AMERICAN JOURNAL OF PHARMTECH RESEARCH

Journal home page: http://www.ajptr.com/

Therapeutic Evaluation of Habb-E-Suranjan In Hyperuricemia

Ehsan Rauf[1]*, M.Mohsin[1], Tabassum Latafat[1]

1. Research Associate (Unani), Central Research Institute of Unani Medicine, Lucknow, UP, India.

2.AKTC, AMU, Aligarh, India

ABSTRACT

The concept of hyperuricemia has not been described at all in Unani system of medicine, but description of a joint disorder known as *Niqris*, has been found in most of the classical Unani texts. The clinical features of *Niqris* very much resemble with the Gout as described in Allopathy, which occurs due to hyperuricemia. In practice, hyperuricemia is frequently defined as a serum urate levels exceeding of 7mg/dl (0.42 mmol/l) in adult males and 6 mg/dl (0.36 mmol/l) in adult females. However, this arbitrary definition of Hyperuricemia has been justified by epidemiological studies showing that those with SUA levels greater than 7mg/dl are at increased risk of developing gouty arthritis and urolithiasis. Hyperuricemia is fairly common, with a prevalence ranging between 2.3 to 41.4 percent in various populations. A variety of factors appear to be associated with higher serum urate concenterations. The present study was conducted on 50 patients of Primary Hyperuricemia attending the OPD of Ajmal Khan Tibbiya College and Hospital. During the study it was observed that the mean serum uric acid level, which was 8.6±1.1before the beginning of the study got reduced to 6.6±1.3 at the end of the study. As we applied paired "t" test to the observations recorded before and after treatment it was found that t=12.6, $p<0.001$ suggesting the effect of drug in lowering the elevated serum uric acid level in patients of hyperuricemia is highly significant.

Keywords: Hyperuricemia, Niqris, Gout, Allopathy.

*Corresponding Author Email: ehsanrauf.rauf@gmail.com

Received 27 November 2016, Accepted 06 December 2016

Please cite this article as: Singh J *et al*., A Comparative Study of Timolol Maleate 0.5% v/s Latanoprost 0.005% In the Treatment of Primary Open Angle Glaucoma. American Journal of PharmTech Research 2016.

INTRODUCTION

The concept of hyperuricemia and gout is much explored by Ancient unani scholars and a vivid description is available in unani literature. Although the disease has its description even in the era of Hippocrates. He has well explained about its incidence and heredity association. Similarly the use of Colchicum (Suranjan) is also since ancient historical periods by Unani Physicians at large. The advancement in knowledge particularly with reference to modern medical science makes the concept of disease its etiopathogenesis and diagnosis more easy and understandable.

The Gout is a disorder that involves the abnormalities of nucleotide metabolism i.e. purine and pyrimidines, in which either there is an increased production of purine metabolites i.e. uric acid or their impaired excretion. If the complex biochemical pathway of production and excretion of uric acid is within the frame of homoeostasis then serum uric acid level does not affect joints and body system any more, but any disturbance in homeostasis makes the plasma urate level high, arising hyperuricemia and then conversion of Mono Sodium Urate (MSU) crystals & its deposition particularly on peripheral smaller joints and development of a reactionary synovitis with the involvement of the surrounding of the joints and a typical presentation of an attack of acute gouty arthritis occurs.

It is also a fact that acute attack is a self limiting process in due course and only needs Anti inflammatory, Analgesics to relieve the unbearable symptoms of pain and inflammation. But Analgesic & Anti inflammatory drugs do not have any effect on level of uric acid. It is therefore patients need further medication after resolution of acute attack. The colchicum (Suranjan) consists of Colchicine is well recognized medicine used as drug of choice for gouty arthritis since ancient time and even its alkaloid colchicine is used in modern medicine for such ailment to relieve clinical features of acute gout. Nowadays many modern physicians prefer other NSAIDs for such condition. But neither the colchicine nor any NSAIDs has effect on hyperuricemia and long term prognosis of gouty arthritis. Therefore in chronic gout and hyperuricemia the uricosuric drugs particularly Allopurinol is used. Both NSAIDs, Allopurinol, colchicines have several undesirable effects which are very much intolerable in future course of disease and are not very much effective in long term prognosis of gouty arthritis particularly in impairment of synovium i.e. synovial membrane, underlying cartilage and intraarticular space and therefore in long term the disease affects the joint, osteoarthritic changes take place.

With above facts a clinical study on hyperuricemia was designed and a Pharmacopoeial unani preparation *Habb-e-Suranjan* was choosen for it, to asses the efficacy along with its safety with following Aims and Objectives.

1. The concept of Niqris and its exploration with hyperuricemia and gout.
2. To observe the efficacy of Unani Pharmacopoeial formulation Habb-e-Suranjan on hyperuricemia and related signs and symptoms.
3. To observe the objective effect of above formulation on serum uric acid level
4. To observe any concomitant and adverse effects of formulation
5. To observe the possible mechanism of action with reference to the action of individual ingredients present in formulation with reference to their action mentioned in various unani Materia Medica.
6. To propose the drug if found effective in condition of hyperuricemia and related disorders.

I hope that present work will contribute to recognize the system as Evidence Based Medicine before medical fraternity, researchers and will be contribution for the system as a whole.

MATERIAL AND METHOD

The study was conducted on 50 patients of Primary Hyperuricemia attending the OPD of Ajmal Khan Tibbiya College and Hospital, during the period extending from September 2011 to December 2013. The clearance was taken from the ethical committee of the department before starting the study. Only the patients fulfilling the inclusion criteria were included in the study. The patients were selected on the basis of history, physical examinations, and investigations. All the findings were recorded on the case report form designed for the study. Before enrolment into the study, informed written consent was obtained. The patients who did not fulfill the inclusion criteria were excluded from the study.

Inclusion Criteria

1. Presence of pain in one or more joints.
2. Presence of swelling, tenderness, redness and raised local temperature in the affected joint.
3. Presence of elevated level of uric acid in the serum i.e., more than 7mg/100ml in males and more than 6 mg/100 ml in cases of females.

Exclusion Criteria

1. Positive Rheumatoid Arthritis factor and presence of more than 200 IU/ml of Antistreptolysin O in the blood.
2. Patients with hepatic and renal disorders

3. Pregnancy and Lactation
4. Patients of Hypertension, Ischaemic heart disease, Diabetes mellitus
5. Cases aged below 16 years and more than 65 years.

Type of Study

Single-Arm Clinical study

Sample Size

The sample size was fixed to 50 patients.

Subjective Parameters

Pain, swelling, tenderness, increased local temperature in the joints, Painful joint movement.

Objective Parameter

Serum uric acid level

All the cases were informed of the duration of the study, the expected benefits and the hazards of drugs to be used. No concomitant treatment was allowed.

While carrying out this study, following approach was followed in all the cases-

1. Detailed History
2. Physical Examination
3. Investigations.

History

A relevant history of the patients was recorded with regard to their chief complaints with duration, name, age, sex, religion, occupation, marital status, food habits and history of use of alcohol were noted down.Other points like family history of gout, history of trauma, renal calculi and acute monoarticular arthritis, history of use of allopurinol, colchicines and NSAIDs were also meticulously noted down at the commencement of the study.

Patients were also interrogated about the nature of pain and various aggravating and relieving factors.

General Physical and Systemic Examination:

All the patients were subjected to a comprehensive general physical, systemic and joints examination. The findings were recorded in the proforma designed for the study. The joint involved were examined for signs of inflammation, active and passive movements and presence of swelling at the beginning of the day (0 day) and thereafter regularly during the follow up i.e. at 15^{th} day, 30^{th} Day, 45^{th} Day and 60^{th} Day. The patients were examined for the presence of any tophi too.

Investigations

Following investigations were carried out during the course of the study to ensure better diagnosis

Examination of Blood

The hematological assessment of all the cases was made at regular intervals. Following tests were carried out-

a. Rheumatoid Arthritis (RA-factor) test-By Latex Slide & Tube Test

b. Anti streptolysin O Titre- By slide test

Both these tests were carried out at the beginning of the study (0 day) to rule out the presence of rheumatoid disease.

c. Blood Sugar (Random) estimation –GOD/POD Method

d. Blood urea estimation- By UV method

e. Serum creatinine estimation –By Picrate method

f. Liver function test (LFT):

S.bilirubin-Jendrassik and Grog method

Asparate aminotransferase (AST)-UV kinetic method

Alanine aminotransferase (ALT)-UV kinetic method

Alkaline Phosphatase-PNPP method

g. Total Leucocyte count using Neubauer's chamber

h. Differential Leucocyte count by visual counting method

i. Haemoglobin percentage.(Sahli's method)

j. Erythrocyte sedimentation rate (ESR) by Wintrobe's method

These tests were carried out twice at beginning of the study (0 Day) and then at the end (60^{th} day). This was done to observe the effect (if any) of our drugs on renal and liver function and blood sugar.

k. Serum Uric acid estimation:-The estimation of serum uric acid was carried out at the beginning of the study (0 Day) and then regularly during the follow-up at 30^{th} day and 60^{th} day.

This estimation was carried out by Enzymatic Colorimetric Method (Trinder).

Urinalysis

Examination of Urine for the presence of albumin, sugar, pus cells and urates was carried out before the commencement of the study and after completion of the study.

Availability of the drugs:

Habb-e- Suranjan is a pharmacopoeial preparation taken from the National Formulary of Unani Medicine. The ingredients of this Habb were procured from DakhanaTibbiya College and identified properly. Thenprepared the tablets from Dispensary of Ajmal Khan Tibbiya College and

Hospital.Habb-e-Suranjan is given in the dosage of 2 tablets three times a day (6gm / day) to all the cases irrespective of age, sex, and the severity of the disease.The ingredients of *Habb-e-Suranjan* are as follows:[1]

SuranjanShirin (Colchicum autumnale)

Turbud (Ipomoea turpethum)

Muqil (Commiphoramukul)

ShahemHanzal (Citrulluscolocynthis)

Post HalelaZard (Terminaliachebula)

All the drugs were in equal weight.

The duration of the study was 60days. The follow up of all the cases were carried out at the interval of 15 days i.e., at 0,15,30,45 and 60 days.

RESULTS AND DISCUSSION

During the study it was observed that painful joint movements were presents in all 50 patients which got improved in 5 cases (10%) after 15 days of treatment. The improvement after 30, 45 and 60 days were 40%, 54% and 70% respectively.(Table 1)

Out of 50 patients 40 patients suffered from swelling, 35 patients suffered from tenderness and 12 patients suffered from increased local temperature. There was an overall improvement of 75% in swelling, 74.28% in tenderness and 75% in increased local temperature.(Table 2)

Table 1: Showing Effect of Drugs on the Painful Joint Movement

	0 Day No of patients	**15th Day No of patients improved & %**	**30th Day No of patients improved & %**	**45th Day No of patients improved &%**	**60thDay No of patients improved &%**
Painful Joint Movement	50	5(10.00)	20 (40.00)	27(54.00)	35(70.00)

Table 2: Showing Effect Of Drugs On Swelling, Tenderness, Increased Local Temperature

Clinical Features	**0 Day No of patients &%**	**15th Day No of patients improved & %**	**30th Day No of patients improved & %**	**45th Day No of patients improved &%**	**60thDay No of patients improved &%**
Swelling	40(80.00)	10(25.00)	18(45.00)	26(65.00)	30(75.00)
Tenderness	35(70.00)	6(17.14)	13(37.14)	20 (57.14)	26(74.28)
Increased local temperature	12(24.00)	2(16.66)	4(33.33)	7(58.33)	9(75.00)

During the study it was observed that 36 patients had intermittent pain while 14 patients had continuous pain before the beginning of the study. The improvement in intermittent pain after 15, 30, 45 and 60 days was 19.44%, 38.88%, 55.55% and 80.55% respectively while in continuous joint pain the improvement after 15,30,45 and 60 days was 14.28%, 35.71%, 64.28% and 78.57% respectively.(Table 3)

During the study it was observed that the mean serum uric acid level, which was 8.6±1.1before the beginning of the study got reduced to 6.6±1.3 at the end of the study. As we applied paired "t" test to the observations recorded before and after treatment it was found that t=12.6, p<0.001 suggesting the effect of drug in lowering the elevated serum uric acid level in patients of hyperuricemia is highly significant.(Table 4)

Table 3: Showing Effect of Drugs on Pain In Joints

Character of Pain	**0 Day No of patients**	**15th Day No of patients improved & %**	**30th Day No of patients improved & %**	**45th Day No of patients improved &%**	**60thDay No of patients improved &%**
Intermittent	36	7(19.44)	14(38.88)	20(55.55)	29(80.55)
Continuous	14	2(14.28)	5 (35.71)	9(64.28)	11(78.57)

Table 4: Showing Effect of Drugs on Serum Uric Acid

	Before Treatment 0 Day	After Treatment 30th Day	60th Day
Mean serum uric acid ±S.D.(mg/100ml	8.6±1.1	7.6±0.85	6.6±1.3

t=12.6, p<0.001

The effect of drug on haematological parameters studied is shown in Table No.15and Graph 15 a &15 b. Mean haemoglobin in patients before the treatment was 12.53±1.08 gm/dl while after the treatment it was 12.43±1.15(t=1.90, p>0.05) which is not significant. Mean TLC before treatment was 7925.4±1632.8while after the treatment it was 7388.2±1505.8 (t=1.90, p>0.05) which is not significant. Mean ESR before treatment was 14.18±5.32 while after the treatment it was 13.84±5.20 (t=1.22, p>0.05) which is not significant. Mean neutrophils before the treatment was 56.18±8.47 while after the treatment it was 55.38±8.43 (t=1.61, p>0.05) which is not significant.Mean lymphocytes before the treatment was 34.68±5.44 while after the treatment it was 34.28±5.65 (t=1.21, p>0.05) which is not significant. Mean eosinophils before the treatment was 3.3±1.31while after the treatment it was 3.36±1.27 (t=0.36, p>0.05) which is not significant. Mean monocyte before treatment was 4.6±2.24 while after the treatment it was 4.74±2.14 (0.73, p>0.05) which is not significant.Mean Basophil before treatment was 0.36±0.48 while after the treatment it was 0.28±0.45 (t=1.0, p>0.05) which is not significant.

The effect of drugs on biochemical parameters studied is shown in (Table : 5)

Table 5: Showing effect of Drugs on Safety Parameters

S.No	Investigation	Mean± SD		t value	p value
		BT	AT		
1.	Hbgm/dl	12.53±1.08	12.43±1.15	1.907	>0.05
2.	TLC/cumm	7925.4±1632.8	7388.2±1505.8	0.4436	>0.05
3.	ESR	14.18±5.32	13.84±5.20	1.22	>0.05
4.	N/cumm	56.18±8.47	55.38±8.43	1.61	>0.05
5.	L/cumm	34.68±5.44	34.28±5.65	1.21	>0.05
6.	E/cumm	3.3±1.31	3.36±1.27	0.36	>0.05
7.	M/cumm	4.6±2.24	4.74±2.14	0.73	>0.05
8.	B/cumm	0.36±0.48	0.28±0.45	1	>0.05
9.	RBS mg/dl	86.04±11.11	86.58±11.58	0.77	>0.05
10.	SB mg/dl	1.07±0.17	2.92+13.14	0.98	>0.05
11.	AST U/L	29.48±6.69	29.8±6.89	0.94	>0.05
12.	ALT U/L	23.6±4.93	23.86±4.89	0.71	>0.05
13.	SAP U/L	112.8±11.91	112.9±12.27	0.20	>0.05
14.	BU mg/dl	28.5±5.76	30.1±14.20	0.79	>0.05
15.	SC mg/dl	1.02±0.14	1.00±0.13	1.30	>0.05

Hb=Haemoglobin, TLC: Total leukocyte count ESR: Erythrocyte sedimentation rate, ,N=neutrophils, L=lymphocyte, E=Eosionophils, M=Monocyte, B=Basophils, RBS=Random blood sugar, SB=serum bilirubin, AST=Aspartate aminotransferase, ALT=Alanine aminotransferase, SAP=serum Alkaline Phosphatase, BU=Blood urea, SC=serum creatinine.

Mean Random blood sugar before treatment was 86.04±11.11 while after the treatment it was 86.58±11.58 (t=0.77, p>0.05) which is not significant. Mean serum bilirubin before treatment was 1.07±0.17 while after treatment it was 2.92+13.14 (t=0.98, p>0.05) which is not significant. Mean AST before treatment was 29.48±6.69 while after treatment it was 29.8±6.89 (t=0.94, p>0.05) which is not significant. Mean ALT before treatment was 23.6±4.93 while after treatment it was 23.86±4.89 (t=0.71, p>0.05) which is not significant. Mean serum alkaline phosphatase before treatment was 112.8±11.91 while after treatment it was 112.9±12.27 (t=0.20, p>0.05) which is not significant. Mean blood urea before treatment was 28.5±5.76 while after treatment it was 30.1±14.20 (t=0.79, p>0.05) which is not significant. Mean serum creatinine before treatment was 1.02±0.14 while after treatment it was 1.00±0.13 (t=1.30, p>0.05) which is not significant.

DISCUSSION

In this clinical study the efficacy of *Habb-e-Suranjan* a pharmacopoeial preparation was observed on clinical symptoms, signs and related biochemical features and the effects were noted on every 15 days up to two months.

The main clinical presentation of hyperuricemia is gouty arthritis. Hence the effect on painful joint movement, swelling, tenderness and increased local temperature was main hallmark of the disease and it was found that significant improvements were observed in all three features. The painful joint movement was present in all 50 patients and there was significant but gradual improvement noted on every visit of the patient and at the 60th day almost 70% patients were noted to be improved in painful joint movement. Similarly the swelling was also improved in 75% cases while as almost 75% improvement in tenderness and increased local temperature were noted. These clinical improvements are mainly because of composition of our drug which are very much suitable to the pathogenesis of hyperuricemia and gouty arthritis. Our drug combination consists of drugs like *Turbud* (Ipomoea turpethum), *Shahem Hanzal* (Citrullus colocynthis) which are mainly purgative in action and mainly facilitates the expulsion of uric acid through intestine. As it is mentioned in our clinical textbooks [2,3,4] that 1/3 of uric acid excretion is taken place by intestine, it is therefore in under excretors these drugs play a wonderful role but it is also a fact that their purgative action is harmful to the patient when used for a prolong period. It is therefore the formulation is well designed by addition of *Post halela zard* (Terminalia chebula) which not only works as anti inflammatory but also rectify the action of above mentioned drugs i.e. *Turbud* and *Shahem hanzal* and making the formulation least toxic because of its astringent action as well as tonic action on stomach and intestine.[5,6,7,8,9,10]

Anti inflammatory action of *shahem hanzal and suranjan* play a vital role on joint pain and painful joint movement along with reduction in swelling and tenderness.[7,11,12,13] The resolvent and analgesic action of *suranjan shirin* (Colchicum autumnale) is enough to explain the mechanism through which the gradual improvements happened.[5,6,7,9,11,12,14,15,16]

The drugs like *Muqil, Turbud, Suranjan and Shahem Hanzal* are very well prescribed drugs for these ailments in day to day practice by ancient unani physicians as well as modern unani physicians with various combinations and it was observed through all descriptions mentioned in classical textbooks that *Suranjan* (Colchicum autumnale) and *Muqil* (Commiphora mukul) are the predominant in almost every condition of the joints where there is inflammation and pain.[5,6,7,11,12]

It is also pertinent to mention here that *Suranjan shirin* (Colchicum autumnale) consists of Colchicine which has pivotal role in gouty arthritis due to its action. It inhibit the aggregation of inflammatory mediators and cytokines on inflammatory sites particularly of synovium and synovial membrane.[17] It is therefore it is also effective in all inflammatory joint conditions, but due to its excretory action on uric acid, it is mainly prescribed for hyperuricemia and gouty arthritis whether it is acute or chronic. The second important action of *suranjan* is its astringent and

resolvent action on joint which is more or less contradictory but its purgative action on intestine, astringent and resolvent action on joint make the drug wonderful. This is why the expulsion of uric acid takes place through intestine.[5,6,7,9,11,12]

Muqil is mainly a resinous substance which is mild laxative [5, 6] and it is not absorbed through intestinal wall but it adsorbs various toxins, lipid fragments as well as facilitates the expulsion of rotten humours and also facilitates the expulsion of excess urate crystals along with drugs like *surnjan and shahem hanzal*. A part form this *Muqil and Post halela zard* are mild diuretic [10,18,19,20] due to its cumulative action the excretion of uric acid is facilitated even through kidney.

The disease *Niqris* (Hyperuricemia and gouty arthritis) is considered a disease predominantly of phlegmatic indulgence and our formulation is very much suitable to expel out excessive accumulated abnormal phlegm and other humours responsible for such a pathognomonic state.[15,21] (Table 8)

Table -14 showing the only objective parameter which was serum uric acid level and it was estimated at monthly interval, the baseline serum uric acid level was 8.6±1.1 and at the 60th day it was 6.6±0.85, t=12.6 p>0.001 suggesting a very significant action of our formulation on serum uric acid level.

The well known action of *suranjan shirin* i.e. the expulsion of Mono sodium urate (MSU) from blood and urate crystals from joints affected and similarly the cumulative action of *Muqil, Turbud, Shahem Hanzal* make the formulation very effective to expel out the urate crystals and uric acid through intestine. It is therefore the findings are very much encouraging in the reduction of serum uric acid level. It is also important to mention here that the expulsion of uric acid level is mainly through kidney i.e. 2/3 and through intestine i.e.1/3, similarly the production of uric acid is from indigenous metabolic process i.e 2/3, and from purine rich diet i.e. 1/3 and any imbalance in production and expulsion makes hyperuricemia. During the study the patients were advised to avoid purine rich diets, encourage to take plenty of water along with our medication.[3]

The significant reduction in serum uric acid level is a cumulative one but the action of our formulation to inhibit the endogenous production of serum uric acid level needs further exploration with more advance study on utmost modern parameters and through interdisciplinary approach to make our formulation to be acknowledged by medical fraternity.

The safety parameters were also there to asses any concomitant toxicity on liver, therefore the liver enzymatic markers like AST, ALT, SAP were also given due regard along with this the adverse effects of drug on kidney were also kept in watch through the kidney function test i.e. Blood urea

and serum creatinine, it was found that there was no apparent and observable adverse effect during the study and at the end of the study. (Table-15)

Similarly the drug has no observable adverse effect on Blood corpuscles, Blood sugar, Haemoglobin therefore it is safe to use in cases of hyperuricemia and gouty arthritis.

CONCLUSION

In view of the above the following conclusion can be inferred.

1. The drug is significantly effective in resolving the symptoms and signs of hyperuricemia and gouty arthritis.
2. Drug has significant effect on serum uric acid level.
3. The drug is safe to advise the patients of hyperuricemia and gouty arthritis but with care because few patients were having complaints about abdominal bloating, loose motion and nausea which was an observable side effects noted during the study in few patients, hence it should be used under medical supervision by competent *Tabeeb* (Unani Physician).
4. The mechanism of action of drug in the reduction of uric acid level is probably the expulsion of urate crystals through intestines, but this action of drug on production of uric acid level needs exploration. Hence the study may be conducted on large sample size and with interdisciplinary approach before drawing any final conclusion.

REFERENCES

1. Anonymous.National Formulary of Unani Medicine. Part I.Urdu ed.,New Delhi:Government of India, Ministry of Health & Family welfare;1993:80.
2. Wortmann Rober L, Kelley William N. Kelley's Textbook of Rheumatology.7th ed.Vol.II., Pennsylvania:Elsevier Saunders;2005:1402-1426.
3. Longo Dan L.et al. Harrison's Principles of Internal Medicine. 18th ed. Vol II.,Mc Graw Hill Companies, Inc;2012:2837-2838, 3182-3184.
4. Syngle Ashit, Deodhar SD. Rheumatology Principles & Practice.Ist ed.,New Delhi:JP Brothers Medical Publishers;2010:190-206.
5. Ghani Hakim Najmul. Khazainatul Advia. Part 1.,New Delhi: Idara Kitab ul Shifa Daryaganj;YNM:281-282, 861-862,1154-1156,1313-1314,1352-1354.
6. Rafeequddin Mohd. Kanzul Advia Mufrada., Aligarh: Muslim University Press; 1985: 239-241, 311-312, 438-440,642-643,681-682.
7. Kabeeruddin Hakeem. Makhzanul Mufradat.Delhi: Ejaz Publishing House Daryaganj;YNM: 96, 193-194, 363-364, 547-548,590-591.

8. Razi Abu Bakr Mohd Bin. Kitab Al Mansoori (Urdu Translation)., New Delhi: CCRUM Ministry of Health and Family Welfare, Government of India; 1991: 136,138,140, 143,148,391-394.
9. Anonymous. Standard Unani Medical Terminology. 1st ed.,New Delhi: CCRUM Department of AYUSH Ministry of Health and Family Welfare,Government of India; 2012: 290,143.
10. Baitar Ziyauddin Abdullah Ibn. Aljamiul Mufradat Al Advia wa Al Aghzia (Urdu Translation) Volume IV., New Delhi: CCRUM Ministry of Health and Family Welfare, Government of India; 2003:354-356, 436-439.
11. Hakeem Abdul. Bustanul Mufradat Jadeed.,New Delhi: Idara Kitab ul Shifa Kocha Chailan Darya Ganj; 2002:97, 193, 358-359,502-503,609.
12. Awan Hakeem Muzaffar Hussain. Kitabul Mufradat. 3rd ed.,Lahore: Sheikh Ghulam Ali and Sons, Kashmeeri Bazar;1960:433, 304-305,503-504,526-527.
13. Gupta AK, Sharma Madhu. Review of Indian Medicinal Plants. Vol 6., New Dehli: Medicinal Plants Unit ICMR; 2008:451-454
14. Baitar Ziyauddin Abdullah Ibn .Aljamiul Mufradat Al Advia wa Al Aghzia (Urdu Translation). Volume III.,New Delhi: CCRUM Minstry of Health and Family Welfare, Government of India; 1999: 96-98.
15. Kintoori Allama Ghulam Hussain. Al Qanoon Fit tib Urdu translation (Original author Ibn-e-Sina). Volume 2nd .,New Delhi: Ejaz Publishing House Kocha Chailan; 2010: 343-344,406
16. Azeez Hakeem Abdul. Mufradat-e-Azeezi., Lucknow: Maktaba Sahitya Mandir Press Ltd; YNM: 43-44, 56, 58, 80.
17. Tripathi KD. Essentials of Medical Pharmacology. 6th ed.,New Delhi: Jaypee Brothers Medical Publishers (P) Ltd; 2008:206-208.
18. Rushd Ibn Kitab ul Kulliyat (Urdu Translation). 2nd edition.,New Delhi: CCRUM Ministry of Health and Family Welfare, Government of India; 1987:.269,288,320
19. Kirtikar KR, Basu B.D.Indian Medicinal Plants. Vol-IInd. 2nd ed., Dehradun: International Book Distributor; 1981:1020-1023, 1147.
20. Chatterjee Asima, Pakrashi Satyesh Chandra.The Treatise of Indian Medicinal Plants. Vol III.,New Delhi: National Institute of Science Communication, CSIR; 1997:69-71,203-204.
21. Kabeeruddin Hakeem Mohd.Tarjuma-e-Kabeer (Sharah-e-Asbab wa Alamat).Part 3., Hyderabad:Hikmat Book Depot; 1916:189-191.