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Preparation of haritakyadi eye drops: An ayurvedic formulation for ophthalmia neonatorum

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Abstract

Arka Kalpana (process of distillation) is an *Upakalpana* (sub type) of *Phanta Kalpana* (hot infusion), which contain the volatile constituents of the drugs used in the preparation in a medium of water and they are equivalent to the 'aqueae' or 'waters' of the western pharmacopeia which is prepared in the same way. *Haritakyadi* preparation is indicated in eye diseases of children which is mentioned in *Kashyapa Samhitha*, contains the ingredients *Terminalia chebula* Retz. (*Haritaki*), *Emblica officinalis* Linn. (*Amalaki*), *Berberis aristata* Dc. (*Daruharidra*), *Glycyrrhiza glabra* Linn. (*Yastimadhu*). The *Haritakyadi* eye drops was prepared by using modern pharmaceuticals equipment. During the process of preparation, the method of preparation of *Arka* according to The Ayurvedic Formulary of India was followed.

Keywords: *Haritakyadi*, pharmacopeia, Preparation, *Arka*, volatile constituents

1. Introduction

Ophthalmia neonatorum, a form of conjunctivitis is the most common eye disease of newborns. Its many different etiologic agents vary greatly in their virulence and outcome [1]. The term Ophthalmia neonatorum is used for any conjunctivitis in this age group, irrespective of causative organism [2]. For its treatment *Kashyapa Samhitha*, an Ayurvedic treatise mentioned *Haritakyadi* formulation [3]. Every drug can be a medicine but some pharmaceutical procedures are done to change or to potentiate its original properties. The basic idea behind the administration of drug is to make it more suitable to the body elements. To achieve this, many processes were invented in a sense of manufacturing process, these are termed as *Kalpanas* (pharmaceutical preparation) [4]. *Arka kalpana* (process of distillation) is one among them, mentioned in an Ayurvedic text named *Ravanakrita Arka Prakasha* [5]. The method by which the volatile oil and active principles of the drug are collected is called as *Arka-kalpana* (process of distillation) and the compound prepared through this procedure is called as *Arka* (distillate) [6]. This article highlights the different steps and stages of preparation of *Haritakyadi* eye drops.

Materials and Method

Ingredients of the formulation

1. *Terminalia chebula* Retz. (*Haritaki*)
2. *Emblica officinalis* Linn. (*Amalaka*)
3. *Berberis aristata* Dc. (*Daruharidra*)
4. *Glycyrrhiza glabra* Linn. (*Yastimadhu*)

1. *Terminalia chebula* Retz. (*Haritaki*)

Belongs to the family Combretaceae and is one of the most important medicinal plants used in medicines of Ayurveda, Siddha, Unani and Homeopathy. It is called the "King of Medicines" in Tibet and is listed first in the Ayurvedic material medica because of its extraordinary power of wound healing and a wide spectrum of medicinal properties. *T. chebula* possesses antibacterial, antifungal, antiviral, antidiabetic, antimutagenic, antioxidant, antiulcer and wound healing properties. The phyto chemical constituents present in *Haritaki* are tannins, anthraquinones and polyphenolic compounds. It also prevents cardiac damage and is used for the treatment of kidney disease. It is a mild, safe and effective laxative in traditional medicine. *T. chebula* and its phyto constituents have therapeutic effect with no toxicity. *T. chebula* is an active ingredient of the well-known herbal preparation *Triphala* which is used for the treatment of enlarged liver, stomach disorders and pain in eyes [7].

Ayurvedic properties

Rasa	: Amla pradhana Lavana varjita pancharasa
Guna	: Laghu, Ruksha, Sheeta
Vipaka	: Madhura
Veerya	: Sheeta
Dosha Karma	: Tridoshahara.
Karma	: Vrishyam, Rasayanam, Bhedanam, Ruchyam, Dipana, Anulomana, Kasahara, Mutrala, Kustagna, Kandugna, Keshya, Chakshushya, Vayasthapana, Virechanopaga, Raktapittagna

2. Emblica officinalis Linn. (Amalaka)

Belonging to Euphorbiaceae family, it is described extensively by *Brhatrayi* texts as well as *Nighantus*. It is useful for healing as well as for curing of human diseases because of the presence of phytochemical constituents. Phytochemicals are naturally occurring in the medicinal plants, leaves, vegetables and roots that have defence mechanism and protect from various diseases. Phytochemicals are primary and secondary compounds. Chlorophyll, proteins and common sugars are included in primary constituents and secondary compounds have terpenoid, alkaloids and phenolic compounds. *Amalaki* bark, leaves and fruits are commonly used for medicinal purpose. The fruits are sour, astringent, bitter, acrid, sweet, cooling, ophthalmic, carminative, laxative and aphrodisiac. They are used in vitiated conditions of *tridosha*, diabetes, cough, asthma, bronchitis, hyperacidity, peptic ulcer, skin diseases, cardiac disorders, intermittent fever, greying of hairs [8].

Ayurvedic properties

Rasa	: Tikta, Kasaya
Guna	: Guru, Rooksha
Vipaka	: Katu
Veerya	: Ushna
Dosha Karma	: Kaphapittasamaka.
Karma	: Sothahara, Vedanastapana, Vranasodhana, Vranaropana, Deepana, Pachana, Yakrittejaka, grahi, Pittavirechaka, Jwaragna, Raktasodaka, Swedajanana, Varnya, Twakdoshahara, Rasayana.

3. Berberis aristate Dc. (Daruharidra)

Belongs to family Berberidaceae, the plant is native to the whole range of the Himalayas and also occurs in Nilgiri range in southern India. The root and wood are rich in the yellow alkaloid, Berberine, a bitter substance, which dissolves in acids and forms salts of the alkaloid. Internally *Daruharidra* is useful against a vast range of diseases. Studies indicate that it is commonly used to treat eye infections, ENT infections, skin disease, menorrhagia, cholera, jaundice, wound healing and urinary tract infections, indigestion and vaginal disorders. *B. aristata*, reported to possess antimicrobial, antioxidant, anti hyperglycaemic, anti amoebic and wound healing properties. Eye infection is the common disease in the world, which plays a major role in medicinal practice. Microbial infections such as microbial keratitis, scleritis, orbital cellulitis, endophthalmitis were caused by eye infecting bacteria such as

Escherichia coli, *Nocardia* sp, *Staphylococcus aureus*, *S. epidermidis*, *Streptococcus pneumoniae*, and *Pseudomonas aeruginosa*. Although, *Daruharidra* is traditionally used to cure ophthalmia and other eye diseases. Experimentally it shows antimicrobial activity to *Nocardia* sp., *S. pneumoniae*, *E. coli* eye infecting organisms [9]

Ayurvedic properties

Rasa	: Tikta, Kasaya
Guna	: Guru, Rooksha
Vipaka:	: Katu
Veerya	: Ushna
Dosha Karma	: Kapha pitta samaka.
Karma	: Sothahara, Vedana stapana, Vrana sodhana, Vranaropana, Deepana, Pachana, Yakrittejaka, grahi, Pittavirechaka, Jwaragna, Raktasodaka, Swedajanana, Varnya, Twakdoshahara, Rasayana.

4. Glycyrrhiza glabra Linn. (Yastimadhu)

Belongs to family leguminosae used as a medicine in many ancient civilizations and even today it continues to be a very popular herb around the globe. It is the root of the plant which constitutes the drug. It has been described as *kapha nissaraka* (expectorant), *kanthya* (good for throat), antimutagenic, antioxidant activity and *nadibalya* (nervine tonic), anticonvulsant anti-pyretic, an anti-inflammatory and a wound healer medicine. The important Phyto-chemical constituents present are glycyrrhizine, glycyrrhizic acid, glycyrrhetic acid, asparagine, sugars, resin and starch. Acharya Bhavamishra has quoted that it improves the complexion and relieves problems of the eyes [10].

Ayurvedic properties

Rasa	: Madhura
Guna	: Guru, Snigdha
Vipaka	: Madhura
Veerya:	: Sheeta
Dosha Karma	: Tridosha hara
Karma	: Rasayana, Vrusya, Chakshushya, Shukrala, Keshya, Bala varnakrit, Kshayapaha, Vajikara, Medhya, Vedanahara.

Collection and authentication of raw drugs

The above mentioned drugs were collected from Sri Dharmasthala Manjunatheshwara Pharmacy, Udupi, Karnataka, India. The drug analysis and standardization was done at SDM centre for Research in Ayurveda and Allied Sciences, Udupi, Karnataka state, India and GC-MS analysis for the drops were done at, Department of Pharmacognosy, Siddha Central Research Institute, Arumbakkam, Chennai, India.

Apparatus required for distillation [11]

Distillation is the process by which liquid is vaporized and re-collected by cooling and condensing the vapor. The apparatus required for distillation are as follows

1. Boiler (Heating mantle) - which provides heat and maintain the heat.

2. Vessel, in which vapours are produced by heating the liquid up to its boiling point.
3. Condenser - This function as a cooling device of vapours either by circulation of water or air at atmospheric temperature.
4. Receiver - It is used for the collection of the condensed liquid.

Method of preparation

Haritakyadi eye drops were prepared by using different parts of medicinally important plant such as *Haritaki* (fruit kernel) (Fig. 1), *Amalaki* (fruit) (Fig. 2), *Daruharidra* (stem) (Fig. 3), *Yastimadhu* (root) (Fig. 4) in equal quantity of 200 grams each. The above mentioned plant materials were taken and made into coarse powder and soaked overnight in 10 parts of water. Next morning, the soaked drugs were subjected for the distillation process. The vapours are condensed and collected in a receiver. In the beginning, the vapours consist of only steam and may not contain the essential principles of the drugs. It should therefore be discarded. The last portion also may not contain therapeutically essential substance and should be discarded. The final product was in the form of drops (Fig. 5). This method of preparation of *Arka* is followed according to The Ayurvedic Formulary of India and article published in The Pharma Innovation ^[12].



Fig 1: Haritaki



Fig 2: Amalaki



Fig 3: Daruharidra



Fig 4: Yastimadhu



Fig 5: Haritakyadi Eye Drops

Precautions to be taken ^[13]

1. The drugs should be in coarse powder form.
2. The coarse powdered drugs should be soaked in water and then should be subjected to the distillation process.

Duration of preparation- 3 Hours

Test of Arka¹⁴

Arka is a suspension of the distillate in water which should be clear and transparent. Colour according to the nature of the drugs used and smell of the predominant drug. When *Arka* is filled in different *Patra*, the colour of *Arka* should be similar to *Shankha*, *Kundan* and *moon rays*.

Organoleptic parameters of finished product

- Colour: colourless
- Consistency: liquid
- Smell: specific odour
- Taste: specific taste

Table showing results of standardization parameters of Haritakyadi Eye Drops

Parameter	Results
p ^H	3.91
Viscosity	0.9996
R I	1.33170
Specific gravity	1.0261

Discussion

The finished product, *Haritakyadi eye drops* was colourless and liquid in consistency which establishes the optimum presentation of *Arka* preparation. The specific odour and taste of *Arka* is attributed to the ingredients used for its preparation. The disease *Ophthalmia Neonatorum* is the most common eye disease of newborn occurring in infants younger than four weeks of age. The term *Ophthalmia Neonatorum* is used in a broad sense to include all types of conjunctivitis of the new-

born. Ophthalmia neonatorum produces various complications for the neonate in the infancy period or further life stages. Some of the common complications of the ophthalmia neonatorum include pseudo follicular formation in tarsal conjunctiva, nasolacrimal obstruction [15]. Therefore, to prevent the complications in neonates this polyherbal preparation was made with all measures of sterility. *Arka kalpana* is explained in an Ayurvedic treatise named *Arka Prakasha*, where it has been said that *Arka* is the most potent among *Kalka*, *Churna*, *Swarasa*, *Kashaya*, *Phanta*, *Hima*. Its shelf life is longer than other *Kalpanas* like *Swarasa*, *Kwatha* etc. This *Kalpana* is easy to administer in the patients compared to *Anjana*, *prakshalana* etc. *Arka* is *Laghupaki*, *Vyavayi*, *Vikasi* and thus acts quickly on the eye there by gives immediate results. *Arka Kalpana* acquires highest position in obtaining the potentially active volatile oils as the condensation takes place during the process of distillation.

Conclusion

Arka is a suspension of the distillate in water having slight turbidity and colour according to the nature of the drugs used and smell of the predominant drug. *Arka Kalpana* is having more dominance over the other *kalpanas*, which is having more shelf life, easy to prepare and administer. *Arka* preparation is also used as eye drops in various eye diseases according to Ayurvedic classics. Hence more practical approach must be incorporated in the field of manufacture and even by introduction of modern pharmaceutical sector the effectiveness of the medicinal formulations is boosted.

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