

ACONITUM HETEROPHYLLUM (ATIVISHA) IN AYURVEDA

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ABSTRACT: Ativisha (*Aconitum heterophyllum* wall) of family Ranunculaceae is an Ayurvedic herb which is known for its important medical properties. The roots of the plant find use in one form or the other in various ayurvedic preparations and, therefore, an attempt has been made to review the various studied carried out in its chemistry as well as pharmacology.

INTRODUCTION

The availability of modern spectroscopic methods of structural determination have heralded a new era in organic natural product chemistry, In the past the difficulty isolable micro constituents were seldom investigated. As a result of this, minor constituents of physiological importance in a plant remained unidentified. These days, however, a complete analysis, of a plant material can readily be accomplished. This is true in case of ativisha and therefore in recent years, its biological value has gained importance in traditional system of medicine.

HABITAT

Ativisha grows in the Himalayas at an attitude of 2000 to 5000 metres. It is a characteristic species of sikkim, Nepal and chumbi area.

BOTANY

It is a tall herb and its roots are tuberous and paried. Based on morphology and anatomy, several forms of *A. heterophyllum* are recognized (white, Yellow, Black and Red)

amongst which the white variety which is commonly available is the best. The white tuberous roots are plumpy with a pale yellow colour.

USES

Puri ⁽¹⁾ has extensively reviewed the uses of aconites where it is mentioned that *A. heterophyllum* is used both externally as well as internally for various ailments.

The underground stem and root as such are used in traditional system of medicine.

The root powder of Ativihsa with honey is prescribed for cough irritations and bronchitis, it is an anthelmintic and in action it is potent against guinea-worms. It is effective in blood-pressure. The aqueous pulp of *A. Phyllum* as well as its main constituent namely atisine produces marked hypotensive effect. It is prescribed in malarial fevers but can not replace quinine. It is one of the bitter constituents which are prescribed in Ayurveda ⁽²⁾ which give relief in non-insulin dependent diabetes *A. heterophyllum* is a good aphrodisiac and effective as a diuretic. It is a good bitter

remedy against gastroenteric fevers amongst infants and children.

Homeopathy designates this natural herb as a principle drug for neuralgia. It is also useful in rheumatism, nervous pains as an analgesic and nerve sedative. It is claimed that the roots of the plant control hysteria and possess heart and nerve sedative property.

The Indian central indigenous drug committee in 1901 declared *A. Heterophyllum* quit ineffective an antiperiodic. Chopra⁽³⁾ and others also have drawn the same conclusion.

The important external medicinal use of aconite is an anodyne liniment in cases of neuralgia and other types of pain.

CHEMISTRY

The chemistry of *Atis* (*Ativisha*, *Ataicha*) has been recently reviewed by Gopinath, et al⁽⁴⁾. The other reviews on the subject are by Pelletier,^(5,8) Stern⁽⁶⁾, and parthasarathy⁽⁷⁾.

Aconitum heterophyllum is a good source of diterpene alkaloids⁽⁹⁻¹⁶⁾ (0.7%).

The biogenesis of intensely bitter diterpene alkaloid atisine (I) (0.4% in the roots) and atidine (II) has been discussed by Whalley⁽¹⁷⁾, Leete⁽¹⁸⁾, Weissner⁽¹⁹⁾ and Wenkert⁽²⁰⁾ and it has been suggested that

these compounds possibly originate from VI & VIII by condensation with – amino ethanol as per hypothetical route given by whalley⁽¹⁷⁾ and Leete⁽¹⁸⁾. The biogenesis of remaining members is also understandable in the above light.

As can be seen, all these compounds have the same absolute stereochemistry at common reference points Gopinath et al⁽⁴⁾. has fractionated the basic components of the roots of *A. heterophyllum* into three broad fractions namely a) weak base fraction b) strong base fraction and c) very strong base fraction. The strong- base fraction containing the bulk of the alkaloids is known to consist mainly of atisine (I). The remaining six new alkaloids are tabulated in table I. The weak base fraction yielded heterophyllisine, heterophylline and heterophyllidine. These compounds are lactone alkaloids which are structurally related to heteratisine. The strong base fraction yielded besides atisine, two new alkaloids atidine and F-dihydroatisine similarly the very strong base fraction yielded in addition to hetidine, alkaloids designated as hetidine and hetisinone. All these alkaloids are tabulated in table I which are in the order of their Pka-values.

The other constituents present in the plant are tannic acid, starch, fat, a mixture of fattyacids and their glycerides, carbohydrates, etc.

Table I:- The constituents of A. heterophyllum wall.

Name		(α) _D	
		M.P (EtoH or MeoH)	Pka (50% MeoH)
1	Atisine	Resin	-30.7°
2	Atidine	182.5 -183.50	-47.0° (chloroform)
3	20 α – Atisine	--	--
4	20 β – Atisine	--	--
5	Hetratisine	267-269°	+26.0°
6	Heterophylline	221.5-223°	+10.5°
7	Heterophyllidine	269-272°	+42.3°
8	Heterophyllisine	178-79°	+15.5°
9	Hetisine	1256.5-259°	+10.9°
10	Hetidine	218-221°	--
11	Hetisinone	275-278°	--
12	Isoatisine	149.5-152°	-24.4°

PHARMACOLOGY

Atisine(I) is much less toxic than aconitine and pseudoaconitine and consequently the species is often regarded as non-poisonous. Although the alkaloid atisine produce hypotension the whole aqueous extract of the root induced marked hypertension apparently through an action on the sympathetic nervous system. It is now confirmed that the alkaloid atisine is the important constituent of A. heterophyllum which acts as antiperodic aphrodisiac and tonic aconitine has action as the CNS CVS and respiratory system due to the presence of benzyl ester and OH-groups in the molecular structure⁽²¹⁾ this system is present is present in the polyesters of celastus paniculatus⁽²²⁾ and these esters have got similar action as aconitine. The similarity I the biological activities of the two ayurvedic

drugs viz A. heterophyllum and celastus paniculatus is tabulated in table II, which may perhaps help the future pharmacologists to deep into the subject.

IDENTIFICATION

It is reported that the aconite under discussion has been subjected to extensive adulteration. In the identification of crude drugs, pharmacognostic techniques are often used, but such techniques do not help is assessing Ayurvedic preparation.

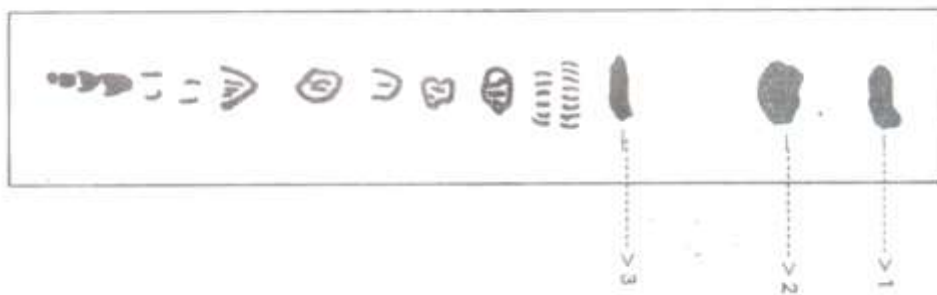
In an Ayurvedic pharmacy, when an Ayurvedic herb is obtained from a marked, it is very important that it is properly identified from the point of view of its chemistry. Very high units can afford HPLC system but small Ayurvedic pharmacies have to follow conservative methods of

analysis (24). It is for the benefit of such Units, some results of chromatographic studies have been reproduced.

Khorana and Murthy (23) have carried out paper chromatography of the extract of the crude drug using whatman No.1 filter- strips with two solvent systems namely n- butanol: acetic acid and Water (4:1:5 and 12:3:5) The strips were developed at room temperature and the spots, located by

spraying modified Dragendorffs reagent recommended by Munier (25). The RF values of the A alkaloids with two solvent systems which gave well defined and distinct spots are as follows: (a) 0.47, 0.53, 0.70 and (b) 0.50, 0.53 and 0.80.

Similar study was carried out by Mehta, et.a (26) and thin layer chromatogram fig II has been reproduced for the proper identification of the crude drug under review.



SOLVENT SYSTEM

Bnz + EtoH + NH₄OH
[5] : [1] : [1DROPS]

Rf value :-
[1] 0.95
[2] 0.65
[3] 0.53

*The spots were developed by exposing the plate to iodine vapour.

**Table II :- Comparison of Biological Activities of A. Heterophyllum and
Celastrus paniculatus (22).**

A. heterophyllum wall	Celastrus paniculatus willd
1. Taste Bitter	1. Bitter
2. Composition Mixture of several diterpen alkaloids. These possess C6H5CO-OC as one of the functional groups present in their molecules.	2. Mixture of several sesquiterpene polyesters, a couple of which are alkaloidal in nature. These possess C6H5CO-OC as one of the four ester groups present in every poly-ester of this drug.
3. Antimalarial	3. Antimalarial particularly against plasmodium falciparum.
4. Analgenic and ante-inflammatory activities.	4. Analgenic and ante-inflammatory activities.
5. Anti diabetic activity.	5. Hypolipidemic activity
6. Anti-emetic	6. Anti-emetic
7. As an anodyne in neuralgia and rheumatism. It is very useful in the region of cerebral nerve.	7. Central muscle relaxant especially in arthritis, nervous pains, and as nerve sedative.
8. A good aphrodisiac	8. As tonic against fatigue of debility after fevers, An antifertility drug.
9. Reduces blood pressure	9. Enhances learning process.
10. As an anthelmintic	10. –
11. As a diuretic	11. –
12. For stomach troubles and diarrahoe	12. –
13. As narcotic	13. As a sedative

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