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Traditional Chinese medicine — Processed *Aconitum carmichaelii* lateral root

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Contents

Page

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 249, *Traditional Chinese medicine*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Processed *Aconitum carmichaelii* lateral root (Aconiti Lateralis Radix, Fuzi, 附子) has been used as a herbal medicine in traditional Chinese medicine for a very long time. It remains a highly valued herb today because of its significant effects. *Aconitum carmichaelii* lateral root is one of the most frequently used herbal medicines in traditional Chinese medicine. Of an approximate total of 80 0000 traditional Chinese medicine formulas, around 7,04 % of formulations include *Aconitum carmichaelii* lateral root as an ingredient. Among 113 formulas in the *Treatise on Cold Pathogenic Diseases* (伤寒论),[1] one of four great classics of traditional Chinese medicine, there are 23 formulations with *Aconitum carmichaelii* lateral root (occupying 20,35 %) as an ingredient. Among 202 formulas in the *Synopsis of Golden Chamber* (金匮要略),[2] another of the four great classics of traditional Chinese medicine, there are 26 prescriptions with *Aconitum carmichaelii* lateral root as an ingredient (12,87 %). Among 148 Kampo medicines for prescription from the Ministry of Health, Labour and Welfare (MHLW) of Japan, there are 10 prescriptions with *Aconitum carmichaelii* lateral root as an ingredient (6,76 %).

Processed *Aconitum carmichaelii* lateral root contains aconitum alkaloids which have anti-inflammatory, analgesic and cardiotonic activities. These aconitum alkaloids are irreplaceably effective for injuries, arthritis, neuropathic pain, sequelae of apoplexy, stomach pain, stomach crymodynia, menoxenia, abscesses, deep-rooted carbuncles and sores. Aconitum alkaloids are, however, a double-edged sword. At present, international trade in processed *Aconitum carmichaelii* lateral root is restricted in a number of nations due to the high natural toxicity of processed *Aconitum carmichaelii* lateral root. Also, there are sporadic cases of aconitum alkaloid poisoning reported worldwide due to misuse.

Nonetheless, the toxicity of processed *Aconitum carmichaelii* lateral root can be reduced dramatically with proper processing (such as repeated boiling or steaming), prolonged decocting and dose control. However, standards for processed *Aconitum carmichaelii* lateral root are not yet harmonized at an international level and regulatory authorities in many nations do not adequately differentiate highly toxic forms from less-toxic forms (or even non-toxic forms) of *Aconitum carmichaelii* lateral root.

The six aconite alkaloids [Aconitine (AC), mesaconitine (MA), hypaconitine (HA), benzoylaconine (BAC), benzoylmesaconine (BMA) and benzoylhypaconine (BHA)] are commonly used as chemical markers for quality control of processed *Aconitum carmichaelii* lateral root.[3] AC, MA and HA are toxic diester diterpenoid alkaloids, while BAC, BMA and BHA are active monoester diterpenoid alkaloids. To guarantee safety, efficacy and quality, these six alkaloids are commonly controlled in different pharmacopoeia. Nevertheless, poisoning cases are still occasionally reported. From 1989 to 2010, 140 cases of aconitum poisoning, including one fatal case, were reported in Hong Kong.[4] Additionally, 17 cases were reported in Taiwan from 1990 to 1999, 2017 cases were reported in China from 1989 to 2008 and 121 cases were reported in Korea from 1995 to 2007.[5] Multiple reasons for aconitum poisoning exist, include overdoses, inadequate processing, aconitum contamination in other herbs, dispensing and management errors, and hidden risk factors. In the 17 cases reported in Hong Kong, yunaconitine (YAC), crassicauline A (CCA) and 8-deacetyl-yunaconitine (DYA) were detected instead of AC, MA and HA in the urine samples of the aconitum poisoning patients.[4,6] Because YAC, DYA and CCA were detected in the urine of the aconitum poisoning patients, these alkaloids are considered to be hidden risk factors and should be covered in laboratory screenings for toxic compounds.[6] Therefore, an International Standard is required for *Aconitum carmichaelii* lateral root for quality control of the herb and its products and to ensure the safe use of these medical materials[5].

This document provides a systematic and practical International Standard for *Aconitum carmichaelii* lateral root to control and guarantee stable quality, to ensure safe and effective use in clinics, to standardize the global market trade and to reduce cases of aconite poisoning.

As national implementation can differ, national standards bodies are invited to modify the values given in 5.2, 5.3 and 5.5 in their national standards. Examples of national and regional values are given in Annex C.

Traditional Chinese medicine — Processed *Aconitum carmichaelii* lateral root

1 Scope

This document specifies minimum requirements and test methods for processed *Aconitum carmichaelii* lateral root (lateral root of *Aconitum carmichaelii* Debx.).

This document applies to processed *Aconitum carmichaelii* lateral root that is sold and used as natural medicines in international trade, including Chinese materia medica (whole medicinal materials) and decoction pieces derived from this plant. Processing methods of *Aconitum carmichaelii* lateral root are excluded.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1575, *Tea — Determination of total ash*

ISO 18664, *Traditional Chinese Medicine — Determination of heavy metals in herbal medicines used in Traditional Chinese Medicine*

ISO 21371, *Traditional Chinese medicine — Labelling requirements of products intended for oral or topical use*

ISO 22217, *Traditional Chinese medicine — Storage requirements for raw materials and decoction pieces*

ISO 22258, *Traditional Chinese medicine — Determination of pesticide residues in natural products by gas chromatography*

ISO 23191, *Traditional Chinese medicine — Determination of selected Aconitum alkaloids by high-performance liquid chromatography (HPLC)*

World Health Organization *Quality control methods for herbal materials*, 2011

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
fresh *Aconitum carmichaelii* lateral root
fresh lateral root of *Aconitum carmichaelii* Debx. with the tap root, rootlet and soil removed

3.2
***Aconitum carmichaelii* lateral root**
unprocessed dried lateral root of *Aconitum carmichaelii* Debx.

3.3
processed *Aconitum carmichaelii* lateral root
dried lateral root of *Aconitum carmichaelii* Debx. after processing

Note 1 to entry: This includes commercial varieties such as salted *Aconitum carmichaelii* lateral root, black slice of *Aconitum carmichaelii* lateral root and white slice of *Aconitum carmichaelii* lateral root.

3.4
salted *Aconitum carmichaelii* lateral root
processed *Aconitum carmichaelii* lateral root in bittern

Note 1 to entry: The decoction pieces are processed with the following method: select the large and uniform fresh *Aconitum carmichaelii* lateral root; wash clean and soak overnight in bittern, of which the main ingredient is edible calcium chloride solution; add salt, soak and take out to sun-dry and air-dry every day; gradually prolong the drying time until a lot of salt is crystallized on the surface of the drug and its texture becomes hard.

Note 2 to entry: Bittern is liquid residue of mineral salt, the major constituent being magnesium chloride.

3.5
black slice of *Aconitum carmichaelii* lateral root
processed *Aconitum carmichaelii* lateral root in bittern with dye

Note 1 to entry: The decoction pieces are processed with the following method: select the large and uniform fresh *Aconitum carmichaelii* lateral root; wash clean and soak in bittern for several days; boil in the infusion thoroughly; take out, rinse in water, cut longitudinally into slices about 0,5 cm in thickness; soak and rinse in water once again; stain the slices dark brown (e.g. with black bean decoction, strong tea water) and steam them until they turn oily and lustrous; bake the slices to half-dryness, then sun-dry or bake to complete dryness.

3.6
white slice of *Aconitum carmichaelii* lateral root
processed *Aconitum carmichaelii* lateral root in bittern without bark

Note 1 to entry: The decoction pieces are processed with the following method: select the large and uniform fresh *Aconitum carmichaelii* lateral root; wash clean and soak in bittern for several days; boil in the infusion thoroughly; take out, peel the bark and cut longitudinally into slices about 0,3 cm in thickness; soak and rinse in water, take out, steam thoroughly, sun-dry to dryness.

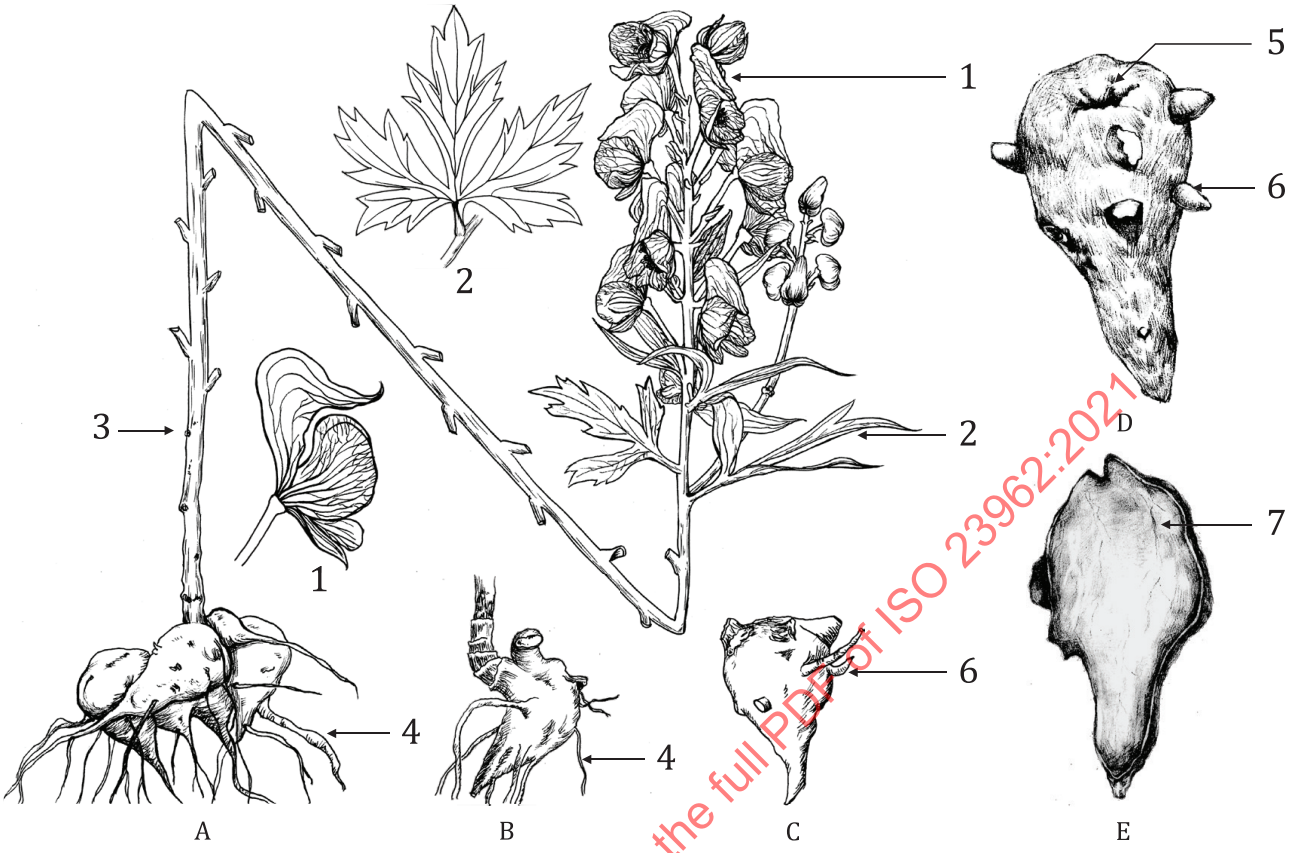
3.7
boiled slice of *Aconitum carmichaelii* lateral root
processed *Aconitum carmichaelii* lateral root with salt, *Glycyrrhizae* root and black beans

Note 1 to entry: The decoction pieces are processed with the following method: blanch salted *Aconitum carmichaelii* lateral root with water two or three times a day until all the salt is rinsed out; boil together with *Glycyrrhizae* root, black beans and water until the centre of the cut surface is devoid of white core and the cut slice is numb to the tongue; remove *Glycyrrhizae* root and black beans, cut the drug into slices and dry.

3.8
batch
samples collected from the same particular place at the same time, of no more than 5 000 kg

4 Descriptions

Processed *Aconitum carmichaelii* lateral root is derived from the dried lateral root of *Aconitum carmichaelii* Debx. (Family Ranunculaceae) after processing (Figure 1).



Key

A	plant of *Aconitum carmichaelii* Debx.	1	flower
B	main root of *Aconitum carmichaelii* Debx.	2	leaf
C	lateral root of *Aconitum carmichaelii* Debx.	3	stem
D	unprocessed *Aconitum carmichaelii* lateral root	4	rootlet
E	black slice of *Aconitum carmichaelii* lateral root	5	depressed bud scar
		6	tubercled short rootlet
		7	longitudinal vascular bundles

Figure 1 — Structure of *Aconitum carmichaelii* lateral root

5 Requirements

5.1 Morphological features of root

5.1.1 Salted *Aconitum carmichaelii* lateral root

Lateral root is conical, 4 cm to 7 cm long, 3 cm to 5 cm in diameter. The colour is externally greyish-black, covered with fine powder of salt, topped with depressed bud scars and encircled with tubercled short rootlets or rootlet scars. The texture is heavy. The transversely cut surface is greyish brown, showing small clefts filled with fine powder of salt and a polyangular cambium ring, and vascular bundles arranged irregularly inside the ring. The odour is slight.

5.1.2 Black slice of *Aconitum carmichaelii* lateral root

Longitudinal slices, the upper portion wide and the lower portion narrow, 1,7 cm to 5 cm long, 0,9 cm to 3 cm wide, 0,2 cm to 0,5 cm thick. The outer bark is blackish brown; the cut surface is dark yellow, oily

and lustrous, translucent and showing longitudinal vascular bundles. The texture is hard and fragile. The fracture is horny. The odour is slight.

5.1.3 White slice of *Aconitum carmichaelii* lateral root

White slice of *Aconitum carmichaelii* lateral root is yellowish-white, translucent, about 3 mm thick, without outer bark.

5.1.4 Boiled slice of *Aconitum carmichaelii* lateral root

In longitudinal cut slices, the upper end wider than the lower end, 1,7 cm to 5 cm long, 0,9 cm to 3 cm wide, 0,2 cm to 0,5 cm thick. Externally brown. Cut surface brown, translucent and showing longitudinal vascular bundles. Texture hard, fracture horny. Odour slight.

5.2 Moisture

The moisture content in percentage mass should not be more than 15,0 %.

5.3 Total ash

The total ash content in percentage mass should not be more than 19,0 %.

5.4 Thin-layer chromatogram (TLC) identification

The identification of extracts of *Aconitum carmichaelii* lateral root with thin-layer chromatogram (TLC) shall present the spots or bands with the same colour and position corresponding to those of reference solutions.

5.5 Marker compounds

The content of marker compounds in percentage mass shall be determined. The total content of aconitine, mesaconitine and hypaconitine in percentage mass should not be more than 0,02 %. The total content of benzoylaconine, benzoylmesaconine and benzoylhypaconine in percentage mass should not be less than 0,01 %. The content of yunaconitine, 8-deacetyl-yunaconitine and crassicauline A, respectively, should not be detected. Relevant structural formulae of the marker compounds are given in Table 1.

Table 1 — Structural formulae of the marker compound(s)

Name	Abbreviation	Molecular formula	CAS[a] No.	Molar mass g/mol
Aconitine	AC	$C_{34}H_{47}NO_{11}$	302–27–2	645,74
Mesaconitine	MA	$C_{33}H_{45}NO_{11}$	2 752–64–9	631,71
Hypaconitine	HA	$C_{33}H_{45}NO_{10}$	6 900–87–4	615,71
Benzoylaconine	BAC	$C_{32}H_{45}NO_{10}$	466–24–0	603,78
Benzoylmesaconine	BMA	$C_{31}H_{43}NO_{10}$	63 238–67–5	589,68
Benzoylhypaconine	BHA	$C_{31}H_{43}NO_{9}$	63 238–66–4	573,67
Yunaconitine	YAC	$C_{35}H_{49}NO_{11}$	70 578–24–4	659,76
8-deacetyl-yunaconitine	DYA	$C_{33}H_{47}NO_{10}$	93 460–55–0	617,72
Crassicauline A	CCA	$C_{35}H_{49}NO_{10}$	79 592–91–9	643,76

5.6 Heavy metals

The contents of heavy metals such as arsenic, mercury, lead and cadmium should be determined.

5.7 Pesticide residues

The contents of pesticide residues should be determined.

6 Sampling

Sampling shall be carried out in accordance with the method described in the World Health Organization's *Quality control methods for herbal materials*, 'General advice on sampling'. Sampling of *Aconitum carmichaelii* lateral root shall be conducted according to the following steps:

a) From a batch of five containers or packaging units, take a sample from each.

b) From a batch of between six and 50 units, take a sample from five.

c) From a batch of over 50 units, sample 10 %, rounding up the number of units to the nearest multiple of 10. For example, a batch of 51 units would be sampled as for 60, i.e. take samples from six packages.

d) From each container or package selected, take three original samples from the top, middle and bottom of the container or package.

e) Combine the three original samples into a pooled sample and mix carefully.

f) Obtain the average sample by quartering:

— take the pooled sample, adequately mixed into an even and square-shaped heap;

— divide it diagonally into four equal parts;

— take two diagonally opposite parts and mix carefully;

— repeat the process as necessary until the required quantity, to within ± 10 %, is obtained.

g) Using the same quartering procedure, divide the average sample into four final samples, taking care that each portion is representative of the bulk material.

h) Test the final samples for the measure and analyses specified in Table 2.

Table 2 — Maximum mass of batch and minimum mass of final sample

Maximum mass per batch kg	Minimum mass of final sample g		
	For measure of root mass and root length	For analysis of marker compound(s)	For other analyses
5000	500	250	250
NOTE 1 The establishment of the requirement is based on processed *Aconitum carmichaelii* lateral root collected from different producing areas.			
NOTE 2 Other analyses include macroscopic identification, the determinations of moisture, total ash, water-soluble extractives, polysaccharides, heavy metals, pesticide residues and TLC identification.			

7 Test methods

7.1 Macroscopic identification

Take samples of not less than 500 g from each batch randomly. These samples are examined by observation in sunlight and by smell.

7.2 Determination of moisture content

See Annex A for additional information.

7.3 Determination of total ash content

The testing method specified in ISO 1575 applies.

7.4 Thin-layer chromatogram (TLC) identification

See Annex B for additional information.

7.5 Determination of marker compounds

The testing method specified in ISO 23191 applies.

7.6 Determination of heavy metal content

The testing method specified in ISO 18664 applies.

7.7 Determination of pesticide residue content

The testing method specified in ISO 22258 applies.

7.8 Roots number/1000 g

Samples of not less than 1000 g are taken from each batch randomly for commercial grading in Annex D. The samples are weighed together accurately to 0,1 g and counted. The number of roots per 1000 g is calculated using the following formula:

$$\text{roots number/1000 g} = (1000\ \text{g} \times \text{number of samples})/\text{mass of samples}$$

8 Test report

For each test method, the test report shall specify the following:

a) all information necessary for the complete identification of the sample;

b) the sampling method used;

c) the test method used, with reference to this document, i.e. ISO 23962:2021;

d) the test result(s) obtained;

e) all operating details not specified in this document, or regarded as optional, together with details of any incidents which can have influenced the test result(s);

f) any unusual features (anomalies) observed during the test;

g) the date of the test.

9 Packaging, storage and transportation

The packaging and transportation shall not transmit any odour or flavour to the product and shall not contain substances which can damage the product or constitute a health risk. The packaging shall be strong enough to withstand normal handling and transportation.

The storage conditions specified in ISO 22217 apply.

The products shall be protected from light, moisture, pollution and entry of foreign substances during long-distance delivery. Carriers should be well ventilated to keep dry and moisture-proof.

10 Marking and labelling

The requirements specified in ISO 21371 shall apply. The following items shall be marked or labelled on the packages:

a) all quality features indicated in Clause 5, determined in accordance with the methods specified in Clause 7;

b) gross mass and net mass of the package;

c) country of origin and province or state of the products;

d) date of production and expiry date of the products;

e) storage method;

f) any items required by regulatory bodies of the destination country;

g) the types of processing should be included in the labelling, such as salted *Aconitum carmichaelii* lateral root, black slice of *Aconitum carmichaelii* lateral root and white slice of *Aconitum carmichaelii* lateral root.

Annex A
(informative)

Determination of moisture content

A.1 Moisture content in *Aconitum carmichaelii* lateral root can be determined by the oven drying method

Determination can be conducted according to the following steps:

a) Powder the test sample and pass it through an 80-mesh or finer sieve.

b) Place 2 g to 5 g of the substance being examined in a flat weighing bottle previously dried to a constant mass to form a smooth layer not exceeding 5 mm in thickness, or not exceeding 10 mm in thickness for a substance of loose texture, and then weigh accurately.

c) Dry in an oven at 100 °C to 105 °C for 5 h with the stopper of the bottle removed.

d) Upon opening the oven, close the bottle promptly and allow it to cool in a desiccator for 30 min.

e) Weigh accurately and dry it again under similar conditions for 1 h; cool and weigh.

f) Repeat the operation until the difference between two successive weighings is not more than 5 mg.

A.2 Expression of result

Calculate the mass fraction of water (%), m_w, in the sample being examined according to the mass loss on drying with Formula (A.1):

$$m_w = (m_1 - m_2)/(m_1 - m_b) \times 100 \quad \text{(A.1)}$$

where

m_b is the mass of flat weighing bottle (g);

m_1 is the mass of flat weighing bottle with the sample being examined before drying (g);

m_2 is the mass of flat weighing bottle with the sample being examined after drying (g).

Annex B
(informative)

Thin-layer chromatogram (TLC) identification

B.1 Identification of extracts of *Aconitum carmichaelii* lateral root

a) Weigh 250 g of sample to grind and pass it through an 80-mesh or finer sieve. Add 2 ml of ammonia TS to 2 g of the powdered sample. Add 25 ml of ether, ultrasonicate for 30 min and filter, evaporate the filtrate to dryness and dissolve in 0,5 ml of dichloromethane as the test solution.

b) Dissolve benzoylmesaconine CRS, benzoylaconine CRS and benzoylhypaconine CRS in a mixture of isopropanol and dichloromethane (1:1) to produce a mixture containing 1 mg of each per ml as the reference solution (monoester-alkaloids). Dissolve a quantity of mesaconitine CRS, hypaconitine CRS and aconitine CRS in a mixture of isopropanol and dichloromethane (1:1) to produce a mixture containing 1 mg of each per ml as the reference solution (diester-alkaloids).

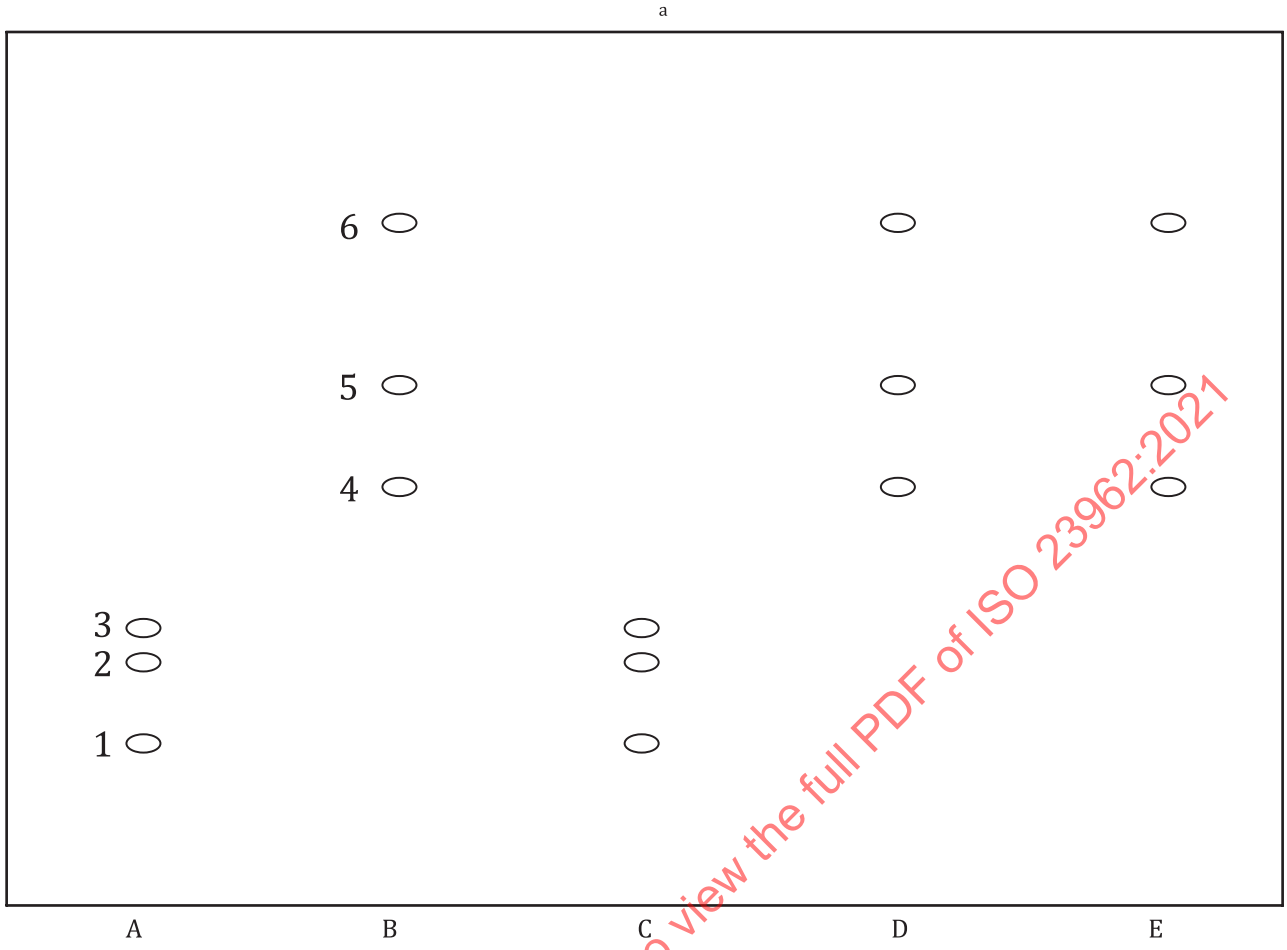
c) Use silica gel G as the coating substance and a mixture of n-hexane, ethyl acetate and methanol (6,4:3,6:1) as the mobile phase.

d) Apply separately to the silica gel G plate 5 µl to 10 µl of each of the test solution and the reference solutions. After developing in a chamber pre-equilibrated with ammonia vapour for 20 min and removal of the plate, dry the plate in air and spray with dilute potassium iodobismuthate TS.

e) The spots in the chromatogram obtained with the test solution of salted *Aconitum carmichaelii* lateral root correspond in position and colour to the spots of mesaconitine CRS, hypaconitine CRS and aconitine CRS obtained with the reference solution. The spots in the chromatogram obtained with the test solution of black slice of *Aconitum carmichaelii* lateral root or white slice of *Aconitum carmichaelii* lateral root correspond in position and colour to the spots of benzoylaconine CRS, benzoylhypaconine CRS and benzoylmesaconine CRS obtained with the reference solution.

B.2 TLC chromatograms of *Aconitum carmichaelii* lateral root

Figure B.1 shows a sequence of spots present in the chromatograms obtained with the reference solution and the test solution. Furthermore, other faint spots can be present in the chromatogram obtained with the test solution.



Key

A monoester alkaloids reference solution
B diester alkaloids reference solution
C salted *Aconitum carmichaelii* lateral root test solution
D black slice of *Aconitum carmichaelii* lateral root test solution
E white slice of *Aconitum carmichaelii* lateral root test solution
1 mesaconitine
2 aconitine
3 hypaconitine
4 benzoylmesaconine
5 benzoylaconine
6 benzoylhypaconine
[a] Top of the plate.

Figure B.1 — TLC chromatograms of processed *Aconitum carmichaelii* lateral root

Annex C
(informative)

Reference information of national and regional requirements for processed *Aconitum carmichaelii* lateral root

Different countries and regions give their own quality requirement items on processed *Aconitum carmichaelii* lateral root, as shown in Table C.1.

Table C.1 — National and regional quality requirement items of processed *Aconitum carmichaelii* lateral root

Items		Chinese Pharmacopoeia	Japanese Pharmacopoeia	Korean Pharmacopoeia
Plant origin		*Aconitum carmichaelii*	*Aconitum carmichaelii*	*Aconitum carmichaeli*
			Aconitum japonicum	
Medicinal part		Prepared daughter root	Prepared tuberous root	Prepared daughter root
Processed products (processing methods)	1	Salted *Aconitum carmichaelii* lateral root (see 3.4)	Processed aconite root 1 (autoclaving)	Yeombuja/salted aconite (Sort by size the daughter root of *Aconitum carmichaeli*, harvested between June and August and with the parent root, rootlets and soil removed. Wash with water and immerse overnight in brine. Add salt, immerse, take out and sun-dry. Repeat the process and gradually prolong the sun-drying time until a lot of salt is crystallized on the surface and its texture becomes hard.)
	2	Black slice of *Aconitum carmichaelii* lateral root (see 3.5)	Processed aconite root 2 (heating or autoclaving after rinsing in salt or rock salt solution)	Bujapyeon/sliced aconite (Immerse Yeombuja in water several times to rinse out the salt and cut longitudinally into slices 3 mm to 5 mm in thickness. Immerse in water and steam until cooked through. Take out, bake to half-dryness then sun-dry.)
	3	White slice of *Aconitum carmichaelii* lateral root (see 3.6)	Processed aconite root 3 (treating with calcium hydroxide after rinsing in salt solution)	Pobuja/boiled aconite (Immerse Yeombuja in water, replacing the water two or three times a day until the salt is completely rinsed out. Boil with liquorice root and black bean until cooked through. Take out when the slice no longer causes numbness in the tongue, remove the periderm and make slices or cut into several pieces and sun-dry.)
	4	Boiled slice of *Aconitum carmichaelii* lateral root (see 3.7)		
Identification		TLC	TLC	UV

Table C.1 *(continued)*

Items		Chinese Pharmacopoeia	Japanese Pharmacopoeia	Korean Pharmacopoeia
Plant origin		*Aconitum carmichaelii*	*Aconitum carmichaelii*	*Aconitum carmichaeli*
			Aconitum japonicum	
Medicinal part		Prepared daughter root	Prepared tuberous root	Prepared daughter root
Assay (methods)	AC	—	≤ 60 μg/g (by HPLC)	The spot of the test solution is no denser than that of the standard solution (by TLC)
	JA	—	≤ 60 μg/g (by HPLC)	—
	HA	—	≤ 280 μg/g (by HPLC)	
	MA	—	≤ 140 μg/g (by HPLC)	
	MA+HA+AC	≤ 0,020 % (Yanfuzi, Heishunpian, Baifupian by HPLC)	—	
		≤ 0,010 % (Danfupian by HPLC)		
	MA+HA+AC+JA	—	≤ 450 μg/g (by HPLC)	
	BAC	—	0,7 % to 1,5 % (processed aconite root 1 by HPLC)	
			0,1 % to 0,6 % (processed aconite root 2 by HPLC)	
			0,5 % to 0,9 % (processed aconite root 3 by HPLC)	
	BMA+BAC+BHA	≥ 0,010 % (by HPLC)	—	
Moisture		≤ 15,0 %	≤ 15,0 %	—
Heavy metals	Lead	—	≤ 10ppm	≤ 5ppm
	Arsenic		≤ 5ppm	≤ 3ppm
	Mercury		—	≤ 0,2ppm
	Cadmium			≤ 0,3ppm
Residual pesticides	Total DDT	33 kinds of pesticides shall not be detected	—	≤ 0,1ppm
	Dieldrin			≤ 0,01ppm
	Total BHC			≤ 0,2ppm
	Aldrin			≤ 0,01ppm
	Endrin			≤ 0,01ppm
Sulfur dioxide		—	—	≤ 30ppm
Total ash		—	≤ 4,0 % (processed aconite root 1)	—
			≤ 12,0 % (processed aconite root 2)	
			≤ 19,0 % (processed aconite root 3)	
Acid-insouluble ash		—	≤ 0,9 %	—