

# Determination of Temperament of Mufrad (Single) Unani Drugs with the Help of an Inventory Exemplifying Their Organoleptic and Physical Attributes

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## Abstract

The physical nature to the concept of *Mizaj-e-Advia* (temperament of drugs) warrants its critical evaluation, which is possible only when the physical correlate of *Mizaj* is made comprehensive and empirical. This work is a preliminary attempt towards this goal. In the context of the importance of organoleptic characters and physical properties of drugs for *Mizaj* assessment, Ibn Rushd in *Kitab-ul Kulliyat* emphasizes on the need for further evaluation of the physical correlates of *Mizaj*. From the basic rules of stating the nature of drugs as hot, cold, moist or dry from its organoleptic characters and physical properties as stated in the classical texts, an inventory was developed consisting of a battery of tests *Mufrad* drugs were subjected to. The score obtained through inventory is correlated to the classical description of *Mizaj* and *Darjae Mizaj* for its reliability. From the definition of the *Darjate Mizaj* and its correlation with acute toxicity ( $LD_{50}$ ) appears a suitable criterion for its validity for classical *Mizaj* description as well as inventory scores. The inventory showed fair accuracy when applied to a group of drugs. In view of these attributes of reliability and validity, this instrument may be useful to determine the temperament of single drugs.

**Key Words:** Mizaj-e-Advia, Mufrad drugs, Darjae Mizaj,  $LD_{50}$ , Inventory, Organoleptic characters

## Introduction

The practical implementation of Unani medicine mainly depends upon identification of drugs, knowledge of their general and specific actions, knowledge of dosage of drugs and information of their quality standards. Unani medicine has its own method of evaluating and predicting the action of drugs which have been procured from plant mineral and animal sources. A priori drug is subjected to *Mizaj* assessment by the method of analogy. Once the temperament is established the drug is further studied to ascertain the effect predicted in it on account of having specific temperament. Pre assessment of *Mizaj* by analogy is carried out on the basis of organoleptic characters of drug and by its physicochemical properties. However, the assessment of these characters have greater component of subjectivity. This makes it difficult to decide about the actual *Mizaj* of such drugs. The experiment can give us an authentic account of the potency of a drug on observing certain specific rules. The difficulty inherent in obtaining consistency and adequate objectivity

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in the process of determination of *Mizaj* of drugs is obvious and understood. The low inter agreement of physicians on *Mizaj* of certain drugs and their arguments, result in assigning different *Mizaj* to drugs by different people. All this called for the development of objective, measurable, and verifiable criteria of determination of *Mizaj* of drugs. There exists high correlation between *Darjae Mizaj* of drugs and their LD<sub>50</sub> (Mudasir and Sofi, 2013) which had been indicated by the very definition of the *Darjae Mizaj* in Unani literature (Ibn Rushd, 1987), so LD<sub>50</sub> as an external criterion was employed for validation of this inventory.

Therefore the present work is directed towards development of a more objective *Mizaj* inventory, so that we may be able to deal with *Mizaj* assessment of those drugs whose *Mizaj* is controversial and also to determine *Mizaj* of new drug by testing them on the *Mizaj* inventory. In addition, this inventory may be applied to any substance intended for human use for its *Mizaj* determination. This study will also help to understand the role of organoleptic characteristics of drugs in respect of their *Mizaj* assessment.

## Material and Methods

### Selection of drugs

Sixty-one *Mufrad* (single) drugs selected from different categories of *Mizaj* were included in the study. Feasibility of procuring the drug samples from authenticated nurseries and herbal gardens was kept in mind. For this purpose, we collected drug samples from herbal garden and the pharmacy of National Institute of Unani Medicine, Bangalore. Whole plants were collected and dried in shade before investigating the actual plant parts used as drugs.

### Documentation of *Mizaj* and LD<sub>50</sub> of drugs

*Mizaj* of the drugs was sorted out from various classical Unani books (Al-Magrabi, 2007; Ghani, YNM; Ibn Baitar, YNM; Hakim, 2001). The difference of opinion about *Mizaj* of certain drugs was resolved by adhering to the most favoured statements in the books. The LD<sub>50</sub> value of the selected drugs was documented from available journals (Mudasir and Sofi, 2013) and FDA approved books (Ross, 2003; Duke, 2003). The LD<sub>50</sub> values of extracts were extrapolated to get appropriate values of LD<sub>50</sub> in animals. The LD<sub>50</sub> of crude drug was calculated from the yield percentage of extract of crude drug. The value of crude drug thus calculated was used to determine the LD<sub>50</sub> of human being by the formulae devised by Ghosh (2008).

### Selection of domain for construction of inventory

Classical Unani authors have described various properties of drugs to assess their *Mizaj*. These properties include the organoleptic characters like taste, smell and colour and other physical properties like flammability, dissolution, fluidity, thickness, stickiness etc. The share of each attribute in terms of its contributory importance deciding the temperament was fixed after evaluating the description contained in classical books. The items or the questions were accordingly framed under two domains-Organoleptic characters and physico chemical properties as emphasized in Unani literature.

### Scaling and scoring of the selected items

Scale for assessing the organoleptic characters was developed from the rules specified in the classical literature (Al-Magrabi, 2007; Ibn Rushd, 1987; Ibn Sina, YNM; Baghdadi, 2005). Taste, smell and colour were assigned scores in the ratio of 6:2:1 in accordance of the relative emphasis laid down in classical literature. The scoring of the rated items was carried out by summation of the individual rate score separately for organoleptic domain and the physical property domain. Total score for the inventory was then calculated from weighted mean of the scores of two domains.

### Administration of the inventory

The inventory was administered to the drugs by taking into account the total score obtained by a drug. *Darjae Mizaj* (degree of temperament) was calculated by dividing the maximum possible range of total score into four equal intervals (Singh, 1986) starting from *Darjae I* to *Darjae IV*. The comparison of *Mizaj* attained by the drug based on its total score was made with its *Mizaj* mentioned in the classical literature.

### Assessment of Classical determinants of Mizaj

#### Organoleptic characters

##### Colour

The drugs were assigned to different types of colours after comparing them with the help of a colour strip that indicated the seven chosen colours on it. Scoring pattern of the colours is shown in the appendix.

## Smell

The drugs were crushed and smelled independently by two persons. A standard drug for each smell category was chosen from the examples given in classical books. The drugs under study were assigned different smell categories with agreement of the two persons tested the smell. The scoring was done in accordance of the Unani description about the role of colours in deciding the temperament.

## Taste

Nine discrete tastes have been well described in relation to type and degree of *Mizaj*, in the Unani literature. We chose a standard reference drug to represent each taste category, amongst the examples given in literature. All drugs were tasted by two persons independently and by their agreement were ascribed different tastes by comparing them with the reference examples. The weightage and scoring of each taste was given in accordance with the Unani description.

## Physical properties

### Injemad (condensation)

This property applies to liquid and semisolid forms of drugs and some of the mineral origin drugs such as salts etc. Drugs were subject to heat, cold and air treatment alternately and the process of condensation was observed. Assessment of condensation was carried out by noting down the mobility (flow) of the drugs on a glass slide and firmness of texture felt by touching the drug. We subjected each drug to four types of treatments and noted the thickening effect induced by them- heat alone, cold followed by air, heat followed by cold and cold alone. The rating was assigned in corroboration with the rules guiding condensation of the drugs (Ibn Rushd, 1987).

### Ratoobat (moisture)

We divided the drugs into five categories based on the rough estimation of amount of moisture. The moisture of the drugs was most often felt by naked eye and by touch, however in case of doubt the drug was crushed and checked for any release of moisture. The drugs were categorized as having high moisture content, low moisture content, little moisture content, dry and very dry.

#### Tahallul (dissolution)

For the assessment of *Tahallul*, we put each drug in water-filled Petri dishes and kept it overnight. It was heated in the morning for fifteen minutes then the dissolution and softening of the drug and release of colour into the water was observed.

#### Lozoojat (stickiness)

Based on stickiness we classified the drugs into sticky, mild sticky and non-sticky ones, by assessing the resistance allowing the index finger and thumb apart after taking a pinch full of the drug.

#### Sakhafat (brittleness)

The assessment of brittleness or breakability was done by noting the ability of the drug to be broken into pieces by applying certain degree of mechanical pressure.

#### Latafat (softness)

Texture of the drugs was assessed through their softness on touch and ease of compressibility.

#### Ihteraq (flammability)

The property of *Ihteraq* was assessed by keeping the drug near the flame of a spirit lamp for few seconds and the ease and duration of catching fire was noted.

#### Takhalkhul (Sponginess)

The sponginess is the property drug marked by the ability of a substance to shrink and expand under pressure or when submerged in to water. The sponginess is attributed to the presence of air spaces within a substance and this was assessed by noting the absorption of water and swelling of a drug when dipped in water. Elasticity, compressibility and light weightiness was also considered to assess the sponginess.

#### Wazan (weight)

Categorization of drugs into heavy, moderate and light was carried, based on their behavior in water. This was assessed by putting the drug in water; floating

drug was considered of light weight while the drug which settled down to the bottom, was considered as heavy. Drug, which remained suspended, or sub immersed in the water was given zero score. A score of +0.25 and -0.25 was given to light and heavy drugs, respectively.

The scoring pattern of all the above properties is shown in the *Mizaj* Inventory given in appendix.

### Reliability and validity of the inventory

The reliability of the inventory was established by comparing the *Mizaj* scores interpretations by the inventory with the *Darjae Mizaj* described in Unani literature by more than three classical books were referred for the purpose. Correlation coefficient greater than 0.6 between the two scores was considered as sufficient agreement of the two methods for *Mizaj* assessment (Cureton, 1965). Internal reliability was calculated by correlation coefficient between the two domains, namely total score for organoleptic domain and total score for physical property domain. Correlation of LD<sub>50</sub> and *Darjae Mizaj* formed the basis for external criterion validity of the inventory (Rosenthal and Rosnow, 1991). Validity coefficient of more than 0.7 is considered sufficient for the validation of the inventory (Cureton, 1965).

### Statistical analysis

The statistical procedures were carried out by using SPSS (Version 17) and Graph pad In Stat. Percentile LD<sub>50</sub> of each drug was computed and assigned the *Daraje Mizaj* from the classical text. Correlation matrix of individual hot and cold drugs was found using Spearman's rank correlation coefficient separately. Correlation for reliability and validity was also estimated by using different methods of correlation. Significance of the correlation was also mentioned by the same statistical software package (Siegel, 1956).

## Results

The total inventory score was formed as combined score for the domain I and domain II. For the development of the inventory the weighted mean for maximum score was calculated by adding the maximum scores for each item from domain I and domain II and dividing it with the number of total items (12). As the maximum combined score for all items was found as 7.25, so the maximum weighted mean came to be 0.6041. Similarly weighted mean for minimum score was calculated which came to be equal to zero. The maximum range of the weighted mean was found as 0.6041. The maximum range of total

score was converted into equal interval scale (Singh, 1986) and divided into four intervals to correspond with four degrees of *Mizaj*. The four equal intervals corresponding to different *Darjae Mizaj* are as 0 to 0.15 (1st degree); 0.16 to 0.31 (2nd degree); 0.32 to 0.47 (3rd degree) and score greater than 0.47 corresponds to 4th degree of *Mizaj*. Weighted mean was calculated from the total score obtained by each drug under the two domains and assigned *Darjae Mizaj* by noting the range score in which it lie. This way *the Mizaj* of each drug was obtained from the inventory.

The correlation coefficient between the *Mizaj* based on our inventory and the classical sources calculated to be 0.6323 (excluding four mineral drugs); it was 0.4336 when mineral drugs were included. Reliability coefficient between two domains, TSOC (total score for organoleptic characters) and TSPP (total score for physical characters) was 0.49; between SPP-B (score for group B physical properties) and TSOC it was 0.5084. The maximum index of correlation (Singh, 1986) calculated from the correlation coefficient between MC and MI, was found as 0.79. Results are shown in table 1.

The validity coefficient between classical *Darjae Mizaj* (MC) and LD<sub>50</sub> was 0.7186. The correlation between *Darjae Mizaj* by inventory (MI) and LD<sub>50</sub> was -0.4340, which was found to be significant. Results are summarised in table 2.

**Table 1 :** Values of LD<sub>50</sub>, MC, MI and score for organoleptic characters and physical properties of drugs

| Sl. No. | Name of drug               | Mizaj type | MC | LD <sub>50</sub> (gm) | TSOC  | SPP-A | SPP-B | MI |
|---------|----------------------------|------------|----|-----------------------|-------|-------|-------|----|
| 1       | <i>Linum usitatissimum</i> | Hot        | 1  | 166.20                | 1     | -0.25 | -0.25 | 1  |
| 2       | <i>Azadirachta indica</i>  | Hot        | 1  | 100.85                | 2.375 | +0.25 | 1     | 2  |
| 3       | <i>Glycyrrhiza glabra</i>  | Hot        | 1  | 124.12                | 2.25  | 0     | 1     | 2  |
| 4       | <i>Valeriana jatamansi</i> | Hot        | 1  | 77.58                 | 2.25  | 0     | 1     | 2  |
| 5       | <i>Cocos nucifera</i>      | Hot        | 2  | 55.41                 | 1     | +0.25 | -1    | 1  |
| 6       | <i>Ruta graveolense</i>    | Hot        | 2  | 55.41                 | 3     | +0.25 | 1     | 2  |
| 7       | <i>Vitex negundu</i>       | Hot        | 2  | 34.91                 | 3.25  | -0.5  | 0.5   | 2  |
| 8       | <i>Aloe vera</i>           | Hot        | 2  | 55.41                 | 3.75  | 0.25  | -0.5  | 2  |

| Sl. No. | Name of drug                | Mizaj type | MC | LD <sub>50</sub> (gm) | TSOC  | SPP-A | SPP-B | M I |
|---------|-----------------------------|------------|----|-----------------------|-------|-------|-------|-----|
| 9       | <i>Cassia fistula</i>       | Hot        | 1  | 51.20                 | 1.5   | 0     | -0.5  | 1   |
| 10      | <i>Psidium guajava</i>      | Hot        | 1  | 44.33                 | -0.25 | 0     | -1    | 1   |
| 11      | <i>Artemisia absinthium</i> | Hot        | 2  | 38.70                 | 2.875 | +0.25 | 0.5   | 2   |
| 12      | <i>Tinospora cordifolia</i> | Hot        | 1  | 33.24                 | 2.125 | -0.25 | 0.5   | 1   |
| 13      | <i>Writia wrightia</i>      | Hot        | 2  | 33.24                 | 1     | 0     | 1     | 1   |
| 14      | <i>Piper longum</i>         | Hot        | 2  | 55.40                 | 2.5   | 0     | 1.25  | 2   |
| 15      | <i>Pimpinella anisum</i>    | Hot        | 2  | 29.92                 | 2.625 | 0     | 1.25  | 2   |
| 16      | <i>Jatropha curcus</i>      | Hot        | 2  | 27.50                 | 1.75  | -0.5  | 0     | 1   |
| 17      | <i>Psoralea corylifolia</i> | Hot        | 2  | 22.01                 | 3     | -0.25 | 1     | 2   |
| 18      | <i>Mangifera indica</i>     | Hot        | 1  | 22.24                 | 1.5   | +0.25 | -0.75 | 1   |
| 19      | <i>Bacopa monnieri</i>      | Hot        | 2  | 22.00                 | 1.875 | +0.25 | +0.5  | 2   |
| 20      | <i>Sesamum indicum</i>      | Hot        | 1  | 22.00                 | 1.125 | -0.25 | 0     | 1   |
| 21      | <i>Myristica fragrance</i>  | Hot        | 2  | 20.00                 | 2.5   | 0     | +1    | 2   |
| 22      | <i>Crocus sativus</i>       | Hot        | 2  | 20.00                 | 2.75  | +0.75 | 1.25  | 3   |
| 23      | <i>Mirabilis jalapa</i>     | Hot        | 3  | 15.51                 | 1.75  | +0.25 | +0.5  | 2   |
| 24      | <i>Sassurea lappa</i>       | Hot        | 3  | 15.51                 | 3     | -0.25 | +1.25 | 3   |
| 25      | <i>Cinnamom zeylanicum</i>  | Hot        | 3  | 15.51                 | 2.75  | +0.25 | +1.25 | 3   |
| 26      | <i>Anacyclus pyrethrum</i>  | Hot        | 3  | 15.51                 | 3.75  | 0     | +1.25 | 3   |
| 27      | <i>Morus alba</i>           | Hot        | 1  | 15.51                 | 1     | +0.25 | -1.5  | 1   |
| 28      | <i>Ficus carica</i>         | Hot        | 1  | 15.51                 | 1.75  | 0     | -1    | 1   |
| 29      | <i>Nigella sativa</i>       | Hot        | 2  | 13.11                 | 3.25  | -0.5  | 0     | 2   |



| Sl. No. | Name of drug                | Mizaj type | MC | LD <sub>50</sub> (gm) | TSOC   | SPP-A | SPP-B | M I |
|---------|-----------------------------|------------|----|-----------------------|--------|-------|-------|-----|
| 30      | <i>Catharanthus roseous</i> | Hot        | 2  | 11.12                 | 1.5    | +0.25 | +0.25 | 2   |
| 31      | <i>Matricaria chamomile</i> | Hot        | 2  | 11.08                 | 2.5    | +0.25 | +0.25 | 2   |
| 32      | <i>Curcuma longa</i>        | Hot        | 3  | 11.08                 | 2.5    | +0.5  | +0.75 | 2   |
| 33      | <i>Mentha piperita</i>      | Hot        | 2  | 9.000                 | 2.875  | +0.25 | 1     | 3   |
| 34      | <i>Abrus precatorius</i>    | Hot        | 3  | 7.75                  | 2.5    | -0.5  | +0.75 | 2   |
| 35      | <i>Zingiber officinale</i>  | Hot        | 2  | 7.75                  | 4      | +0.5  | -0.5  | 3   |
| 36      | <i>Allium sativum</i>       | Hot        | 3  | 11.82                 | 4.125  | +0.75 | 0     | 3   |
| 37      | <i>Withania somnifera</i>   | Hot        | 3  | 9.77                  | 2.5    | -0.25 | +0.75 | 2   |
| 38      | <i>Calotropis procera</i>   | Hot        | 4  | 4.14                  | 2.75   | 0.25  | -0.75 | 2   |
| 39      | <i>Clitoria ternatia</i>    | Hot        | 4  | 10.08                 | 2.5    | +0.25 | 0.5   | 2   |
| 40      | Copper sulphate             | Hot        | 4  | 3.33                  | -0.875 | +0.50 | 0     | 1   |
| 41      | Ferrus sulphate             | Hot        | 4  | 2.61                  | -0.125 | 0     | 0     | 1   |
| 42      | <i>Nux vomica</i>           | hot        | 4  | 1.93                  | 3.25   | -0.75 | +0.75 | 2   |
| 43      | <i>Rauwolfia serpentina</i> | cold       | 3  | 1.08                  | 4      | -0.25 | 0     | 2   |
| 44      | Arsenics oxide              | Hot        | 4  | 0.31                  | -0.5   | +0.25 | 0     | 1   |
| 45      | <i>Musa sapientum</i>       | Hot        | 1  | 38.79                 | 1.25   | +0.25 | -1.25 | 1   |
| 46      | <i>Punica granatum</i>      | Cold       | 1  | 55.41                 | -0.25  | +0.25 | -1    | 1   |
| 47      | <i>Tamarindus indica</i>    | cold       | 1  | 55.41                 | -1.5   | 0     | -1.5  | 2   |
| 48      | <i>Asparagus racemosus</i>  | Cold       | 1  | 35.46                 | 0.875  | 0     | -0.25 | 1   |

| Sl. No. | Name of drug                | Mizaj type | MC | LD <sub>50</sub> (gm) | TSOC  | SPP-A | SPP-B | MI |
|---------|-----------------------------|------------|----|-----------------------|-------|-------|-------|----|
| 49      | <i>Terminalia bellerica</i> | Cold       | 2  | 32.97                 | -0.75 | +0.25 | -0.5  | 1  |
| 50      | <i>Citrus limon</i>         | Cold       | 2  | 22.27                 | -3    | +0.25 | -0.75 | 2  |
| 51      | <i>Solanum nigrum</i>       | Cold       | 2  | 22.16                 | 0.25  | +0.25 | 0     | 1  |
| 52      | <i>Ananas cosmos</i>        | Cold       | 2  | 22.16                 | -0.5  | +0.25 | -1.5  | 1  |
| 53      | <i>Viola odorata</i>        | Cold       | 1  | 22.16                 | 1.375 | +0.25 | 0.5   | 1  |
| 54      | <i>Emblica officinalis</i>  | Cold       | 1  | 22.16                 | -2    | -0.25 | -1    | 2  |
| 55      | <i>Bixa orellena</i>        | Cold       | 1  | 22.16                 | 0.25  | +0.25 | 0     | 1  |
| 56      | <i>Saraca indica</i>        | Cold       | 1  | 15.51                 | -0.5  | 0     | 0     | 1  |
| 57      | <i>Lawsonia inermis</i>     | Cold       | 1  | 15.51                 | 2.175 | +0.25 | 1     | 2  |
| 58      | <i>Cinnamomum camphora</i>  | Cold       | 3  | 10.16                 | 2.5   | 0     | +0.75 | 3  |
| 59      | Litharge                    | Cold       | 3  | 6.93                  | -0.5  | -0.75 | 0     | 1  |
| 60      | <i>Santalum album</i>       | Cold       | 3  | 5.54                  | 3.65  | +0.5  | 0     | 3  |
| 61      | <i>Conium maculatum</i>     | Cold       | 4  | 2.64                  | 3.25  | +0.25 | 0     | 3  |

MC = *Darjae Mizaj* by classical sources; MI = *Darjae Mizaj* by Inventory; TSOC = total score for organoleptic characters; SPP-A = total score for physical properties including condensation, dissolution, brittleness and texture; SPP-B = total score for physical properties including weight, flammability, sponginess, moisture and stickiness. The LD<sub>50</sub> values shown in table 1 show absolute values of LD<sub>50</sub> (in grams) of the drugs, corresponding to an adult human being of 70kg body weight (extrapolated from animal values).

**Table 2 :** Correlation matrix for *Mizaj* Classical (MC), *Mizaj* by Inventory (MI) and LD<sub>50</sub>

| Parameter        | MC      | MI      | LD <sub>50</sub> |
|------------------|---------|---------|------------------|
| MC               | —       | 0.6323  | - 0.7186         |
| MI               | 0.6323  | —       | -0.4340          |
| LD <sub>50</sub> | -0.7186 | -0.4340 | —                |

## Inventory for Mizaj determination

| Parameters  | Score  |
|---|--------|
| <b>I. Organoleptic character</b>                    |        |
| <b>A. Colour</b>                                    |        |
| 1. White  | -0.5   |
| 2. Creamy white                                     | -0.25  |
| 3. Yellowish white                                  | -0.125 |
| 4. Yellow   | 0      |
| 5. Green  | +0.125 |
| 6. Red  | +0.25  |
| 7. Dark red   | +0.5   |
| <b>B. Smell</b>                                     |        |
| 1. Sour( <i>khatta</i> ) smell                      | -1     |
| 2. Soothing   | -0.5   |
| 3. No smell   | 0      |
| 4. Dull   | +0.25  |
| 5. Fragrant /aromatic                               | +0.5   |
| 6. Sharp  | +0.75  |
| 7. Pungent  | +1     |
| <b>C. Taste</b>                                     |        |
| 1. Iffs   | -3     |
| 2. Hamiz  | -2     |
| 3. Kabiz  | -1     |
| 4. Tuffa  | 0      |
| 5. Dasmi  | + 0.5  |
| 6. Sweet  | +1     |
| 7. Maleh  | +1.5   |
| 8. Murr   | +2     |
| 9. Hareef   | +3     |
| <b>II. Physical property</b>                        |        |
| <b>A. Condensation</b>                              |        |
| 1. Condensing due to heat                           | +0.25  |
| 2. Condensing due to cold                           | +0.25  |
| 3. Condensing by cold, previously thickened by heat | +0.25  |
| 4. Condensed by cold but not thickened by heat      | -0.25  |
| 5. Condensing by both                               | 0      |
| <b>B. Moisture</b>                                  |        |
| 1. High moisture content                            | -0.50  |
| 2. Less moisture content                            | -0.25  |
| 3. Some moisture                                    | 0      |
| 4. Dry  | +0.25  |
| 5. Very dry   | +0.50  |

### C. Dissolution

|                               |       |
|-------------------------------|-------|
| 1. Soluble in cold medium     | +0.25 |
| 2. Partially soluble          | 0     |
| 3. Not soluble in cold medium | -0.25 |
| 4. Stickiness                 |       |
| 5. Sticky                     | -0.25 |
| 6. Mild stickiness            | 0     |
| 7. Non-sticky                 | +0.25 |
| 8. Brittleness                |       |
| 9. Friable                    | +0.25 |
| 10. Moderate                  | 0     |
| 11. No friability             | -0.25 |
| 12. Softness                  |       |
| 13. Soft                      | +0.25 |
| 14. Firm                      | 0     |
| 15. Hard                      | -0.25 |
| 16. Flammability              |       |
| 17. Highly flammable          | +0.50 |
| 18. Flammable                 | +0.25 |
| 19. Moderately flammable      | 0     |
| 20. Less flammable            | -0.25 |
| 21. Least flammable           | -0.5  |
| 22. Shrinking/expansion       |       |
| 23. Muttakasif                | -0.25 |
| 24. Moderate                  | 0     |
| 25. Mutakhalkhal              | +0.25 |
| 26. Weight                    |       |
| 27. Light                     | +0.25 |
| 28. Moderate (submersed)      | 0     |
| 29. Heavy                     | -0.25 |

**(-) means *Barid* and (+) means *Ha'ar***

### Scoring

Total max score for organoleptic characters = 4.5

Total minimum score for organoleptic characters = 0

Total maximum score for Physical Properties = 2.75

Total maximum score for Physical Properties = 0

Weighted mean for maximum score =  $\frac{4.5+ 2.75}{12} = 0.6041$  (12 = total number of items)

Similarly, calculating weighted mean for minimum score is zero

Therefore Maximum possible range of score = 0.6041

### Interpretation

Thus 4 point equal interval scale will be formed by dividing the range by total number of *Darjae Mizaj* (4) = 0.15

| Degree of <i>Mizaj</i> | Score range  |
|------------------------|--------------|
| 1 <sup>st</sup> degree | 0 to 0.15    |
| 2 <sup>nd</sup> degree | 0.16 to 0.31 |
| 3 <sup>rd</sup> degree | 0.32 to 0.47 |
| 4 <sup>th</sup> degree | > 0.47       |

For each drug, total score for both the domains need to be converted to weighted mean score and compared as above to describe its *Mizaj* and *Darjæ Mizaj*.

## Discussion

The organoleptic characters are considered as important indicators of the *Mizaj* of drugs in Unani system of medicine. Amongst the organoleptic characters, the taste is considered the strongest indicator. The scoring of different tastes was done in accordance with statements in classical literature. For example the *Hirreef/pungent* taste is considered hottest than all other tastes, so it was given a score of +3 to indicate severe heat. The *Afis / kaseela* taste is considered coldest of all, so a score of -3 was given. *Tuffa* or tastelessness is considered as an indicator of moderate temperament, therefore a score of zero was given to it. The tastes indicating hotness of a drug in decreasing order are; *Hareef > Murr > Maleh > Hulw > Dasim*. The tastes indicating coldness in increasing order is as; *Qabiz < Hamiz < Afis* (Ibn Rushd, 1987; Baghdadi, 2005; Qureshi, 1995).

Smell is the next important indicator of *Mizaj* while colour is considered as weakest evidence amongst the three organoleptic characters (Baghdadi, 2005; Al-Magrabi, 2007). There are different types of general smell categories described in classical literature. Generally, pungent and sharp smells are considered hot while cooling and soothing smells are considered cold in nature.

Amongst the colours, whiteness indicates cold and as the colour darkens, the coldness decreases. Yellow colour is considered moderate, while green, red and black colours indicate hotness of temperament (Baghdadi, 2005). Therefore keeping in view all these classical statements, the scoring of the three organoleptic characters was given in the ratio of 6:2:1 for taste, colour and smell respectively. The negative and positive signs to the scoring numbers indicate cold and hot temperament, respectively.

As there is no accurate measurement strategy for various properties described under the two domains, and these properties are entirely based and measured on classical methods therefore their measurement was entirely dependent on

the expertise of the individual scholars notwithstanding the descriptions and measurement have an element of subjectivity. However, we tried to reduce the subjectivity in measuring these parameters by adopting the methodology, which included simple physical tests in accordance with the textual meaning as described in Unani literature. The tests employed were used to assess accurately the extant of physical property of individual drug. The scoring for physical properties was almost uniform, with maximum score of  $\pm 0.25$  and minimum score of zero, except for the property of *Ihteraq* and *Ratoobat*, which had maximum score of  $\pm 0.5$ . The higher score for these two properties was given in view of the greater emphasis laid down for them in classical literature (Al-Magrabi, 2007).

The reliability coefficient between *Mizaj* by inventory and *Mizaj* by classical sources was 0.6323, which is promising but needs further improvement for validating the inventory. The reliability coefficient between the two domains; domain I of organoleptic characters and domain II based on physical properties was found moderate (0.49) which may be improved by devising objective and accurate measurement procedures for the organoleptic and physical properties of drugs. In spite of this significant level of correlation between the two domains, we may still not consider this part of the reliability assessment as conclusive. However, these properties along with the organoleptic characters may show more promising results on further evaluation. This work is although of preliminary nature but may serve as a lead for further studies.

Validity coefficient between  $LD_{50}$  and MC was 0.7186, and between MI and  $LD_{50}$ , it was 0.4340. Significant correlation exists between the *Mizaj* by classical sources and the *Mizaj* assessed through the inventory. It was observed that the organoleptic characters are better indicators of *Mizaj* of drugs than the physical properties. Moderate correlation exists between the organoleptic scores and scores for physical properties of drugs.

In the light of the above, it may be concluded that this inventory may be used to assess the temperament of single Unani drugs.

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## References

- Al-Magrabi, A.S.I., 2007. Kitab-ul-Fateh. Dept of Kulliyat, Faculty of Unani Medicine, Jamia Hamdard., New Delhi, pp. 25-36.
- Baghdadi, H., 2005. Kitab Al Mukhtarat fil Tib (Urdu Translation). CCRUM, New Delhi, pp. 22-23, 36-40.
- Cureton, E.E., 1965. Reliability and Validity: Assumptions and Experimental Design. *Educational and Psychological Measurement* 25: 327-46.
- Duke, J.A., 2003. Handbook of Medicinal Herbs. 2<sup>nd</sup> Edition. CRC Press, Boca, Raton (NY), Washington DC.
- Ghani. N., YNM. Khazain-ul-Advia. Idara Kitabul Shifa, Kocha Chalan, New Delhi.
- Gosh, M.N., 2008. Fundamentals of experimental pharmacology, 4th Edition. S.K. Ghosh and others, College Street, Kolkata.
- Hakim, M.A., 2001. Bustanul Mufardat. Idarah Kitabul Shifa, Darya Ganj, New Delhi. Ibn Baitar., YNM. Al Jami-ul-Mufardat Advia wa Agzia. (Vol. 1-4). CCRUM, New Delhi.
- Ibn Rushd., 1987. Kitabul Kulliyat (Urdu translation). CCRUM, New Delhi, pp. 212-217.
- Ibn Sina., YNM. Al-Qanoon. (Urdu translation by Ghulam Hussain kantoori). Idarah Kitabul Shifa, New Delhi, pp. 17-23, 255-242.
- Mudasir, K. Sofi, G., 2013. Correlation of Degree of *Mizaj* (Temperament) of Unani Drugs with their Acute Toxicity Status (LD<sub>50</sub>): An Empirical Study. *J Research Unani Med.* 2(1): 52-61.
- Qureshi, E.H., 1995. Muqaddama Ilmul-Advia. Aijaz Publishing House, New Delhi, pp. 34-48.
- Rosenthal, R. Rosnow, R.L., 1991. Essentials of behavioural research. Methods and data analysis. (2nd Edition). McGraw-Hill, New York.
- Siegel, S., 1956. Non parametric statistics for the behavioral sciences. McGraw-Hill book Company Inc., New York.
- Ross, I.A., 2003. Medicinal Plants Of The World, 2<sup>nd</sup> Edition (Vol. 2 & 3). Human press, Totowa, New Jersey.
- Shannon, R.S., Minakshi, N., and Nihal, A., 2007. Translation from animal to human studies. *The FASEB Journal* 22: 659 – 661.
- Singh, A.K., 1986. Tests, Measurements and Research Methods in Behavioral Sciences. Tata McGraw Hill, New Delhi, p. 258.

