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PHARMACEUTICAL STANDARDIZATION OF GUDUCHI GHANA (SOLIDIFIED AQUEOUS EXTRACT OF *TINOSPORA CORDIFOLIA* MIERS.)

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ABSTRACT
Ghana Kalpana (preparation of aqueous extract) is the modified form (Upakalpana) of Kwatha Kalpana. (Method of preparation of decoction) In the present study Guduchi Ghana was prepared in seven consecutive batches. In each batch average 10.17 kg of fresh Guduchi (*Tinospora cordifolia* Miers.) stem, already cut into the size of 1.5 to 2.5 inches were taken with the eight times of water and Kwatha was prepared which was further heated to procure the final Ghana. Average temperature of slurry was taken with the thermometer as 91.71°C.Average flame temperature recorded was 555.43°C with pyrometer. Average time taken for the Kwatha preparation was 9.43 hrs. Average quantity of Ghana obtained in wet condition was 1593.43 g and after drying it turned to an average of 853.57 g i.e.8.42%.
Key words: Ghana, aqueous extract, Upakalpana, Kwatha.

INTRODUCTION

Guduchi is mentioned for the first time in Kaushika Sutra[1]. The herb *Tinospora cordifolia* (*T. cordifolia*, Menispermaceae) belongs to a group of medicinal plants that grows in the tropical and subtropical regions of India[2]. Guduchi [*Tinospora cordifolia* (Willd.) Miers ex Hook. F. & Thoms] is a large, glabrous, deciduous climbing shrub belonging to the family Menispermaceae[3,4]. It is distributed throughout tropical Indian subcontinent and China, ascending to an altitude of 300 m. In Hindi, the plant is commonly known as Giloya, which is a Hindu mythological term that refers to the heavenly elixir that has saved celestial beings from old age and kept them eternally young. The stem of *T. cordifolia* is rather succulent with long filiform fleshy aerial roots from the branches. The bark is creamy white to grey, deeply left spirally, the space in between being spotted with large rosette like lenticels. The leaves are membranous and cordate. The flowers are small and yellow or greenish yellow. In auxiliary and terminal racemes or racemose panicles, the male flowers are clustered and female are usually solitary (Fig. 1). The drupes are ovoid, glossy, succulent, red and peasized. The seeds are curved. Fruits are fleshy and single seeded. Flowers grow during the summer and fruits during the winter[5,6] The herb is extensively used in the Indian System of Medicine; the extract of different parts of the herb has found wide use in variety of diseases. Guduchi is widely used in veterinary folk medicine and Ayurvedic system of medicine for its general tonic, antiperiodic, anti-spasmodic, anti-inflammatory, antiarthritic, anti-allergic and anti-diabetic properties[7-11]. The plant is used in Ayurvedic, "Rasayanas" to improve the immune system and the body resistance against infections. The root of this plant is known for its antistress, anti-leprotic and anti-malarial activities[12,13]. It is known for its immunomodulatory, antioxidant, and antibacterial properties[14]. Earlier investigations of the plants of the family Menispermaceae and found that the constituents and activities were similar to other reports[15,16]. The aqueous fraction of *T. cordifolia* stem parts is effective in ameliorating immunosuppressive effects and prevents pathogenic insults in an immuno-compromised state[17]. Therefore, in the present study, standardization of solidified aqueous extract of Guduchi was carried out.

MATERIALS AND METHODS

Fresh Guduchi stem was collected from the periphery of Jamnagar in the rainy season 6/7/2010 – 21/7/2010. Steel vessels, ladles, thermometer, pyrometer, muslin cloths, gas stove, R.O. water etc. were taken from the department of RS & BK, IPGT & RA, GAU, Jamnagar.

OBSERVATIONS & RESULTS

Preparation of Guduchi Kwatha[18]

Green Guduchi stems were washed with water and then hammered and cut into small pieces of size 1.5 to 2.5 inches and kept overnight for soaking in water (Fig. 2). Next morning it was heated on gas stove on mild heat & stirring without covering the mouth of vessel. Water was evaporated slowly and reduced till the quantity become 1/4th part. The heating process was ceased and allowed to filter through single fold cotton cloth. This filtered Kwatha was collected as Guduchi Kwatha. Total 8 times of water was used for 10 kg of fresh Guduchi.

Initially the raw materials floated over the surface of the menstrum, which gradually settled down after 4 hours of heating. Evaporation started at 70 ° C, which was aggravated on stirring. The menstrum was light brownish green color in the initial stage, which gradually turned to dark green in color (Fig. 3). The maximum temperature was found in the liquid in between 95°C-100°C. All vessels had been washed and cleaned properly before used. (Table 1)

Preparation of Guduchi Ghana[19]

Previously prepared Guduchi Kwatha was taken in steel vessel and heating process was carried out on the gas stove with stirring till it converted into semi solid mass. Then heating process was stopped and taken into glass tray and kept in the oven at 50^{0}C, till complete drying. After five days it was scraped with the help of scraper. That dried Ghana was collected as Guduchi Ghana. After six hours of boiling, mild sticky nature was observed on rubbing between two fingers. After eight hours of heating, stickiness of the liquid and adhesiveness to the vessels was found to be increased. After drying in the oven, brownish green colored and semi-solid material was converted into brown colored solid material (Fig. 4). Continuous stirring of Kwatha was done to avoid its burning. Temperature was maintained below 100°C. During final stage mild heat was given and continuous stirring was done to avoid adhesiveness to the vessel. To protect the material from direct heating, it was transferred into oven for drying. To remove the water content completely, drying process was done in oven in between 50°C temperature over five days. After five days it was scraped with the help of scraper (Table 2)

DISCUSSION

Ghana Kalpana, a secondary derivative preparation of Kwatha Kalpana, is also one of the extraction methods in which maximum of

water-soluble as well as a little amount of water insoluble materials are extracted by Kwatha method, then reheating till it gets converted completely into solid form. Various references are found in Ayurvedic classics for the preparation of Ghana Kalpana along with their method of preparation and consistency[20]. It has been mentioned by the name of 'Dadhi'[21] but Acharya Chakrapani has clarified that Ghana is caused to 'Dadhi'. It should be in semisolid form[22]. At one place it is mentioned that Vati (Pill) is to be prepared from semisolid form and at another place where Varti (Suppository) [23]is to be prepared from the semisolid form.

The concept of herbal extract is good in providing some degree of standardization to the herbal medicine. As the active principle of herbal origin drugs varies geographically and seasonally, there is a need to have minimum quantity of active principle or marker compound in the extract for efficacy. One of the advantages to use of herbal extracts for reducing the dose and also has more shelf life or stability and increases the bioavailability[24].

In Charaka Samhita Kalpa Sthana, Swarasa (fresh Juice) is subjected for heating, instead of Kwatha (decoction) and it is boiled till it becomes semisolid and then subjected for complete drying. In one of the references the decoction is boiled till it becomes completely dry i.e Ghana (Solid)[25]. Acharya Dalhana (Commentator of Sushruta Samhita) has clearly mentioned that Rasakriya (semi-solid dosage form of herb) is prepared by decoction and the ratio of Kwatha Kalpana has also found mentioned[26]. In Ashtanga Hrudayam, Rasakriya is mentioned under Anjana Kalpana (collyrium), where Anjana Kalpana has been divided into three types according to their consistency and the order of consistency i.e. Pinda, Rasakriya and Churna[27]. Thus Rasakriya is converted into powdered form by decreasing the moisture contains. Acharya Bhava Mishra[28], Madhavacharya[29] and Chakrapani Datta[30], have described the Ghana Kalpana in context of Darvyadi Rasakriya or Rasanjana, Kutaja Rasakriya respectively. Later, Acharya Sharangadhara has clearly mentioned in the definition of Ghana, Kwathadi (decoctions etc) should be boiled till the decoction reach to semisolid stage. Here Kwathadi is taken for commercialization of Ayurvedic drugs at national and international levels leading to large scale manufacturing. In recent times some modifications are also carried out and a wide range of new formulations are figured from the Panchavidha Kashaya Kalpanas. Swarasa (fresh juice), Kalka (paste), Kwatha (Decoction), Hima (cold infusion), Phanta (hot infusion) have some drawbacks like every time drug is not available, less shelf life, unpalatable, high dose and chance of contamination i.e. microbial growth etc. Finally the single herb prepared Ghanavati (tablet or pill) is mentioned by Acharya Yadavaji Trikaramji in Siddha Yoga Samgraha for Jwara in the context of Guduchi Ghana by the name of Samsamani Vati[31].

In the present study Guduchi Ghana was prepared in seven consecutive batches. Average 10 kg of fresh Guduchi stem, already cut into the size of 1.5 to 2.5 inches were taken with the 8 times of water and Kwatha was prepared which was further heated to procure the final Ghana (Table 2). Average temperature of slurry was taken with the thermometer as 91.71°C and average flame temperature was recorded as 555.43 °C.Average time taken for the Kwatha preparation was 9.43 hrs. Average quantity of Ghana obtained in wet condition was 1593.43 g and after drying it was turned to average 853.57 g i.e.8.42%.

Before the present study Bharati umrethiya et al[32], Sanjay Khedekar et a.l[33] and Darshan K Parmar et al[34] have prepared Guduchi Ghana using 4 times of water to the weight of Guduchi and the average percentage of Guduchi Ghana procured was 3.2 - 3.68%, 4.04 - 5.56% and 5 - 5.50 % respectively.. According to some scholars and experts in pharmaceutical field, amount of water used in the preparation of Kwatha is directly proportional to the % of Ghana obtained and hence in this study eight times water, of the weight of Guduchi, was taken and Kwatha was prepared by reducing it to 1/4th which, after further boiling yielded average 8.42% of Guduchi Ghana i.e. the maximum up to date proving the hypothesis.

CONCLUSION

Average 8.42% of Guduchi Ghana was procured from the seven subsequent batches of 10 kg of fresh Guduchi (*Tinospora cordifolia* Miers) using eight times water w/w.

Table 1: Numerical summary of various parameters obtained during the pharmaceutical process of Guduchi Kwatha:

Batch No.	Total time taken for Kwatha (hr)	Total qty. of Kwatha Obtained (litre)	Wt. of residue after Filtration (kg)
GK-1	12	10	8.1
GK-2	12.45	10.2	8.1
GK-3	12.25	10.4	8.2
GK-4	12.10	10.4	8.9
GK-5	12.45	10	8.3
GK-6	12.25	10.2	8.2
GK-7	12	10	8.5

Table 2: Numerical summary of various parameters obtained during the pharmaceutical process of Guduchi Ghana.

Batch No.	Total qty. of Kwatha obtained (l)	Temp of slurry in vessel	Temp of flame	Total time taken for preparation of Guduchi Ghana (hr: min)	Final qty. of Ghana obtained (g)	Final quantity of dried Ghana obtained (g)	% of dried Ghana obtained (g)
GG-1	10	94	530	08:55	1612	862	8.62
GG-2	10.2	92	548	10:15	1640	878	8.61
GG-3	10.4	94	560	10:00	1652	866	8.33
GG-4	10.4	92	536	09:30	1596	856	8.23
GG-5	10	88	580	08:50	1582	850	8.50
GG-6	10.2	88	550	09:30	1601	861	8.44
GG-7	10	94	584	10:20	1450	802	8.20
Ave.	**10.17**	**91.71**	**555.43**	**09.43**	**1590.43**	**853.57**	**8.42**

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Fig. 1: Fresh Guduchi

Fig. 2: 1.5-2.5 cm of Guduchi stem

Fig. 3: Guduchi Kwatha

Fig. 4: Dried Guduchi Ghana

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