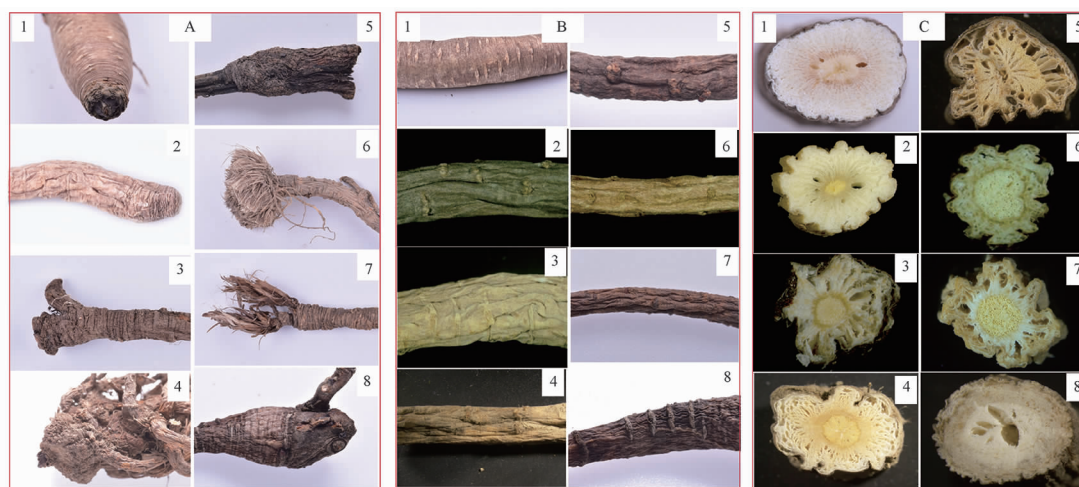


1 - 西藏凹乳芹; 2 - 迷果芹; 3 - 西藏棱子芹; 4 - 东当归; 5 - 松潘棱子芹; 6 - 羽苞蘼本; 7 - 裂叶独活; 8 - 峨参。

1 - *Vicatia thibetica* de Boiss.; 2 - *Sphallerocarpus gracilis* (Bess.) K.-Pol.; 3 - *Pleurospermum hookeri* var. *thomsonii* C. B. Clarke; 4 - *Angelica acutiloba* (Sieb. et Zucc.) Kitagawa; 5 - *Pleurospermum franchetianum* Hemsl.; 6 - *Ligusticum daucooides* (Franch.) Franch.; 7 - *Heracleum millefolium* Diels; 8 - *Anthriscus sylvestris* (L.) Hoffm.

图5 藏药西藏凹乳芹及其近似种药材对比图

Fig. 5 Comparison photo of character identification of *V. thibetica* de Boiss. and its similar species



A - 根头部特征; B - 表面特征; C - 断面特征; 1 - 西藏凹乳芹; 2 - 迷果芹; 3 - 西藏梭子芹; 4 - 东当归; 5 - 松潘梭子芹; 6 - 羽苞蕈本; 7 - 裂叶独活; 8 - 峨参。

A - root head characteristics; B - surface characteristics; C - cross-section characteristics; 1 - *Vicatia thibetica* de Boiss.; 2 - *Sphallerocarpus gracilis* (Bess.) K.-Pol.; 3 - *Pleurospermum hookeri* var. *thomsonii* C. B. Clarke; 4 - *Angelica acutiloba* (Sieb. et Zucc.) Kitagawa; 5 - *Pleurospermum franchetianum* Hemsl.; 6 - *Ligusticum daucooides* (Franch.) Franch.; 7 - *Heracleum millefolium* Diels; 8 - *Anthriscus sylvestris* (L.) Hoffm.

图6 藏药西藏凹乳芹及其近似种药材特征部位对比图

Fig. 6 Comparison photo of characteristic parts identification of *V. thibetica* de Boiss. and its similar species

表2 西藏凹乳芹与近似种药材区别

Tab. 2 Difference of character identification between *V. thibetica* de Boiss. and its similar species

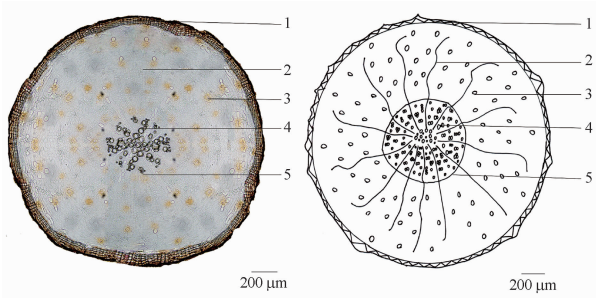
No.	Species	Shape	Color	Root head	Surface	Cross-sectional	Odor
1	<i>Vicatia thibetica</i> de Boiss.	Oblong conic	Yellowish brown to reddish brown	Remaining black depressed stem scar at tip, with dense annulus under root head	Longitudinal wrinkles, branched root scars and transverse lenticels	Powdery and slightly horny	Aromatic odor, sweet taste
2	<i>Sphallerocarpus gracilis</i> (Bess.) K.-Pol.	Long fusiform	Earthy yellow or brownish yellow	Dense annular striations	Longitudinal wrinkles, light yellowish brown transverse long lenticel scars and branching root scars	Fissures visible, cortex is yellowish white, cambium are yellowish brown and conspicuous, xylem is yellowish	Slight odor, sweet and slightly pungent taste, chewing with a distinct carrot flavor
3	<i>Pleurospermum hookeri</i> var. <i>thomsonii</i> C. B. Clarke	Oblong conic	Grayish brown or yellowish brown	Transverse wrinkles, residual stem bases, and withered fibrous leaf base remnants	Longitudinal wrinkles, yellowish brown punctate lenticel scars and punctate thin root scars	Mostly cracked, cortex is yellowish with minute oil spots; cambium is brown and conspicuous; xylem yellowish-white, rays fine and dense	Slightly fragrant odor, slightly sweet taste
4	<i>Angelica acutiloba</i> (Sieb. et Zucc.) Kitagawa	Cylindrical	Tan to brown	Slightly inflated, with depressed remnant stem scar and leaf sheath at tip	Longitudinal wrinkles and rounded or transversely long raised lenticels	The cortex is yellowish-white with visible cracks, the xylem is yellowish, and the cambium is brown	Special aroma, taste sweet, pungent, slightly bitter
5	<i>Pleurospermum franchetianum</i> Hemsl.	Oblong conic or cylindrical	Tan to brown	Root head enlarged, 1 to 3 caudexes remaining at the tip, with dense annular transverse striations, some Ring pattern residues of tan hairy leaf bases, gradually the lower part of the epidermis falling off	Longitudinal wrinkles, transverse long lenticel scars and punctate thin root scars	The cortex is much cracked with numerous brownish-red oil spots, the xylem is yellowish	Special odor, slightly pungent taste
6	<i>Ligusticum daucooides</i> (Franch.) Franch.	Oblong conic	Yellowish brown or grayish brown	Fibrous withered leaf sheaths	Longitudinal wrinkles, scattered lenticels and punctate thin root scars	Mostly cracked, cortex is yellowish-white and has tiny oil dots, cambium is brown and conspicuous, xylem yellowish-white	Slightly fragrant, peculiar, mild odor
7	<i>Heracleum millefolium</i> Diels	Oblong conic	Grayish brown to tan	Densely fibrous withered leaf sheaths	Longitudinal wrinkles, branched root scars and transverse lenticels	Cortex is brownish-yellow and mostly cracked, with tiny brownish-red oil spots, xylem is yellowish	Special odor, slightly bitter and pungent taste
8	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Cylindrical, curved, thick at the top and thin at the bottom	Brown to brownish black	With ringed transverse stripes	Longitudinal wrinkles, branched root scars and transverse lenticels	Cracks visible in the center of the section, cortex is yellowish white with most of the oil dots scattered, cambium is yellowish brown and distinct, xylem is white	Special odor, slightly pungent taste

1. 根头部无叶鞘
2. 下部支根较多,数十条或更多
..... 东当归[*Angelica acutiloba* (Sieb. et Zucc.) Kitagawa]
2. 下部无支根或少支根
3. 木质部白色 峨参(*Anthriscus sylvestris* (L) Hoffm.)
3. 木质部淡黄色或黄色
4. 根头部膨大,顶端残留1~3个茎基
..... 松潘棱子芹(*Pleurospermum franchetianum* Hemsl.)
4. 根头部不膨大
5. 断面皮部有多数裂隙和细小油点
..... 西藏棱子芹(*Pleurospermum hookeri* var. *thomsonii* C. B. Clarke)
5. 断面皮部无裂隙
6. 味甜 西藏凹乳芹(*Vicatia tibetica* de Boiss.)
6. 味微甜辛,嚼之有明显的胡萝卜味
..... 迷果芹[*Sphallerocarpus gracilis* (Bess.) K. -Pol.]
1. 根头部密被纤维状叶鞘
7. 形成层环纹棕色,明显
..... 羽苞蘘本[*Ligusticum daucoides* (Franch.) Franch.]
7. 形成层不明显
..... 裂叶独活(*Heracleum millefolium* Diels)

2.3 显微鉴别

按照《中国药典》2020年版四部通则项下显微鉴别法,采用徒手切片法,对各品种药材进行根横切面研究并绘制简图,同时对药材粉末进行研究,找出其显微鉴别特征并制作检索表。

2.3.1 根横切面 西藏凹乳芹与近似品种的根横切面显微图及简图见图7~14,各品种根横切面鉴别要点见表3。

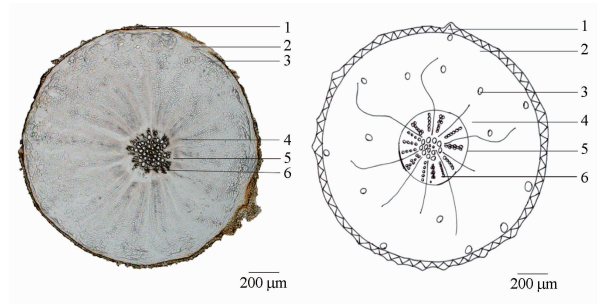


1 - 木栓层;2 - 射线;3 - 油管;4 - 导管;5 - 形成层。
1 - Phellogen; 2 - Ray; 3 - Oil tube; 4 - Conduit; 5 - Cambium.

图7 西藏凹乳芹根横切面

Fig. 7 Root cross-section of *V. tibetica* de Boiss.

2.3.2 粉末显微鉴别 8个品种粉末特征主要区别在于分泌细胞为油管或油室、薄壁细胞是否含有淀粉粒及草酸钙晶体,西藏凹乳芹、东当归、松潘棱子芹、羽苞蘘本及峨参分泌组织为油管,其余均为

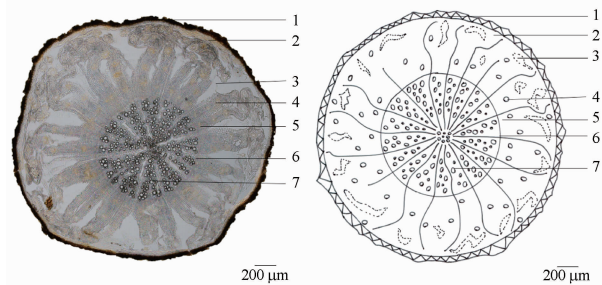


1 - 木栓层;2 - 皮层;3 - 油室;4 - 韧皮部;5 - 形成层;6 - 导管。

1 - Phellogen; 2 - Cortex; 3 - Oil chamber; 4 - Phloem; 5 - Cambium; 6 - Conduit.

图8 迷果芹根横切面

Fig. 8 Root cross-section of *S. gracilis* (Bess.) K. -Pol.

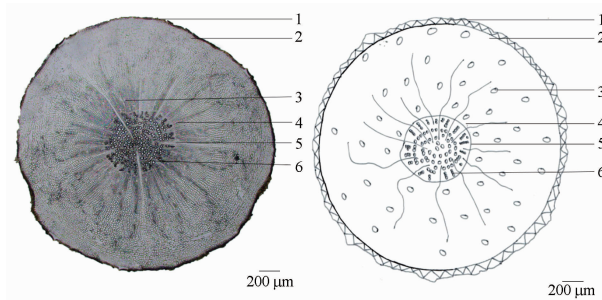


1 - 木栓层;2 - 皮层;3 - 裂隙;4 - 油室;5 - 韧皮部;6 - 形成层;7 - 导管。

1 - Phellogen; 2 - Cortex; 3 - Crack; 4 - Oil chamber; 5 - Phloem; 6 - Cambium; 7 - Conduit.

图9 西藏棱子芹根横切面

Fig. 9 Root cross-section of *P. hookeri* var. *thomsonii* C. B. Clarke



1 - 木栓层;2 - 皮层;3 - 油管;4 - 韧皮部;5 - 形成层;6 - 导管。

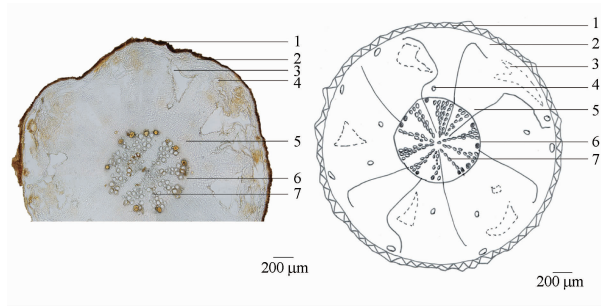
1 - Phellogen; 2 - Cortex; 3 - Oil tube; 4 - Phloem; 5 - Cambium; 6 - Conduit.

图10 东当归根横切面

Fig. 10 Root cross-section of *A. acutiloba* (Sieb. et Zucc.) Kitagawa

油室;除西藏凹乳芹、峨参外,其余淀粉粒均少见且多为单粒,见图15,各品种粉末鉴别要点见表4。

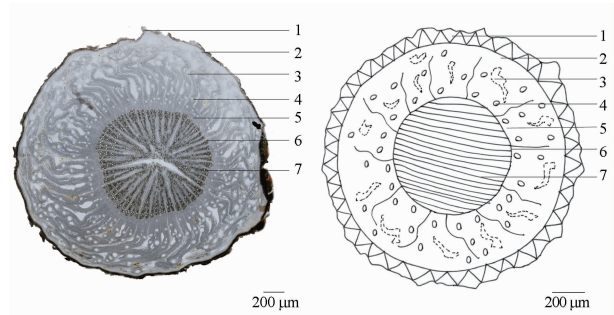
2.3.3 显微鉴别分类检索表的建立 根据以上西藏凹乳芹与其近似品种根横切面与粉末显微鉴别特征,建立西藏凹乳芹及7个近似种的药材显微鉴别分类检索表,如下所示。



1 - 木栓层; 2 - 皮层; 3 - 裂隙; 4 - 油管; 5 - 韧皮部; 6 - 形成层; 7 - 导管。
1 - Phellogen; 2 - Cortex; 3 - Crack; 4 - Oil tube; 5 - Phloem; 6 - Cambium; 7 - Conduit.

图 11 松潘棱子芹根横切面

Fig. 11 Root cross-section of *P. franchetianum* Hemsl.

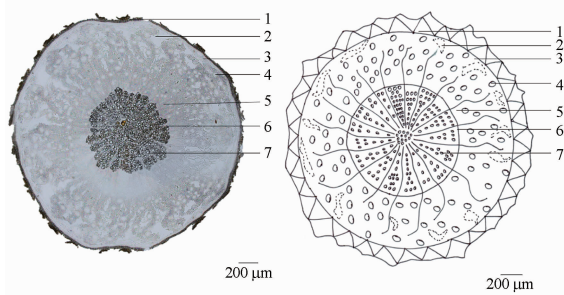


1 - 木栓层; 2 - 皮层; 3 - 裂隙; 4 - 油室; 5 - 韧皮部; 6 - 形成层; 7 - 导管。

1 - Phellogen; 2 - Cortex; 3 - Crack; 4 - Oil chamber; 5 - Phloem; 6 - Cambium; 7 - Conduit.

图 13 裂叶独活根横切面

Fig. 13 Root cross-section of *H. millefolium* Diels

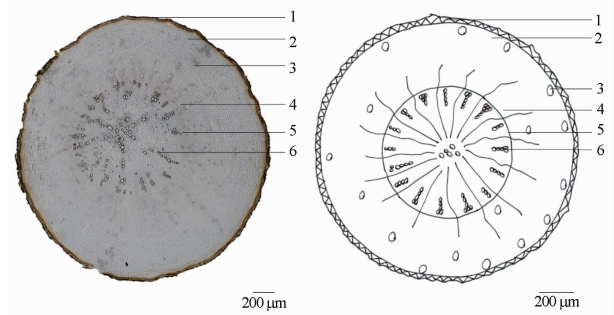


1 - 木栓层; 2 - 裂隙; 3 - 皮层; 4 - 油管; 5 - 韧皮部; 6 - 形成层; 7 - 导管。

1 - Phellogen; 2 - Crack; 3 - Cortex; 4 - Oil tube; 5 - Phloem; 6 - Cambium; 7 - Conduit.

图 12 羽苞藁本根横切面

Fig. 12 Root cross-section of *L. daucooides* (Franch.) Franch.



1 - 木栓层; 2 - 皮层; 3 - 油管; 4 - 韧皮部; 5 - 形成层; 6 - 导管。

1 - Phellogen; 2 - Cortex; 3 - Oil tube; 4 - Phloem; 5 - Cambium; 6 - Conduit.

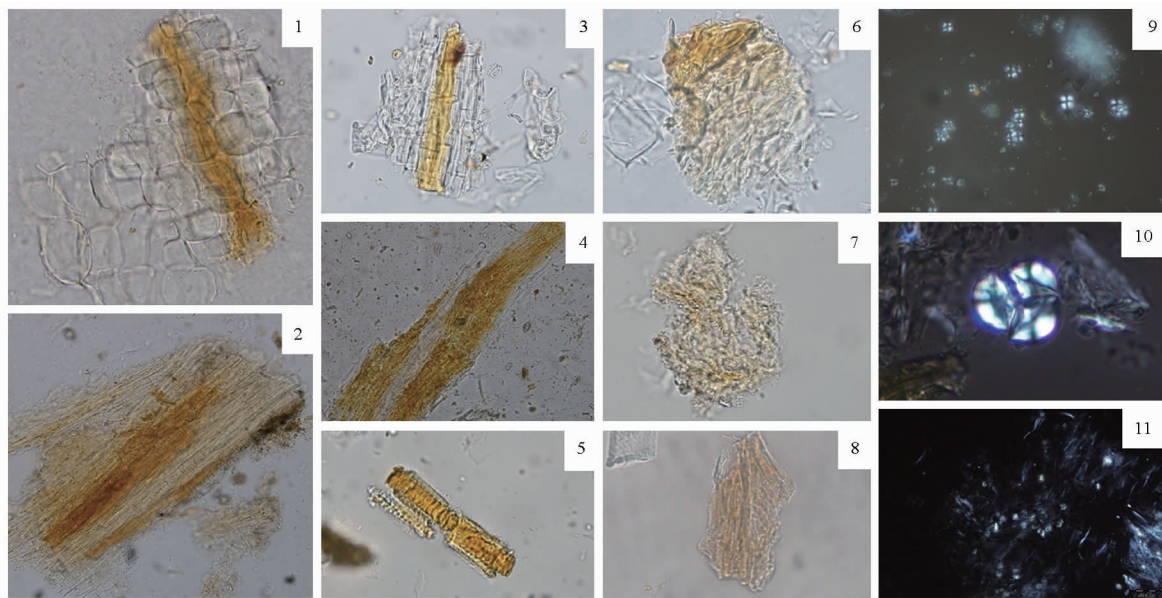
图 14 峨参根横切面

Fig. 14 Root cross-section of *A. sylvestris* (L.) Hoffm.

表 3 各品种根横切面鉴别要点

Tab. 3 Key points of identification of root cross-section of each species

No.	Species	Cortex	Phloem	Cambium	Xylem	Parenchyma cell
1	<i>Vicatia tibetica</i> de Boiss.	Minority of oil tubes	Most circular oil tubes	Conspicuous	Conduits are arranged in a slightly radial pattern	Numerous starch grains, single and compound grains
2	<i>Sphallerocarpus gracilis</i> (Bess.) K.-Pol.	Occasional chambers	oil	Visible cracks, no oil chamber	Conspicuous	More starchy grains, mostly single
3	<i>Pleurospermum hookeri</i> var. <i>thomsonii</i> C. B. Clarke	Occasional chambers	oil	Multiple cracks, with scattered mostly oil chambers	Conspicuous	Few starch grains, mostly single
4	<i>Angelica acutiloba</i> (Sieb. et Zucc.) Kitagawa	One row of oil tubes arranged in a ring	Visible oil tubes	Conspicuous	Single or several conduits arranged in a slightly radial pattern	Few starch grains, mostly single
5	<i>Pleurospermum franchetianum</i> Hemsl.	Occasional oil tubes	Visible cracks, occasional oil tubes	Conspicuous	Visible oil tubes, xylem conduits mostly in longitudinal bundles, radially arranged	No starch grains
6	<i>Ligusticum daucooides</i> (Franch.) Franch.	Occasional oil tubes	Multiple cracks, with scattered mostly oil tubes	Inconspicuous	The conduits are arranged either singly or in bundles in a longitudinal radial pattern.	Starch grains rare
7	<i>Heracleum millefolium</i> Diels	Occasional chambers	oil	Multiple cracks, with scattered mostly oil tubes	Inconspicuous	Starch grains rare
8	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Occasional oil tubes	Visible oil tubes	conspicuous	Xylem conduits arranged in single or bundled longitudinal radial rows	More starch grains, mostly single, compound grains visible; contains calcium oxalate crystals



1 - 西藏凹乳芹油管; 2 - 东当归油管; 3 - 松潘棱子芹油管; 4 - 羽苞蘘本油管; 5 - 峨参油管; 6 - 迷果芹油室碎片; 7 - 西藏棱子芹油室碎片; 8 - 裂叶独活油室碎片; 9 - 西藏凹乳芹复粒; 10 - 峨参复粒; 11 - 峨参草酸钙晶体
 1 - Oil tube of *Vicatia thibetica* de Boiss.; 2 - Oil tube of *Angelica acutiloba* (Sieb. et Zucc.) Kitagawa; 3 - Oil tube of *Pleurospermum franchetianum* Hemsl.; 4 - Oil tube of *Ligusticum daucooides* (Franch.) Franch.; 5 - Oil tube of *Anthriscus sylvestris* (L.) Hoffm.; 6 - Oil chamber debris of *Sphallerocarpus gracilis* (Bess.) K. -Pol.; 7 - Oil chamber debris of *Pleurospermum hookeri* var. *thomsonii* C. B. Clarke; 8 - Oil chamber debris of *Heracleum millefolium* Diels; 9 - Compound starch granule of *Vicatia thibetica* de Boiss.; 10 - Compound starch granule of *Anthriscus sylvestris* (L.) Hoffm.; 11 - Calcium oxalate crystals of *Anthriscus sylvestris* (L.) Hoffm.

图 15 藏药西藏凹乳芹及其近似种粉末显微差异对比图

Fig. 15 Comparison photo of microscopic differences in powders of *V. thibetica* de Boiss. and its similar species

表 4 西藏凹乳芹与近似种粉末显微鉴别要点

Tab. 4 Microscopic differences in powders of *V. thibetica* de Boiss. and its similar species

No.	Species	Starch grain	Secretory tissue	Crystal
1	<i>Vicatia thibetica</i> de Boiss.	The starch grains are numerous, single or compound, and the compound grains consist of 2 to 5 fractions, with a diameter of 2-20 μm	Oil tube	Hasn't
2	<i>Sphallerocarpus gracilis</i> (Bess.) K. -Pol.	Starch granules are visible, mostly single, with a small diameter of 2-5 μm	Oil chamber	Hasn't
3	<i>Pleurospermum hookeri</i> var. <i>thomsonii</i> C. B. Clarke	Occasional starch grains, mostly single, with a small diameter of 2-5 μm	Oil chamber	Hasn't
4	<i>Angelica acutiloba</i> (Sieb. et Zucc.) Kitagawa	Visible starch grains, mostly single	Oil tube	Hasn't
5	<i>Pleurospermum franchetianum</i> Hemsl.	Without starch granule	Oil tube	Hasn't
6	<i>Ligusticum daucooides</i> (Franch.) Franch.	Few starch grains, mostly single	Oil tube	Hasn't
7	<i>Heracleum millefolium</i> Diels	Few starch grains, mostly single	Oil chamber	Hasn't
8	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Starch grains are visible, mostly single, compound grains consist of 2-3 fractions, with a small diameter of 5-20 μm	Oil tube	Exist (Fig. 15)

1. 分泌组织为油管

2. 可见草酸钙晶体 峨参 [*Anthriscus sylvestris* (L.) Hoffm.]

2. 无草酸钙晶体

3. 淀粉粒众多, 单粒或复粒

..... 西藏凹乳芹 (*Vicatia thibetica* de Boiss.)

3. 淀粉粒较少, 多单粒

4. 皮层有 1 列油管环状排列

... 东当归 [*Angelica acutiloba* (Sieb. et Zucc.) Kitagawa]

4. 皮层偶见油管

5. 韧皮部多裂隙, 多数油管散在

... 羽苞蘘本 [*Ligusticum daucooides* (Franch.) Franch.]

5. 韧皮部可见裂隙, 偶见油管

..... 松潘棱子芹 (*Pleurospermum franchetianum* Hemsl.)

1. 分泌组织为油室

6. 韧皮部裂隙少见, 无油室

... 迷果芹 [*Sphallerocarpus gracilis* (Bess.) K. -Pol.]

6. 韧皮部多裂隙, 多数油室散在

7. 木质部发达, 导管与纤维交错放射状排列

..... 裂叶独活 (*Heracleum millefolium* Diels)

7. 木质部仅导管单个或数个成束纵列, 放射状排列

..... 西藏棱子芹 (*Pleurospermum hookeri* var. *thomsonii* C. B. Clarke)

3 结论与讨论

本实验所建立的植物、药材性状、显微鉴别分类检索表可直接对西藏凹乳芹与藏区常见伞形科近似品种原植物、药材进行有效的鉴别。西藏凹乳芹与近似种原植物的区别主要在于开花期和果期,即每年的7~9月,其在幼苗期很难与藏区常见的伞形科植物进行区分。药材性状区别主要在于形状、颜色、根头部特征、表面特征以及断面特征等。显微鉴别的区别主要在于分泌组织、淀粉粒以及晶体等。

同时,本实验将数码成像技术、光学显微镜及体式显微镜等仪器应用于西藏凹乳芹与其近似品种的原植物、药材性状和显微鉴别中,对其各鉴别特征进行了全面的数字化表征,使得各品种间的区别更加直观的展现,为藏药西藏凹乳芹与7个近似品种的鉴定工作提供保障,也为藏药数字化平台的搭建提供资料。

西藏凹乳芹在各藏医院已成为加哇主流品种投入使用,且西藏地区藏医院成方制剂配料表中已直接写西藏凹乳芹投料而不再写加哇,目的就是统一加哇的品种使用,但一直没有相应的质量标准控制其药材质量,造成品种使用混乱,故亟须出台相应的标准,控制其用药的安全性和有效性。本实验首次研究并建立了西藏凹乳芹以及7个近似种的植物分类、药材性状及显微鉴别检索表,为西藏凹乳芹质量标准的制定打下坚实基础,为藏药加哇的临床规范应用提供科学依据。

REFERENCES

- [1] YUTUO · Y D G B. *The Four Medical Tantras* (四部医典) [M]. Shanghai: Shanghai Scientific & Technical Publishers, 1987: 169.
- [2] Tibetan Medicine Classic Literature Integration Editorial Committee. *Marginal Notes of The Jin Ba Four Medical Tantras* (金巴四部医典注释) [M]. Beijing: People's Publishing House, 2006: 233.
- [3] Tibetan Medicine Classic Literature Integration Editorial Committee. *De Ge La Man Medical Writing* (德格拉曼医著) [M]. Beijing: People's Publishing House, 2008: 320.
- [4] Tibetan Medicine Classic Literature Integration Editorial Committee. *Blue Lapislazuli* (蓝琉璃) [M]. Beijing: People's Publishing House, 2004: 248.
- [5] MAO J Z. *Shuizhu Caoben* (晶珠本草) [M]. Shanghai: Shanghai Scientific & Technical Publishers, 2012: 131.
- [6] Translated by MAO J Z. *Yu Tuo Materia Medica* (宇妥本草) [M]. Xining: Qinghai People's Publishing House, 2016: 179.
- [7] YANG J S. *Investigate of The Botanical Resources of Chinese Tibetan Medicine: Vol 2* (中国植物资源考订·下卷) [M]. Kunming: Yunnan Scientific & Technical Publishers, 2016: 129.
- [8] Northwest Institute of Plateau Biology. *Tibetan Medicine Journal* (藏药志) [M]. Xining: Qinghai People's Publishing House, 2019: 82.
- [9] Qihai Institute for Drug Control. *Chinese Tibetan Medicine: Vol 3* (中国藏药·第三卷) [M]. Shanghai: Shanghai Scientific & Technical Publishers, 1996: 84.
- [10] Institute of Tibetan medicine. *Chinese Materia Medica of Tibetan Medicinal Volume* (中华本草·藏药卷) [M]. Shanghai: Shanghai Scientific & Technical Publishers, 2002: 147.
- [11] GA-WU. *The Stainless Crystal Mirror: A Tibetan Materia Medica* (藏药晶镜本草) [M]. Beijing: The Ethnic Publishing House, 2018: 169.
- [12] KANG S, LIN F, LIN L F, et al. Study on pharmacognosy identification and digitization of zanthoxyl pericarpium and zanthoxyl semen [J]. *Chin J Pharm Anal* (药物分析杂志), 2021, 41 (8): 1297-1305.

(收稿日期:2023-11-06)