

Review Article:**Contribution of *al-Zahrawi* (Albucasis) in the field of Pharmacy and Pharmacology with respect to his treatise *Kitab al-Tasreef***Mohd Akhtar Ali¹, Mohd Danish², Hamiduddin³**Abstract**

Abūl-Qāsim Khalaf ibn 'Abbās al-Zahrāwī Latinised as Abulcasis or Zahraavius, lived between 936–1013 AD. He was born and raised in *Al-Zahra* a suburb of Córdoba (Arabic: Cortoba) in Spain. He was a famous surgeon, a talented pharmacist and a capable pharmacologist. Zahrawi is very famous for his surgical contribution, but this work explores his pharmaceutical and pharmacological contribution with respect to his treatise *Kitab al-Tasreef*. He served as the court physician to Caliph 'Abd ar-Raḥmān III an-Nāṣir (912–961 AD). He wrote his famous book "*Kitab al-Tasreef li-man 'ajaza 'an al-ta'lif*" (*The Arrangement of Medical Knowledge for one who is not able to compile it*) around the year 1000 AD after fifty years of clinical experience. This book is also a chief source for indicating pharmaceutical contribution of *al-Zahrāwī* apart from the field of surgery. Twenty seven volumes, from Volume 3 to 29, of thirty volumes of the book *Kitab al-Tasreef* are related to Unani pharmacy and pharmacology. Ibn Abī Uṣaybi'a (1203-1270 AD) remarked him only as an expert of pharmacy and pharmacology. *Al-Zahrāwī* devoted his entire life and genius to the advancement of pharmacy, medicine and surgery. He sketched a few drawings of pharmaceutical instruments and mentioned their use in his book. Significant pharmaceutical contributions of *al-Zahrāwī* are reflected by him through *Kitab al-Tasreef* which has not been highlighted, there is need to evaluate and emphasize the pharmaceutical contributions of *al-Zahrāwī*. This review is an attempt in this direction.

Keywords: *Zahrāwī*, Abulcasis, *Kitab al-Tasreef*, triple strainer, *Liber Servitoris*, Pharmacy, Pharmacology.

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Introduction

Abū al-Qāsim Khalaf ibn 'Abbās al-Zahrāwī, is well-known in the West as Albucasis or Abulcasis or Zahraavius. He was born in 936 AD in *al-Zahra*, which is six miles northwest of Córdoba, Spain (*al-Andalus*).¹ His ancestors were from the *al-Ansar* tribes of *Madina*, who came with Muslim armies which conquered and after that stayed in Spain.

Al-Zahrawi travelled rarely and resided mostly in Córdoba. He was a practicing physician, pharmacist as well as great surgeon. He also served as court physician to caliph 'Abd ar-Raḥmān III

an-Nāṣir (912–961 AD)² who ruled Andalusia (*al-Andalus*) for the 50 years which formed all sciences reached their peak so this period was known as 'Golden age'.³ Zahrawi also served as the personal physician to Al-Hakam II (915–976 son of 'Abd ar-Raḥmān III).

The first recognized biography of *al-Zahrawi* was revealed in Al-Humaydi's *Jadhwat al-Muqtabis fi Dhikri Volat al-Andalus* (*On Andalusian Savants*) compiled six decades after Al-Zahrawi's death⁴. After a long and memorable medical profession, he died in 1013 AD at the age of 77.

He authored his famous book "*Kitab al-Tasreef*

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Figure 1: Abu al-Qasim Al-Zahrawi (936-1013 AD) (Source: <http://www.muslimheritage.com/article/abu-al-qasim-al-zahrawi-great-surgeon>)

li-man 'ajaza 'an al-ta'lif" (The arrangement of medical knowledge for one who is not able to compile it) around 1000 AD. It is collection of about fifty years of his medical practice and experience knowledge.

The book consists of thirty volumes and it covers different aspects of medical knowledge. The book has sections on medicine, surgery,

midwifery, pharmacology, therapeutics, dietetics, psychotherapy, weights and measures, and medical chemistry.⁵ In European languages his name is written in more than a dozen ways like Abulcasis, Albucasis, Bulcasis, Bulcasim, Bulcari, Alzahawi, Ezzahrawi, Zahravius, Alcarani, Alsarani, Alcaravi, Alcaravius, Alsahrawi.³

Brief introduction of *Kitab al-Tasreef li-man 'ajaza 'an al-ta'lif*

The *Kitab al-Tasreef* is a compilation of Al-Zahrawi's over 50 years of medical and surgical experience. Many people are of opinion that al-Zahrawi has contributed only in the field of surgery, which is not the case. This misunderstanding among the medical fraternity is may be due to the fact that he has been highlighted mostly for his surgical contribution.

Till date most of the information available regarding Zahrawi's medical contribution is related to only his surgical contribution. Surgery is mentioned and described only in 30th volume of at *Tasreef*. Twenty-seven volumes, from Volume 3 to 29 of the book are related to Unani pharmacy and pharmacology.

According to Ibn Abī Uṣaybi'a (1203-1270) Zahrawi was the person having great knowledge of *Mufrad* (single drugs) and *Murakkab* (compound formulations). He was also an expert physician. The largest among all his writings is *al-Tasreef* which is complete in every aspect of

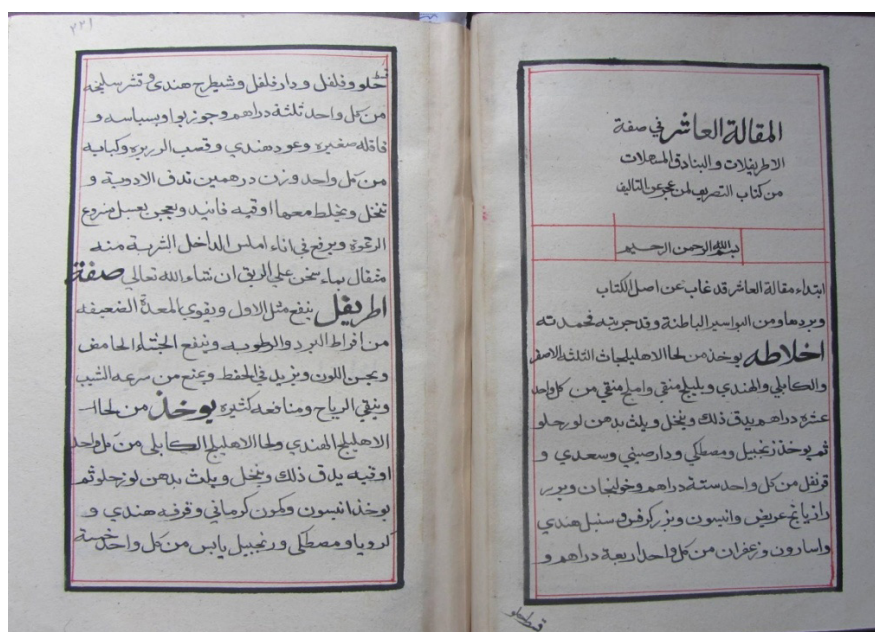


Figure 2: Manuscript of *Kitab al-Tasreef* (Source: Khuda Bakhsh Oriental Library Patna)

its meaning and description.⁶ The book *Kitab al-Tasreef* is considered as a medico-pharmaceutical encyclopedia, and one of the greatest of its time.³

Dr. Sami Khalaf Hamarneh (b. 1925), in recent years has investigated the life and work of *al-Zahrawi*, and gave a major emphasis to the pharmaceutical information and contribution, which is found not only in the twenty-fifth and twenty-eighth treatises of *Kitab al-Tasreef* but in most of the volumes (3rd to 29th volume).¹

Al-Zahrawi's name was forgotten for so many centuries for two reasons: firstly, his name was altered and distorted in so many ways; and secondly, those who copied his works did not refer to him as being the source of their knowledge.³

Al-Tasreef was a manual text for medical syllabus in several of the European universities for many centuries, but displaced Avicenna's "The Canon of Medicine" as the flanked by 12–17th centuries AD.⁴

Brief volume wise introduction of *Kitab al-Tasreef*

Vol.	Brief Contents of Volume
1 st	المقالة الاولى ضمنيتها مقال في الاسطوانات والامزجة والاغذية وتركيب الادوية و عيون من التشريح وما اشبه ذلك جعلتها كالمدخل لهذا الكتاب ⁷ Discussion about atoms; the natural matters as pertaining to body's constitution, and condition; diets; features of general medicine, anatomy and its related chapters ⁷ including meaningful introduction, manners of discussions, and methodology; physiology and Advia Mushila (Purgative drugs). ⁸
2 nd	المقالة الثانية في تقاسيم الامراض و علاماتها والاشارة الى علاجها ⁷ Classification of diseases, symptoms of diseases, and their treatment, ⁷ including classification of drugs; clinical medicine, pathology, and diagnosis, the preservation of health, especially for the children and the senior citizens. Finally, elaboration on fevers as symptoms and as diseases. ⁸
3 rd	المقالة الثالثة في تقاسيم المعاجين القديمة التي تخزن و تدخر ⁷ Properties of old confection and its preservation. ⁷
4 th	المقالة الرابعة في صناعة الترياق الكبير و سائر الترياقات و الادوية المفردة النافعة من جميع السموم ⁷ Preparation of Theriac al-Kabeer (Big Antidote) and all other antidotes; single drugs useful in all types of poisons. ⁷
5 th	المقالة الخامسة في صفات الايارجات القديمة و ادخارها و تخميرها ⁷ Properties of old Ayarijaat (a semisolid dosage form), its preservation and fermentation. ⁷
6 th	المقالة السادسة في صفات الادوية المسيلة من الحبوب المدبرة لجميع العلل ⁷ Properties of purgative medicines of pills beneficial for all kinds of diseases, including bitter and sweet-tasting aromatic laxatives. ⁷
7 th	المقالة السابعة في صفات الادوية التي تجلب القي و الحقن و الفرزجات و الشيفات ⁷ Properties of nauseating and emetic drugs, use of Enemas, Tampons and Vaginal suppository ⁷ , including Fatal (Bougie) and their pharmacological virtues. ⁸
8 th	المقالة الثامنة في الادوية المسيلة الذية الطعم المألوفة المأمونة ⁷ Purgative drugs, delicious, safe and protective diets; ⁷ including scent and fragrance used by wealthy and Gentleman. ⁸
9 th	المقالة التاسعة في ادوية القلب من المثليات و ادوية المسك وما اشبه ذلك ⁷ Drugs for Heart form, Muslisat and drugs of musk and other like this. ⁷
10 th	المقالة العاشرة في صفة الاطربفات و البنادق المسهلات ⁷ Properties of Itrifalaat (a semisolid dosage form) and purgative cathartic nuts. ⁷
11 th	المقالة الحادية عشرة في صفة الجوارشات و الكمليات و ما اشبه ذلك ⁷ Properties of Jawarishaat (a type of Confection) and Confections and their other types. ⁷
12 th	المقالة الثانية عشرة في ادوية الباءة و المسمنة للابدان المهزولة و المدرة و نحو ذلك ⁷ Aphrodisiacs; fattening for emaciated, and galactagogue and other related drugs ⁷ ; including geriatrics, anti-obesity, Zamadaat (pastes), Huqna (enemas), Adhan (oils) and Hamulaat (Pesseries) used in gynaecological disorders. ⁸
13 th	المقالة الثالثة عشرة في الاشربة و السكتجيينات و الربوبات ⁷ Syrups, Sikanjabeen (a liquid dosage form) and Rububaat (dry extract). ⁷
14 th	المقالة الرابعة عشرة في اللخاخ و المطبوخات و المنقوعات المسهلة و غير المسهلة ⁷ Purgative and non-purgative inhalations, decoctions and infusions ⁷ ; including strong and purgative aromatic juices. ⁸
15 th	المقالة الخامسة عشرة في المربيات و منافعها و حكمة ترتيبها و ادخارها ⁷ Preservers its properties, concept of preparation and preservation. ⁸
16 th	المقالة السادسة عشرة في السفوفات المسهلة و غير المسهلة ⁷ Purgative and non-purgative powders ⁷ ; including other medicinal dusting powders for the treatment of wounds. ⁸
17 th	المقالة السابعة عشرة في الاقراص المسهلة و الممسكة و غير المسهلة و الممسكة ⁷ Purgative and non-purgative, retentive and non-retentive tablets; specially prepared by Zahrawi. ⁷

18 th	المقالة الثامنة عشرة في السعوطات والبخورات والقطورات والذرورات والغراغر ⁷ Nasal drops, fumigations, eye drops, medicated dusting powders and gargles ⁷ ; including Bougies and drugs for Epistaxis. ⁸
19 th	المقالة التاسعة عشرة في الطيب والزينة وصناعة الغوالي وما اشبهها ⁷ Scents, perfumery and fragrances, cosmetics, methods of preparation of perfumed powders and other like that ⁷ ; including toilettries, hair dressing, and delicacy and charmer adornments. ⁸
20 th	المقالة العشرون في الاكحال و الشياقات و اللطوخات ⁷ Coryllium, suppositories, liquid pastes; ⁷ including eye compresses and other dosage forms used for treatment of ophthalmic disorders, prophylactic and preventive medical remedies. ⁸
21 st	المقالة الحادية والعشرون في السنونات و ادوية الفم و الحلق اما اشبه ذلك ⁷ Tooth powders, drugs for mouth, throat and other like this. ⁸
22 nd	المقالة الثانية والعشرون في ادوية الصدر والسعال خاصة ⁷ Special medicines for chest and cough; ⁷ including drugs for lungs abscess and sore throat, various tumors of lungs and swellings, expectorants and dressings; and the cases of wasting disease consumption and phthisis. ⁸
23 rd	المقالة الثالثة والعشرون في الضمادات لجميع علل البدن من الفرق الى القدم ⁷ Pastes for diseases of whole the body from head to toe. ⁷
24 th	المقالة الرابعة والعشرون في صناعة المراهم النخلى و سائر المراهم للجالينوس وغيره ⁷ Methods of preparation of strainer ointments and all other types of ointments of Galen and others. ⁷
25 th	المقالة الخامسة والعشرون في الادهان و منافعها و احكام اخراجها ⁷ Oils, their uses, and the methods of extracting and preparing them; ⁷ including both fixed and volatile oils, divided into three parts: the first one deals with pharmaceutical technology, the second with the therapeutic uses of oils, and the third deals with the drugs which may be blended with the adhan (oils). ⁸
26 th	المقالة السادسة والعشرون في اطعمة المرضى و كثير من الاصحاء مرتبة على حسب الامراض ⁷ Diets for patients and healthy persons according to diseases; ⁷ including properties of diets and drugs, and their preparation; restoration, amelioration, and cooking procedures. ⁸
27 th	المقالة السابعة والعشرون في طبائع الادوية و الاغذية و اصلاحها وقواها و خواصها ⁷ Characteristic of drugs and diets, their correctives, potential and properties; ⁷ including identifying of cereals, breads, wines, waters, soft drinks, legumes, meats, fishes, and wools and their correctives; and the suitability of clothing and outfitting of raiment, and colours. ⁸
28 th	المقالة الثامنة والعشرون في اصلاح الادوية و حرق الاحجار المعدنية وما يتصرف في الطب من ذلك ⁷ Corrections of many drugs and calcination of mineral stones and their processes in Tibb; ⁷ including their preparation, rectification, restoration and corrections of many drugs simples and compounds, which are derived from the three natural kingdoms: mineral, vegetable and animal, and their substitution and recovery processes. ⁸
29 th	المقالة التاسعة والعشرون في تسمية العقاقير باختلاف اللغة و بدلها و اعمارها و اعمار المركبة و غيرها و شرح الاسماء الواقعة في كتاب الطب الاكبال والاوزان ⁷ Medico-pharmaceutical nomenclature in other languages, their alternative, aging, aging of compound formulations and others, description of nomenclature related to measures and weights; ⁷ including toxins. ⁸
30 th	المقالة الثلاثون في العمل باليد من الشق والبط والجبر والكي والخلع ⁷ Surgery of incision, perforation, venesection, fractures, cauterization, and dislocations. ⁷

Manuscripts of *Kitab al-Tasreef*

There is no complete collection of the 30 volumes of *al-Tasreef* in any one library in the world.³ Some partial or about to complete manuscripts of *al-Tasreef* are present in around 12 countries, including Rabat, Morocco; Patna, India; Istanbul, Turkey; Damascus; Baghdad; Cairo, Egypt and Azerbaijan; Paris; London; Oxford; the Vatican; Bologna; and Venice. According to Dr. Sami Khalaf Hamarneh (b. 1925) below is given a list of some manuscripts which are present in different libraries in various countries.¹

1) Ali Emiri-Arabi MS No 2854 is housed at the Süleymaniye Library of Istanbul, Turkey. It consists of the last three treatises of *al-Tasreef* (28-30), with pictures of the tablet moulds, and the filtering funnels.¹⁰

2) Bankipore MS. No 16 is housed at the Khuda Bakhsh Oriental Library in Patna, India. It consists of 27 treatises (1-27). Bankipore MS. no 17 (the register general library no. is 2146) is also housed at the same above library, but it consists of only the 30th volume which is mainly concerned to surgery) it was written in the Naskhi script in 1188 CE. This manuscript has nearly 200 illustrations and drawings of clinical and surgical instruments. This is considered as one of the earliest and one of the finest manuscripts of *al-Tasreef*.⁹

3) Besir Agha MS. No. 503 housed at the Süleymaniye Library of Istanbul, it is considered as the most complete known manuscript of *al-Tasreef* as a whole 902/1496 AD.¹⁰

4) Besir Agha MS. No. 503, which is also present

at the above library. It contains all the treatises of *al-Tasreef*, with some of its parts or pages missing 1115/1703 AD.¹⁰

5) Hasan Husni MS. No. 1361, of Ayyub, Egypt. This manuscript is in two volumes incorporating 29 treatises, only the last treatise which is on surgery is missing. Copyist is Muhammad al-Qaysari, 1093/1682AD. The first volume contains 14 treatises from volume one to fourteen and the second volume contains 15 treatises from volume 15-29.¹⁰

6) Rabat MS. no 134, and it is housed at the Royal Library of Morocco, it incorporates incorporating the total of *al-Tasreef* entire book in six volumes copied by Abd al-Qadir Ibn al-Muqaddam. Dated 1307 /1889.¹⁰

7) Rabat MS no. 673, housed at the above Library, containing two parts of the subdivisions of *al-Tasreef*. It is in poor condition contains the two figures of the tablet molds and the strainers.¹⁰

8) Rabat MS. no. 6779 is also preserved in the Royal Library of Morocco mentioned above. It consists of treatises 20-29.¹⁰

9) Rabat MS. no. 6780 is also present at the above library. It contains treatises 16 to the end. It is in poor condition of preservation. The 28th treatise consists of illustrative drawings. It also consists of drawings of 30th treatise on surgical instruments. The copyist was Abd Allah b. Muhammad 1125/1713.¹⁰

10) Rabat MS No. 8364 is also housed at royal library morocco. It has a designer binding in leather, with the list of 'table of contents' well accomplished for treatises 3-30, but several pages are missing.¹⁰

11) Veliyuddin MS. No. 2491, housed at the Süleymaniye Library of Istanbul, containing treatises 28-30.¹⁰

12) Some manuscripts are preserved in Bibliotheque Nationale of Paris (Manuscript Num. 5772 and 1163).¹⁰

Translations and Publishing of *Kitab al-Tasreef*

Kitab al-Tasreef was originally available as a main text in 30 volumes in about 1000 CE. It was later published in three parts after the invention of printing: the pharmaceutical part in 1471, and the surgical part in 1497, and the featured volume on general medicine in 1519. The book was edited by the Physician Augsburg and printer Sigismund Grimm (fl. 1519).¹¹ Some manuscripts of the book are present at the Süleymaniye Library of Istanbul

Turkey and it was published by the Institute for the History of Arabic-Islamic Science, Johann Wolfgang Goethe University, Frankfurt Germany. Partial translations into French, English, Spanish, Hebrew and Latin of contemporary times are also available:⁴ under various titles because of the difficulty in translating the original name.¹² Guy de Chauliac (1300-1368 AD) A French surgeon quoted *al-Tasreef* over 200 times in his notable and seminal work on surgery "*Chirurgia magna*".¹³

French translation: Treatise XXIX, Part V of *al-Tasreef* was translated in French language by Henri Joseph Sauvage (1831-1896) in 1884; and Treatise XXX by Louis Leclerc in 1861 and published from Paris.¹⁰

English translation: Treatise XXV of *al-Tasreef* was translated in English by Hamarneh & Sonnedecker and was published in 1963. The Arabic, edition with English translation and commentary annotation and glossary of Treatise XXX by M.S. Spinks and G.L. Lewis was published between 1972-1973.¹⁰ Under the auspices of the Wellcome Institute of the History of Medicine of London, England and the Near Eastern Center of the University of California, USA, yet having misnomer and connotation in the title of Albucasis, on Surgery and Instruments.¹⁴

Spanish translation: Treatise XVI of *al-Tasreef*

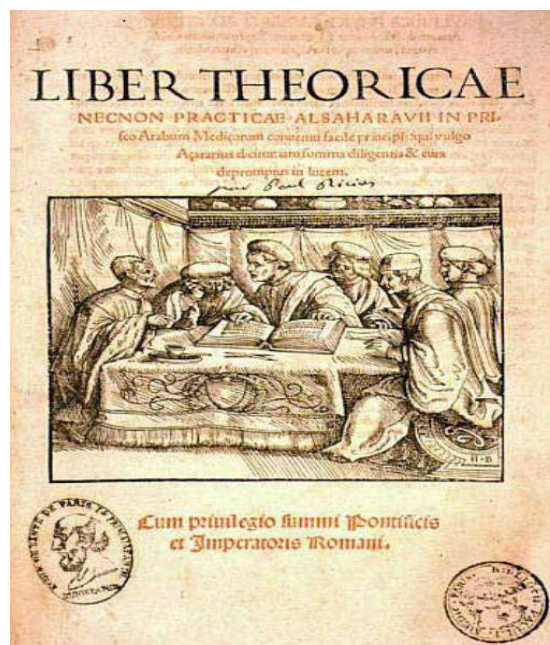


Figure 3: Title page of the Latin translation of Al-Zahrawi's *Kitab al-Tasreef*: Liber theoricæ necnon practicae Alsaharavii (Source: <http://www.muslimheritage.com/article/abu-al-qasim-al-zahrawi-great-surgeon>)

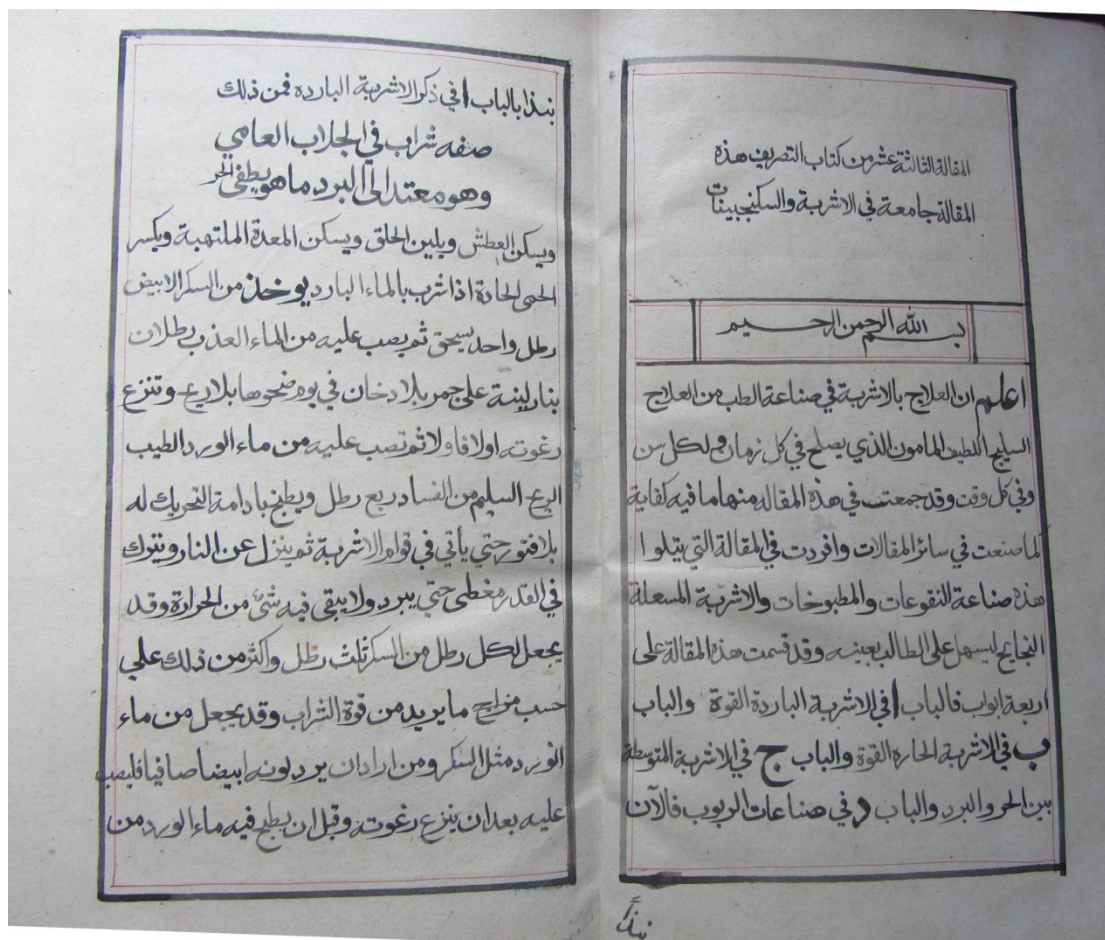


Figure 4: Manuscript of *Kitab al-Tasreef* (Source: Khuda Bakhsh Oriental Library Patna)

was translated in Spanish by Arvide Cambra in 1994; Treatise XVIII by Gil Gangutia in 1995; Treatise XX by Arvide Cambra in 2000; Treatise XXI by Arvide Cambra in 2003; Treatise XIX, Part II by Arvide Cambra in 2010;¹⁰

Hebrew translation: Treatises I-II of *al-Tasreef* was translated into Hebrew by Chem Tob, and Mechoulam.¹⁰

Latin Translation: The most famous Latin translation of *al-Tasreef* is: “*Concessio ei data qui componere haud valet*” by unknown hands.¹² Partial translations from Arabic: Treatises I-II *al-Tasreef*, translated into Latin with the title of *Liber theoricarum nec non practicae Alzahravi* (Theoretical and practical book by al-Zahravi). It was published at Augsburg (a city in Germany) in 1519 and edited by Paulus Ricius (1480-1541); Treatise XXVII and Treatise XXVIII were translated into Latin at the end of thirteenth century (1288 AD) by Simeon Januensis and Abraamo Judaeo of Tortosa and printed by Nicola Jenson Gallicum at Venice in 1471, and become widely known in Europe under the title of “*Liber Servitoris de preparatione Medici*

arum simplified”.¹⁵

Treatise XXIX, Part V of *al-Tasreef* was translated into Latin named as “*Explicatio ponderum et mensurarum in libris medicis accurrentium*” according to the Arabic MS No.42 and published from the Bodleian Library in Oxford; and Treatise XXX, translated into Latin by Gerard of Cremona (1114-1187 AD) with the title of “*Albucasis methodus medendi cum instrumentis ad omnes fere morbis depictes*” and printed in incunabula at Venice in 1471, and was later printed in 1497, 1499 and 1500 also. In the 16th century about 20 more editions appeared in many European printing centers.^{10, 14} This treatise played a major role and as a primary source of medical text in the universities of Europe from the 12th to the 17th century AD.¹⁶

It went into ten Latin editions between 1497 and 1544. The last edition of the surgical text was that of Johannes Channing in Oxford in 1778, which contained both the original Arabic text and its Latin translation on alternate pages in two volumes.¹⁷ Another Latin translation was done by Peter Argellata on 30th treatise on surgical and

medical instruments was published in 1531.¹⁸

Arabic Text: The first Arabic translation independently, was done at Lucknow, India in 1908 under the auspices of the College of Medicine (presently known as State *Takmil-ut-Tib College*) Hakim al-Molwi Muhammad ‘Abd al ‘Aziz, al-Lucknawi (1855–1911).¹⁴

Urdu translation: Urdu translation of 30th treatise was done by Hindustani Press Kanpur, India entitled “Jarahiyate Zahrawi” in 1947.¹⁹ Another Urdu translation of 30th treatise with same title was published by Central Council for Research in Unani Medicine (CCRUM) in 2012.²⁰

Contribution of Zahrawi in Pharmacy and Pharmacology

Al-Zahrawi (Abulcasis 936–1013) devoted his whole life and brilliance for the betterment practice and advancement of surgery, medicine and pharmacy. He was one of the greatest surgeon of early Islam, and also a great educator and psychiatrist.²¹ His principal writing is the *Kitab al-Tasreef*, a thirty-volume medical encyclopedia.²²

He pioneered the preparation of drugs by distillation and sublimation. His *Liber Servitoris* contains a large number of recipes and elucidated how to prepare simple as well as complex drugs.

There are excellent explanations and comprehensive descriptions of medico-pharmaceutical technology. In syrup section there was description of every pharmaceutical step in preparation as well as methods for making syrup transparent and clear.

He discussed the three natural sources of medicines: vegetable, animal and mineral origin and their compound products. Further the procedures including preparing, washing, burning, roasting, and storing of medicinal products are also discussed.

In 28th treatise, he mentioned Galena, litharge, cadmia and the special procedures for their isolation, cleaning and the physical and chemical treatment. He also mentioned Verdigris, vitriols, method of changing of trioxide arsenic (white arsenic) into red arsenic, method of calcination of mercury, method of making Cinnabar or vermilion by sulphur and mercury, method of salt ammoniac extraction. These method remained as it is up to late European Renaissance.

Al-Zahrawi recommended a caustic distillate which is known in Persian as “deg bardeg” which means earthenware or an urn on top of another

(boiler over boiler) in processing of medicines. He also recommended the use of minerals, elements and precious stones either in individual form or compounded with other simple medicines.

He also mentioned processes for the extraction of juices such as Aloe, Absinthium, Fumitory, Lycium, Galbanum, Sarcocol and Liquorice. Further some more procedures e.g., method of washing Acacia (gum arabic), distilling of camphor, whitening of vinegar, ameliorating colocynth with additional gums, burning Scammony, drying Squill, opium extraction from the poppy, cardamom and lily cooked with honey for medicament. He also described processes for distillation of sandal and other woods, refining of olive oil. A modified and sophisticated method of aromated water of Roses is also discussed by him.

The author also discussed the burning (*Ihraq*) of horns and shells, eggshells, various bones, lobsters and crab, snakes, and scorpions hounds. He described the processes for preparing, cleaning, perfuming and preservation of fats and other greases; purification of honey, and its incorporation with syrups and other compound of medicine and the whitening procedure of wax.

He described in detail various dosage forms like confection, laxatives, pills, enemas, pessaries and suppositories, ordinary syrups with or without vinegar, and robs; strong and purgative aromatic juices, decoctions and infusions; inhalers, gargles and medicinal dusting powders for the treatment of wounds and their pharmacological virtues; and recipes of cordial remedies.

Al-Zahrawi described cosmetics luxuriously spiced perfumery, toiletries, delicacy, hair dressing and charmer adornments, eye salves (pulverized as in kohl, and in liquid form for drops), collyria and eye compresses, balms, liniments and dentifrices.

He is credited for inventing under-arm deodorants, hair removal sticks, hand lotions, hair dyes for changing human hair color, hair care for normalizing kinky or curly hair. Some other cosmetics were also invented by him including solid lipsticks which were perfumed stocks rolled and pressed in special moulds and some mineral oils which were used for medication purposes as well as aesthetic and beautification purposes. He made copious advances in perfumery and discovered perfumed stocks, rolled and pressed in special moulds which are comparable to modern roll-on deodorants. Zahrawi also made-up nasal sprays and developed efficient mouth washes.^{13, 23}

He mentioned properties of diets and drugs, and their preparation, restoration, amelioration, and cooking procedures, identifying of cereals, breads, wines, waters, soft drinks, legumes, meats, fishes.

He also mentioned aging of drugs; medico pharmaceutical nomenclature, and technology; and weights and measures.¹⁴ He mentioned methods of fumigation to kill mice, lice and undesired insects in pharmaceutical vicinity.²¹

Al-Zahrawi was the first physician to use a sponge steeped in aromatics to patient's nostrils and lips. This Arabic innovation consisted in immersing the anesthetic sponge in a boiled solution made of water with resin of the cannabis plant (hashish), opium and wheat infusion. The dried sponge used as a carrier for the active ingredients after the evaporation of solution.²⁴ He also explained advantages and disadvantages of powder and tablet.¹

Three drawing are exhibited in the manuscript versions of the 28th treatise which are related to pharmaceuticals. Their importance lies in the fact that they were projected more as illustrations of pharmaceutical processes rather than as adornment of the manuscript.

Figure 5: Mould for Tablets (Source : Hamarneh



Fig. 14b. Moulds for Tablets. (See p. 160)

1963:72.)

The first two drawings are of molds prepared of ebony wood, or some other kinds of wood, or grinding stone-for making tablets. Zahrawi's *al-Tasreef* refers for the first time how tablet molds are perfectly described and marvelously illustrated.

The chosen board or plate was made of smooth, hard wood piece two fingers in thickness (about 2 inches thick, 9 inches long and 1 1/2 inches wide). It was cut vertically in two halves. Circles equal to the size of the desired tablets are pinched upon both halves and each circled area is imprinted to half the height of the tablet.

For printing name of tablet, a mirror image of the name of the manufactured tablets can be inscribed on one side of the mold. These engravings are painted with suitable oil (*duhn*) similar or complementary to the manufactured medication, which also acts as a lubricant or to prevent sticking of material in the molds. For making the tablets of an exact weight, Zahrawi recommended the following process: Press a small part of the kneaded material into the mold while soft, and then weigh it. If it is lighter than the required weight, widen the engravings in the wood until the pressed tablet achieves the desired weight.²¹

Figure 6: 'The Triple Strainer' (Source: Kremers



SK, Sonnedecker GA. A Pharmaceutical View of Abulcasis Al-Zahrāwī in Moorish Spain: With Special Reference to the "Adhān, ". Brill Archive;

E, Sonnedecker G. Kremers and Urdang's history of pharmacy. Amer. Inst. History of Pharmacy; 1986:27.)

The third pharmaceutical drawing is mentioned under the title: "How to Strain Decoctions and the Illustration of the Strainers '*al-Marawiq*'". It comprises three strainers. The first one is smallest in size and is prepared with thin, porous cloth. The second is larger than the first and is prepared with less porous cloth; while the third which is also the largest, is prepared with thick cohesive cloth. The drawing of the strainers is very practical and scrupulous, and is executed very clearly.

The medication to be prepared was first boiled into decoction and macerated, then strained through a sieve made of hair. Meanwhile the strainer was set so that one would be shelved over the other, with the coarsest on the top and the finest at the bottom. Then, into the strainer, a fluffy (carded) piece of horsehair or washed palm fibers was placed. Thereafter, the decoction was decanted in and strained from the first to second to the third. The filtrate was collected from the strainer to a receiver underneath. The useless was then removed while the clear and useful filtrate was taken for use either alone or mixed with other syrup.²¹

DISCUSSION AND CONCLUSION

Abul Qasim Zahrawi (936-1013 AD) was not only a great surgeon, but also a great physician, pharmacist and pharmacologist. His expertness in various aspects of medicinal science can be observed and understood by an overview at one of his most famous book *al-Tasreef*. He compiled this book after around 50 years of medical, surgical and pharmaceutical practice and experience. His surgical expertise is mostly known and highlighted by many people. It is true that the basics and foundations of many surgical procedures and instruments are applied today and many things have been adopted from his book. The contribution of *al-Zahrawi* in pharmacy and pharmacology was mostly neglected and not highlighted. In the

present paper we have discussed about *al-Tasreef* and their topics in each volume of the book.

The detail about surgery has been discussed only in volume 30; in most of the volumes from 3 to 29 the description is mainly about different aspects of pharmacy and pharmacology i.e., preparation of different type of compound formulations, their efficacy, preservation and many more. Preparation of sharbat (syrup), sikanjabeen (a liquid dosage form), itrifal (a semisolid dosage form), majoon (Confection), jawarish (a semisolid dosage form), eye drops, safoof (powder), oils, perfumes etc, all are discussed in detail. Some chapters are devoted to dietary regimen, schedule according to age and disease. We have mentioned about some of manuscripts which are present in libraries of different countries. The translations of *al-Tasreef* in different era and different languages have also been mentioned in the paper. A section regarding pharmaceutical and pharmacological contribution is also discussed in the paper.

Thus, it can be concluded that *al-Zahrawi*'s pharmaceutical and pharmacological contribution needs more popularity and publication. It will help people of present era to gain knowledge and apply it in present time which was discussed thousand years ago but applicable even today. Only surgical contribution has made *al-Zahrawi* so great that he is referred as *Father of Surgery*, his pharmaceutical and pharmacological contribution's publicity will benefit more people and elevate his greatness.

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