Pharmaceutical Standardization

Standard manufacturing procedure for syrup and tablet forms of Jwarahara Dashemani

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Abstract

Jwarahara Dashemani (JHD) is mentioned by Acharya Charaka under the different categories of Mahakashayas (groups of drugs having similar pharmacological actions). For the present study, syrup and tablet forms of JHDs were prepared and analyzed. The formulations were prepared in various batches by following the standard manufacturing procedure (SMP). JHD Kwatha (2200 ml) and 1430 g sugar candy powder were heated (80–90°C) together for 3.10 hours and 2200 ml syrup was obtained, whereas an average of 446 g of tablet was obtained from the mixture of 285 g Ghana and powder of sugar candy (125 g), JHD Dravyas (55 g) and talc (18 g). These formulations were subjected to various analytical parameters and the results were observed on the basis of preparation.

Key words: Jwarahara Dashemani, Kwatha, Ghana, standard manufacturing procedure, syrup, tablet.

Introduction

Concepts regarding standardization and quality control of Ayurvedic drugs can be traced back to the ancient times. Vaidyas of ancient days, by themselves used to collect the herbs based on their organoleptic characters, i.e., typical taste, texture, smell, color, and utilized them in preparing medicines. Based on their own observations, principles of drug processing and ideal qualities of finished drugs, etc., have been documented. Even though the principles were developed based upon the scientific parameters prevailing in those days, they are to be viewed and answered looking at the advancement of science and technology in the present scenario.

Considering the significance of traditional practices in global health care, World Health Organization (WHO) has been encouraging and promoting these traditional practices since the past few decades. Hence, the standardization of raw drug, in process, finished products, verification of the claims, mechanism of action, making it free from heavy metal and microbial contamination, etc. have become some of the major issues which have to be taken into consideration in order to increase the worldwide acceptability of herbal drugs throughout the globe and also to prove their respective clinical efficacy.

Today, the movement for globalization of Ayurveda is going on in fast rush up. The world is in a fresh mood to accept this age-old health system too. Meanwhile, people around the country woke up to visualize the drug standards by all possible means to find efficacious and safe medicines; also, it is a timely necessity followed by compulsion to go for quality control of the raw drugs as well as finished products.

It is a very tedious job to standardize Ayurvedic herbal formulations, especially compound drugs, because of their complex chemical nature. Nonavailability of reference standards also is a hurdle for the study. In spite of this, the task is undertaken to evaluate and compare the formulation with the available physicochemical parameters.

Acharya Charaka has described 50 groups of drugs, i.e., Dashemani,[1] on the basis of their pharmacological activities but he has not given any information about the type of dosage form of these groups. Jwarahara Dashemani[2] (JHD) is one of them. Syrup and tablet are widely acceptable dosage forms in the present scenario due to their palatability, shelf life, easy administration, etc. Keeping this in view, syrup and tablet forms of JHD were prepared in the present study.

With the intention of preparing a standard formulation, the standard manufacturing procedures (SMP) for JHD syrup[3] and JHD tablet[4] were carried out and analyzed by various analytical parameters for their quality control.

Materials and Methods

The ingredients of JHD were collected during the month of July from Pharmacy of Gujarat Ayurved University, Jamnagar, Gujarat, and authenticated by Pharmacognosy department of IPGTRA, Gujarat Ayurved University, Jamnagar. Both the
formulations were prepared in three batches by following standard operative procedures. It was prepared by Kwatha[9] and labeled as follows:
Jwarahara Dashemani Kwatha = JHD Kwatha
Jwarahara Dashemani syrup = JHD syrup
Jwarahara Dashemani tablet = JHD tablet

Preparation of Jwarahara Dashemani Kwatha
Ingredients and parts used for Kwatha are mentioned in Table 1. Individual drugs were powdered by using a grinding mill. The powder of each material was suspended in water at room temperature, and then mildly heated to reduce it up to one-eighth. The filtrate was collected and equally divided into two parts for the preparation of syrup and Ghana[10] [Table 2].

Preparation of Jwarahara Dashemani syrup
Sugar candy powder (65% w/v of Kwatha) was added to one part of previously prepared Kwatha and the volume adjusted to the proper level (i.e., 2200 ml) by mild heat, filtered and stored at room temperature in amber colored glass bottle [Table 3].

Preparation of Jwarahara Dashemani tablet
Another part of the previously prepared Kwatha was subjected to heat till the material got concentrated, and it was collected and placed in a hot air oven at 45°C for drying. After complete drying, powder of sugar candy (equal to other drugs, i.e., 125 g) and talc (18 g = about 4%) were added and converted into granules which were compressed into tablets of 500 mg, and stored in stoppered glass bottle for further compliance [Tables 4 and 5].

Raw drugs and both the formulations of JHD were analyzed by employing various related analytical parameters like the following:
• organoleptic characteristics: color, odor, taste, form;
• physical tests for JHD tablet: shape, size (diameter and width), hardness,[11] uniformity,[12] friability,[13] disintegration time,[14]
• physicochemical analysis: loss on drying at 110°C (LOD),[11] ash value (AV),[12] acid insoluble ash (AIA),[11] pH value,[14] specific gravity at 40°C,[15] total solid content,[16] water soluble extractives (WSE),[17] methanol soluble extractives (MSE),[16] and
• qualitative test for various functional groups.[18,19]

Results
Initially, the liquid was orange brown in color in the preparation of JHD Kwatha which changed into brown color and it was bitter and astringent in taste. Almost all the batches were prepared between 10 hours 45 minutes and 11 hours.

The color of JHD Kwatha in syrup form changed into dark brown and it was sweet in taste. Almost all the batches of JHD syrup were prepared in between 3 hours and 3 hours 15 minutes, whereas in Ghana preparation, it changed into dark brown colored solid material. Almost all the batches of Ghana were prepared between 5 hours to 5 hours 15 minutes.

JHD tablet, color of Ghana, changed into blackish brown,

Table 1: Ingredients of JHD Kwatha

| Dravya     | Latin Name            | Part used | Condition | Quantity (g) |
|------------|-----------------------|-----------|-----------|--------------|
| Sariva     | *Hemidesmus indicus* Linn. | Root      | Dry       | 250          |
| Patha      | *Cissampelos pareira* Linn. | Root      | Dry       | 250          |
| Manjishtha | *Rubia cordifolia* Linn. | Root      | Dry       | 250          |
| Draksha    | *Vitis vinifera* Linn.  | Fruit     | Dry       | 250          |
| Pili       | *Salvadora persica* Linn. | Fruit     | Dry       | 250          |
| Parooshaka | *Grewia asiatica* Mast. | Fruit     | Dry       | 250          |
| Haritaki   | *Terminalia chebula* Retz. | Fruit     | Dry       | 250          |
| Amalaki    | *Emblica officinalis* Gaertn. | Fruit     | Dry       | 250          |
| Bibhitaki  | *Terminalia bellirica* Roxb. | Fruit     | Dry       | 250          |

Table 2: Details of JHD Kwatha preparation

| Parameters                           | I          | II         | III        |
|--------------------------------------|------------|------------|------------|
| Initial quantity of Kwatha Churna (g) | 2250       | 2250       | 2250       |
| Size of the Kwatha Churna (mesh no.) | 08         | 08         | 08         |
| Total quantity of water (l) 16 parts | 36.00      | 36.00      | 36.00      |
| Total time for soaking (hours)       | 12         | 12         | 12         |
| Temperature during preparation of Kwatha (after 1 hours) | 80–90°C | 80–90°C | 80–90°C |
| Total time taken for Kwatha (hours)  | 10.50      | 11.00      | 10.45      |
| Total quantity of Kwatha obtained (l) | 4.6        | 4.7        | 4.6        |
| Wt. of residue after filtration (g)  | 2300       | 2380       | 2350       |

Table 3: Details of JHD syrup preparation

| Parameters                          | Batches   |
|-------------------------------------|-----------|
| I | II | III |
| Quantity of Kwatha (ml)             | 2200 2200 2200 |
| Quantity of sugar candy powder (g) | 1430 1430 1430 |
| Temperature during process          | 80–90°C 80–90°C 80–90°C |
| Total time taken for preparation of syrup (hours) | 3.00 3.10 3.15 |
| Final quantity of syrup obtained (ml) | 2180 2200 2190 |
| Percentage of syrup obtained (%)    | 99.09 100 99.55 |

Table 4: Details of JHD Ghana preparation

| Parameters                          | Batches   |
|-------------------------------------|-----------|
| I | II | III |
| Quantity of Kwatha (ml)             | 2200 2200 2200 |
| Temperature during process          | 70–85°C 70–85°C 70–85°C |
| Total time taken for preparation of Ghana (hours) | 5.00 5.15 5.15 |
| Final quantity of Ghana obtained before drying (g) | 300 305 295 |
| Total time for drying (days) in oven at 45°C | 05 05 05 |
| Final quantity of dried Ghana obtained (g) | 280 285 270 |
| Percentage of dried Ghana obtained (%) | 12.73 12.96 12.27 |
solid material and average time taken for the preparation of all the batches was between 24 and 25 hours.

Observation of the analysis is given in Tables 6–11.

Discussion

The quality assurance of any preparation is important from the raw materials and in-process conditions to the finished product, and the data compiled after several (at least three) repetitions of the same procedure are to be compared to generate a standard protocol for any formulation.

The whole procedure of JHD syrup was divided into two parts, i.e., first Kwatha preparation and then syrup preparation. To prepare JHD Kwatha, the same parameters were followed in each batch as shown in Table 3. The size of powder, soaking time and temperature were the same for each batch. The amount of water was taken as per w/v concept, i.e., 2250 g of Kwatha Churna and 36 l water was taken by volume, i.e., in the ratio 1:16. During the preparation of Kwatha, the basic fundamentals as mentioned by Acharya Charaka were followed. In this study, Kwatha Churna was passed through mesh no. 08. Overnight soaking (12 hours) was done before application of heat to allow micelles take up a liquid film and the tissues swell. Mild heating with peak temperature 90–95°C was done along with continuous stirring. It was applied for proper extraction and reducing the chances of degradation of some of the active constituents, which may decompose due to hydrolysis. For preparing JHD syrup, the range of temperature was 80–90°C.

The whole procedure of JHD tablet was divided into two parts, i.e., first Ghana preparation and then tablet preparation. For both steps, the same parameters were followed in all the batches as shown in Tables 4 and 5. During Ghana preparation, Kwatha was further heated and converted into semisolid to remove watery portion, the temperature was between 70 and 85°C. After 3 hours of heating, the liquid became stickier. It may be due to the presence of starch in the material. Ghana of JHD Dravya was very sticky in nature; so, to covert it into solid material and average time taken for the preparation of all the batches was between 24 and 25 hours.

Observation of the analysis is given in Tables 6–11.

Table 5: Details of JHD tablet preparation

| Parameters                   | Batches        |
|------------------------------|----------------|
|                              | I              | II             | III            |
| Quantity of Ghana (g)        | 280            | 285            | 290            |
| Quantity of sugar candy (Sharkara powder (g) | 125            | 125            | 125            |
| Fine powder of JHD Dravayas (g) | 055           | 055            | 055            |
| Quantity of lubricant (talc powder (g) | 018           | 018            | 018            |
| Total time taken for preparation of tablet (hours) | 25.00          | 25.00          | 25.00          |
| Final quantity of tablet obtained (g) | 440.40        | 450.30         | 448.60         |
| Final quantity of tablet obtained (%) | 95.65         | 96.77          | 95.75          |
| Quantity of residue after making tablet (g) | 20.00          | 15.50          | 21.20          |

Table 6: Physicochemical characters of the JHD Dravya

| Name of drug | AV (w/w (avg.)) | AIA (w/w (avg.)) | WSE (w/w (avg.)) | MSE (w/w (avg.)) |
|--------------|-----------------|-----------------|-----------------|-----------------|
| Sariva       | 09.31           | 02.65           | 16.64           | 22.44           |
| Sharkara     | Nil             | Nil             | 99.79           | 01.42           |
| Patha        | 06.92           | 01.09           | 12.91           | 12.10           |
| Manjistha    | 10.86           | 01.41           | 44.42           | 05.32           |
| Draksha      | 05.03           | 02.04           | 72.83           | 19.56           |
| Pili         | 12.34           | 02.72           | 40.20           | 17.82           |
| Paroooshka   | 04.39           | 00.096          | 32.25           | 15.12           |
| Haritaki     | 04.85           | 00.50           | 64.41           | 49.14           |
| Amalaki      | 05.66           | 01.52           | 53.58           | 51.04           |
| Bibhitiaki   | 07.35           | 01.02           | 40.31           | 10.64           |

Table 7: Physical analysis of three batches of JHD tablet

| Parameters          | JHD tablet |                |                |
|---------------------|------------|----------------|----------------|
|                     | I          | II             | III            |
| Shape               | Round      | Round          | Round          |
| Size (mm)           | Diameter   | 12.44          | 12.75          | 12.81          | 12.73          |
|                     | Max.       | 12.12          | 12.70          | 12.78          | 12.68          |
|                     | Min.       | 12.32          | 12.72          | 13.09          | 12.71          |
|                     | Avg.       | 4.61           | 4.71           | 4.78           | 4.70           |
| Width (mm)          | Max.       | 4.30           | 4.30           | 4.30           | 4.30           |
|                     | Min.       | 1.80           | 1.80           | 1.80           | 1.80           |
|                     | Avg.       | 3.91           | 4.14           | 4.28           | 4.11           |
| Hardness (kg/cm²)   |            | 5.78           | 6.10           | 6.33           | 6.07           |
| Weight of tablet    | Max. (mg)  | 588.0          | 596.0          | 589.0          | 591.0          |
|                     | Min. (mg)  | 530.0          | 538.0          | 528.0          | 532.0          |
|                     | Avg. (mg)  | 564.0          | 568.0          | 585.2          | 572.4          |
| Friability test (%) |            | 0.9120         | 0.9010         | 0.9020         | 0.9050         |
| Disintegration time (minutes) | 21.44     | 22.08          | 22.60          | 22.04          |

Table 8: Physicochemical analysis of three batches of JHD syrup

| Parameters                      | JHD syrup |                |                |
|---------------------------------|-----------|----------------|----------------|
| Specific gravity at 40°C         | I         | II             | III            |
|                                 | 1.3165    | 1.3110         | 1.3274         | 1.3183         |
| Solid content % w/v             | 90.1282   | 90.1180        | 90.1798        | 90.1420        |

Table 9: Physicochemical analysis of three batches of JHD tablet

| Parameters          | JHD tablet |                |                |
|---------------------|------------|----------------|----------------|
| LOD %w/w            | 5.26       | 5.32           | 5.32           | 5.30           |
| AV %w/w             | 6.46       | 6.56           | 6.60           | 6.54           |
| AIA %w/w            | 1.12       | 1.20           | 1.22           | 1.18           |
| pH                  | 3.51       | 3.54           | 3.51           | 3.52           |
| WSE %w/w            | 58.9       | 61.1           | 60.9           | 60.3           |
| MSE %w/w            | 43.1       | 45.2           | 45.5           | 44.6           |
materials was required with talc powder (18 g) as a lubricant. Then, it was passed through sieve no. 20 to prepare the granules and with the help of tabletting machine, it was compressed and 500 mg weight tablets were prepared.

Average time required for the preparation of Kwatha was 11 hours 05 minutes, while the average time required for preparing syrup was 3 hours 10 minutes, and for Ghana and tablet it was 5 hours 10 minutes and 24 hours 45 minutes, respectively [Figure 1]. Average yield of Kwatha, syrup, Ghana and tablet were 4.63 l, 2200 ml, 276 g and 446 g, respectively [Figure 2].

Physico-chemical parameters of raw drugs were passed through prescribed limit of API, which is required for the quality control as well as standardization. Though some variations were there, these passed in the other tests; so, these were considered good raw materials [Table 6].

JHD Kwatha was brown in color, had a characteristic smell and was Kashaya in taste. Syrup was dark brown in color, whereas tablet was brownish black. JHD Dravyas had mostly dominance of Madhura in taste followed by Tikta and Amla. JHD Kwatha was Kashaya in taste, whereas both the formulations were having Madhura–Kashaya taste due to the Madhura Rasa dominance in the raw drugs. Syrup was more Madhura in taste compared to the tablet.

Physical analysis of JHD tablet and physicochemical analysis of JHD Kwatha and both the formulations were done for the quality control purpose. The WSE and MSE values of tablet were found to be different, which depicts more solubility of the components in water.

Qualitative tests are used to detect the presence of functional groups, which play a very important role in the expression of biological activity. Present study reveals the presence of tannin, sterols, saponins, starch, flavanoids, glycosides, amino acids and tertiary amines in all three batches of both the formulations, whereas absence of alkaloids, phenols, anthocyanins and coumarins was also seen [Table 10]. The reducing sugar of JHD syrup was slightly more than that of JHD tablet [Table 11].

![Figure 1](image1.png) The total time taken for the preparation of JHD Kwatha, JHD syrup, JHD Ghana and JHD tablet

![Figure 2](image2.png) Percentage yield obtained of JHD syrup, JHD Ghana and JHD tablet

Table 10: Qualitative tests for various functional groups of three batches of JHD syrup and JHD tablet

| Components     | JHD syrup | JHD tablet |
|----------------|-----------|------------|
|                | I         | II         | III        | I         | II         | III        |
| Tannin         | Present   | Present    | Present    | Present   | Present    | Present    |
| Terpenoid/sterols | Present | Present    | Present    | Present   | Present    | Present    |
| Alkaloid       | Absent    | Absent     | Absent     | Absent    | Absent     | Absent     |
| Saponin        | Present   | Present    | Present    | Present   | Present    | Present    |
| Starch         | Present   | Present    | Present    | Present   | Present    | Present    |
| Flavonoid      | Present   | Present    | Present    | Present   | Present    | Present    |
| Glycoside      | Present   | Present    | Present    | Present   | Present    | Present    |
| Phenols        | Absent    | Absent     | Absent     | Absent    | Absent     | Absent     |
| Anthocyanins   | Absent    | Absent     | Absent     | Absent    | Absent     | Absent     |
| Amino acids    | Present   | Present    | Present    | Present   | Present    | Present    |
| Tertiary amines| Present   | Present    | Present    | Present   | Present    | Present    |
| Coumarins      | Absent    | Absent     | Absent     | Absent    | Absent     | Absent     |

Table 11: Reducing sugar of JHD syrup and JHD tablet

|              | JHD syrup | JHD tablet |
|--------------|-----------|------------|
| Reducing sugar in % | 32        | 27         |
may also be inferred that the material was not affected by any contaminants during the preparation.

Conclusion

These methods of preparation for syrup and tablet of JHD are considered as SMPs. To prepare 2200 ml JHD syrup, the requirements of JHD Kwatha and sugar candy powder were 2200 ml and 1430 g, respectively; 3 hours 10 minutes was the time taken at the temperature range of 80–90°C. To prepare 446 g JHD tablet, 285 g Ghana, powder of sugar candy (125 g), JHD Dravyas (55 g) and talc (18 g) were required and an average of 25 hours was the time taken.

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