ISSN: 0974-1291

HIPPOCRATIC JOURNAL OF UNANI MEDICINE

Volume 13 • Number 3 July–September 2018

CENTRAL COUNCIL FOR RESEARCH IN UNANI MEDICINE

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Volume 13, Number 3, July - September 2018

Hippocratic J. Unani Med. 13(3): 1- 74, 2018

CENTRAL COUNCIL FOR RESEARCH IN UNANI MEDICINE

Ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH)

Government of India

Hippocratic Journal of Unani Medicine

Editorial Office

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Annual Subscription: ₹ 300/- (India) US $ 100/- (Other Countries) **Single Issue:** ₹ 150/- (India) US$ 50/- (Other Countries)
Payments in respect of subscription may be sent in the form of bank draft drawn in favour of Director General, CCRUM, New Delhi.

Printed and published by Shri Devanand, Assistant Director (Admn.) on behalf of Central Council for Research in Unani Medicine
Ministry of AYUSH, Government of India
Printed at Rakmo Press Pvt. Ltd., C-59, Okhla Industrial Area (Phase I), New Delhi - 110020

Editorial

The recent decades have witnessed positive trends in the favour of traditional medicine. The ailing population across the globe has been increasingly shifting towards herbal medicines resulting in their phenomenal growth. With this, issues of their quality, safety and efficacy and scientific validity have received renewed attention of scientists.

Unani Medicine is a comprehensive traditional medical system which provides promotive, preventive, curative and rehabilitative healthcare. The fundamentals, diagnosis and treatment modalities of the system are based on scientific principles and holistic concepts of health and healing. Its holistic approach considers individual in relation to his temperament and stresses on health of body, mind and soul.

The Central Council for Research in Unani Medicine (CCRUM) as the apex research organization of Unani Medicine has been busy making concerted efforts to generate scientific evidences to validate its principles, fundamentals and therapeutics. Since its inception, the CCRUM has been contributing significantly through its research programmes namely clinical research, drug research, survey & cultivation of medicinal plants and literary research.

To propagate its research outcomes, the Council has been publishing Hippocratic Journal of Unani Medicine (HJUM) since 2006. HJUM is a peer-reviewed scientific quarterly journal and covers papers on clinical research on single and compound Unani drugs, validation of regimen therapy, experimental pharmacological studies, standardization of single and compound drugs, development of standard operating procedures, ethnobotanical studies and development of agro-techniques thereof and literary research on classics of Unani Medicine. The journal is also open for studies on safety evaluation of Unani and other herbo-mineral drugs, nutraceuticals, cosmotherapeutics, aromatics, oral health, lifestyle disorders, sports medicine, etc. and such other newer areas which are the outcome of modern day living.

This issue of HJUM comprises seven papers on different research areas related to Unani Medicine. In the first paper, the authors have presented data of a study on clinical efficacy and safety of Unani pharmacopoeial formulations *Jawārish Kamūnī and ʻAraq-i-Bādiyān in Sū' al-Haḍm* (Dyspepsia). The second paper is based on a study to evaluate efficacy of coded drugs UNIM-152 and UNIM-158 in cases of malaria. In the third paper, clinical evaluation of another Unani coded drug UNIM-856 in *Dhahāb Māʻ al-Asnān* (Tooth Hypersensitivity) has been discussed. In the fourth paper, the authors have made an attempt to present anti-bacterial activity of *Bisbāsa* (*Myristica fragrans* HOUTT). The fifth paper depicts extraction and evaluation of anti-helminthic activity of *Bisehri Booti* (*Aervalanata* L.), while the sixth paper is based on standardization of classical Unani formulation – *Sharbat Zūfā Murakkab*. In the last paper, an attempt has been made to present information on medicinal properties of *Pudina* as mentioned in Unani classical literature as well as in studies conducted in the recent past.

We sincerely appreciate the authors and reviewers of the papers included in this issue. We encourage the scientists and scholars engaged in research and development in Unani Medicine and related health sciences to submit their papers for publication in the upcoming issues. As we aim at improving the journal, we trust that the mission can be accomplished with active partnership of quality-conscious individuals and institutions.

Prof. Asim Ali Khan
Editor-in-Chief

Contents

Clinical Efficacy and Safety of Unani Pharmacopoeial Formulations *Jawārish Kamūnī* and *'Araq-i-Bādiyān* in *Sū' al-Haḍm* (Dyspepsia)

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Abstract

Dyspepsia (*Sū' al-Haḍm*) is defined as a chronic or recurrent pain or discomfort centered on the upper abdomen. The prevalence of dyspepsia is about 20-30% worldwide. This study was conducted to validate Unani pharmacopoeial formulations *Jawārish Kamūnī* and *'Araq-i-Bādiyān* in the cases of *Sū' al-Haḍm* (dyspepsia) at Regional Research Institute of Unani Medicine (RRIUM), Patna during 2014–2016. After a detailed history, clinical examination and relevant investigations, *Jawārish Kamūnī* and *'Araq-i-Bādiyān* were given to the patients in two divided doses of 5 gm and 60 ml respectively with water after meals daily for 14 days. The patients were advised lifestyle and dietary modifications. The results of the study were encouraging and none of the patients reported to have any adverse side effects after the treatment.

Keywords: *'Araq-i-Bādiyān, Jawārish Kamūnī, Sū' al-Haḍm,* Dyspepsia

Introduction

In the classical *Unani* texts, *Sū' al-Haḍm* is broadly explained and well-correlated with a gastrointestinal disorder, dyspepsia. Dyspepsia (*Sū' al-Haḍm*) is the term used to describe symptoms such as nausea, heartburn, hyperacidity, abdominal pain or discomfort, bloating or fullness and wind or belching which are thought to originate from the upper gastrointestinal tract. Prevalence of dyspepsia is about 20-30% worldwide. A study from India reported the prevalence of dyspepsia as 30.4%. In another multi-centric study from India, it was found that the frequency of dyspeptic symptoms is as high as 49% in community. In a study from Chandigarh, India, out of 2,048 individuals, 155 (7.5%) had dyspepsia. Therefore, from the limited data available, it may be concluded that 7.6 to 49% of Indian population reported to have dyspeptic symptoms (Ghoshal, *et al.,* 2008; Singh, 2002; Ghoshal, 2012). Patients under 55 years of age without alarming symptoms can be treated without investigation. Patients over 55 years of age with recent onset of dyspepsia (*Sū' al-Haḍm*) or those with alarming symptoms and younger patients unresponsive to empirical treatment should be urgently investigated by upper gastrointestinal endoscopy. This will rule out peptic ulcer disease, medication-related ulceration, malignancy and other rare causes (Colledge, 2010; Anonymous, 2004). Signs and symptoms of *Sū' al-Haḍm* (dyspepsia) include burned belching, sour belching, nausea, vomiting, lack of thirst, anorexia, distaste, heartburn, acid regurgitation (sour water in the mouth), abdominal distention, abdominal pain, undigested food in stool, foul smell of stool, constipation, weakness and headache (Hasan, 2008; Khan, 1987).

Quwwat Jādhiba, *Quwwat Māsika*, *Quwwat Hāḍima* and *Quwwat Dāfi'a* are *Quwā Arba'a* (four faculties) of *Mi'da* (stomach). They are responsible for the process

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of *Haḍm* (digestion). If they all are in accurate proportions, digestion will be fine and if the proper ratio is not fulfilled, the functioning (process of digestion) will be disturbed. These faculties have their own focused tasks in the process of digestion in the stomach. They work stepwise in the process of digestion (Arzani, 1903). If the cause of *Sū' al-Haḍm* (dyspepsia) is present in *Mi'da* (stomach), it can be due to *Sū'-i-Mizāj Sāda* (abnormal temperament not associated with the matter or substance), *Sū'-i-Mizāj Māddī* (abnormal substantial temperament) of the stomach or it can be due to *Tahalhul al-Mi'da* (gastromalacia) which leads to the weakening of the digestive process or it may increase the process of the digestion (Kabiruddin, 2003).

Sū' al-Haḍm (dyspepsia) can also be caused by the dominancy of *Ḥarārat Qawiyya* (heat) or *Burūdat Qawiyya* (cold) in the *Mi'da* (stomach) or it can be due to quantity and quality of *Ghidhā'* (diet) or *Tadbīr* (*regime*) of food in such a way that *Mi'da* (stomach) is not capable of digesting *Ghidhā'* (Hasan, 2008; Khan, 1987). It is assumed that the disease mostly occurs due to excess intake of diet or *Raddī Kayfiyāt* (morbid properties) of *Ghidhā'* (diet) (Khan, 2010). If *Sū' al-Haḍm* (dyspepsia) is caused by *Ruṭūbat* (wetness), it will be treated on the basis of *Sū'-i-Mizāj Raṭb* (ill wet temperament). If *Sū' al-Haḍm* is caused by *Yubūsat* (dryness), it will be treated on the basis of *Sū'-i-Mizāj Yābis* (ill dry temperament). If *Sū' al-Haḍm* is due to *Ghalīz Ghidhā'* like fish, beef, curd and eggs then try to vomit; if there is difficulty in vomiting then advise potent *Jawārish* (Kabiruddin, 2003).

Jawārish Kamūnī and *'Araq-i-Bādiyān* are Unani pharmacopoeial drugs which are used for *Sū' al-Haḍm* (dyspepsia) since long but they needed to be validated on scientific parameters in order to generate data for their safety and efficacy. Therefore, this clinical study was planned to evaluate the safety and efficacy of Unani pharmacopoeial formulations *Jawārish Kamūnī* and *'Arq-i-Bādiyān* in the cases of *Sū' al-Haḍm* (dyspepsia) due to *Sū'-i-Mizāj Bārid* with the objective to assess their safety and efficacy.

Materials and Methods

The study was carried out to evaluate clinical efficacy of the above-mentioned drugs in *Sū' al-Haḍm* (dyspepsia) patients at RRIUM, Patna during 2014-2016 in 69 cases of OPD and IPD for up to two weeks. The diagnosis was based on clinical history, examination and routine laboratory investigations. *Jawārish Kamūnī* and *'Araq-i-Bādiyān* were given to the patients in two divided doses of 5 gm and 60 ml respectively with water after meals daily for 14 days. The patients were advised to follow lifestyle and dietary modifications, i.e. to use *Laṭīf* and *Zūd Haḍm Aghdhiya* (light and easily digestible foods) like green lentil, mess of green lentil, chicken soup and *Murabba-i-Zanjabīl* (compote of

Zingiber officinale), chew food properly and avoid *Bādī* and *Thaqīl Aghdhiya,* e.g. cauliflower and beef, oily and spicy food, excess hot and cold diets, excess intake of water with or just after food, vigorous physical activity just after taking food, bath just before food and quitting exercise in case of excess *Ḥarārat Qawiyya* (dominancy of heat). The patients were assessed clinically every week. The subjective and objective clinical observations were recorded in the follow-up sheet. The following exclusion and inclusion criteria were adopted for selection of the patients.

Inclusion Criteria

1. Patients of either sex in the age group of 18-55 years
2. Patients having abdominal discomfort with any of the following signs and symptoms:
    - Abdominal pain
    - Heartburn
    - Acid regurgitation
    - Eructation
    - Nausea and vomiting
    - Abdominal distention

Exclusion Criteria

- Inflammatory bowel disease, e.g. ulcerative colitis, *Crohn's* disease
- Dysphagia, palpable abdominal mass
- History of *Zollinger ellison* syndrome
- History of sudden weight loss
- History of long-term medication
- Known cases of cancer, anaemia / haematemesis / melaena / diabetes mellitus
- Known cases of severe hepatic, renal or cardiac ailments
- History of addiction (tobacco chewing, smoking, alcohol, drugs)
- Pregnancy and lactation

Study Drug Details

S. No.	Study Drug	Form	Route of Administration	Dose	Frequency	Instruction
1.	*Jawārish Kamūnī*	Semisolid	Oral	5 gm	Twice daily	Take with water after meals
2.	*'Araq-i-Bādiyān*	Liquid	Oral	60 ml	Twice daily	

Composition of Unani Formulations

Table 1: Composition of *Jawārish Kamūnī* (Anonymous, 2007)

S.No.	Unani Name	Scientific Name	Weight
1.	*Zīra Siyāh Mudabbar*	*Cuminum cyminum*	350 g
2.	*Barg-i-Suddāb*	*Ruta graveolens*	350 g
3.	*Filfil Siyāh*	*Piper nigrum*	350 g
4.	*Zanjabīl*	*Zingiber officinale*	350 g
5.	*Būra Armānī*	*Borax*	100 g
6.	*'Asal or Qand Safaid*	*Honey or Sugar*	5 kg

Table 2: Composition of *'Araq-i-Bādiyān* (Anonymous, 2009)

S.No.	Unani Name	Scientific Name	Weight
1.	*Bādiyān*	*Foeniculum vulgare*	01 Part
2.	*Āb*	*Oxidane (Water)*	20 Parts

Assessment

The assessment of patients was done according to the subjective parameters such as abdominal pain, heartburn, acid regurgitation, eructation, abdominal distention and nausea and vomiting. As the subjective parameters differ in severity from patient to patient, an arbitrary grading, i.e. Gastrointestinal Symptom Rating Scale (GSRS) was applied for proper assessment and statistical analysis.

Abdominal pain: Representing subjectively experienced bodily discomfort, aches and pains, type of pain may be classified according to the patient's description of the appearance and quality of pain as epigastric on the basis of typical location, association with acid-related symptoms, and relief of pain by food or antacids; as colicky when occurring in bouts, usually with a high intensity, and located in the lower abdomen; and as dull when continuous, often for several hours, with moderate intensity.

Rating according to intensity, frequency, duration, request for relief and impact on social performance is as given below:

0 = No or transient pain

1 = Occasional aches and pains interfering with some social activities

2 = Prolonged and troublesome aches and pains causing requests for relief and interfering with many social activities

3 = Severe or crippling pains with impact on all social activities

Heartburn: Rating according to intensity, frequency, duration and request for relief is as given below:

0 = No or transient heartburn

1 = Occasional discomfort of short duration

2 = Frequent episodes of prolonged discomfort; requests for relief

3 = Continuous discomfort with only transient relief by antacids

Acid regurgitation (sour water in the mouth again and again): Rating according to intensity, frequency and request for relief is as given below:

0 = No or transient regurgitation

1 = Occasional troublesome regurgitation

2 = Regurgitation once or twice a day; requests for relief

3 = Regurgitation several times a day; only transient and insignificant relief by antacids

Eructation (sour and burned burping): Rating according to intensity, frequency and impact on social performance is as given below:

0 = No or transient eructation

1 = Occasional troublesome eructation

2 = Frequent episodes interfering with some social activities

3 = Frequent episodes seriously interfering with social performance

Nausea and vomiting: Rating according to intensity, frequency and duration is as given below:

0 = No nausea

1 = Occasional episodes of short duration

2 = Frequent and prolonged nausea; no vomiting

3 = Continuous nausea; frequent vomiting

Abdominal distention: Rating according to intensity, frequency, duration and impact on social performance is as given below:

0 = No or transient distension

1 = Occasional discomfort of short duration

2 = Frequent and prolonged episodes which can be mastered by adjusting the clothing

3 = Continuous discomfort seriously interfering with social performance

The subjective parameters were recorded before and after treatment. Statistical analysis was restricted to those patients who completed full duration of the study. Student's t-test was used to analyze the efficacy of Unani formulations. The confidence level was set at $p<0.05$ for significant result.

Observations and Results

The findings of demographic and subjective parameters are presented in the following tables:

Table 3: Age-wise Distribution of Patients

Age Group (Years)	Total	Percentage (%)
18-30	26	37.68
31-40	21	30.43
41-50	15	21.74
51-55	7	10.15
Total	**69**	**100**
Mean ± S.E.M.	**34.94 ± 1.34**	

Out of 69 patients, 26 (37.68%) were found in the age group of 18-30 years followed by 21 (30.43%) in the age group of 31-40 years, 15 (21.74%) in the age group of 41-50 years and 7 (10.15%) in the age group of 51-55 years (Table 3).

Table 4: Sex-wise Distribution of Patients

Sex	Number of Cases	Percentage (%)	Mean ± S.E.M
Male	23	33.33	34.74 ± 2.42
Female	46	66.67	35.04 ± 1.62
Total	**69**	**100**	**34.94 ± 1.34**

Table 4 reveals the number of male and female patients in the study. The study had 69 patients in all, of which 23 patients (33.33%) were male and 46 (66.66%) female.

Table 5: Distribution of Patients According to Temperament

Temperament	Number of Cases	Percentage (%)
Damwī (Sanguine)	11	15.94
Balghamī (Phlegmatic)	22	31.88
Ṣafrāwī (Bilious)	34	49.28
Sawdāwī (Melancholic)	02	02.90
Total	**69**	**100**

Temperament-wise, the patients are distributed in Table 5. Data reveal that 11 (15.94%) patients were found *Damwī Mizāj*, 22 (33.88%) *Ṣafrāwī Mizāj*, 34 (49.28%) *Balghamī Mizāj* and 2 (02.90%) *Sawdāwī Mizāj*.

Table 6: Response in Relation to Sex of the Patients and Relief

Sex	Number of Cases (%)	Completely Relieved (90-100%)	Relieved (60-89%)	Partially Relieved (30-59%)	Not Relieved (< 30%)
Male	23 (33.33%)	02 (2.90%)	14 (20.29%)	07 (10.14%)	-
Female	46 (66.67%)	03 (4.35%)	21 (30.43%)	22 (31.89%)	-
Total	**69 (100%)**	**05 (7.25%)**	**35 (50.72%)**	**29 (42.03%)**	-

Out of 23 male patients, two (02.29%) got completely relieved, 14 (20.29%) relieved and seven (10.14%) partially relieved. In case of female patients, out of 46, three (04.35%) got completely relieved, 21 (30.43%) relieved and 22 (131.89%) partially relieved. No patient reported to have no relief (Table 6).

Table 7: Response in Relation to the Temperament of the Patients

Temperament	No. of Patients (%)	Completely Relieved (90-100 %)	Relieved (60-89 %)	Partially Relieved (30-59 %)	Not Relieved (< 30 %)
Damwī (Sanguine)	11 (15.94%)	04 (5.80%)	05 (07.24%)	02 (02.90%)	-
Balghamī (Phlegmatic)	22 (31.88%)	-	11 (15.94%)	11 (15.94%)	-
Ṣafrāwī (Bilious)	34 (49.28%)	01 (01.45%)	18 (26.09%)	15 (21.74%)	-
Sawdāwī (Melancholic)	02 (02.90%)	-	01 (1.45%)	01 (01.45%)	-
Total	**69 (100%)**	**05 (7.25%)**	**35 (50.72%)**	**29 (42.03%)**	**-**

Out of 11 *Damwī* patients, four (05.80%) got completely relieved, five (07.24%) relieved and two (02.90%) partially relieved. Out of 22 *Balghamī* patients, 11 (15.94%) got relieved and 11 (15.94%) partially relieved, whereas none was completely relieved. Out of 34 *Ṣafrāwī* patients, one (01.45%) got completely relieved, 18 (26.09%) relieved and 15 (21.74%) partially relieved. Out of the two *Sawdāwī* patients, one got relieved and the other partially relieved (Table 7).

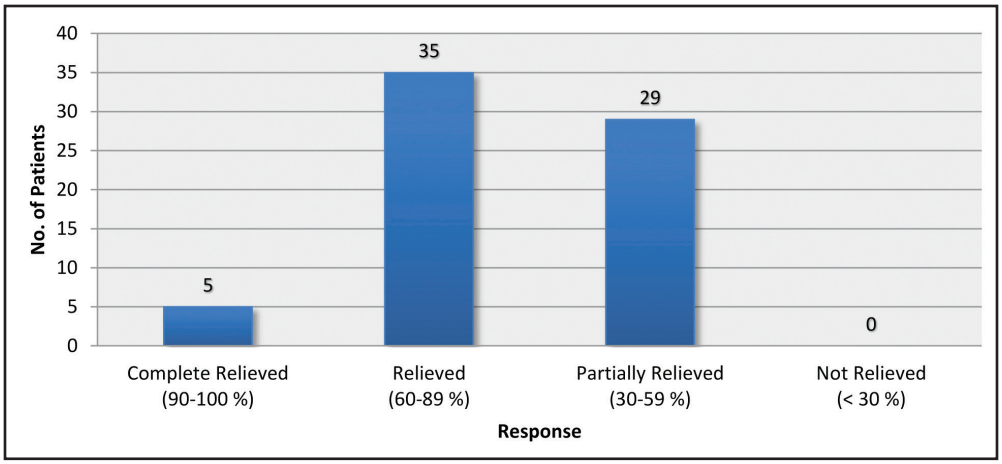

Fig. 1: General Therapeutic Response

Out of 69 patients, five (07.25%) got completely relieved, 35 (50.72%) relieved and 29 (42.03%) partially relieved.

Table 8: Effect of Drugs on Clinical Parameters

Sr. No.	Clinical Symptoms	Mean ± S.E.M			Comparison			
					Baseline vs 1st Follow-up		Baseline vs 2nd Follow-up	
		Base-line	1st Follow-up	2nd Follow-up	Efficacy (%)	P-value	Efficacy (%)	P-value
1	Abdominal Pain	2.19 ± 0.11	1.49 ± 0.1	0.77 ± 0.07	31.96	<0.001	64.84	<0.001
2	Heartburn	2.25 ± 0.11	1.59 ± 0.1	0.83 ± 0.07	29.33	<0.001	63.11	<0.001
3	Acid Regurgitation	2.04 ± 0.1	1.64 ± 0.1	0.74 ± 0.07	19.61	0.02	63.73	<0.001
4	Eructation	1.77 ± 0.11	1.26 ± 0.1	0.7 ± 0.07	28.81	<0.001	60.45	<0.001
5	Nausea Vomiting	1.87 ± 0.08	1.23 ± 0.09	0.71 ± 0.06	34.22	<0.001	62.03	<0.001
6	Abdominal Distention	2.35 ± 0.07	1.52 ± 0.08	0.81 ± 0.06	35.32	<0.001	65.53	<0.001

The mean score of abdominal pain was 02.19 before starting the treatment while it was 0.77 at the end of the treatment. The improvement in abdominal pain at the end of the treatment was 64.84% which was statistically significant at p<0.001. The mean score of heartburn was 2.25 before starting the treatment while it was 0.83 at the end of the treatment. The improvement in heartburn at the end of the treatment was 63.11% which was statistically significant at p<0.001. The mean score of acid regurgitation was 02.04 before starting the treatment while it was 0.74 at the end of the treatment. The improvement in

acid regurgitation at the end of the treatment was 63.73%, which was statistically significant at p<0.001. The mean score of eructation was 01.77 before starting the treatment, while it was 0.7 at the end of the treatment. The improvement in eructation at the end of the treatment was 60.45%, which was statistically significant at p<0.001. The mean score of nausea and vomiting was 01.87 before starting the treatment, while it was 0.71 at the end of the treatment. The improvement in nausea and vomiting at the end of the treatment was 62.03%, which was statistically significant at p<0.001. The mean score of abdominal distention was 02.35 before starting the treatment, while it was 0.81 at the end of the treatment. The improvement in abdominal distention at the end of the treatment was 65.53%, which was statistically significant at p<0.001. All the above described parameters are graphically presented in Fig. 2 and 3.

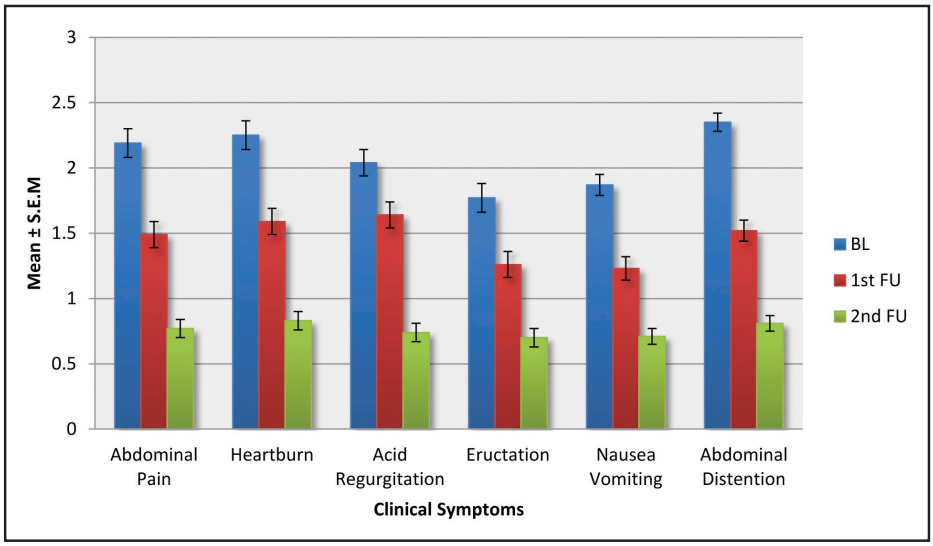

Fig. 2: Effect of Drugs on Clinical Parameters
BL = Baseline / 1st FU = 1st Follow-up / 2nd FU = 2nd Follow-up

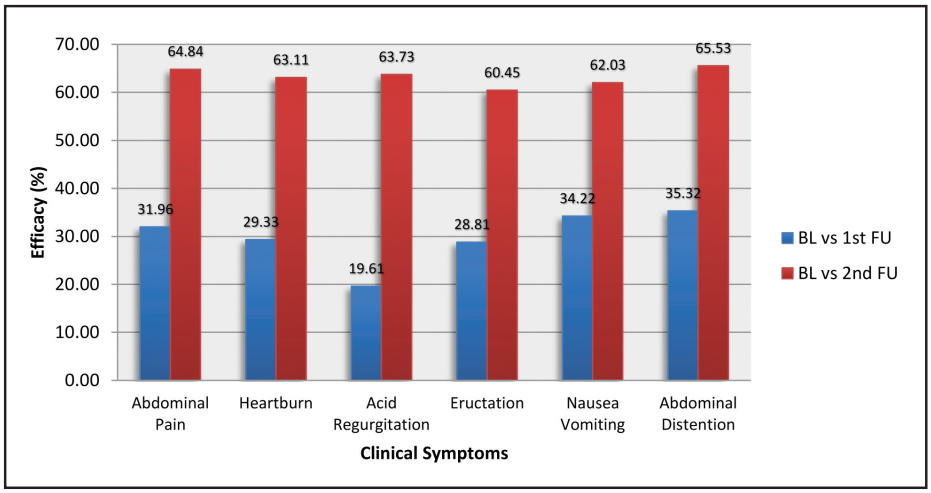

Fig. 3: Efficacy (%) of Drugs on Clinical Parameters
BL = Baseline / 1st FU = 1st Follow-up / 2nd FU = 2nd Follow-up

Table 9: Effect of Drugs on HAEMOGRAM, LFT and KFT

Name of Parameter			No. of Observation (n)	Mean ± S.E.M		Range		Percentage of Increase (↑) / Decrease (↓)		Paired 't' test	
				Before Treatment	After Treatment	Before Treatment	After Treatment			Statistic value	P-value
HAEMOGRAM	Hb (gm/dL)		69	82.7 ± 0.87	83.01 ± 0.94	68-98	62-104	0.38	↑	-0.55	0.57
	TLC (/mm)		69	6051.74 ± 130.99	5933.91 ± 80.92	4300-9800	4500-7950	1.95	↓	0.83	0.4
	DLC	N (%)	69	58.97 ± 0.79	59.23 ± 0.62	44-74	43-73	0.44	↑	-0.3	0.76
		L (%)	69	34.84 ± 0.77	35.41 ± 0.61	21-52	23-52	1.6	↑	-0.6	0.54
		E (%)	69	4.49 ± 0.41	3.84 ± 0.25	1-26	0-15	14.52	↓	1.97	0.052
		M (%)	69	1.61 ± 0.09	1.55 ± 0.09	0-4	0-4	3.6	↓	0.46	0.64
		B (%)	69	0 ± 0	0 ± 0	0-0	0-0	-	-	-	-
	ESR (mm)		69	21.59 ± 2.29	22.04 ± 2.3	2-110	2-110	2.04	↑	-0.29	0.76
LFT	S. Bilirubin (mg/100 ml)		62	0.7 ± 0.03	0.9 ± 0.03	0.27-1.3	0.5-1.3	21.77	↑	-5.45	<0.001
	SGOT (IU/L)		57	20.96 ± 1.23	19.26 ± 0.96	8-44	8-40	8.11	↓	1.75	0.08
	SGPT (IU/L)		60	27.5 ± 1.77	22.81 ± 1.09	3.6-62	10-50	17.05	↓	3.11	<0.01
	S. Alkaline Phosphatase (KA)		60	7.21 ± 0.33	6.57 ± 0.23	4-16.1	3-12	8.87	↓	2.39	0.02
KFT	S. Creatinine (mg/100 ml)		69	0.93 ± 0.03	0.89 ± 0.02	0.6-1.4	0.5-1.3	4.43	↓	2	0.04
	S. Urea (mg/100 ml)		69	20.75 ± 0.56	21.57 ± 0.69	12-38	10-46	3.8	↑	-1.51	0.13
	S. Uric Acid (mg/dL)		67	3.62 ± 0.09	3.57 ± 0.08	2.4-6.2	2.4-5.8	1.48	↓	0.93	0.35

The percentage reduction in SGOT, SGPT, TLC, serum uric acid, serum creatinine, serum alkaline phosphatase was 08.11% (p=0.08), 17.05% (p=0.01), 01.95% (p=0.4), 01.48% (p=0.35), 04.43% (p=0.04) and 08.87% (p=0.02) respectively while the percentage increase in serum urea, serum bilirubin and ESR was 03.8% (p=0.13), 21.77% (p<0.001) and 02.04% (p=0.76). Biochemical parameters of liver function test (S. bilirubin, SGOT, SGPT, alkaline phosphatase) and kidney function test (blood urea, serum creatinine), as assessed by laboratory investigations, were found within the normal range after treatment with the trial drugs.

Discussion

General therapeutic response shows that out of 69 patients, five (07.25%) were completely relieved, 35 (50.72%) relieved and 29 (42.03%) partially relieved. It is evident from the result that the symptoms and signs of dyspepsia were improved after the follow-ups. After completion of the treatment, highly significant improvement was found in acid regurgitation (63.73%), heartburn (63.11%), eructation (60.45%), abdominal pain (64.84%), abdominal distention (65.53%) and nausea and vomiting (62.03%). All these parameters were statistically significant at p<0.001. The improvement is in accordance with the statements of Ibn Sīnā (YNM), A'zam Khān (YNM), Akbar Arzānī (1903) and Kabīruddīn (1938).

The study disclosed that the highest incidence (37.68%) of the disease was in the age group of 31-40 years. This is due to the fact that the young people are fond of eating outside food as compared to homemade food. The study also revealed higher prevalence of the disease among the females. The findings are in agreement with the findings of Yazdanpanah *et al.*, 2012.

Abdominal discomfort is the classical feature of *Sū' al-Haḍm* (dyspepsia). It is produced due to *Sū'-i-Mizāj* either *Bārid* or *Ḥār* but the investigators selected patients of *Sū' al-Haḍm* (dyspepsia) caused by *Sū'-i-Mizāj Bārid* as a result of excessive accumulation of *Balgham* (morbid phlegm) inside the body and in *Mi'da* (stomach). The effect may be because of *Ḥār Mizāj* of all the ingredients (*Zīra Siyāh, Barg-i-Suddāb, Filfil Siyāh, Zanjabīl, Būra Armānī* and *Bādiyān*) of test formulations. These herbal Unani drugs possess various pharmacological properties like *Muqqawwi-i-Mi'da, Kāsir-i-Riyāḥ, Mulaṭṭif, Mushil, Mujaffif, Mufattih-i-Sudad*, *Dāfi'-i-Tashannuj* (antispasmodic), *Musakkin-i-Alam* (analgesic) *Muḥallil-i-Warm,* etc. (Ghani, YNM). These drugs alleviated the excess *Burūdat* from the body as well as from the *Mi'da* and produced *Ḥarārat (heat)*. Consequently, blood circulation of the affected part might have enhanced. The beneficial effect of the test formulation is substantiated by the use of these drugs in a variety of gastrointestinal diseases by eminent Unani scholars.

Conclusion

On the basis of above observations, it can be concluded that *Jawārish Kamūnī* and *'Araq-i-Bādiyān* are clinically effective and safe in the treatment of dyspepsia. All the clinical symptoms and signs such as abdominal pain, heartburn, acid regurgitation, eructation, nausea and vomiting and abdominal distention were significantly reduced. The trial drugs can be prescribed safely to the patients for the management of dyspepsia.

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सारांश

सू-ए-हज़्म (डिस्पेप्सिया) में यूनानी भेषजकोशीय मिश्रण *जवारिश-ए-कमूनी* और *अर्क़-ए-बादियान* की नैदानिक प्रभावकारिता और सुरक्षा

मो. इश्तियाक़ आलम, *मो. हशमत ईमाम, आयशा परवीन, मो. वसीम अहमद, अनीर्बान गोस्वामी और निग़हत अन्जुम

डिस्पेप्सिया (*सू–ए–हज़्म*) को उदर के ऊपरी हिस्से के आसपास बार–बार होने वाले दर्द या बैचेनी के रूप में परिभाषित किया गया है। दुनियाभर में लगभग 20–30 प्रतिशत लोगों को डिस्पेप्सिया की समस्या है। यह अध्ययन *सू–ए–हज़्म* की स्थिति में यूनानी भेषजकोशीय मिश्रण *जवारिश–ए–कमूनी* और *अर्क़–ए–बादियान* का वैधीकरण करने के लिए वर्ष 2014–2016 के दौरान क्षेत्रीय यूनानी चिकित्सा अनुसंधान संस्थान, पटना में किया गया। विस्तृत विवरण और नैदानिक तथा प्रासंगिक जांच के बाद *जवारिश–ए–कमूनी* और *अर्क़–ए–बादियान* रोगियों को भोजन के बाद दो विभाजित खुराक़ में क्रमशः 5 ग्राम और 60 मि.ली. प्रतिदिन 14 दिनों के लिए दिया गया। रोगियों को जीवनशैली और आहार में सुधार की सलाह दी गई। अध्ययन के परिणाम उत्साहजनक थे और उपचार के बाद किसी रोगी में कोई प्रतिकूल प्रभाव नहीं पाया गया।

शब्दकुंजी: *अर्क़–ए–बादियान, जवारिश–ए–कमूनी, सू–ए–हज़्म,* डिस्पेप्सिया

Study to Evaluate Efficacy of Coded Drugs UNIM -152 and UNIM -158 in Cases of Malaria

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Abstract

The study aimed to evaluate the therapeutic efficacy of Unani coded drugs UNIM-152 and UNIM-158 of Central Council for Research in Unani Medicine in mild malaria (*Ḥummā Ajāmiyya*) cases selected from the special health camp held at Jaipur, Rajasthan during March 8-25, 2007. The cases were selected based on the cardinal signs and symptoms of malaria like high spiking fever with or without periodicity, chills, headache, myalgia's, malaise and GI symptoms. The cases were subjected to routine urine microscopic test (to exclude urinary tract infection), blood test for TLC and DLC (to exclude typhoid fever provisionally) and thick and thin blood smear as well as rapid tests for falciparum and vivax species. They were divided into four groups; P. vivax positive, P. falciparum positive, negative, and both positive (P. vivax and P. falciparum). Further, the patients were randomly divided into two groups; group 1 (UNIM-152) and group 2 (UNIM-158). Thirty-four cases were enrolled in each group and three capsules each were given to the patients three times a day with follow-up on day 3, 5, 7 and 10. Significant decrease in temperature in group I (UNIM-152) was observed as compared to group II (UNIM-158), including relief in other signs and symptoms. The findings of the study reveal that UNIM-152 and UNIM-158 can be used for relieving fever and other signs and symptoms associated with malaria (*Ḥummā Ajāmiyya*).

Keywords: *Ḥummā Ajāmiyya,* Cytokines, Haemolysis, Malaria, Parasite, UNIM-152, UNIM-158

Introduction

Malaria (*Ḥummā Ajāmiyya*) is a protozoan disease of genus plasmodium affecting humans and some animals. Humans are affected by four plasmodium species, viz. P. vivax, P. falciparum, P. malariae and P. ovale, transmitted by infected female Anopheline mosquito (Anonymous, 2004; Caraballo, 2014). This disease is widespread in tropical and subtropical regions and exists in broadband around equator (Caraballo, 2014; Anonymous, 2006) which includes much of Sub-Saharan Africa, Asia and Latin America causing about 90% deaths in Africa. Malaria is commonly associated with poverty and has a major negative effect on economic development (Gollin, 2007; Worrall, *et al.*, 2005). In Africa, it is estimated to result in losses of USD 12 billion a year due to increased healthcare costs, loss of workforce and negative effects on tourism (Greenwood, *et al.*, 2005). Malaria affected states in India include Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Andhra Pradesh, Maharashtra, Gujarat, Rajasthan, West Bengal and Karnataka (Anonymous, 2004). It has been observed in India that there has

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been an increase in death rates in spite of reduction in total number of cases which is due to the development of drug resistance to falciparum malaria. Thus, there is always a need for a cost-effective, safer and cheaper drug.

Unani Perspective of Malaria (*Ḥummā Ajāmiyya*)

As per the Unani perspective, malaria (*Ḥummā Ajāmiyya*) is caused by *Mādda 'Ufūniyya* (infectious agents) and *Ajsām Khabītha* (pathogenic organisms). Ibn Sīnā stated that it is caused by *Mādda 'Ufūniyya* (infectious agents) which contains *Ajsām Khabītha* (pathogenic organisms). It propagates in stagnated open water and on flaccid objects. The *Ajsām Khabītha* convert natural humour to morbid humour (*Fāsid Akhlāṭ*). Drinking of such type of water causes disease of spleen (*Amrāḍ-i-Ṭihāl*). According to *Samarqandī,* it is caused by mosquito biting which lives in humid and open places.

Māhiyyat (Pathogenesis) of Malaria (*Ḥummā Ajāmiyya*)

The pathology in malaria is due to haemolysis of infected red cells and adherence of infected red blood cells to capillaries. Haemolysis is most severe with P. falciparum which invades red cells of all ages, especially young cells. Whereas P. vivax and P. ovale invade young cells, reticulocytes and P. malariae invade senescent RBCs for which infection remains lighter. In P. falciparum malaria, red cells containing schizonts adhere to capillary endothelium in brain, kidney, liver, lungs and gut. These vessels get congested and the organ becomes anoxic.

Malaria parasite digests the hemoglobin inside their acidic digestive vacuoles generating highly reactive byproducts of free radicals and iron-bound heme (Goldberg, 2005). The toxic heme is sequestered by the parasite to an inert insoluble malarial pigment i.e. hemozoin. Rupture of schizonts releases the above mentioned material that induces activation of macrophages and the release of proinflammatory mononuclear cell derived cytokines which causes fever and other pathologic effects. Thus, the main effects of malaria are haemolytic anaemia and, with P. falciparum, widespread organ damage (Fauci *et al.,* 2008). In addition to these factors, the plasmodial DNA is also highly pro-inflammatory and can induce cytokinemia and fever (MacKintosh, *et al.*, 2004; Chakravorty, 2008). The outcome of malaria infection is determined by the balance between the pro and anti-inflammatory cytokines (Omer, 2003).

Signs and Symptoms

Symptoms usually begin from ten to fifteen days after being bitten by mosquito, though it varies from ten days to eight months as per the species of parasite. Malaria causes symptoms of febrile paroxysms with typical cold, hot and sweating stage which may be mild to severe. In patients with P. falciparum

infection, fever may be irregular or even continuous and associated with severe headache, nausea and vomiting having tendency towards delirium (cerebral malaria), haemolytic jaundice, anaemia and acute renal failure. The complications of P. vivax, P. malariae and P. ovale are anaemia, spleenomegaly, hepatomegaly, renal complications, etc. Symptoms occur later in those individuals who take antimalaria drugs for prevention. If not properly treated, people may have recurrences of the disease months later (Caraballo, 2014). In individuals who have recently survived an infection, re-infection usually causes milder symptoms. This partial resistance disappears over months to years if the person has no continuing exposure to malaria.

Diagnosis

Malaria is diagnosed by demonstration of parasite in peripheral blood which is only available during fever with rigor. Thus, attending the patients with the a febrile stage mostly getting a negative result and suspicion of malaria arises from epidemiological and clinical evidence. A thin and thick smear on a single glass slide is useful in searching the malaria parasite as well as identifying the species. The latest antigen-based rapid diagnostic tests for different species of malaria parasite are widely used and compared favourably with microscopy (Moody, 2002).

Methods that use the polymerase chain reaction to detect the parasite's DNA have been developed but are not widely used due to their cost and complexity. The malarial fluorescent antibody test becomes positive after two weeks, thus it is only used in epidemiological studies (Johnston, *et al.*, 2006).

Materials and Methods

This study was done in malaria cases selected from the OPD of the special camp held at Jaipur, Rajasthan from 8 March 2007 to 25 March 2007. The cases were selected on the basis of presenting signs and symptoms of malaria such as fever with / without rigor, headache, body-ache, loss of sense of taste and appetite, nausea and vomiting, epigastric discomfort with/without a positive blood smear for malaria parasite. The subjects were clinically examined and presenting signs and symptoms were recorded on a case sheet devised for this purpose followed by laboratory tests.

Urine samples were collected first and routine tests were performed by Bayer's Strip Reader Clinitek-Status with multistix 10SG. Urine samples showing pus cells were excluded from the study. Cases without pus cells in their urine were subjected to blood test. Blood was collected by finger prick to make thick and thin blood smear on the same slide and three drops were put for antigen-based rapid diagnostic tests of P. vivax and P. falciparum. All the slides were stained

with geimsa stain. TLC, DLC and presence of malaria parasite in peripheral smear along with species identification were conducted. Cases with malaria parasite negative but with leucocytosis and/or neutrophillia were excluded from the study due to suspected Typhoid fever. Thus, total number of cases screened were 68 which were divided into the following four groups:

Group-A

Cases with the signs and symptoms of malaria along with a positive blood smear for malaria parasite P. vivax.

Group-B

Cases with the signs and symptoms of malaria along with a positive blood smear for malaria parasite P. falciparum.

Group-C

Cases with the signs and symptoms of malaria but blood smear for malaria parasite is negative.

Group-A+B

Cases with the signs and symptoms of malaria along with a positive blood smear for both P. vivax and P. falciparum.

Cases in each group were randomly allocated in either of the treatment groups:

Group-I: UNIM 152 - Three capsules (250 mg each) thrice daily

Group-II: UNIM 158 - Three capsules (250 mg each) thrice daily

Duration of Treatment: Three days in the first instance and extended to a maximum of nine days

Sample Size: Total 68 cases; 34 cases in group-I (UNIM 152), and 34 cases in group-II (UNIM 158)

TLC, DLC, Malaria Parasite in Peripheral Smear and in rapid diagnostic test were repeated after completion of treatment

Criteria for Assessment of Results

Response of the drugs was assessed in terms of subsidence in signs and symptoms along with clearance of parasite in the blood smear and rapid diagnostic test in malaria parasite positive cases. In malaria parasite negative cases, assessment was made on the basis of signs and symptoms only.

Results and Discussion

In group-I, 34 cases were screened, out of which 25 (75 %) completed the study and 9 (25 %) dropped out (Table 1). In all, 14 males (56%) and 11 females (44%) were enrolled in this subgroup. Out of 25 cases, 4 (16%) were diagnosed with vivax positive, 9 (36%) falciparum positive and 12 (48%) negative. All the four vivax positive cases remained vivax positive after the treatment while the effect of UNIM-152 on falciparum positive cases was different. Out of nine falciparum positive cases, seven remained falciparum positive, one became negative and one became both falciparum and vivax positive. Out of 12 negative cases, nine remained negative and three cases became vivax positive. In this group, five cases (20%) got relieved, 11 (44%) partially relieved, whereas nine (36%) not relieved and none got cured. Total and differential leucocyte counts were performed before and after the treatment. There was non- significant increase in TLC and lymphocytes, while in differential count there was non-significant decrease in polymorph, eosinophil and monocytes (Table 2).

Various signs and symptoms associated with malaria were also studied in this group. There was significant decrease in fever with rigor, headache, body ache

Table 1: MP Assessment in Study Group-I (UNIM-152)

Malaria Parasite (BL)	Malaria Parasite (Final)	Cases Screened	Completed Study	Dropout Cases	Symptom-wise Response
4 vivax (16%)	4 vivax	34 cases	25 cases (75%)	9 cases (25%)	P=11 cases (44%) R=5 cases (20%) NR=9 cases C=Nil
9 falciparum (36%)	7 cases falciparum 1 case negative 1 case both				
12 negative (48%)	3 cases vivax 9 cases negative				

P=Partially relieved, R=Relieved, NR=Not relieved, C=Cured

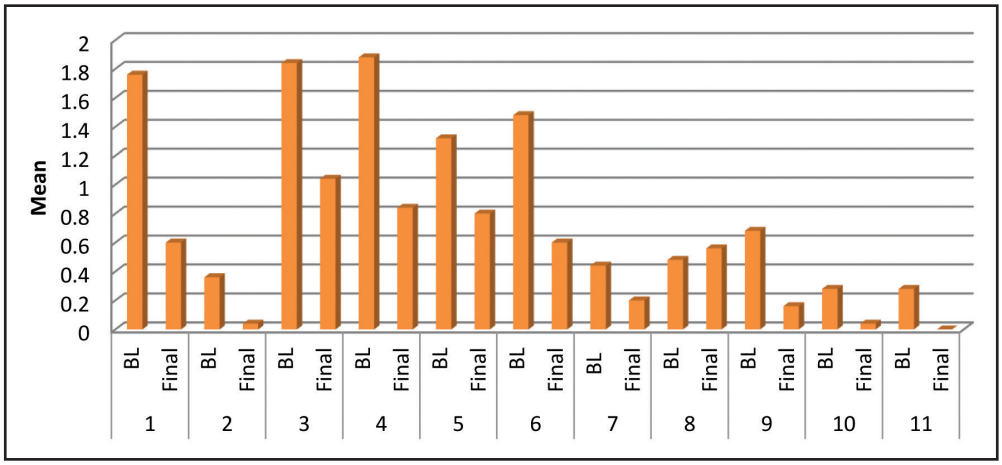
Table 2: Assessment of TLC and DLC in Group-I (UNIM-152)

Parameter → Group ↓	TLC (10^3/mm^3)	DLC			
		Polymorph	Lymphocyte	Eosinophil	Monocyte
Pre-treatment	5.53 ± 1266.4	61.68 ± 4.81	31.48 ± 9.70	4.28 ± 7.950	1.52 ± 1.08
End of follow- up	6.12 ± 1329.86**	59.20 ± 12.92**	36.16 ± 7.37**	3.72 ± 5.56**	1.200 ± 0.912**

*= Significant, ** = Non-significant

and temperature (Figure 1 and 2), while non-significant decrease was seen in case of fever without rigor. No change in loss of sense of taste, nausea, epigastric discomfort, liver and spleen size and tenderness were observed. Hence, it can be said that UNIM-152 not only helps in lowering the temperature but also gives relief in headache, body ache and fever with rigor.

In group-II, 34 cases were screened, of which 27 completed the study (79%) and seven (21%) dropped out. Out of the completed cases, nine (33%) were males and 18 (67%) females. As shown in Table 3, out of 27 completed cases, three cases (11%) were vivax positive, 10 (37%) falciparum positive, 13 (48%) negative and one (4%) both vivax and falciparum positive. All the three vivax and 10 falciparum positive cases remained unchanged after the treatment, while effect of UNIM-158 on 13 negative cases was entirely different. Out of



1: Fever with rigor; 2: Fever without rigor; 3: Headache; 4: Bodyache; 5: Loss of sense of test; 6: Nausea; 7: Epigastric pain; 8: Hepatomegaly; 9 Liver tenderness; 10: Spleenomegaly; 11: Spleen tenderness

Fig. 1: Effect of UNIM-152 on Signs and Symptoms

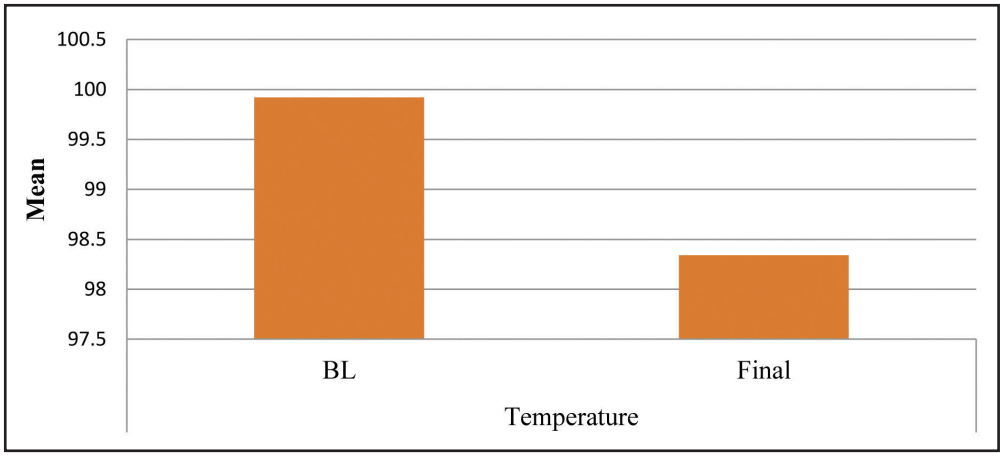


Fig. 2: Effect of UNIM 152 on Temperature

13 negative cases, one became falciparum positive, 10 remained negative and one became vivax positive. There was no effect on 4% of cases which were both vivax and falciparum positive. Out of the completed cases, 12 (44%) were partially relieved, one (4%) relieved, 14 (52%) not relieved and none got cured. There was non-significant decrease in TLC, polymorph and monocytes, while there was significant decrease in eosinophill (Table 4). In case of lymphocytes, there was non-significant increase.

Signs and symptoms associated with malaria were also studied in this group. There was significant decrease in fever with rigor and headache. On the other hand, there was non-significant decrease in fever without rigor, body ache, loss of sense of test, spleen and liver size and tenderness, epigastric discomfort and temperature (Figure 3 and 4). Hence, it can be said that UNIM-158 helps in lowering fever with rigor along with headache. Role of UNIM-158 in clearance of parasite in positive cases was not found. Therefore, it can be said that UNIM-158 is not effective in clearing parasite from the body; it only helps in relieving signs and symptoms.

Table 3: MP Assessment in Study Group-II (UNIM -158)

Malaria Parasite (BL)	Malaria Parasite (Final)	Cases Screened	Completed Study	Dropout Cases	Symptom-wise Response
3 vivax (11%)	3 vivax	34 cases	27 cases (79%)	7 cases (21%)	P=12 cases (44%) R=1 cases (4%) NR=14 cases (52) C=Nil
10 falciparum (37%)	10 cases falciparum				
13 negative (48%)	1 case falciparum 1 case vivax 10 case negative				
1 both (4%)	1 both				

P=Partially relieved, R=Relieved, NR=Not relieved, C=Cured

Table 4: Assessment of TLC and DLC in Group-II (UNIM-158)

Parameter → Group ↓	TLC ($10^3/mm^3$)	DLC			
		Polymorph	Lymphocyte	Eosinophil	Monocyte
Pre-treatment	6.09 ± 1311.21	61.185 ± 5.94	34.40 ± 5.87	2.92 ± 1.26	1.48 ± 1.188
End of follow-up	5.9407 ± 1128.139**	60.92 ± 4.187**	35.5926 ± 4.012**	2.2593 ± 0.594*	1.0370 ± 0.80773**

*= Significant, ** = Non-significant

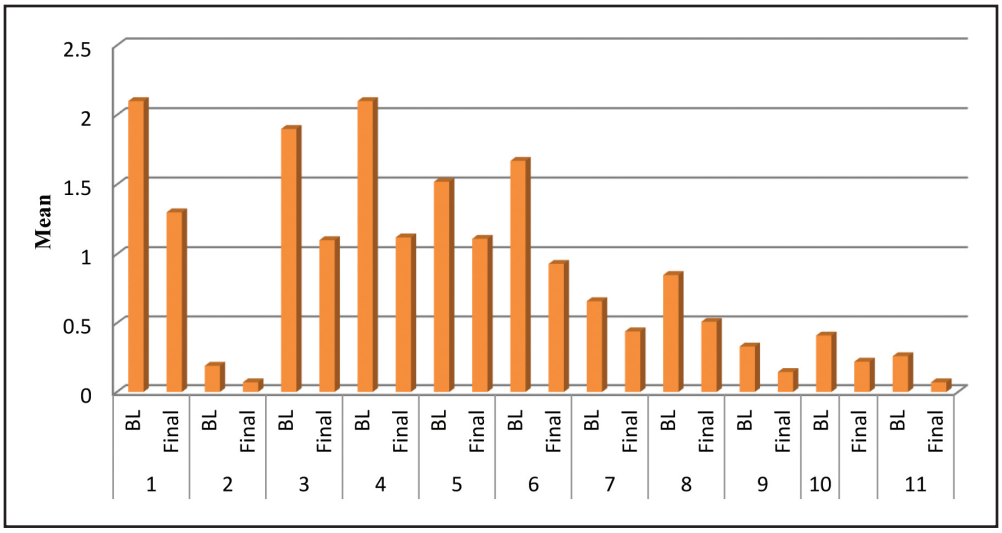


Fig. 3: Effect of UNIM-158 on Signs and Symptoms

1: Fever with rigor; 2: Fever without rigor; 3: Headache; 4: Bodyache; 5: Loss of sense of test; 6: Nausea; 7: Epigastric pain; 8: Hepatomegaly; 9 Liver tenderness; 10: Spleenomegaly; 11: Spleen tenderness

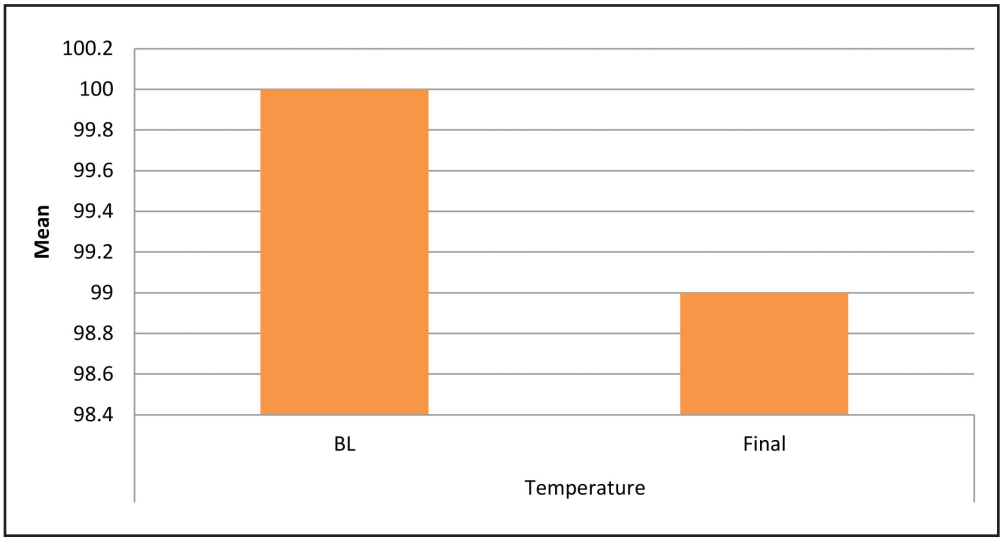


Fig. 4: Effect of UNIM-158 on Temperature

Conclusion

On the basis of the above findings, it can be concluded that both the Unani formulations, i.e. UNIM-152 and UNIM 158, were not able to clear the parasite from blood stream but these trial drugs were highly effective in subsidence of signs and symptoms in cases of malaria. It might be possible that either the chemical nature or dose of the trial drugs is such that it only acts on cytokines causing the signs and symptoms but does not act on the parasite. The drug concentration in the digestive vacuoles of the parasite might not be sufficient

to interfere with heme detoxification which helps parasite survival (Valderramos and Fidock, 2006).

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सारांश

मलेरिया रोगियों में कोडित औषधियों यूनिम-152 और यूनिम-158 की प्रभावकारिता का मूल्यांकन अध्ययन

***मीना के. नाईक, अनवर जमाल, वसीम अहमद और प्रियंका वर्मा**

इस अध्ययन में केन्द्रीय यूनानी चिकित्सा अनुसंधान परिषद् द्वारा 8–25 मार्च 2007 को जयपुर, राजस्थान में आयोजित विशेष शिविर के बहिरंग रोगी विभाग से चयनित मलेरिया रोगियों में यूनानी कोडित औषधियों यूनिम–152 और यूनिम–158 की चिकित्सीय प्रभावकारिता का मूल्यांकन करने का प्रयास किया गया। रोगियों का चयन मलेरिया के मुख्य संकेत और लक्षण जैसे मियादी और ग़ैर मियादी तेज बुख़ार, सिरदर्द, वात–रोग, बेचैनी और जी.आई. लक्षणों के आधार पर किया गया। रोगियों का नियमित मूत्र सूक्ष्म परीक्षण (मूत्रमार्ग संक्रमण को ख़ारिज करने के लिए), टी.एल.सी. और डी.एल.सी. (अस्थायी रूप से टाइफाइड बुख़ार को ख़ारिज करने के लिए) और थिक और थिन ब्लड स्मेयर के साथ–साथ फेल्सीपेरम और वाइवैक्स प्रजातियों के लिए तत्काल परीक्षण के अधीन थे। इन्हें चार समूहों पी. वाइवैक्स सकारात्मक, पी. फेल्सीपेरम सकारात्मक, नकारात्मक और दोनों सकारात्मक (पी. वाइवैक्स और पी. फेल्सीपेरम) में विभाजित किया गया। इसके अलावा रोगियों को यादृच्छिकता से दो समूहों समूह–। (यूनिम–152) और समूह–।। (यूनिम–158) में विभाजित किया गया। प्रत्येक समूह में 34 रोगियों को पंजीकृत किया गया। रोगियों को प्रतिदिन तीन कैप्सूल दिये गये और तीसरे, पांचवें, सातवें तथा दसवें दिन पर जांच की गई। अन्य लक्षणों में राहत के साथ–साथ समूह–। (यूनिम–152) के रोगियों के तापमान में समूह–।। (यूनिम–158) की तुलना में उल्लेखनीय कमी देखी गई। इस अध्ययन से यह निष्कर्ष निकलता है कि यूनिम–152 और यूनिम–158 का उपयोग बुख़ार और हुम्मा अजामिया (मलेरिया) से जुड़े अन्य लक्षणों से राहत के लिए किया जा सकता है।

शब्दकुंजी: *हुम्मा अजानिया,* साइटोकाइन्स, हिमोलाइसिस, मलेरिया, परजीवी लक्षण, यूनिम–152, यूनिम–158

Clinical Evaluation of Unani Coded Drug UNIM-856 in *Dhahāb Mā' al-Asnān* (Tooth Hypersensitivity)

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Abstract

The clinical efficacy of Unani coded drug UNIM-856 was evaluated in 35 patients of *Dhahāb Mā' al-Asnān* (tooth hypersensitivity) of either sex ranging from 20 to 60 years of age. The patients were advised to use 2 gm of the test drug as fine powder to rub over the surface of the gums and teeth by the index finger and leave it for five minutes then rinse with fresh water. Scoring for tooth hypersensitivity was done before the treatment and at weekly intervals after initiating the treatment. The treatment was given initially for 15 days. Out of 35 cases, six showed 100% response, seven showed 71-99% response, another six showed 51-70% response, nine showed 31-50% response, three showed below 30% response and four showed no response. Thus, the test drug may be attributed to be quite effective in reducing *Dhahāb Mā' al-Asnān* (tooth hypersensitivity).

Keywords: Air stimulus, Gingival recession, *Dhahāb Mā' al-Asnān,* Tooth hypersensitivity, UNIM-856

Introduction

Gingival recession (receding gums) is the exposure of the roots of teeth caused by a loss of gum tissue or retraction of the gingival margin from the crown of teeth. Gum recession is a common problem in adults over the age of 40 years, but it may also occur among teens (Addy, 2002; Bal and Kundalgurkhe, 1999; Curro, 1990; Orchardson and Collins, 1987; Nagata, *et al.* 1994; Rees and Addy, 2002). Dental hypersensitivity is not elaborately discussed in Unani classics. It is described in *Al-Mu'ālajāt al-Buqrāṭiya* as gaseous disease which induces an acute condition on dental surroundings and results in accumulation of gases and pain, particularly this condition is associated with appearance of tinismus in the nerves. A number of Unani drugs are reported to be effective in dental hypersensitivity by many eminent Unani physicians (Khan, 1902; Tabari, 1997; Razi, 1998). Hence, this clinical study was planned to evaluate the therapeutic efficacy of Unani formulation in the patients of *Dhahāb Mā' al-Asnān* (tooth hypersensitivity).

It is not unusual for patients to complain of root surface sensitivity which causes sharp pain usually associated with gingival recession and exposed root surface. Several theories have been proposed to explain the unusual sensitivity and response of such exposed dentin to a stimulus or irritation. The most accepted theory is the hydrodynamic theory presented by Brannstrom, *et al.* (1972) which suggests that the fluids within the dentin tubules flow due to the thermal, mechanical, evaporative and osmotic stimuli. The flow of liquids

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in dentinal tubules can trigger nerves along the pulpal canal of the dentin, causing pain. This hydrodynamic flow can be increased by hot, cold, sweet or sour beverages (Chabanski *et al.,* 1996; Fischer *et al.,* 1992; Flynn *et al.,* 1985; Hastings, 2002; Kakaboura *et al.,* 2005; Taani and Awartani, 2002).

Dentinal hypersensitivity is a particular problem in patients immediately after periodontal surgery. A number of treatments have been used to provide relief such as topical fluorides, oxalates solutions, dentin bonding agents and desensitizing tooth pastes. But prolonged use of these drugs may have side effects as well as limited efficacy, while Unani drugs usually do not have such side effects, so it is worthwhile to test the Unani drug UNIM-856 on scientific parameters.

Type of Trial: An open-label clinical study

Subject Selection

Patients attending the dental OPD of Central Research Institute of Unani Medicne, Lucknow for treatment of *Dhahāb Mā' al-Asnān* (tooth hypersensitivity) were screened after written informed consent.

Inclusion Criteria

- Patients having *Dhahāb Mā' al-Asnān* (tooth hypersensitivity)
- Age from 20 to 60 years
- Patients of either sex
- Patients with adequate oral hygiene and only those willing to participate in the study

Exclusion Criteria

- Dental carries
- Periodontal disease
- Pregnant women
- Subjects not willing to come for regular follow-up for the entire duration of the study
- Non co-operative subjects
- Patients suffering from diabetes mellitus, hypertension, any systemic illness, etc.

Treatment Schedule

Drug: UNIM-856

Dosage and Mode of Administration

The patients were advised to use 2 gm of the test drug as fine powder to rub over the surface of the gums and teeth by the index finger and leave it for five minutes then rinse with fresh water.

Follow-up Method and Interval during Treatment

The patients were instructed to visit the OPD every week for assessment of tooth hypersensitivity and it was recorded accordingly.

Criteria of Assessment

1. Tooth hypersensitivity was observed by subjective scale from 0-100. Initially, tooth hypersensitivity was considered as 100%. After subsequent visits, reduction in tooth hypersensitivity was recorded in terms of percentage according to patient's spontaneous report on pro forma on weekly intervals.
2. Determination of percent improvement in each case was categorized in the following groups:
    - 100% improvement
    - 71-.99% improvement
    - 51- 70% improvement
    - 31-50% improvement
    - 01-30% improvement
    - 0% improvement

Grading of Disease

Grade I: Subject responds to air stimulus but does not request discontinuation of stimulus

Grade II: Subject responds to air stimulus and requests discontinuation or moves from stimulus

Grade III: Subject responds to air stimulus, considers stimulus to be painful and requests discontinuation of the stimulus

Data Recording: Data recording was done on a separate case sheet for each subject at the baseline and on every follow-up, i.e. every week up to two months.

Observations

The drug UNIM-856 was tried in 35 patients of tooth hypersensitivity of either sex in the age group of 20 to 60 years. The overall response was noted as 100%

in six cases, 71-99% in seven cases, 51-70% in another six cases, 31- 50% in nine cases, below 30% in three cases and no response in four cases (Table 1).

Age group-wise response in relation to the study drug reveals that the age groups 20-30 years and 41-50 years had better response as compared to other two groups, viz. 31-40 years and 51-60 years. However, the age group of 31-40 years responded better to the study drug than the age group of 51-60 years (Table 2).

Table 1: Overall Response to the Study Drug

Response	100%	71-99%	51-70%	31-50%	01-30%	No response
Patients	06	07	06	09	03	04

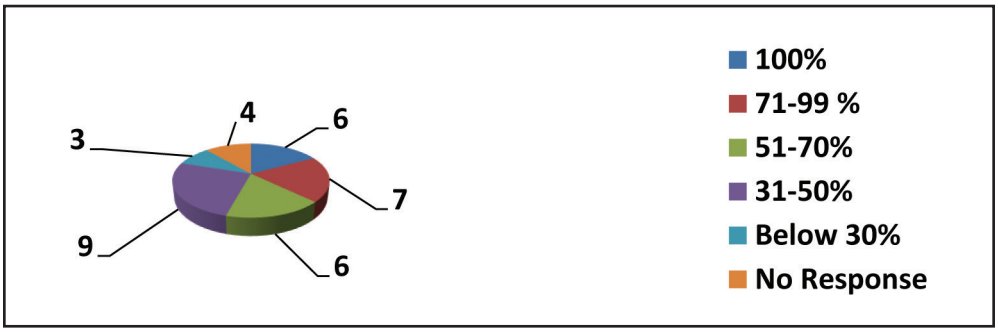

Fig. 1: Overall Response to the Drug UNIM-856

Table 2: Age Group-wise Response to the Study Drug

Age in Years	Response						Total (%)
	100%	71-99%	51-70%	31-50%	01-30%	No Response	
20-30	2	2	1	3	1	1	10 (28.57)
31-40	-	2	2	3	1	1	09 (25.71)
41-50	3	3	1	2	-	1	10 (28.57)
51-60	1	-	2	1	1	1	06 (17.15)
Total (%)	06 17.14	07 20.00	06 17.14	09 25.71	03 8.57	04 11.44	35 (100.00)

The sample size of 35 patients included 17 males and 18 females. The response to the study drug in both males and females was almost similar. However, data presented in Table 3 reveal that females responded better to the study drug as compared to males. Eleven females responded 51-100% to the study drug as compared to eight males (Table 3).

Table 3: Sex-wise Response to the Study Drug

Sex	Response						Total (%)
	100%	71-99%	51-70%	31-50%	01- 30%	No response	
Male	1	4	3	5	1	3	17 (48.51%)
Female	5	3	3	4	2	1	18 (51.49%)
Total (%)	**6 (17.14)**	**7 (20.00)**	**6 (17.14)**	**9 (25.71)**	**3 (8.57)**	**4 (11.44)**	**35 (100%)**

Temperament-wise assessment of response revealed that 20 cases were *Balghamī*, out of which four each got 100%, 71-99%, 51-70% and 31-50% response respectively and two got 01-30% response, whereas two showed no response. Five cases were *Damwī*, out of which one each got 71-99% and 51-70% response and three cases got 31-50% response. Data further revealed that seven cases were *Ṣafrāwī* and three were *Sawdāwī* (Table 4).

Table 4: Temperament-wise Response to the Study Drug

Tempera-ment	Response						Total (%)
	100%	71-99%	51-70%	31-50%	01-30%	No Response	
Balghamī	4	4	4	4	2	2	**20 (57.14)**
Damwī	-	1	1	3	-	-	**05 (14.28)**
Ṣafrāwī	1	1	1	2	1	1	**07 (20.00**
Sawdāwī	1	1	-	-	-	1	**03 (8.58)**
Total (%)	**6 (17.14)**	**7 (20.00)**	**6 (17.14)**	**9 (25.72)**	**3 (8.57)**	**4 (11.43)**	**35 (100.00)**

Table 5 reveals three grades of the disease. Response was 100% in six cases irrespective of the grades, however, three cases of grade I had 100% response to the study drug followed by two cases of grade II and one case of grade I. Overall response to the study drug was 42.86% in grade III, 31.43% in grade II and 25.71% in grade I.

Response of six patients out of 35 to the study drug was 100% where the duration varied from 15 days to 31-45 days. The overall response to the study drug was 48.57% in 16-30 day duration followed by 34.29% in treatment duration up to

15 days and 17.14% in treatment duration of 31-45 days. Further, data presented in Table 6 reveal that the study drug did not work in four (11.43%) patients (Table 6).

Table 5: Grade-wise Response to the Study Drug

Grade of Disease	Response						Total (%)
	100%	71-99%	51-70%	31-50%	01- 30%	No response	
Grade-III	1	2	1	3	1	1	15 (42.86)
Grade- II	2	2	3	2	1	1	11 (31..43)
Grade-I	3	3	2	4	1	2	09 (25.71)
Total (%)	6 (17.14)	7 (20.00)	6 (17.14)	9 (25.72)	3 (8.57)	4 (11.43)	35 (100.00)

Table 6: Duration of Treatment-wise Response to the Study Drug

Duration of Treatment in Days	Response						Total (%)
	100%	71-99%	51-70%	31-50%	01-30%	No Response	
Up to 15 days	2	1	2	3	2	2	12 (34.29)
16-30 days	3	5	3	4	1	1	17 (48.57)
31-45 days	1	1	1	2	-	1	06 (17.14)
Total (%)	6 (17.14)	7 (20.00)	6 (17.14)	9 (25.72)	3 (8.57)	4 (11.43)	35 (100.00)

The chronicity of the problem was less than one year in most (85.71%) of the patients followed by 1 to 3 three years in 14.29% patients. The study drug responded 100% in case of five patients with chronocity of less than one year. The study drug did not work in four patients (Table 7).

Dietary habit-wise, 23 (68.57%) patients were vegetarian and 12 (31.43%) non-vegetarian. The vegetarian patients responded better to the study drug as compared to the non-vegetarians. In case of vegetarian, five patients got 100% response and only one patient got 100% response in case of non-vegetarian. In case of vegetarian patients, five each got 71-99% and 31-50% response. The study drug did not work in four patients, including two vegetarian and two non-vegetarian patients (Table 8).

Table 7: Chronicity-wise Response to the Study Drug

Chronicity (In Years)	Response						Total (%)
	100%	71-99%	51-70%	31-50%	01-30%	No Response	
Less than 1 year	5	6	5	8	3	3	30 (85.71)
01-03 years	1	1	1	1		1	05 (14.29)
04-06 years	-	-	-	-		-	-
Total (%)	6 (17.14)	7 (20.00)	6 (17.14)	9 (25.72)	3 (8.57)	4 (11.43)	35 (100.00)

Table 8: Dietary Habit-wise Response to the Study Drug

Dietary Habit	Response						Total (%)
	100%	71-99%	51-70%	31-50%	01-30%	No Response	
Vegetarian	5	5	4	5	2	2	23 (68.57)
Non Vegetarian	1	2	2	4	1	2	12 (31.43)
Total (%)	6 (17.14)	7 (20.00)	6 (17.14)	9 (25.72)	3 (8.57)	4 (11.43)	35 (100.00)

Almost 50% of the respondents had the habit of chewing gutka/tobacco and it could be one of the reasons for developing tooth hypersensitivity. The overall response of the study drug in both groups seems to be not much different, 51.43% in case of non-chewers of gutka/tobacco as compared to 48.57% in chewers. Table 9 further shows that out of 17 patients with gutka/tobacco chewing habit, four each got 100% and 71-99% response respectively and three got 31-50% while another three showed no response. In case of non-chewing group of gutka/tobacco, two each got 100% and 1-30% response respectively. In case of one patient, the study drug did not work. Around 10 patients got 31 to 70% response (Table 9).

Statistical Analysis

Mean tooth hypersensitivity was 61.78% ($p<0.01$) after treatment. The test applied for the analysis was z-test (Table 10).

Table 9: Oral Hygiene Habit-wise Response to the Study Drug

Oral Hygiene Habit	Response						Total (%)
	100%	71-99%	51-70%	31-50%	01-30%	No response	
Gutka/ Tobacco Chewer	4	4	2	3	1	3	17 (48.57)
Gutka/ Tobacco Non-Chewer	2	3	4	6	2	1	18 (51.43)
Total (%)	6 (17.14)	7 (20.00)	6 (17.14)	9 (25.72)	3 (8.57)	4 (11.43)	35 (100.00)

Table 10: Mean Reduction in Scores

Initial Scores	Final Scores	Reduction Percentage (%)	Result
66.10 ±13.14	25.44 ± 33.67	61.78	P<0.0001, significant at p<0.01

N=35

Discussion

In Unani Medicine, there are many compound formulations which are safe and effective in the treatment of tooth hypersensitivity. It is not unusual for patients to complain of root surface sensitivity which causes sharp pain usually associated with gingival recession and expose root surface.

Much attention has been given to fluoride toothpastes in recent clinical trials in modern medicine which supply calcium and phosphate salts to the teeth and as such have demonstrated a significant effect in decreasing tooth hypersensitivity. It was related to the effect of occlusion of the dentinal tubules with a layer of calcium phosphate which has a calcium-to-phosphate ratio consistent with the formation of either amorphous calcium phosphate or hydroxyapatite.

The results of the present clinical study showed a significant reduction in tooth hypersensitivity. A statistically significant reduction in tooth hypersensitivity to thermal and cold liquid stimuli was noticed among the subjects between the 2nd and the 4th week. Tooth hypersensitivity is one of the most common and uncomfortable conditions that affect oral comfort and function. Studies regarding the prevalence of tooth hypersensitivity have reported that 4% to 57% of adults experience tooth hypersensitivity in one or more teeth. Some epidemiological studies have also revealed the prevalence of hypersensitivity

between 15% and 18% but some other studies have reported a higher prevalence of up to 50%. Dentin hypersensitivity is reported more frequently in women. The results of the present study indicated that experimental Unani coded drug UNIM-856 caused a significant reduction in dentin hypersensitivity for at least one week. The investigators followed-up the subjects for 60 days after treatment and found that the treatment was effective.

Conclusion

It can be concluded that the desensitizing agents used in the current clinical study were effective in relieving tooth hypersensitivity. The short-term treatment of tooth hypersensitivity with UNIM-856 showed statistically significant results. In order to substantiating the findings of the study, the authors suggest that a study of this kind may be conducted with a larger sample size for a longer duration.

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सारांश

ज़हाब माइल अस्नान (टूथ हाईपरसेंसिटिविटी) में यूनानी कोडित औषधि यूनिम-856 का नैदानिक मूल्यांकन

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यूनानी कोडित औषधि यूनिम–856 की नैदानिक प्रभावकारिता का मूल्यांकन दांतो में हाईपरसेंसिटिविटी के 20 से 60 वर्ष की आयु के 35 रोगियों पर किया गया। रोगियों को सलाह दी गई कि 2 ग्राम परीक्षण औषधि को महीन पाउडर के रूप में तर्जनी से मसूड़ों और दांतों की सतह पर रगड़ें और इसे पांच मिनट के लिए छोड़ दें और फिर ताजे पानी से कुल्ला करें। उपचार से पहले और उपचार के बाद साप्ताहिक अंतराल पर दांतो में हाईपरसेंसिटिविटी की स्कोरिंग की गई। शुरू में उपचार 15 दिनों के लिए किया गया। 35 रोगियों में से छः ने 100% प्रतिक्रिया, सात ने 71.99% प्रतिक्रिया, छः ने 51.70% प्रतिक्रिया, नौ ने 31.50% प्रतिक्रिया और तीन ने 30% से कम प्रतिक्रिया दर्शायी जबकि चार ने कोई प्रतिक्रया नहीं दर्शायी। इस प्रकार, यूनानी कोडित औषधि यूनिम–856 ने दांतों में हाईपरसेंसिटिविटी को कम करने में काफी प्रभावकारिता दिखाई।

शब्दकुंजी: ऐयर स्टिम्यूलस, जिन्जाइवल रिसेशन, टूथ हाईपरसेंसिटिविटी, यूनिम–856

Evaluation of Antibacterial Activity of *Bisbāsa* (*Myristica fragrans* Houtt.)

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Abstract

A wide variety of spices are available in nature and one among them is nutmeg (*Myristica fragrans Houtt.*). It is reported to have various activities such as antioxidant and antimicrobial properties. Apart from its traditional use in numerous medical conditions, nutmeg offers vital natural sources of antioxidants and antimicrobials. Antibacterial activity of arils part of *Myristica fragrans* (Mace) was assessed in this study against most prevalent gram negative microbes like *Escherichia coli, Pseudomonas aeruginosa*, *Shigella, Proteus vulgaris, Salmonella paratyphi, Klebsiella pneumoniae* and Gram positive *Staphylococcus aureus* in the solvent extracts using agar well diffusion method. The evaluation of antibacterial activity on ethanol extract was found to be more active than other extracts and among the tested organisms *Shigella* was found to be more sensitive followed by *Pseudomonas aeruginosa, Staphylococcus aureus, Klebsiella pneumoniae* and *Proteus*.

Keywords: Arils, Bacterial infections, *Bisbāsa*, Gram negative microbes, Mace

Introduction

Despite extensive uses of antibiotics and vaccination programmes, bacterial infections continue to be a leading cause of morbidity and mortality worldwide. Resistance to antimicrobial agents such as antibiotics is emerging in a wide variety of organisms and multi drug resistant organisms pose serious threat to the treatment of bacterial infections. Hence, plant-based antimicrobials have received a considerable attention in recent years and herbal plants used in Indian systems of medicine have antimicrobial property (Ahmad, *et al.*, 2015). *Myristica fragrance* is a small evergreen tree of the family Myristicacea. Arils of *Myristica fragrance* is popularly known as *Bisbāsa* / *Jāvitrī* (Mace) in Unani Medicine. Mace has been in use for a long time in the traditional system of medicine due to its beneficial properties (Dymock, 1980; William 2009; Saeed, 1996; Al-Baghdadi, 1362; Khan, 1892). It is used as tonic, stimulant, aphrodisiac, carminative and digestive (Anonymous, 1962). Mace oil is used as a remedy against sprains, rheumatism and paralysis (Kokate, 2017; Naikodi, *et al.*, 2011) and recommended for the treatment of inflammation of urinary bladder and urinary tract infection (Santapau and Henry, 1973). Mace contains 4-15% volatile oil and organic compounds such as terpenoids, phenols, alcohol, saponins, resins, starch, carbohydrates and inorganic compounds such as aluminium, calcium, magnesium, sodium, potassium, sulphate and phosphate (Anonymous, 1997; Kirtikar and Basu, 1999; Moodien, 1869; Nadkarni, 1976; Ghani, 1926). Studies conducted with mace showed anthelmintic effect (Dwivedi, *et al.*, 2011) and

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used in dental pain (Jangid, *et al*., 2014). Mutagenic activities have also been reported (Anonymous, 1992).

Materials and Methods

Collection of Plant Material

Arils of *Myristica fragrans* (Mace) were collected from the local market of Hyderabad and botanical identification was done by Dr. V. C. Gupta, SMPU, Central Research Institute of Unani Medicine, Hyderabad.

Preparation of Extracts

The material was extracted with three solvents independently, viz. methanol, ethanol and aqueous. 100g of the coarse powder was soaked into the respective solvent for three days followed by filtration of the solvent using Whattman's filter paper under aseptic condition. A stock solution of the extracts was prepared at the concentration of 200 mg/ml and stored at 20°C till further use.

Bacteria Cultures

To evaluate the antibacterial studies, all the strains were approved by the Clinical and Laboratory Standards Institute (CLSI) i.e. Gram negative microbes like *Escherichia coli, Pseudomonas aeruginosa*, *Shigella, Proteus vulgaris, Salmonella paratyphi, Klebsiella pneumoniae* and Gram positive *Staphylococcus aureus*. They were sub cultured on nutrient agar for every 15 day and maintained on nutrient agar slants at 4°C. Fresh inoculums were taken for the test.

Evaluation of Antibacterial Activity

Antibacterial activity of the extract was determined by agar diffusion assay (Reeves, 1979). Bacterial strains were first grown on Mueller Hinton broth (MHB) under shaking conditions for 24 hrs. at 37°C and after the incubation period, 0.1 ml of the test organisms and the inoculums were spread evenly with a sterile glass spreader on Mueller Hinton Agar (MHA) 90 mm plates with media thickness around 4-5 mm. In seeded plates, wells were made using sterile 6 mm cork borer in the inoculated MHA plate. The wells were filled with 200 microliter of the extracts (resuspended in respective solvents). The concentrations of stock solutions were 200 mg/ml. The inoculated plates were incubated at 37°C for 24 hrs. The plates were observed for the presence of inhibition of bacterial growth that was indicated by a clear zone around the wells. The size of the zone of inhibition was measured and the antibacterial activity was expressed in terms of average diameter of the zone of inhibition in millimeters.

Results and Discussion

Bacterial infections are always a public health concern in most of the developing countries. Nowadays, microbes are developing resistance to the currently used antimicrobial agents so a renewed effort has to be made to seek antibacterial agents which are effective against resistant pathogenic bacteria. Many of the plants have been investigated scientifically for antimicrobial activity and a large number of plant products have shown to inhibit the growth of pathogenic bacteria. A large number of these agents appear to have structures and modes of action that are distinct from those of the antibiotic in current use (Zahner and Fielder, 1995).

In the present study, three different extracts were tested for antibacterial activity of Mace. The size of the zone of inhibition was measured and the antibacterial activity was expressed in terms of average diameter of the zone of inhibition in millimeters. The ethanol, methanol and aqueous extract of *Myristica fragrans* were screened for antibacterial activity against the bacterial strains, i.e. Gram negative microbes like *Escherichia coli, Pseudomonas aeruginosa*, *Shigella, Proteus vulgaris, Salmonella paratyphi, Klebsiella pneumoniae* and Gram positive like *Staphylococcus aureus* (Table 1). Shigella was found to be more sensitive with high inhibition zone of 11 mm in ethanol extract and *Pseudomonas aeruginosa* showed sensitive with inhibition zone of 10 mm in ethanol extract. *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Proteus vulgaris* were found to be sensitive with inhibition zone ranges from 6 mm to 9 mm in ethanol extract whereas in other extract the zone of inhibition is less.

Table 1: Antibacterial Activity of Arils of *Myristica fragrans* (Mace)

S. No.	Bacterial Strains	Zone of Inhibition		
		Ethanol Extract (Mean ± SD)	Methanol Extract (Mean ± SD)	Aqueous Extract (Mean ± SD)
1	*Shigella*	11 ± 0.70 mm	Nil	Nil
2	*Staphylococcus aureus*	7 ± 1.2 mm	6 ± 1.0 mm	Nil
3	*Pseudomonas aeruginosa*	10 ± 0.70 mm	Nil	Nil
4	*Klebsiella pneumoniae*	6 ± 1.2 mm	Nil	Nil
5	*Proteus vulgaris*	6 ± 1.0 mm	6 ± 1.8 mm	Nil
6	*Salmonella paratyphi,*	Nil	9 ± 1.4 mm	Nil
7.	*Escherichia coli*	Nil	Nil	Nil

Zone of inhibition (mm) ± SD of three replicates

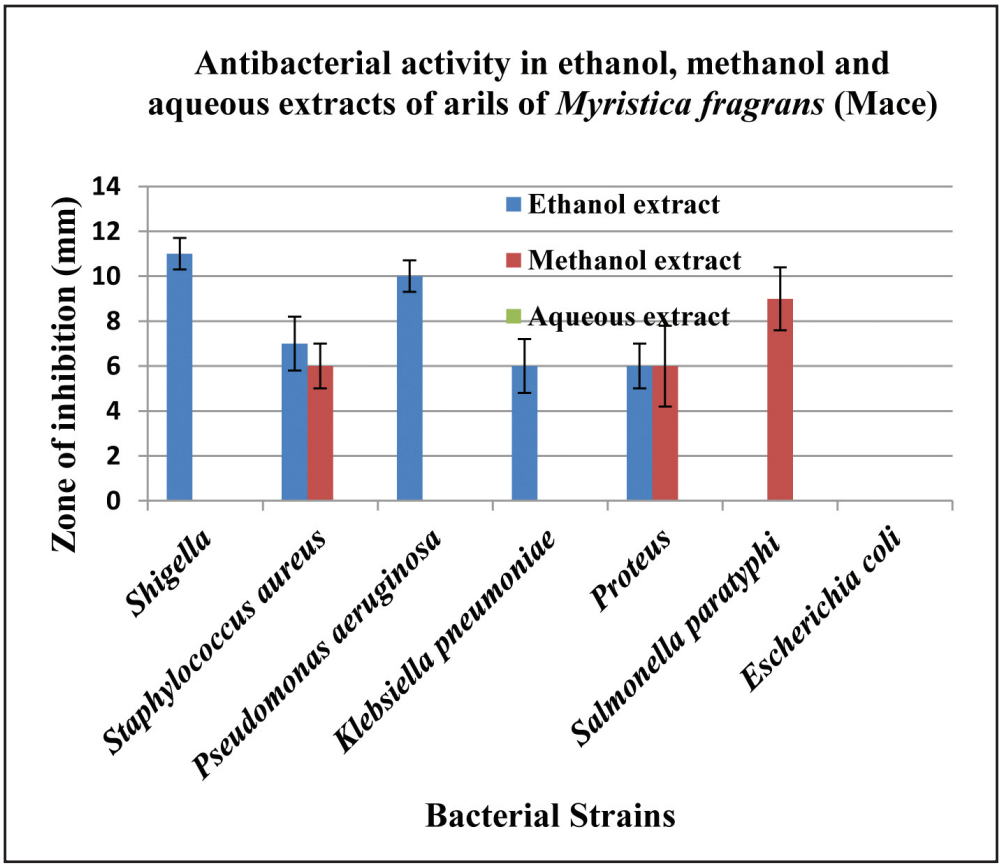

Fig.1: Zone of inhibition (mm) of bacterial strains in ethanol, methanol and aqueous extracts

Conclusion

The results obtained in the study provide scientific support to the indigenous uses of mace for the treatment of bacterial infections. Further, more efforts are needed for investigating the principle in these extracts which has the antibacterial activity against bacterial infections.

Acknowledgement

The authors are grateful to the Director, Central Research Institute of Unani Medicine, Hyderabad for providing financial support and other necessary facilities to carry out the present study.

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सारांश

बिसबासा (मिरिस्टिका फ्रैग्रेन्स हाउट) की जीवाणुरोधी सक्रियता का मूल्यांकन

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प्रकृति में विभिन्न प्रकार के मसाले उपलब्ध हैं और इनमें एक *बिसबासा* (मिरिस्टिका फ्रैग्रेन्स हाउट) है। इसमें एन्टीऑक्सिडेंट और एंटीमाइक्रोबियल जैसे विभिन्न गुण उपलब्ध हैं। अनगिनत चिकित्सा स्थितियों में पारंपरिक उपयोग के अलावा, जायफल एन्टीऑक्सिडेंट और एंटीमाइक्रोबियल सक्रियता का महत्वपूर्ण प्राकृतिक स्रोत प्रदान करता है। बिसबासा के जीवाणुरोधी सक्रियता का अनेकों गराम निगेटिव माइक्रोब्स जैसे ई. कोलाई, स्यूडोमोनास एरुगिनोसा, शीजेला, प्रोटियेस वल्गेरिस, सालमोनेला पेराटाइफी, क्लेबसिल्ला न्यूमेनाई और गराम पॉज़िटिव स्टेफाइलो कोक्कस आरियस पर एगर वेल डिफ्यूसन विधि का प्रयोग करते हुए विलयन सत्त में मूल्यांकन किया गया। इथेनॉल सत्त पर जीवाणुरोधी सक्रियता का मूल्याकंन अन्य सत्त की तुलना में अधिक सक्रिय पाया गया। परीक्षण किए गए जीवाणुओं में शीजेला को सबसे अधिक संवेदनशील पाया गया, उसके बाद स्यूडोमोनास एरुगिनोसा, स्टैफिलोकोकस ऑरियस, क्लेबसिएला न्यूमेनाई और प्रोटियस को अधिक संवेदनशील पाया गया।

शब्दकुंजी: एरिल्स, जीवाण्विक संक्रमण, बिसबासा, गराम निगेटिव माइक्रोब्स, जावित्री

Extraction and Evaluation of Anti-helminthic Activity of *Bisehri Booti* (*Aerva lanata* (L.) Juss), A Unani Medicinal Plant

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Abstract

The anti-helminthic activity of hydroalcoholic, alcoholic and aqueous extracts of aerial parts of *Bisehri Booti* (*Aerva lanata* L.) was evaluated against Indian earthworm *Pheritima posthuma* measuring 7-10 cm in length and 0.2-0.4 cm in width with various concentrations (25mg, 50mg and 100mg) of extracts and standard drugs. Albendazole was used as a reference drug, whereas normal saline and dimethyl formamide (DMF) were used as control. Results were expressed in terms of time taken for paralysis and time taken for death of earthworms. Dose dependent effect was observed in different extracts of the plant. High dose (100mg) of hydro-alcoholic extract possessed more significant effect than alcoholic, aqueous extracts of *Bisehri Booti* and Albendazole. Thus, this study indicates that the hydro-alcoholic extract may be used for anti-helminthic activity as an alternative to the synthetic drugs available in the market.

Keywords: Anti-helminthic, Alcoholic, Aqueous extract, *Bisehri Booti,* Hydro-alcoholic

Introduction

The infections of worm and helminthes are more common in the slum areas among men and affect a large number of population worldwide. According to World Health Organization (WHO), nearly 80% population in developing countries depend upon the herbal/conventional medicine like Unani, Ayurveda and Siddha for treatment of infections of worm and helminthes. The use of medicinal plants has been growing steadily because of the fear of toxicity and allergic reactions of the synthetic drugs. *Bisehri Booti* (*Aerva lanata*) is a relatively lesser known drug in Unani Medicine. Only Hakim Abdul Qadir (1930) mentioned about this drug in his book *Mujarrabāt-i-Qādrī*. Now, it is commonly known as *Bisehri Booti* and has been identified as *Aerva lanata* (L.) Juss and belongs to family of Amaranthecae (Afaq, *et al.*, 1991). It is prostrate to decumbent, sometimes wooly tomentose erect herb, 30-60 cm in height. It grows in the tropical part of India and distributed as a common weed in fields and wastelands. It is also grown in tropical part of Sri lanka, Phillippines, Africa, Java and Arabia (Krishnamurthi, 2003). It is commonly known as Bui Kalan (Hindi), Sirupulai (Tamil), Astambadya (Sanskrit), Gedue ki Chaal (Dehli), Khul (Daccini), Gorkha (Gujrati), Bui (Rajasthani), Sirupulai (Tamil) and Pindiconda (Telgu) (Siddiqui, 2015).

A survey of literature reveals that the different parts of the plant are used to treat a number of diseases in different parts of the country. The root is used to

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treat jaundice; biliousness in cases of snakebite (Rajasthan), headache (Gujarat) and the roasted root powder mixed with mustard oil is applied externally over the affected area in skin diseases (Madhya Pradesh). The whole plant is used in dyspepsia, pneumonia, typhoid and herpes in Orissa. In Thiruvanthapurum (Kerala), people use this plant as *garbhashayabalya* (uterine tonic) from 6th day of delivery for three days in the form of Halwa (sweat dish) with rice and jaggery. The literature also reveals that it is extensively used in Sri Lanka for sore throat, cough and dewormification of children (Siddiqui, 2015). It has been demonstrated scientifically for its important pharmacological actions by modern scientist such as diuretic (Siddiqui, *et al.*, 2016), anti-inflammatory (Vetrichelvan, *et al.*, 2000), antioxidant (Battu and Kumar, 2012), anti-diarrhoeal (Sunder, *et al.*, 2011), anti-hyper glycemic activity (Deshmukh, *et al.*, 2008), analgesic activity (Venkatesh, *et al.*, 2009), anti-urolithatic activity (Nirmaladevi, *et al.*, 2013), anti-asthmatic activity (Kumar, *et al.*, 2009), anthelminthic activity (Rajesh, *et al.*, 2010) and antibacterial potential (Siddiqui, *et al.*, 2016). But still no scientific report is available in Unani literature for anti-helminthic activity and comparative studies on *Bisehri Booti*. Hence, an attempt has been made in this article for the comparative evaluation of anti-helminthic potential of aerial parts of *Bisehri Booti* in different solvent systems.

Materials and Methods

Collection of Plant Material

The aerial parts of the plant *Bisehri Booti* known as Pindiconda (Telgu) was collected from the Raitu Bazar, A.G. Colony, Eragadda, Hyderabad, Telangana. The identity of the drug samples was confirmed by the Survey of Medicinal Plants Unit (SMPU), Central Research Institute of Unani Medicine, Hyderabad and voucher specimen was preserved under SMPU/CRI-HYD 13174 at SMPU for the purpose of records and future reference.

Drug and Chemicals

The drug Albendazole (Apple Formulation Pvt. Ltd.) was purchased from commercial sources and all other chemicals procured were of analytical grade.

Preparation of Extract

The aerial part of the plant was first dried in shade and then in hot air oven below 40°C. The dried plant was powdered with the help of an electric grinder and sieved with sieve no. 80 to get uniformity in the powder. This powder was used to prepare the extract by the method of Melecchi, *et al.* (2002). In this method, the coarse powder of the crude drug was placed in a stopper flask with

the solvent and allowed to stand at room temperature for a minimum period of two to three days with frequent agitation till the soluble matter was dissolved.

The powdered plant material was weighed 10 grams and the powder was placed into three conical flask and solvents like hydro alcohol (50% ethanol: 50% water), ethanol and distilled water were added respectively until the powder was fully soaked and 1ml of benzene was also added to that to avoid microbial contamination and allowed to stand for 48 hours. After 48 hours, the mixture was filtered by using Whatmann's filter paper, the filtrate containing drug extract was dried. The extracts of aerial parts of *Aerva lanata* were subjected to qualitative test for the purpose of identification of various active constituents and evaluation of anti-helminthic activity.

Phyto-chemical Evaluation

Tests for Alkaloids

Dragendorrf's Reagent Test: In the extract, a drop of Dragendorrf's reagent was added. The brown precipitate showed the presence of alkaloids.

Mayer's Reagent Test: In test solution, a drop of Mayer's reagent was added. The colour of the precipitate was observed. The white precipitate gives the evidence for the presence of alkaloids (Afaq, *et al.*, 1994).

Test for Amino Acids

The extract was mixed with Ninhydrin solution (0.1% in acetone). On heating gently over a water bath for a few minutes, the colour was observed. A change of colour to red-violet was taken as the indicator of the presence of amino acids (Brewster and Mc Ewen, 1971).

Test for Flavonoids

A piece of Magnesium ribbon was added to the extract of the drug followed by drop wise addition of concentrated HCl. Change of colour from orange to red is a confirmatory test for flavonoids. In the extract, concentrated hydrochloric acid was added and the colour was observed. Red colour indicates the presence of flavonoids (Fornasworth, 1966; Peach and Tracy, 1955).

Test for Tannin

Ferric chloride solution (1%) was added in the extracts of the drug. A bluish-black colour, which disappeared on addition of dilute sulphuric acid followed by a yellowish brown precipitate, showed the presence of tannins (Afaq, *et al.*, 1994).

Test for Proteins

Xanthoproteinic Reaction

In the test solution, concentrated nitric acid was added. A yellow precipitate appears and dissolves in strong solution of ammonia and gives yellow colour, showing the presence of proteins (Afaq *et al.*, 1994).

Sterols / Terpenes

Moleschott's Reaction

1 ml of extract was mixed with 5 ml of distilled water and 2 ml of concentrated sulphuric acid was poured by the side of the test tube and the colour was noted. The appearance of red coloured ring at the junction of two layers confirms the presence of sterols / terpenes (Afaq, *et al.*, 1994; Peach and Tracy, 1955).

Biological Evaluation

The assay was performed on adult Indian earth worm *Pheritima posthuma* due to its anatomical and physiological resemblance with the intestinal round worm parasite of human beings (Vidyarthi, 1967; Thorn, 1977; Vigar, 1984), easy availability of earthworm and widely *in vitro* used for the initial evaluation of anti-helminthic compounds (Sollmann, 1918; Jain and Jain, 1972; Dash *et, al.*, 2002; Shivkar and Kumar, 2003).

Earthworms and Dosage of the Drugs

Indian adult earthworms were collected from the slum area of J.J. Colony, Raj Nagar, Madan Pur Khader, Phase-3, Okhla, New Delhi. The collected earthworms were washed thoroughly in saline water to remove the external debris to be used for anti-helminthic activity. The earthworms of 7-10 cm in length and 0.2-0.4 cm in width were used for all the experimental protocol. All the extracts and the standard drug solution were freshly prepared before starting the experiments at a dose of 25mg, 50mg and 100mg in 2 ml of dimethyl formamide (DMF) and volume adjusted up to 15 ml with normal saline of each solution. Meantime for paralysis (in min) was noted when no movement of any sort could be observed except when the worm was shaken vigorously; time for death of worms (in min) was recorded after ascertaining that worms neither moved when shaken vigorously nor when dipped in warm water (50°C). Albendazole was used as a standard reference drug.

Anti-helminthic Activity

Anti-helminthic activity was carried out as per the method reported by Ravalli, *et al.* (2015) with minor modifications. The earthworms were divided into

four groups of six each. Six earthworms of nearly equal size were placed in a standard drug solution and test compound's solutions at room temperature. The test compounds and standard were evaluated by the time taken for complete paralysis and death of earthworms.

Statistical Analysis

The results were expressed as Mean ± SEM and statistically analyzed by one way ANNOVA followed by Dunnett's multiple comparison test with level of significance set at $P < 0.05$

Observations and Results

Table 1: Qualitative Analysis of *Bisehri Booti* (*Aerva lanata* (L.) Juss)

S.No.	Tests	Result
1.	Alkaloid	+ve
2.	Amino acid	+ve
3.	Protein	+ve
4.	Flavonoid	+ve
5.	Sterol/Terpene	+ve
6.	Tannin	+ve

Table 2: Treatment Drug Concentration and Time Taken for Paralysis (Min)

Concentration (in mg)	Time in Minutes ± EM			
	Albendazole	Hydroalcohol Extract	Alcoholic Extract	Aqueous Extract
25 mg	12.66±0.52	13.2±0.60^{ns}	25.61±0.92***	30.13±1.15***
50 mg	10.23±0.66	11.16±0.58^{ns}	18.06±0.59***	24.13±0.60***
100 mg	6.73±0.37	5.83±0.71^{ns}	9.28±0.54*	13.2±0.60***

Table 3: Treatment Drug Concentration and Time Taken for Death (Min)

Concentration (in mg/ml)	Time in Minutes ± EM			
	Albendazole	Hydroalcohol Extract	Alcoholic Extract	Aqueous Extract
25 mg	18.30±0.51	18.50±0.43^{ns}	32.71±0.78***	40.13±0.57***
50 mg	12.50±0.51	12.83±0.31^{ns}	22.13±0.52***	29.2±0.55***
100 mg	8.35±0.43	7.13±0.57^{ns}	12.13±0.56***	17.03±0.73**
Where, Std. = Albendazole, Control=Saline + DMF, SEM = standard Error Mean, ***= potent (p<0.001), **= potent (p<0.01), *= potent (p<0.05) and ns= (p>0.05)				

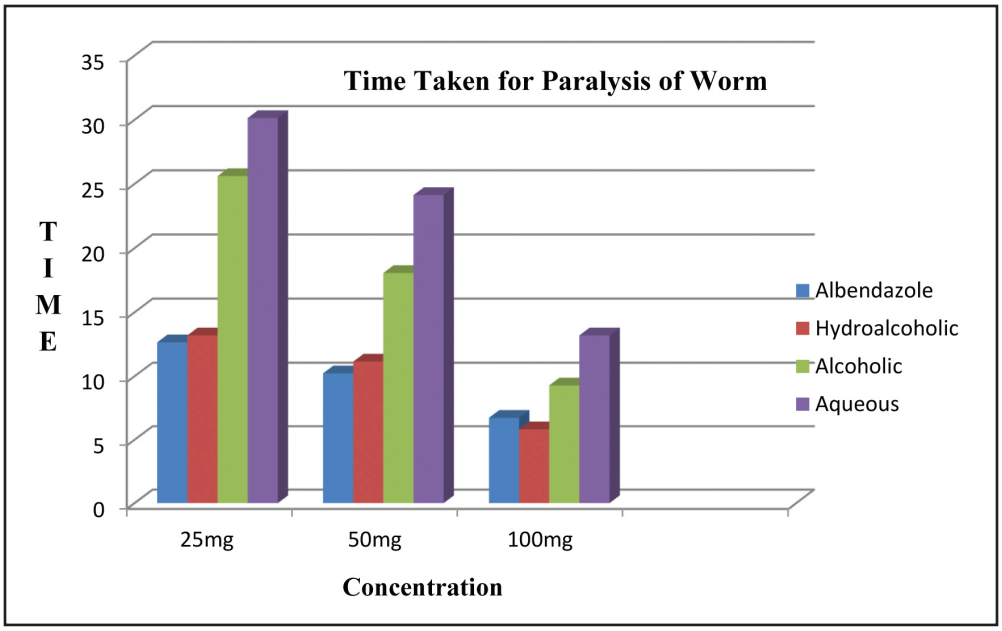

Fig. 1: Time taken for paralysis (min) of hydro-alcoholic, alcoholic and aqueous extracts of aerial parts of *Bisehri Booti* (*Aerva lanata* (L.) Juss) on *Pheretima posthuma*

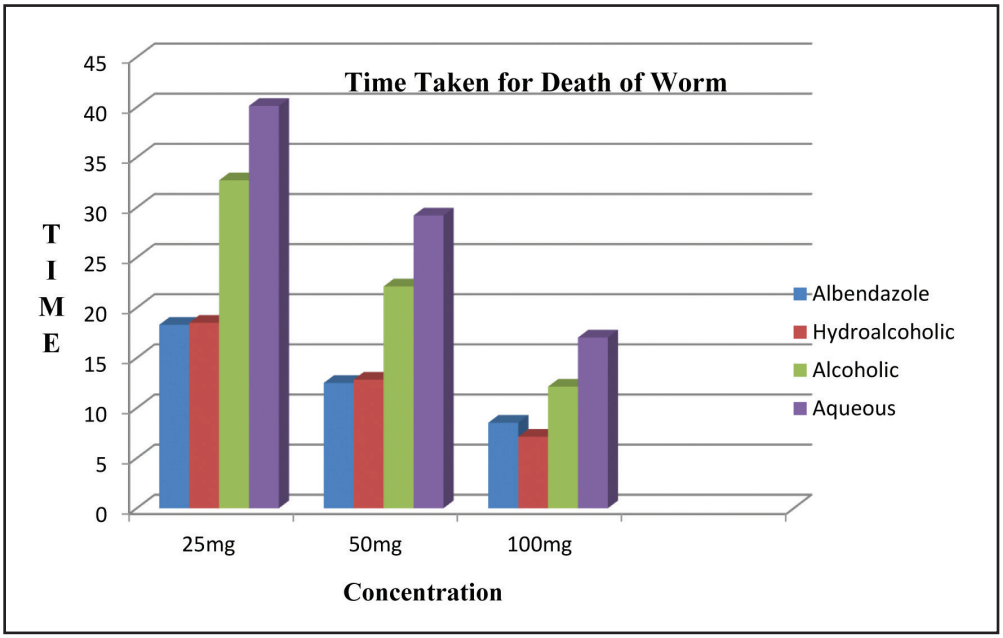

Fig. 2: Time taken for death (min) of hydro-alcoholic, alcoholic and aqueous extracts of aerial parts of *Bisehri Booti* (*Aerva lanata* (L.) Juss) on *Pheretima posthuma*

Discussion

It is a matter of concern that helminthes parasites infections are causing very serious problems socially and recoiling economy at a global level among the developing countries. Among the helminthic infections, only a few therapeutic agents have exclusive treatment but they are in limited range of compound

according to a report by World Health Organization (Bacikova, *et al.*, 1965). The continuous dependency of treatment on the limited range of compound has developed resistance to a number of species. Besides, treatment with Albendazole has also reported that it leads to multiple side effects like allergy, symptoms of nervous system and GIT disturbance, etc. Additionally, drugs like praziquantel and albendazole are contraindicated in lactating and pregnant women, hepatitis patients and in children below 2 years of age (Ravalli, *et al.*, 2015). Hence, the use of medicinal plants has increased nowadays because of the fear of toxicity and allergic reactions of the synthetic drugs. Preliminary phytochemical studies on *Aerva lanata* revealed the presence of flavanoids, sterol/ terpine, alkaloids, tannins, amino acid and proteins. Some of these phyto-constituents may be responsible to show a potent anti-helminthic activity. In this study, all the extracts (aqueous, alcoholic and hydro-alcoholic) showed anti-helminthic activity in dose dependent manner. Hydro-alcoholic extract of aerial parts of *Aerva lanata* at the dose of 100 mg took shortest time for paralysis and death in *Pheritima posthuma* in comparison to aqueous and alcoholic extracts and also showed slight potent anti-helminthic effect against the standard drug albendazole. The phytochemical analysis of the crude extracts divulged the presence of important chemical constituent tannin that possesses anti-helminthic activities because they are polyphenolic compounds chemically (Niezen, *et al.*, 1995; Bate, 1962). Synthetic anti-helminthic phenolic compound like bithionol, etc. have shown that they interfere with energy generation by uncoupling oxidative phosphorylation process in helminth parasites (Martin, 1997). Therefore, it is possible that the extracts of *Bisehri Booti* also possess tannins compound and may produce similar effect as that of synthetic phenolic compound by interfering energy generation in helminth. Similarly, tannins can bind free proteins of gastro intestinal tract of host animal or glycoprotein on the cuticle of the parasite and cause paralysis and death (Athnasiadou, *et al.*, 2001; Thompson and Geary, 1995).

Conclusion

Based on the results, it can be concluded that hydro-alcohol extract of the aerial part of *Bisehri Booti* exhibits a considerable potent anti-helminthic activity when compared to the alcoholic and aqueous extracts as well as to the reference standard. The present research work showed the validity and the clinical use of hydro alcohol extract of *Bisehri Booti* in the control of anti-helminthic activity. However, further studies are required to isolate and divulge the active compound in the crude extracts of *Aerva lanata* responsible for anti-helminthic activity.

Acknowledgement

The authors thank Prof. Asim Ali Khan, Director General, Central Council for Research in Unani Medicine, New Delhi and Dr. (Prof.) Munawwar H. Kazmi,

Deputy Director Incharge of Central Research Institute of Unani Medicine, Hyderabad for providing financial support to carry out the research work.

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सारांश

एक यूनानी औषधीय पादप बिसेहरी बूटी (*ऐरवा लनाटा* (लिन.) जस्स) का निष्कर्षण एवं उसकी एंटी-हेल्मिंथिक गतिविधि का मूल्यांकन

नजमुद्दीन ए. सिद्दीक़ी, असमा आबिद, मोहम्मद ज़ाकिर, अमीर आज़म और मसरूर अली कुरैशी

बिसेहरी बूटी (*ऐरवा लनाटा* (लिन.) जस्स) के ऊपरी भागों के हाइड्रोएल्कोहलिक, एल्कोहलिक और जलीय सत्त की एंटी–हेल्मिंथिक गतिविधि का मानक औषधि एवं सत्त की विभिन्न सांद्रता (25 मि.ग्रा, 50 मि.ग्रा. और 100 मि.ग्रा.) के साथ 7–10 से.मी. लम्बे और 0.2–0.4 से.मी. चौड़े भारतीय केंचुओं फेरितिमा पोस्तुमा के विरूद्ध मूल्यांकन किया गया। अल्बेंडाजोल का उपयोग एक सम्बंधित औषधि के रूप में किया गया जबकि सामान्य सेलाइन और डाइमिथाइल फॉर्मामाइड (डीएमएफ) का उपयोग नियंत्रण के रूप में किया गया। इसका परिणाम केंचुओं की गतिहीनता का समय एवं मृत्यु के लिए लिये गए समय के अनुसार व्यक्त किया गया। पादप के विभिन्न सत्तों में खुराक निर्भरता प्रभाव पाया गया। हाइड्रोएल्कोहलिक सत्त की उच्च खुराक (100 मि.ग्रा.) ने बिसेहरी बूटी के एल्कोहलिक एवं जलीय सत्त और अल्बेंडाजोल की तुलना में अधिक महत्वपूर्ण प्रभाव दिखाया। इस प्रकार, इस अध्ययन से पता चलता है कि बाज़ार में एंटी–हेल्मिंथिक गतिविधि के लिए सिंथेटिक औषधि के विकल्प के रूप में हाइड्रोएल्कोहलिक सत्त का उपयोग किया जा सकता है।

शब्दकुंजी: एंटी–हेल्मिंथिक, एल्कोहलिक, जलीय सत्त, बिसहेरी बूटी, हाइड्रोएल्कोहलिक

Standardization of Classical Unani Formulation – *Sharbat Zūfā Murakkab*

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Abstract

The traditional systems of medicine, including Unani Medicine, are being extensively used in primary health care. These medicines have lesser side effects and play a significant role in maintaining human health. In high altitude areas, traditional medicines are the first line of treatment for upper respiratory diseases. Considering their increasing popularity, standardization of traditional medicines has become essential to ensure their quality.

Unani polyherbal formulation, *Sharbat Zūfā Murakkab* is an important remedy which is widely used to cure *Su'āl Balghamī* (phlegmatic cough) and *Dama* (asthma) in high altitude areas. It possesses *Munaffith-i-Balgham* (expectorant) action and clears wet cough effectively. In view of the extensive use, it was taken up for standardization and development of Standard Operative Procedure (SOPs) to ensure the genuineness of the drug and availability of quality medicine in the market. *Sharbat Zūfā Murakkab* was standardized using pharmacopoeial parameters such as physico-chemical analysis and WHO parameters, viz. microbial contamination, pesticide residue, aflatoxins level and the presence of heavy metals to ascertain the quality of the drug.

Keywords: *Sharbat Zūfā Murakkab,* Physico-chemical, Standardization

Introduction

Sharbat Zūfā Murakkab is a Unani poly-herbal formulation, categorized as *Sharbat* (syrup) and is described in *Bayāḍ-i-Kabīr,* Vol.2. It is a reputed expectorant *(Munaffith-i-Balgham)* and used in the treatment of *Su'al Balghamī* (phlegmatic cough) and *Dama* (asthma) (*Kabiruddin,* 1938). *Gul-i-Zūfā* (flower of *Hyssopus officinalis*) is the main ingredient of this formulation. This ingredient is used in Unani Medicine for its deobstruent, expectorant, antiseptic, anti-inflammatory, carminative and vermicidal actions for the treatment of chronic cough, cold, stomachache, sciatica and colic (Khan, 2013).

The present study was aimed to standardize this important Unani drug to ensure its authenticity, quality and efficacy. In order to develop standard operating procedure, three batches of *Sharbat Zūfā Murakkab* were prepared on a laboratory scale at Drug Standardization Research Unit, New Delhi according to the formula described in *Bayāḍ-i-Kabīr,* Vol.2 (*Kabiruddin,* 2008) using all the ingredients of plant origin (UPI, Part I, Vol I, II, III, IV and V) (Table 1) which were botanically identified and standardized. The present paper describes the salient features of preparation, physico-chemical parameters, heavy metal estimations, aflatoxins and pesticide estimation (Anonymous, 2000).

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Materials and Methods

All the ingredients were procured from a local raw drug dealer and identified botanically (Wallis, 1967; Johanson, 1940) using pharmacognostical methods. The ingredients were further validated by comparing with their monographs available in UPI, Part I, Vol. I, II, III, IV and V. All the ingredients taken were of pharmacopoeial quality. The ingredients were cleaned and soaked in water (except sugar and *Gulqand*) for 24 hours. The soaked contents were then boiled till the water was reduced to half. The vessel was taken off from fire and allowed to cool at room temperature. The boiled ingredients were mashed in the decoction and strained through muslin cloth. Then sugar and *Gulqand* were added to the remaining decoction. The decoction was heated again till syrup of about 65 brix consistency was formed and again cooled at room temperature. The prepared syrup was transferred into a sterile container and preserved in a cool and dry place.

Chemical Analysis

Physico-chemical parameter of *Sharbat Zūfā Murakkab* such as removal of foreign matter, refractive index (Trease and Evans, 1972), pH (as such), total ash and acid insoluble ash, viscosity, optical rotation, reducing and non-reducing sugars were analyzed by standard methods (Anonymous, 2006). Detection of microbial load, aflatoxins, analysis of pesticide residue and heavy metals were carried out as per standard methods (Anonymous, 1998).

Observation

Sharbat Zūfā Murakkab is yellow brown colored syrup with pungent odour and slightly sour in taste. It does not show any foreign matter filth or fungal growth.

As *Sharbat Zūfā Murakkab* consists of aqueous extract of crude drug material, its microscopic studies do not show any histological structure. The result observed from the physico-chemical data, microbial load, aflatoxins, pesticide residues and heavy metals are shown in Table 2, 3, 4, 5 and 6 respectively.

Results and Discussion

The physico-chemical data of the formulation are shown in Table 2. The optical rotation value is +2.70. This *Sharbat* is dextrorotatory as it rotates in clockwise direction in the plane of polarization. The refractive index value is 1.463. The pH value is 5.34, which indicates the slightly acidic nature of *Sharbat*. The mean specific gravity of *Sharbat* is 1.3673, which is attributed to the dilute nature of *Sharbat*. Total ash value is very low which confirms its liquid nature and proves the absence of solid material. Acid insoluble ash is negligible. Reducing sugar is

Table 1: Formulation Composition

S.No.	Ingredients	Botanical / English Name	Part used
1.	Anjeer	*Ficuscarica* Linn.	Fruit
2.	Tukhm-e-Khatmi	*Althaea officinalis* Linn	Seed
3.	Asl-us-soos	*Glycyrrhiza glabra* Linn.	Root
4.	Irsa	*Iris ensata* Linn.	Root
5.	Badiyan	*Foeniculum vulgare* Mill.	Seed
6.	Tukhm-e-Karafs	*Apium graveolens* Linn.	Seed
7.	Parsiaoshan	*Adiantum-capillus-veneris* Linn.	Whole plant
8.	Zoofa Khushk	*Hyssopus officinalils* Linn.	Flower
9.	Maweez Munaqqa	*Vitis vinifera* Linn.	Fruit
10.	Gulqand	*Rosa damascene* Mill	Petals
11.	Qand	Sugar	Crystals

Table 2: Physico-Chemical Parameters

Sharbat Zūfā Murakkab			
Parameters	**Batch I**	**Batch II**	**Batch III**
Optical Rotation (5% Aq. Soln)	+ 2.70	+2.70	+2.69
Viscosity (50 % AqSoln)	4.01 CP	4.03 CP	4.05 CP
Total ash (%)	0.12	0.13	0.12
Acid Insoluble ash (%)	Nil	Nil	Nil
Specific Gravity	1.3510	1.3601	1.3909
Ref. Index	1.462	1.463	1.464
pH as such	5.34	5.35	5.34
Reducing Sugar	29.25	29.31	29.16
Non Reducing Sugar	39.75	39.82	39.91

29.25 and non-reducing sugar is 39.75% which indicates its sweet taste and high sugar content. It is fairly viscous as the viscosity value is 4.03 CP. The results of microbial studies, viz. TBC and TFC, are within the permissible limits while the other microbes are absent (Table 3). The results of aflatoxin studies (Table 4) and pesticide residue (Table 5) show that the drug is free from aflatoxin as well as from pesticide residue. The contents of heavy metals are below detection limits (Table 6) which suggests that the drug is free from any type of heavy metal contamination.

Table 3: Microbial Load

S.No.	Parameters Analysed	Results	Permissible limit as per WHO
1.	Total Bacterial load	Absent	10^5cfu/g
2.	*Salmonella spp*	Absent	Nil
3.	*Escherichia coli*	Absent	Nil
4.	Total *Fungal* count	Absent	10^3cfu/g

Table 4: Aflatoxins

S.No.	Parameters Analyzed	Results	Detection Limit
1.	BI	Not detected	0.50 ppm
2.	B2	Not detected	0.10 ppm
3.	G1	Not detected	0.50 ppm
4.	G2	Not detected	0.10 ppm

Table 5: Pesticide Residue

S.No.	Parameters Analyzed	Results	Detection Limit
1.	DDT	Not detected	1.00 mg/kg
2.	Endosulfan	Not detected	3.00 mg/kg
3.	Chlorpyriphos	Not detected	0.20 mg/kg
4.	Malathon	Not detected	mg/kg

Table 6: Heavy Metals

S.No.	Heavy Metals Analyzed	Results	Permissible limit as per WHO
1.	Arsenic	Not detected	3.00 ppm
2.	Cadmium	Not detected	0.30 ppm
3.	Mercury	Not detected	1.00 ppm
4.	Lead	Not detected	10.00 ppm

Conclusion

It can be concluded that organoleptic parameters are not much reliable in the identification of herbal drugs once the ingredients are powdered and mixed together for preparation of compound formulation. The present study, therefore, holds high significance as the various physico-chemical parameters provide criteria for easy identification of *Sharbat Zūfā Murakkab* and set standards for ensuring the authenticity, quality and efficacy of the medicine.

Acknowledgement

The authors are extremely thankful to the Director General, Central Council for Research in Unani Medicine, New Delhi for providing necessary facilities to carry out the study.

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सारांश

क्लासिक यूनानी मिश्रण *शर्बत-ए-जूफ़ा मुरक्कब* का मानकीकरण

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यूनानी चिकित्सा सहित पारंपरिक चिकित्सा पद्धति का उपयोग प्राथमिक स्वास्थ्य देखभाल में बड़े पैमाने पर किया जा रहा है। इन औषधियों के दुष्प्रभाव कम होते हैं इसलिए मानव स्वास्थ्य को बनाए रखने में महत्वपूर्ण भूमिका निभाते हैं। ऊंचाई वाले क्षेत्रों में पारंपरिक चिकित्सा सांस की बीमारी में प्राथमिक उपचार के रूप में उपयोग की जाती है। इनकी बढ़ती लोकप्रियता को देखते हुए गुणवत्ता को सुनिश्चित करने के लिए पांरपरिक चिकित्साओं का मानकीकरण आवश्यक हो गया है। यूनानी पॉली हर्बल मिश्रण, *शर्बत–ए–जूफ़ा मुरक्कब* एक महत्वपूर्ण औषधि है जिसका उपयोग व्यापक रूप से ऊंचाई वाले क्षेत्रों में *सुआल–ए–बलग़मी* (बलगमी खांसी) और *दमा* (अस्थमा) का उपचार करने के लिए किया जाता है। इसमें *मुनफ़िफ़स–ए–बलग़म* (एक्सपेक्टोरेंट) कार्यशीलता होती है जो बलगमी खांसी को प्रभावी ढंग से ठीक करती है। इसके व्यापक उपयोग को देखते हुए बाज़ार में वास्तविक और गुणवत्ता युक्त औषधि की उपलब्धता सुनिश्चित करने के लिए मानक संचालन प्रक्रिया (एस.ओ.पी.) के विकास और मानकीकरण के लिए इसे चुना गया। *शर्बत–ए–जूफ़ा मुरक्कब* को भेषजकोशीय मापदंडों जैसे भौतिक–रासायनिक विश्लेषण और डब्ल्यू.एच.ओ. मापदंडों अर्थात् सूक्ष्मजीवी संदूषण, कीटनाशक अवशेष, एफ्लाटोक्सिन्स स्तर और भारी धातुओं की उपस्थिति का उपयोग करके औषधि की गुणवत्ता का पता लगाने के लिए मानकीकृत किया गया।

शब्दकुंजी: *शर्बत–ए–जूफ़ा मुरक्कब,* भौतिक–रासायनिक, मानकीकरण

Phyto-chemical and Pharmacological Investigations of *Pūdīna* (*Mentha arvensis* L.)

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Abstract

The use of herbal drugs is as old as human beings. *Pūdīna* or *Mentha arvensis* L. belongs to the family of Lamiaceae. It is a common edible and aromatic perennial herb cultivated throughout India. It is one of the oldest culinary herbs known to the mankind and widely used in pharmaceutical, cosmetic and flavoring industries. As per the ancient Unani classical literature, it is used for various ailments such as nausea, vomiting, flatulence, indigestion, hiccup, mastitis, etc. In recent times, a lot of scientific studies have been conducted on *Pūdīna* namely; phyto-chemical, physico-chemical, pharmacological and clinical studies. In this paper, an attempt has been made to collect information on medicinal properties of *Pūdīna* as mentioned in Unani classical literature as well as in studies conducted in the recent past.

Keywords: Essential oil, Medicinal properties, *Pūdīna*, *Mentha arvensis*

Introduction

The medicinal plants are being therapeutically used throughout the world for treating various ailments. *Pūdīna* (*Mentha arvensis* L.) is a herb belonging to the family of Lamiaceae. It is a common edible and aromatic perennial herb cultivated throughout India and widely used in pharmaceutical, cosmetic and flavoring industries (Sharma, *et al.*, 2001). In Unani system of medicine, *Pūdīna* is widely used to relieve digestive ailments and known as kitchen herb from time immemorial. Regular cultivation of *Pūdīna* on a large scale started around 1870 in Japan (Chand, *et al.*, 2004). Some compound formulations which are available in the market are *Jawārish Pūdīna, Jawārish Anārain, 'Araq 'Ajīb* and *'Araq Pūdīna* (Ali, 2010).

Ethno-Pharmacological Description

Pūdīna is a well-known aromatic plant in Unani system of medicine and some Unani scholars have called it *Misni* (Ibn Baitar, 2003). In the medieval period, the Arab scholars described three types i.e. *barrī*, *kohī* and *nehrī*. Later on, the Unani scholars added a few more types of *Pūdīna* viz. *junglī*, *pahārī* and *bustānī*. (Hakim, 2002).

According to the classical literature, it has an erect stem which is quadrangular and slightly whitish in appearance and about one foot tall. The leaves are oval having toothed margins and very aromatic. Leaves are minutely hairy especially on lower side. Flowers are small, slightly reddish and blossom in the months of July and August (Ghani, YNM). Specimen of fresh *Pūdīna* leaves is shown in Figure 1.

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Fig. 1: *Pūdīna* leaves

Morphological Description

It is a perennial herb, mainly sowed in February-March. The stem is dark green, quadrangular, 60-90 cm high, bearing opposite leaves at each node. The internode region is smooth and striated. The twigs are 11 cm to 22 cm long bearing 6-9 nodes. Leaf base is exstipulate, petolate; petiole size 0.8 cm to 1.8 cm in length and 0.9 to 1.8 mm in breadth. Lamina surface shows hairs which are 5-celled, un-branched and moderately thick walled with warty surface, length 780 micron. Lamina composition is simple, incision absent, elliptical shape; reticulate venation, serrate margin, acute apex, lamina base symmetrical with tapering base, surface hirsute, green in colour, texture coriaceous, lamina length is variable ranging from 3-7 cm while the breadth ranges from 1 to 2.5 cm. The plant gives a sharp peppermint odour and has a pleasant acrid taste. Flowers are small purplish and arranged in loose cylindrical pattern with slender

Table 1: Scientific Classification of *Pūdīna* (Chawla, 2013)

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Asteridae
Order	Lamiales
Family	Lamiaceae
Genus	*Mentha*
Species	*arvensis*

spikes. Seeds are small and mucilaginous (Anonymous, 1997; Anonymous, 2008; Kirtikar, *et al.*, 2005)

The herb is native of temperate northern and western Himalayas and Kashmir at the altitude of 5,000-10,000 ft., and also found in Europe, North and West Asia, China and Japan. Now, it is mostly cultivated in gardens and fields especially in Konkan. Owing to commercial value of mentha oil, menthol and peppermint, it has become a cash crop and widely cultivated in western U.P. (Anonymous, 1997; Chopra, *et al.*, 1992; Kirtikar, *et al.*, 2005; Nadkarni, 1994)

Microscopic Description

The transverse section (T.S.) of the stem shows a quadrangular smooth outline. Epidermis is single layered covered with a cuticle layer. A group of annular collenchymatous cells are present below the epidermis in each of the four angles of the stem. The cortex is parenchymatous. Outer cortical cells have chloroplast. Vascular tissue is aggregated in four groups opposite to the four corners which gradually thin out towards the sides. The centre consists mostly of parenchyma (Anonymous, 1997). T.S. of midrib of leaf shows protruded midrib towards the lower surface, compact parenchymatous cells; enclose a crescent shaped vascular bundle. Lamina is dorsiventral, epidermal cells of both surfaces are wavy, stomata diacytic, uniseriate, 1 to 4 cells long, 42 to 350 micron in size with pointed apex. Palisade ratio is 6 to 8, vein islet number 18 to 20, stomatal index for upper epidermis 10 to 20 and lower epidermis 15 to 30 (Anonymous, 2008).

Parts Used

The parts used for medicinal purpose are mainly leaves and stems (Anonymous, 1997).

Temperament

Hot^2 and Dry^2 (Anonymous, 2008; Ibn Sina, 2007; Jagetia, *et al.*, 2002).

Hot^3 and Dry^3 (Anonymous, 1997; Ibn Baitar, 2003; Ghani, YNM; Khan, 1892; Momin, 2002)

Pharmacological Actions of *Pūdīna*

- *Kāsir-i-Riyāh* (Carminative) (Ali, 2010; Anonymous, 1992; Anonymous, 1997; Anonymous, 2008; Chopra *et al.*, 1992; Hakim, 2002; Khare, 2007; Kirtikar *et al.*, 2005; Momin, 1850; Nadkarni, 1994; Wyk *et al.*, 2004)

- *Muqawwī-i-Mi'da* (Stomachic) (Ali, 2010; Anonymous, 2008; Chopra *et al*., 1992; Khan, 1892; Nadkarni, 1994)
- *Mudirr-i-Bawl* (Diuretic) (Ali, 2010; Anonymous, 1997; Anonymous, 2008; Chopra *et al*., 1992; Kirtikar *et al*., 2005)
- *Mudirr-i-Hayḍ* (Emmenogogue) (Anonymous, 1997; Anonymous, 2008; Chopra *et al*., 1992; Kirtikar *et al*., 2005; Nadkarni, 1994)
- *Dāfi'-i-Qay'* (Anti-emetic) (Ghani, YNM; Khan, 1892; Momin, 1850)
- *Mu'aṭṭir* (Aromatic) (Ali, 2010; Ibn Sina, 2007; Nadkarni, 1994)
- *Munḍij-ī-Mawād Ghalīza* (Concoctive) (Anonymous, 2008; Ibn Sina, 2007; Khan, 1892)
- *Musakkin-ī-Alam* (Analgesic) (Anonymous, 1997; Anonymous, 2008; Ibn Sina, 2007; Khan, 1892; Momin, 1850; Nadkarni, 1994)
- *Qātil-i-Dīdān* (Anthelmintic) (Anonymous, 2008; Hakim, 2002; Khan, 1892; Momin, 1850)
- *Mushtahī* (Appetizer) (Ghani, YNM; Hakim, 2002; Ibn Sina, 2007; Khan, 1892; Momin, 1850)
- *Dāfi'-i-'Ufūnat* (Antiseptic) (Ali, 2010; Anonymous, 2008; Ibn Baitar, 2003)
- *Muḥarrik* (Stimulant) (Anonymous, 1997; Chopra, *et al*., 1992; Kirtikar, *et al*., 2005; Nadkarni, 1994)
- *Hāḍim* (Digestive) (Anonymous, 1992; Anonymous, 1997; Ghani, YNM; Hakim, 2002; Ibn Sina, 2007; Khan, 1892; Momin, 1850)
- *Mubarrid* (Refrigerant) (Chopra, *et al*., 1992; Kirtikar, *et al*., 2005; Nadkarni, 1994)
- *Munaffith-i-Balgham* (Expectorant) (Ali, 2010; Ibn Sina, 2007; Khan, 1892; Khare, 2007; Kirtikar *et al*., 2005)
- *Muqawwī-i-Kulya* (Renal tonic) (Kirtikar *et al*., 2005)
- *Mu'arriq* (Diaphoretic) (Kirtikar *et al*., 2005)
- *Muqawwī-i-Qalb* (Cardio-tonic) (Ibn Sina, 2007)
- *Mufarriḥ* (Exhilarant) (Ibn Sina, 2007; Khan, 1892; Momin, 1850)
- *Mukhrij-i-Janīn* (Abortifacient) (Khare, 2007)
- *Muraqqiq-i-Dam-i-Ghalīz* (Khan, 1892; Momin, 1850)
- *Muhallil* (Resolvent) (Ghani, YNM; Khan, 1892; Momin, 1850)

- *Mushil-i-Ṣafrā'* (Cholagogue) (Khan, 1892; Khare, 2007; Wyk *et al*., 2004)
- *Qābiḍ* (Astringent) (Ali, 2010; Ghani, YNM; Khan, 1892; Momin, 1850)
- *Mulaṭṭif* (Demulcent)(Ali, 2010; Ghani, YNM; Hakim, 2002; Ibn Sina, 2007; Khan, 1892; Momin, 1850)
- *Mujaffif* (Desiccant) (Ghani, YNM; Khan, 1892; Momin, 1850)
- *Muqawwī-i-Bāh* (Aphrodisiac) (Ali, 2010; Khan, 1892; Momin, 1850)
- Anti-bacterial (Khare, 2007; Wyk *et al*., 2004)
- Anti-fungal (Khare, 2007; Wyk *et al*., 2004)

Therapeutic Uses

- *Nafkh al-Mi'da* (Flatulence) (Ali, 2010; Anonymous, 1992; Anonymous, 1997; Anonymous, 2008; Chopra *et al*., 1992; Hakim, 2002; Khare, 2007; Kirtikar *et al*., 2005; Momin, 1850; Nadkarni, 1994; Wyk *et al*., 2004)
- *Du'f al-Mi'da* (Weakness of stomach) (Anonymous, 2008; Chopra *et al*., 1992; Khan, 1892; Kirtikar *et al*., 2005; Momin, 1850; Nadkarni, 1994)
- *Iḥtibās al-Bawl* (Retention of urine) (Anonymous, 1997; Anonymous, 2008; Chopra *et al*., 1992; Kirtikar *et al*., 2005)
- *Iḥtibās al-Ṭamth* (Amenorrhoea) (Anonymous, 1997; Anonymous, 2008; Chopra *et al*., 1992; and Kirtikar *et al*., 2005; Nadkarni, 1994)
- *Ghathayān* (Nausea) (Ghani, YNM; Khan, 1892; Momin, 1850)
- *Qay'* (Vomiting) (Ghani, YNM; Khan, 1892; Momin, 1850)
- *Waja' al-Mafāṣil* (Arthralgia/ Joints pain) (Anonymous, 1997; Anonymous, 2008; Ibn Sina, 2007; Khan, 1892; Momin, 1850; Nadkarni, 1994)
- *A'ṣābī Dard* (Neuralgia) (Anonymous, 1997; Anonymous, 2008; Ibn, 2007; Khan, 1892; Momin, 1850; Nadkarni, 1994)
- *Ṣudā'* (Cephalagia / Headache) (Anonymous, 1997; Anonymous, 2008; Ibn Sina, 2007; Khan, 1892; Momin, 1850; Nadkarni, 1994)
- *Ishāl* (Diarrhoea) (Anonymous, 1997; Anonymous, 2008; Nadkarni, 1982)
- *Hayḍa* (Cholera) (Anonymous, 1997; Anonymous, 2008; Ghani, YNM; Ibn Sina, 2007; Khan, 1892; Momin, 1850)
- *Fasād al-Haḍm* (Dyspepsia) (Anonymous, 1992; Anonymous, 1997; Ghani, YNM; Ibn Sina, 2007; Khan, 1892; Momin, 1850)
- *Amrād-i-Kabid* (Ailments of liver) (Anonymous, 1997; Ghani, YNM; Khan, 1892; Kirtikar, *et.al*., 2005 Momin, 1850)

- *Yaraqān* (Jaundice) (Anonymous, 1997; Ghani, YNM; Khan, 1892; Kirtikar, *et al.*, 2005 Momin, 1850)
- *Istisqā'* (Dropsy) (Ghani, YNM; Momin, 1850)
- *Amrād-i-Ṭiḥāl* (Ailments of spleen) (Kirtikar *et al.*, 2005)
- *Ḥummayāt* (Pyrexias) (Chopra, et.al., 1992; Kirtikar, *et al.*, 2005)
- *Nafth al-Dam* (Haemoptysis) (Ibn Sina, 2007; Momin, 1850)
- *Iltihāb al-Shu'ab* (Bronchitis) (Ibn, 2007; Khan, 1892; Khare, 2007; Kirtikar, *et.al.*, 2005)
- *Ḍīq al-Nafas* (Bronchial Asthma) (Ibn Sina, 2007; Khan, 1892; Khare, 2007; Kirtikar, *et al.*, 2005)
- *Fuwāq* (Hiccup) (Ghani, YNM; Khan, 1892; Momin, 1850; Nadkarni, *et al.*, 1994)
- *Khafaqān* (Palpitation) (Ghani, YNM; Khan, 1892)
- *Khurāj wa Dubayla* (Abscess) (Khan, 1892)
- *Waram Aṣl al-Udhun* (Parotitis) ((Ghani, YNM; Khan, 1892)
- *Waram al-Thadī* (Mastitis) (Khan, 1892; Momin, 1850)

Phyto-chemical Investigations

Organic constituents include glycosides, phenolics/tannins, proteins, reducing sugars, resins and steroids/terpenoids. The volatile oil contains menthol as main constituent. The leaves yield about 0.2 - 0.8% essential oil. According to the monographs of International Pharmacopoeia (I.P.), various constituents are limonene (1.0-5.0%), cineole (3.5-14.0%), menthone (14.0-32.0%), menthofuran (1.0 -9.0%), isomenthone (1.5-10.0%), menthyl acetate (2.8-10.0%), isopulegol (max. 0.2%), menthol (30.0-55.0%), pulegone (max. 4.0%) and carvone (max. 1.0%). Inorganic chemical constituents include antimony, calcium, iron, magnesium, potassium and sodium (Alankar, 2009; Anonymous, 1998; Anonymous, 1997; Anonymous, 2008; Chopra, *et al.* 1992)

Researches carried out at the Calcutta School of Tropical Medicine show that the amount of essential oil obtained from the whole dried plant from Kashmir was 0.18 – 0.2%. It is likely that specimens of fresh herb will give higher percentage of oil because the drying of herb before distillation will result in a loss of 50% of the oil. It has also been found by the Department of Agriculture Researches, U.S.A. that if the leaves are collected during the budding and flowering stages, the yield of oil on distillation is much higher than obtained afterwards (Nadkarni, 1994).

In a study, the gas chromatography–mass spectrometry (GCMS) analysis of *Pūdīna* extract revealed the presence of Eucalyptol, Isomethone, Linalool, methnol, 4-Terpineol, Oleic Acid, Tetra decanoic acid, 12-methyl-, methyl ester, Hexadecanoic acid, (Palmitic acid) and methyl ester (Dar, *et al.* 2014). In another study, the volatile oil composition of *Pūdīna* showed the presence of various components namely; dl-Limonene, Eucalyptol, α-Pinene, α-3-Carene, α-Phellandrene, Octylcyclobutanecarboxylate, 3-Octanol, L-Menthone, cis-Sabinene hydrate, Isomenthone, Linalool, neo-Menthol acetate, trans-Caryophyllene, neo-Menthol, 4-Terpineol, Menthol, trans-Anethole, δ-Terpineol, 2-Acetylfuran, δ-Terpineol, cis-Piperitone oxide, Isomenthone, 5-Isopropyl-6,7-epoxy-8-hydroxy-8-methylnon-2-one, 2,6,6-Trimethyl-cyclohex-1-enecarboxylic acid, 3-Methyl-3-(4-methyl-3-pentenyl)-oxiranemethanol, Caryophyllene oxide and 2,5-Dimethyl-3-hexyne-2,5-diol (Sharma, *et al.* 2009).

Physico-Chemical Investigations

Foreign matter	:	Not more than 2%
Total ash	:	Not more than 14%
Acid insoluble ash	:	Not more than 4%
Alcohol soluble extract	:	Not less than 2%
Water soluble extract	:	Not less than 7%
Essential oil	:	Not less than 0.2%
Loss on drying at 105°C	:	5.66%
Solid contents	:	72.01% pH: 6.5

(Anonymous, 1998; Anonymous 1997; Anonymous, 2008; Gupta, *et al.*, 2010)

Pharmacological Investigations

Antioxidant Activity

In a study, the analysis of antioxidant activity of *methanolic* and *aqueous extracts* of *Pūdīna* was done using free radical scavenging assays like DPPH, FRAP, SO, NO and H_2O_2. The presence of greater amount of phenolic compounds leads to a more powerful radical scavenging effect. It was found that *methanolic* extract of the leaves had a significant concentration of phenols as compared to the *aqueous* extract which concludes that *Pūdīna* has good activity against deleterious oxidants (Garg, *et al.,* 2012).

In another study, the *in-vitro* antioxidant activity of *ethanolic* extract of *Pūdīna* was investigated using DPPH radical scavenging assay and the extract showed free radical scavenging activity in assay (IC50~41 µg/ml) as compared to the standard antioxidant ascorbic acid (IC50~19 µg/ml) (Biswas, *et al.,* 2014).

Another study was carried out to evaluate the antioxidant potential of *methanolic* root extract of *Pūdīna* from Kashmir region by using 1, 1-diphenyl, 2-picrylhydrazyl (DPPH) scavenging, reducing power, metal chelating, nitrous oxide scavenging and hydrogen peroxide scavenging assays. The results indicated that the *methanolic* root extract of *Pūdīna* has good antioxidant potential (Dar, *et al.,* 2014).

Antimicrobial Activity

In a study, 63 urine samples were collected from urinary tract infected patients and subjected to microscopic observation and biochemical characterization to identify the presence of bacteria. The *Proteus mirabilis* was isolated on a specific medium using XLD (xylose lysine deoxycholates agar deficient), Macconkey agar, Mullen hinton agar, CLED and UTI agar. The positive isolate was used for the study. Leaves of *Pūdīna* were extracted by using acetone, isopropyl alcohol and petroleum ether. A comparative study on the total antibiotic activity of plant extracts was found to be effective against the tested isolated organism *Proteus mirabilis* and MTCC 442 strain. Minimal Inhibitory Concentration (MIC) and Minimal Bactericidal Concentration (MBC) were performed by agar dilution method. The result showed that plant extract of *Pūdīna* showed high antibacterial activity against tested organism (Pidugu, *et al.,* 2012).

In another study, the antibacterial efficacy of various solvent extracts namely 50% Methanol, 10% Methanol and ethyl acetate chloroform of *Pūdīna* plant against the human cariogenic bacteria was evaluated and showed varied levels of inhibition. Activity of different solvent extracts of *Pūdīna* was investigated by disc diffusion method and well diffusion method. As per the result, *methanolic* extract showed a broad spectrum of very significant antibacterial activity of producing a clear zone of inhibition against *Streptococcus mutans*, *Streptococcus sanguis*, *Staphylococcus aureus, Lactobacillus acidophilus* and *Lactobacillus casei* when compared to standard drug, Amoxycillin (Dwivedi, *et al.,* 2012).

In a study, cytotoxic potential of *ethanolic* extract of *Pūdīna* was investigated. The anti bacterial activity was studied by disc diffusion assay against some Gram-positive and Gram-negative bacterial strains. Brine shrimp lethality assay was used to investigate cytotoxity effects of the plant extract. The extract showed free radical scavenging activity in the DPPH assay (IC50~41 µg/mL) as compared to the standard antioxidant ascorbic acid (IC50~19 µg/mL). The extract also produced prominent antimicrobial activity against *Salmonella typhi*, *Salmonella paratyphi*, *Shigella boydii*, *Streptococcus pyogenes* and *Staphylococcus aureus* as compared to standard drug kanamycin (Biswas, *et al.,* 2014).

In another study, *in vitro* evaluation of the antimicrobial effects of essential oil of *Pūdīna* for a possible application to reduce the content of microorganisms in the

air of animal farms was done. The essential oil of *Pūdīna* was screened against bacteria *Staphylococcus aureus*, *Enterococcus faecium*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Proteus mirabilis* and *Candida albicans*. The MIC of the essential oil was tested using broth dilution assay. The oil showed a wide spectrum of antibacterial activity (Mickiene, *et al.,* 2011)

In another study, the anti-bacterial efficacy of chloroform, ethanol, ethyl acetate and water extracts of inter-nodal and leaves derived *calli extracts* from *Pūdīna* against *Salmonella typhi*, *Streptococcus pyogenes*, *Proteus vulgaris* and *Bacillus subtilis* was carried out. Antibacterial efficacy was performed by disc diffusion method and incubated for 24 hours at 37 °C. The leaves and stem derived *calli extracts* showed that the plants can be used in the treatment of urinary tract infection associated with *Proteus sp.* (Johnson, *et al.,* 2011).

Anti-fertility Activity

In a study, an uterotonic fraction of *Pūdīna* (UM-fraction) was tested for anti-fertility effect in rats. Subcutaneous administration of the UM-fraction to pregnant rats from day 1 to day 10 caused a significant interruption in pregnancy. The effect was pronounced during the post-implantation period (Kanjanapothi, *et.al.,* 1981).

In another study, alcoholic extract of leaves of *Pūdīna* at a dose of 100mg/kg and 500 mg/kg showed 80 and 100% inhibition of implantation respectively in female rats. The alcoholic extract of leaves also showed encouraging anti-ovulatory activity in rabbits (Rastogi, *et al.,* 1999).

Recent study shows that uterotonic fraction of *Pūdīna* has anti-implantation activity by enhancing the estrogenic effect of estradiol as it contains menthol, menthone and camphene (Khan, *et al,* 2016).

Anti-emetic Activity

In a research study, the efficacy of *Pūdīna* oil as a treatment for post-operative nausea was investigated. The study demonstrated that inhalation of oil vapors significantly reduces the postoperative nausea. It was also found that the oil vapors reduced the requirement of anti-emetics drugs after gynecological surgery (Tate, 1997).

A randomized, double-blind clinical trial was conducted to determine the efficacy of *Mentha* species in preventing chemotherapy-induced nausea and vomiting (CINV). Prior to the study, patients were randomly divided into four groups to receive the test drug. The treatment and placebo groups were applied essential oils of *Mentha* or a placebo, while the control group continued with its previous antiemetic regimen. The results showed a significant reduction in the intensity

and number of emetic events in the first 24 hours with *Mentha* in both treatment and placebo groups when compared to the control group. No adverse effect was reported. The cost of treatment was also reduced when essential oils were used (Hassanzadeh, *et.al*, 2013).

Antidepressant Activity

In this study, aqueous and methanol extracts of *Pūdīna* were investigated for antidepressant activity by Tail suspension and Forced swim test in Swiss albino mice. Fluoxetin was used as a positive control. It was concluded that methanol extract of *Pūdīna* showed a significant antidepressant activity as compared to *aqueous* extract (Tupe, 2010).

Analgesic Activity

An *in-vivo* study was conducted to investigate the analgesic activity of ethanolic extract of *Pūdīna* by acetic acid-induced writhing test in Swiss albino mice. The extract demonstrated statistically significant analgesic effect in mice (Biswas, *et al*, 2014).

Anti-allergic Activity

In this study, the anti-allergic activity of *ethanolic* and *aqueous extracts* (leaves, stem and roots) of *Pūdīna* was determined by histamine release inhibition test. The inhibitory effect on histamine production by mast cells was evaluated using a modified method and was compared with standard drug, disodium cromoglicate. Results revealed that *ethanolic* extracts of leaf and root possessed noticeable inhibitory activity (Malik, *et al*, 2012).

Anti-inflammatory Activity

Anti-inflammatory activity of *ethanolic* and *aqueous extracts* of *Pūdīna* was determined by histamine induced paw edema in mice. The effects of extracts were tested and compared with standard drug, diclofenac sodium. All *ethanolic* extracts of leaves, stem and roots showed a more pronounced anti-inflammatory effect as compared to their respective *aqueous* extracts (Malik, *et al*, 2012).

Anti-cataleptic Activity

In a study, the protective effect of the *aqueous* extract of *Pūdīna* on haloperidol induced catalepsy in mice was found by employing the standard bar test and assessment of the locomotor activity. The mice received repeated dosage of test drug *Pūdīna* and the standard drug for fourteen days, 30 minutes before the administration of haloperidol. Then, the effects of the test drug *Pūdīna* and the

standard drug, trihexyphenidyl were assessed. On fourteenth day, the mice were sacrificed. After sacrificing the mice, TBARS, glutathione, SOD and the catalase activities of brain tissues were estimated. The study suggested that *Pūdīna* had significantly reduced the oxidative stress and the cataleptic score induced by haloperidol (Ahmad, *et al*, 2012).

Radio-protective Activity

In this study, the radio protective effect of various doses of *Pūdīna* on the survival of mice exposed to various doses of whole-body gamma radiation was evaluated. The 10 mg/kg of *Pūdīna* extract was found to afford best protection as evidenced by the highest number of survivors at 30 days post-irradiation. Further, radiation-sickness and mortality up to 30 days post-irradiation were also observed. It was found that the *Pūdīna* extract reduced the severity of symptoms of radiation sickness and mortality at all exposure doses (Jagetia, *et al*, 2002).

Anticancer Activity

In a study, *ethanolic* extract of *Pūdīna* was studied for the *in-vitro* cytotoxicity against human liver cancer (Hep G2 cell line). The results demonstrated that *Pūdīna* significantly suppresses the growth and induces apoptosis in Hep G2 cell lines by MTT assay (Chandan, *et.al*, 2014).

In another study, *in-vitro* anticancer potential of *methanolic* and *aqueous* extracts of whole plants of *Mentha arvensis, M. longifolia, M. spicata* and *M. viridis* was evaluated against eight human cancer cell lines — A-549, COLO-205, HCT-116, MCF-7, NCI-H322, PC-3, THP-1 and U-87MG (from six different origins (breast, colon, glioblastoma, lung, leukemia and prostate) using sulphorhodamine blue (SRB) assay and it was concluded that *methanolic* extracts of the above mentioned *Mentha* Spp. showed anti-proliferative effect against four human cancer cell lines, namely COLO-205, MCF-7, NCI-H322 and THP-1; however, aqueous extracts were found to be active against HCT-116 and PC-3 (Sharma, *et al*, 2014).

Anti-ulcerogenic Activity

A study was conducted to examine the anti-ulcerogenic effects of various extracts of *Pūdīna* on acid, ethanol and pylorus ligated ulcer models in rats and mice. Aqueous, petroleum ether and chloroform extracts of *Pūdīna* were used. It was concluded that various extracts of *Pūdīna* clearly showed a protective effect against all ulcer models (Londonkar, *et al*, 2009).

Fungi-toxic and Insecticidal Activity

In a study, antifungal and insecticidal effect of *Pūdīna* was evaluated. The Mentha essential oil showed a potent fungi toxic and insecticidal efficacy and

recommended as a plant-based preservative in the management of fungal and insect infestation of chickpea and other pulses during storage (Kumar, *et al*, 2009).

In a single blind, randomized placebo controlled study, the efficacy of Tukhm-i-Sambhālū (*Vitex agnuscastus*) and '*Arq-i-Pūdīna* in the management of *Mutalāzima Qabl Ḥayḍ* (Premenstrual Syndrome) was evaluated and found that the test drugs were effective in reducing the somatic and psychological symptoms of *Mutalazima Qabl Hayd* (Premenstrual Syndrome) as compared to placebo (Hafeeza, *et al*, 2014).

Adverse Effects and Toxicity

It is non-toxic; hence, no processing is required (Anonymous, 1997). The Research Institute for Fragrance Materials (RIFM) and the joint FAO/ WHO Expert Committee on Food Additives have reviewed the available data on toxicity of menthol and its isomers and concluded that they were not genotoxic, teratogenic or carcinogenic. Flavour and Extract Manufacturer's Association (FEMA) has assessed the use of menthol as flavoring ingredient and reported that menthol isomers exhibit a very low acute, sub-chronic and chronic toxicity (Chawla, *et al*, 2013).

Adulteration

Adulteration of *Pūdīna* with *Mentha pulegiton* (pennyroyal) may occur from wild crafting (Bone, *et al*, 2013). Initially the oil of *Pūdīna* was reported to be adulterated with various oils such as camphor oil, cedar wood oil, balsam oil, eucalyptus oil, sandalwood oil, castor oil, mineral oil, paraffin oil, etc. Later on with the advent of chromatographic techniques, the addition of synthetic compounds was ceased and the use of de-mentholised oil or oil of inferior mint species was noted (Chawla, *et al*, 2013). In India, adulteration of *Pūdīna* oil by field distillers has been observed occasionally. Sometimes cottonseed oil is used for this purpose (Pruthi, 1998).

Conclusion

Pūdīna is a common edible and aromatic perennial herb cultivated throughout India. It is one of the oldest culinary herbs known to the mankind and widely used in pharmaceutical, cosmetic and flavoring industries. As per the ancient Unani classical literature, Unani physicians used *Pūdīna* for treating several diseases. However, more researches need to be done to exploit the unexplored potentials of *Pūdīna*.

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सारांश

पुदीना (*मेंथा अर्वेन्सिस* एल.) का फाइटो-केमिकल और फार्माकोलॉजिकल अन्वेषण

***फौज़िया बशीर, जमाल अख़्तर, निग़्हत अन्जुम, शाह आलम, आसिम अली ख़ान और नाहीद परवीन**

हर्बल औषधियों का उपयोग मानव जाति जितना ही पुराना है। पुदीना या *मेंथा अर्वेन्सिस* एल. लामियासी परिवार से संबंधित है। यह एक सामान्य खाद्य और सुगन्धित बारहमासी जड़ी–बूटी है जिसकी खेती पूरे भारत वर्ष में की जाती है। यह मनुष्य जाति द्वारा जानी जाने वाली सबसे पुरानी जड़ी बूटियों में से एक है जिसका प्रयोग औषधीय, कॉस्मेटिक और स्वादिष्ट मसाले बनाने वाले उद्योगों में व्यापक रूप से किया जाता है। प्राचीन यूनानी क्लासिकी साहित्य के अनुसार इसका उपयोग विभिन्न लक्षणों जैसे मतली, उल्टी, पेट फूलना, अपच, हिचकी, मैस्टाइटिस इत्यादि के लिए किया जाता है। हाल के दिनों में पुदीना पर बहुत सारे वैज्ञानिक अध्ययन जैसे फाइटो–केमिकल, फिजिको–केमिकल, फार्माकोलॉजिकल और नैदानिक अध्ययन किए गए। इस पेपर में पुदीना के औषधीय गुणों पर जानकारी एकत्र करने का प्रयास किया गया है जोकि यूनानी क्लासिकी साहित्य के साथ–साथ हाल में किए गए अध्ययनों में भी उल्लेख किया गया है।

शब्दकुंजी: गंध तेल, औषधीय गुण, पुदीना, मेंथा अर्वेन्सिस

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